European Aviation Safety Agency

Notice of Proposed Amendment 2014-26

Halon: Update of Part-26 to comply with ICAO Standards

RMT.0560 — 18.11.2014

EXECUTIVE SUMMARY

This Notice of Proposed Amendment (NPA) addresses an environmental issue related to the replacement of halon in fire protection systems in aircraft cargo compartments, engine and Auxiliary Power Unit (APU) compartments, lavatory waste receptacles and in portable handheld fire extinguishers for use in cabins and crew compartments. It applies to large aeroplanes (CS-25) and large rotorcraft (CS-29).

This rulemaking task takes into account amendments to ICAO Annex 6, applicable as from 15 December 2011, but not yet transposed into common EU rules: Amendment 35 to Part I (International Commercial Air Transport — Aeroplanes), Amendment 30 to Part II (International General Aviation — Aeroplanes) and Amendment 16 to Part III (International Operations — Helicopters). The specific objective is to progressively mitigate the environmental impact that halon extinguishing agents in fire fighting equipment have on the atmosphere and the climate change and to progressively achieve a 'halon-free' aviation, which balances the environmental needs with safe and cost-efficient rules. The Regulatory Impact Assessment (RIA) demonstrates that for cargo and engine/APU compartments the most appropriate option at the present moment is to 'do nothing'.

This NPA, hence, proposes to develop an Opinion to amend Part-26 (Additional Airworthiness Requirements) and a Decision to amend CS-26 (Additional Airworthiness Specifications for Operations), laying out the framework for the replacement of halon in lavatories and in handheld fire extinguishers on newly produced aircraft (i.e. 'forward fit') based on existing Type Certificates (TCs); as from 31 December 2015 in lavatories and as from 31 December 2018 in handheld fire extinguishers. These dates constitute a difference in respect of ICAO Annex 6. No 'forward-fit' dates are mentioned in Commission Regulation (EU) No 744/2010. No 'retrofit' on the aircraft currently in the fleet is proposed.

The proposed changes are expected to maintain safety, improve harmonisation and ensure compliance, albeit with some delay, with ICAO Standards.

A second NPA is planned to cover some CS-23 aeroplanes and some CS-27 rotorcraft often used in international air navigation.

Applicability		**Process map**	
Affected regulations and decisions:	Draft Commission Regulation on additional airworthiness requirements for operations (Part-26) (expected to be adopted 2015/Q1) CS-26 (related AMC/GM) (expected to be adopted 2015/Q1)	Concept Paper:	No
		Terms of Reference (Issue 2):	18.9.2014
		Rulemaking group:	Yes
		RIA type:	Light
		Technical consultation during NPA drafting:	No
Affected stakeholders:	Aircraft manufacturers	Duration of NPA consultation:	3 months
		Review group:	Yes
Driver/origin:	Legal obligation (ICAO alignment)	Focussed consultation:	No
Reference:	ICAO State Letters 44, 45 and 46 of 11 July 2011: Amendment 35 to Part I of Annex 6 to the Chicago Convention applicable as from 15 December 2011 and similar Amendments 30 to Part II and 16 to Part III.	Publication date of the Opinion (simultaneously with the CRD):	2015/Q4
		Publication date of the Decision:	2016/Q4

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1. Procedural information

1.1. The rule development procedure

The European Aviation Safety Agency (hereinafter referred to as the 'Agency') developed this Notice of Proposed Amendment (NPA) in line with Regulation (EC) No 216/2008[1] (hereinafter referred to as the 'Basic Regulation') and the Rulemaking Procedure[2].

This rulemaking activity is included in the Agency's Rulemaking Programme 2014-2017[3] under RMT.0560, whose ToR (Issue 2) have been published on 18 September 2014[4].

The text of this NPA has been developed by the Agency supported by a Group[5] of external experts designated from industry and competent authorities at national level.

The NPA is hereby submitted for consultation of all interested parties[6].

The process map on the title page contains the major milestones of this rulemaking activity to date and provides an outlook of the timescale of the next steps.

A second NPA is planned to cover some CS-23 aeroplanes and some CS-27 rotorcraft often used in international air navigation.

1.2. The structure of this NPA and related documents

Chapter 1 of this NPA contains the procedural information related to this task. Chapter 2 (Explanatory Note) explains the core technical content. Chapter 3 contains the proposed text for the new requirements. Chapter 4 contains the Regulatory Impact Assessment (RIA) showing which options were considered and what impacts were identified, thereby providing the detailed justification for this NPA.

1.3. How to comment on this NPA

Please submit your comments using the automated **Comment-Response Tool (CRT)** available at **http://hub.easa.europa.eu/crt/**[7].

The deadline for submission of comments is **18 February 2015**.

1.4. The next steps in the procedure

Following the closing of the NPA public consultation period, the Agency will review all comments.

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1 Regulation (EC) No 216/2008 of the European Parliament and of the Council of 20 February 2008 on common rules in the field of civil aviation and establishing a European Aviation Safety Agency, and repealing Council Directive 91/670/EEC, Regulation (EC) No 1592/2002 and Directive 2004/36/EC (OJ L 79, 19.3.2008, p. 1).

2 The Agency is bound to follow a structured rulemaking process as required by Article 52(1) of the Basic Regulation. Such process has been adopted by the Agency's Management Board and is referred to as the 'Rulemaking Procedure'. See Management Board Decision concerning the procedure to be applied by the Agency for the issuing of Opinions, Certification Specifications and Guidance Material (Rulemaking Procedure), EASA MB Decision No 01-2012 of 13 March 2012.

3 http://easa.europa.eu/document-library/rulemaking-programmes/revised-2014-2017-rulemaking-programme

4 http://easa.europa.eu/system/files/dfu/ToR%20RMT.0560%20issue%202.pdf

5 http://www.easa.europa.eu/rulemaking/docs/gc/RMT/GC%20RMT.0560.pdf

6 In accordance with Article 52 of the Basic Regulation and Articles 5(3) and 6 of the Rulemaking Procedure.

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

The outcome of the NPA public consultation will be reflected in the respective Comment-Response Document (CRD).

The Agency will publish the CRD simultaneously with the Opinion addressed to the European Commission, which uses it as a technical basis to prepare a legislative proposal. The Opinion will contain proposed changes to the draft Commission Implementing Regulation on Additional Airworthiness Requirements for Operations (Part-26), voted by the EASA Committee in July 2014.

Such Commission Implementing Regulation was proposed by NPA 2012-13 of 13 September 2012. The corresponding CRD to NPA 2012-13, containing also the resulting draft of CS-26, has been published on 27 May 2013 with reactions possible until 29 July 2013. The Agency published Opinion 08/2013[8] proposing the initial issue of Part-26 on 25 September 2013.

The proposal was positively voted by the EU Member States in the EASA Committee in July 2014.

The promulgation of the first issue of Part-26 is, hence, envisaged around end of 2014, before the publication of the Opinion stemming from this NPA, proposing to amend such Part-26 in relation to 'forward fit' of halon in lavatories and portable handheld fire extinguishers.

The CRD to this NPA will also contain the resulting text of the draft Decision to amend Certification Specifications CS-26.

The Decision containing the amendments to CS-26 will be published by the Agency when the related amendment to the Implementing Rule on Part-26 is adopted by the Commission.

8 http://easa.europa.eu/agency-measures/docs/opinions/2013/08/Amending%20Reg%20965-2012%20to%20Opinion%2008-2013.pdf

2. Explanatory Note

2.1. Overview of the issues to be addressed

Given the considerable time gap between the 'end' dates in Regulation (EU) No 744/2010[9] (i.e. 2020 for lavatories and 2025 for handheld fire extinguishers, respectively) and ICAO SARPs (i.e. 2011 for lavatories and 2016 for handheld fire extinguishers, respectively) for newly manufactured aircraft, it is necessary to align Part-26/CS-26 with ICAO Annex 6 in relation to halon matters: Amendment 35 to Part I (International Commercial Air Transport — Aeroplanes), Amendment 30 to Part II (International General Aviation — Aeroplanes) and Amendment 16 to Part III (International Operations — Helicopters), all applicable as from 15 December 2011, but not yet transposed into EU Regulations.

For more detailed analysis of the issues addressed by this proposal, including information on ICAO decisions, EU Regulations and EASA Certification Specifications, please refer to the RIA Section 4.1. 'Issues to be addressed'.

2.2. Interfaces

Rulemaking Task RMT.0273 (MDM.071) already removed any mention of halon from Book 1 of CS-25[10], CS-23[11] and CS-29[12], adding in parallel Guidance Material to 'Book 2' of said CSs. These amendments brought Agency's rules in compliance with amendment 103 to ICAO Annex 8, applicable to new aircraft models (i.e. new designs). However, they have effect only on new applications for Type Certificates.

The above-mentioned Certification Specifications are harmonised with currently applicable AIR-OPS rules CAT.IDE.A/H.250, NCC.IDE.A/H.205, NCO.IDE.A/H.160 and SPO.IDE.A/H.180, reproduced for ease of reference in Appendix A.

The Agency plans to issue a new specific ETSO-2C515 on halon-free portable fire extinguishers to be used in aircraft cabins, based on industry standard SAE AS 6271 (Halocarbon Clean Agent Handheld Fire Extinguisher). This task is being progressed through RMT.0206 (ETSO.011). Readers are reminded that the application of an ETSO is voluntary.

The Agency has also planned rulemaking task RMT.0368 to address the safety concerns raised about the halon contamination occurrences in civil aviation. RMT.0368 has the objective to ensure that owners, air operators, aviation suppliers and maintenance organisations verify the quality of halons in their possession or those provided by suppliers.

Regulation (EU) No 744/2010 prohibits halon in new applications for Type Certificates ('cut-off') in relation to engine nacelles and APU (after 31 December 2014) and to normally unoccupied cargo compartments (after 31 December 2018).

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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 halons (OJ L 218, 19.8.2010, p. 2).

10 Amendment 12 to CS-25, including halon, published on 6 July 2012.

11 Amendment 3 to CS-23 published on 13 July 2012 (only on halon matters).

12 Amendment 3 to CS-29 , including halon, published on 11 December 2012.

2.3. Objectives

The overall objectives of the EASA system are defined in Article 2 of the Basic Regulation. This proposal will contribute to the achievement of the overall objectives by addressing the issues outlined in this NPA.

The specific objective of this proposal is to publish an Opinion and an ED Decision, respectively, amending Part-26 and CS-26 (whose resulting draft text was published in mentioned CRD to NPA 2012-13) to comply with the ICAO SARPs in Annex 6 for lavatory waste receptacles and handheld fire extinguishers in cabins and crew compartments on newly produced (i.e. forward-fit) CS-25 large aeroplanes and CS-29 large helicopters. These rules are proposed to apply as from the date specified in the foreseen Commission Regulation and not earlier than the publication of such Regulation in the Official Journal of the EU (no retroactivity).

This NPA does not propose any 'retrofit' on the existing fleet since:

— retrofit is not mandated by ICAO;

— in the EU, retrofit is mandated by Regulation (EU) No 744/2010 ('end dates'), unless derogation per Article 13 of Regulation (EC) No 1005/2009[13] applies.

2.4. Summary of the Regulatory Impact Assessment (RIA)

2.4.1. General

The RIA focusses on '**forward fit of lavatory and portable extinguishers**' since:

— halon has already been eliminated from Agency's Certification Specifications (CSs), which cover new applications for Type Certificates (compliant with ICAO Annex 8 and with 'cut-off' dates in Regulation (EU) No 744/2010);

— retrofit is not mandated by ICAO, but already established in the EU by said Regulation (EU) No 744/2010;

— ICAO has adopted standards in Annex 6, for the time being only covering handheld (portable) and lavatory fire extinguishers.

2.4.2. Handheld fire extinguishers

For handheld fire extinguishers, three options have been identified and compared using the Multi-Criteria Analysis (MCA):

— Option 0 (i.e. 'do nothing') is not a viable option, although market forces will drive transition anyway due to the decreasing halon supplies and although 'end dates' in Regulation (EU) No 744/2010 still apply. In fact Option 0 will not transpose existing ICAO SARPs, which are mandatory according to the Chicago Convention[14] (unless a difference is notified). Furthermore it will contravene Article 2.2(d) of the Basic Regulation which mandates the Agency

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

[14] http://www.mcgill.ca/files/iasl/chicago1944a.pdf

to take in due account the ICAO provisions, including the amendments to the Annexes to the Chicago Convention.

— Option 1 (i.e. forward fit on large aircraft as from 31 December 2016 onwards, date as standardised by ICAO), although being slightly positive for regulatory harmonisation, is, however, overall almost as negative as Option 0 and in particular significantly negative in economic terms and highly negative from the environmental perspective.

— Option 2 (i.e. forward fit on large aircraft, however by 2018 and not by 2016) is the only one exhibiting a clearly positive overall score while all options are equivalent and neutral in terms of safety. It is the best from the environmental perspective (as Option 3).

In conclusion, Option 2 (i.e. forward fit on large aircraft as standardised by ICAO, however by 2018 and not by 2016) is the preferred one for this NPA, allowing for a feasible transition to either 2-BTP or, if needed, to the worst case scenario as agreed to by the industry during the 3rd International Halon Replacement Coordinating Meeting (IHRCM/3) in 2012.

2.4.3. Lavatory fire extinguishers

For fixed fire extinguishers installed in lavatory waste receptacles, four options have been identified and compared using the Multi-Criteria Analysis (MCA):

— Option 0 ('do nothing') is not a long-term viable option due to the decreasing halon supplies and the deviation from the harmonisation with the ICAO and FAA in case that no action would be taken. Overall, it has a negative score.

— Option 1 (MPS-based rules to mandate forward fit from 2015, which is four years later than required by ICAO) is nevertheless positive from the regulatory harmonisation point of view since based on the FAA MPS. It is the only one exhibiting a positive overall score although minimal.

— Option 2 (prescribe forward fit of HFC-236fa or HFC-227ea) has a significantly negative overall score and is in particular negative from the economic and harmonisation point of view.

— Option 3 (retrofit on aircraft delivered on or after 31 December 2011), although implementing a corrective action to comply ex-post with the ICAO standard, is the most negative in particular from the economic point of view.

Hence, Option 1 is the one to be recommended.

2.4.4. Derogations

In any case, Article 13(4) of Regulation (EC) No 1005/2009[15] allows derogations from 'cut-off' and 'end dates', where it is demonstrated that no technically and economically feasible alternative is available, and this is accepted by the European Commission based on a proposal by the national authority (not the aviation authority) competent for the matter.

[15] http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:02009R1005-20131125&qid=1406969959053&from=EN

2.5. Overview of the proposed amendments

The changes to draft Commission Implementing Regulation (EU) No XXX/XXXX (Part-26), voted by the EASA Committee in July 2014, envisaged through this NPA, are:

Inclusion of a new definition in Article 2 to extend the applicability of this Regulation from large aeroplanes to large helicopters, where, in fact, fire extinguishers may be present.

In Subpart B, a new rule (26.170) to mandate the use of halon alternatives on newly produced large aeroplanes, based on existing Type Certificates (TCs) for fire extinguishers located in lavatory and cabin and crew compartments.

A new Subpart C to mandate the use of halon alternatives in newly produced large helicopters for fire extinguishers located in lavatory and cabin and crew compartments.

The envisaged changes to Decision No XXX/XXXX (CS-26) are:

Book 1

A new paragraph in Subpart B to detail the Certification Specifications for the fire-extinguishing agents used in newly produced large aeroplanes for fire extinguishers located in lavatory and cabin and crew compartments.

A new Subpart C to detail the Certification Specifications for the fire-extinguishing agents used in newly produced large helicopters for fire extinguishers located in lavatory and cabin and crew compartments.

3. Proposed amendments

The text of the amendment is arranged to show deleted text, new or amended text as shown below:

(a) deleted text is marked with ~~strike through~~;

(b) new or amended text is highlighted in grey;

(c) An ellipsis (…) indicates that the remaining text is unchanged in front of or following the reflected amendment.

3.1. Draft Regulation (amending EASA Opinion No 08/2013 of 25 September 2013 — Part-26)

DRAFT COMMISSION IMPLEMENTING REGULATION (EU) No XXX/201X

of […]
amending Commission Implementing Regulation (EU) No XXX/201X on additional airworthiness requirements for operations

THE EUROPEAN COMMISSION,

Having regard to the Treaty on the Functioning of the European Union,

Having regard to Regulation (EC) No 216/2008[16] of the European Parliament and of the Council of 20 February 2008 on common rules in the field of civil aviation and establishing a European Aviation Safety Agency as last amended by Commission Regulation (EU) No 6/2013[17], and in particular Articles 2 and 5 and Annex I thereto,

Whereas:

(1) Pursuant to Regulation (EC) No 216/2008, the Commission is required to adopt appropriate provisions on the safety of civil aviation, taking into account also the Standards and Recommended Practices (SARPs) of the International Civil Aviation Organization (ICAO);

(2) Accordingly, the Commission adopted the Commission Implementing Regulation (EU) No XXX/201X on additional airworthiness requirements for operations;

(3) By State Letters AN 11/1.3.24-11/44, AN 11/6.3.24-11/45 and AN 11/32.3.8-11/46 of 11 July 2011, ICAO has informed contracting States of the adoption of Amendment 35 to Part I (International Commercial Air Transport — Aeroplanes), Amendment 30 to Part II (International General Aviation — Aeroplanes) and Amendment 16 to Part III (International Operations — Helicopters) of Annex 6 to the Chicago Convention, all applicable from 15 December 2011;

(4) Said ICAO Standards require equipping newly produced aircraft with halon-free fire extinguishers used in lavatories and cabin and crew compartments;

(5) The European Aviation Safety Agency prepared draft implementing rules and submitted them as an Opinion to the Commission in accordance with Article 19(1) of Regulation (EC) No 216/2008;

(6) The measures provided for in this Regulation are in accordance with the opinion of the Committee established by Article 65 of Regulation (EC) No 216/2008,

HAS ADOPTED THIS REGULATION:

Article 1

The Commission Implementing Regulation (EU) No XXX/201X is amended as follows:

1. A new paragraph (c) is introduced in Article 2 as follows:

[16] OJ L 79, 19.3.2008, p. 1.
[17] OJ L 4, 09.01.2013, p. 34.

… 'Large helicopter' shall mean a helicopter that has the Certification Specifications for large rotorcraft 'CS-29' or equivalent in its certification basis.

2. A new paragraph 26.170 is introduced in Subpart B (Large Aeroplanes) of Annex I (Part-26):

ANNEX I (PART-26)
Additional airworthiness requirements for operations

SUBPART B — LARGE AEROPLANES

26.170 Fire extinguishers

Operators of large aeroplanes shall ensure that built-in fire extinguishers for each lavatory waste receptacle for towels, paper or waste in a large aeroplane for which the individual certificate of airworthiness is first issued on or after 31 December 2015 and portable fire extinguishers in a large aeroplane for which the individual certificate of airworthiness is first issued on or after 31 December 2018 do not use halon as an extinguishing agent.

3. A new Subpart C (Large Rotorcraft) is added to Annex I (Part-26):

SUBPART C — LARGE ROTORCRAFT

26.400 Fire extinguishers

Operators of large rotorcraft shall ensure that built-in fire extinguishers for each lavatory waste receptacle for towels, paper or waste in a large rotorcraft for which the individual certificate of airworthiness is first issued on or after 31 December 2015, and portable fire extinguishers in a large rotorcraft, for which the individual certificate of airworthiness is first issued on or after 31 December 2018, do not use halon as an extinguishing agent.

3.2. Draft Certification Specifications (Draft EASA Decision CS-26)

CS-26
Additional airworthiness specifications for operations
BOOK 1

SUBPART B — LARGE AEROPLANES

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CS 26.170 Fire extinguishers

Compliance with 26.170 is demonstrated by complying with the following:

(a) Any agent used in a built-in fire extinguisher for each lavatory waste receptacle and any extinguishing agent used in a portable fire extinguisher for cabins and crew compartments is not listed in Annex A, Group II of the Montreal Protocol on Substances that Deplete the Ozone Layer, 8th Edition, 2009; and
(b) Any fire extinguisher meets the Minimum Performance Standards (see GM1 26.170(b)).

SUBPART C — LARGE ROTORCRAFT

CS 26.400 Fire extinguishers

Compliance with 26.400 is demonstrated by complying with the following:

(a) Any agent used in a built-in fire extinguisher for each lavatory waste receptacle and any extinguishing agent used in a portable fire extinguisher for cabins and crew compartments is not listed in Annex A, Group II of the Montreal Protocol on Substances that Deplete the Ozone Layer, 8th Edition, 2009; and
(b) Any fire extinguisher meets the Minimum Performance Standards (see GM1 26.170(b)).

3.3. Draft Acceptable Means of Compliance and Guidance Material (Draft EASA Decision)

CS-26
Additional airworthiness specifications for operations
BOOK 2 — GUIDANCE MATERIAL (GM)

SUBPART B — LARGE AEROPLANES

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GM1 26.170(b) Fire extinguishers

1. LAVATORY FIRE EXTINGUISHERS

Minimum Performance Standards (MPS) for fire extinguishers used in lavatory waste receptacles are laid down in Appendix D to Report DOT/FAA/AR96/122 of February 1997. They are applicable when showing compliance with CS 26.170(b).

General guidance on the alternative extinguishing agents considered as acceptable can be found in AMC 25.851(c) in CS-25.

2. HANDHELD FIRE EXTINGUISHERS

Minimum Performance Standards (MPS) for fire extinguishers used in handheld fire-extinguishing agents are laid down in SAE AS 6271 or equivalent. They are applicable when showing compliance with CS 26.170(b).

General guidance on the alternative extinguishing agents considered as acceptable can be found in AMC 25.851(c) in CS-25.

SUBPART C — LARGE ROTORCRAFT

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GM1 26.400(b) Fire extinguishers

1. LAVATORY FIRE EXTINGUISHERS

Minimum Performance Standards (MPS) for fire extinguishers used in lavatory waste receptacles are laid down in Appendix D to Report DOT/FAA/AR96/122 of February 1997. They are applicable when showing compliance with CS 26.400(b).

General guidance on the alternative extinguishing agents considered as acceptable can be found in AMC 29.1197 in CS-29.

2. HANDHELD FIRE EXTINGUISHERS

Minimum Performance Standards (MPS) for handheld fire extinguishers are laid down in SAE AS 6271 or equivalent. They are applicable when showing compliance with CS 26.100(b).

General guidance on the alternative extinguishing agents considered as acceptable can be found in AMC 29.1197 in CS-29.

4. Regulatory Impact Assessment (RIA)

4.1. Issues to be addressed

4.1.1. Halons in aviation

Halon 1211, halon 1301 and halon 2402, successfully used for decades by civil aviation for fire-extinguishing purposes, have been demonstrated as ozone-depleting substances.

Their production (or import) in the EU Member States has been limited since 1985 and banned since 1994 in line with the Vienna Convention for the Protection of the Ozone Layer[18] and the subsequent Montreal Protocol on Substances that Deplete the Ozone Layer[19].

However, their use has been allowed to continue for certain 'critical uses', i.e. those for which a safe and feasible alternative for replacement was not yet available at the end of the 20th century. Aviation was considered 'critical use' and, therefore, halon is still used today in civil aircraft, mainly for fire protection of:

(a) unoccupied cargo compartments;

(b) compartments hosting engines and auxiliary power units (APU);

(c) cabin and crew compartments through handheld (portable) fire extinguishers;

(d) cargo/baggage compartment accessible in flight through handheld (portable) fire extinguishers; and

(e) fire extinguishers in lavatory waste receptacles.

4.1.2. EU Regulations on substances depleting the ozone layer

In the EU, the use of halons in aviation has been allowed to continue for certain 'critical uses' under the exemption of Article 13(1) [20] of Regulation (EC) No 1005/2009.

Therefore, halon is still used today in civil aircraft for all four applications mentioned in 4.1.1 and for other optional applications in business aviation, such as protection of electrical equipment against fire in extremely small volumes.

Nevertheless, in subsequent Article 13(2) of said Regulation, the EU legislator tasked the Commission to review the exemptions for critical uses and, where appropriate, to progressively adopt phase-out dates even for those critical uses, taking into account the availability of technically and economically feasible alternatives.

In 2010, the European Commission, hence, adopted Regulation (EU) No 744/2010, which establishes for each application:

— **cut-off dates**, after which the use of halon for new equipment or facilities (i.e. related to new applications for aircraft type certification) would no longer be permitted; and

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18 http://ozone.unep.org/Publications/VC_Handbook/VC-Handbook-2012.pdf

19 http://ozone.unep.org/pdfs/Montreal-Protocol2000.pdf

20 Article 13 (Critical uses of halons and decommissioning of equipment containing halons) of Regulation (EC) No 1005/2009.

— **end dates**, after which the use of halon would no longer be permitted, i.e. all aircraft halon fire extinguishers and fire protection systems should be decommissioned (= retrofit on the fleet).

The 'end date' indirectly implies that halon can no longer be implemented on newly manufactured aircraft on the basis of existing Type Certificates (= forward fit on aircraft not yet delivered to operators). In fact, said Regulation (EU) No 744/2010 does not explicitly mention a termination date for installation or use of halon in newly manufactured aircraft (i.e. forward fit) according to an existing Type Certificate before the end dates.

A summary of the dates contained in Regulation (EU) No 744/2010 is presented in the table below:

Table 1: EU applicable dates for halon replacement in civil aviation

Regulation (EU) No 744/2010[21]				
Purpose	**Location of fire extinguishers or fire-extinguishing systems**	**Type of extinguisher**	**Type of halon**	**Dates**
End date[22] (Mandatory **Retrofit**)	Normally unoccupied cargo compartments	Fixed	1301 1211 2402	2040
	Handheld in cabins and crew compartments	Portable (handheld)	1211 2402	2025
	Engine nacelles and APU	Fixed	1301 1211 2402	2040
	Lavatory waste receptacles	Fixed	1301 1211 2402	2020
Forward fit New applications for individual Certificate of Airworthiness (CofA)	Normally unoccupied cargo compartments	Fixed	1301 1211 2402	**Not mentioned**
	Handheld in cabins and crew compartments	Portable (handheld)	1211 2402	
	Engine nacelles and APU	Fixed	1301 1211 2402	
	Lavatory waste receptacles	Fixed	1301 1211 2402	
Cut-off[23] New applications for Type Certificates (new design)	Normally unoccupied cargo compartments	Fixed	1301 1211 2402	2018
	Handheld in cabins and crew compartments	Portable (handheld)	1211 2402	2014

[21] Regulation (EU) No 744/2010 does not mention a date for newly manufactured aircraft (i.e. date of request of the individual Certificate of Airworthiness), according to an existing Type Certificate.

[22] After the end date, the use of halon would no longer be permitted; all halon fire extinguishers and fire protection systems should be replaced, converted or decommissioned by this date.

[23] No new application for Type Certificates possible if halon is present in the design unless derogation is obtained as per Article 13(4) of Regulation (EC) No 1005/2009.

	Engine nacelles and APU	Fixed	1301 1211 2402	2014
	Lavatory waste receptacles	Fixed	1301 1211 2402	2011

4.1.3. ICAO Resolutions and Standards

The ICAO General Assembly discussed halon matters for the first time at its 36th session in 2007. On that occasion, it adopted Resolution A36-12, which requested the Council to consider a mandate to be effective in the 2011 timeframe for the replacement of halon in:

— lavatories for new production aircraft (i.e. forward fit); and
— lavatories, handheld extinguishers, engines and APU for aircraft for which a new application for type certification was submitted (i.e. 'cut-off' for new designs).

Same Resolution requested the Council to consider a mandate to be effective in the 2014 timeframe for the replacement of halon in handheld extinguishers for new production aircraft.

Said Resolution, reproduced in Appendix B only for information purposes (since it is no longer in force), implicitly acknowledged that alternatives for halon were (in 2007):

— almost mature for lavatories;
— under development for handheld fire extinguishers and fire-extinguishing systems in engine/APU compartments; but
— not yet identified for cargo compartments, which represent the application requiring the largest quantities of halon (further information on alternatives to halon in cargo compartments is provided only for information purposes in Appendix C).

ICAO Assembly Resolution A36-12 did not, however, produce any amendment to the ICAO Standards before the subsequent 37th session of the General Assembly in 2010.

In preparation of this 37th session, the International Halon Replacement Coordinating Meeting (IHRCM), populated by industry and regulators, recommended to ICAO to adopt achievable timeframes regarding halon replacement in aviation applications. Therefore, the Assembly adopted new timeframes by Resolution A37-9 in 2010, reproduced in Appendix D.

This Resolution A37-9 repealed the former A36-12 and de facto postponed the cut-off date for engines/APU to 2014 and the forward fit for handheld fire extinguishers to 2016, taking into account that the developed alternatives where not totally satisfactory. Additional information on development of alternatives to halon for engines/APU is provided in Appendix E.

Specific timeframes were, hence, introduced in 2011 in Annex 8 (Airworthiness) to the Chicago Convention by Amendment 103 (reproduced in Appendix F) and in Annex 6 (Operation of Aircraft) by Amendment 35 to Part I[24], Amendment 30 to Part II[25] and Amendment 16 to Part III[26], respectively, reproduced in Appendices G, H and I, as Standards and Recommended Practices (SARPs).

[24] Amendment 35 to ICAO Annex 6 — Operation of Aircraft, Part I — International Commercial Air Transport — Aeroplanes

[25] Amendment 30 to ICAO Annex 6 —Operation of Aircraft, Part II — International General Aviation — Aeroplanes

Finally the 38th session of the ICAO General Assembly (2013) repealed Resolution A37-9 and replaced it by A38-9, reproduced in Appendix J. This latter Resolution does not mention any dates (i.e. implicitly confirming the already agreed ones), and postpones the decision on the timeframes for replacement in cargo compartments to a subsequent session (possibly the 39th in 2016). ICCAIA had presented its concerns to this session of the Assembly (see Appendix K).

A summary of the dates agreed in ICAO is presented in the table below:

Table 2: ICAO applicable dates for halon replacement in civil aviation

Dates agreed or standardised by ICAO					
Purpose	**Location of fire extinguishers**	**A36-12 2007**	**A37-9 2010**	**Amendments Annexes 6 and 8, 2011**	**A38-9 2013**
End date[27] (Mandatory **retrofit**)	Normally unoccupied cargo compartments	**Never considered by ICAO**			
	Handheld in cabins and crew compartments				
	Engine nacelles and APU				
	Lavatory waste receptacles				
Forward fit New applications for individual Certificate of Airworthiness (CofA)	Normally unoccupied cargo compartments	Not mentioned	Not mentioned	Not mentioned	Not mentioned
	Handheld in cabins and crew compartments	2014	2016 (postponed)	2016	Not mentioned since already in SARPs
	Engine nacelles and APU	Not mentioned	Not mentioned	Not mentioned	Not mentioned
	Lavatory waste receptacles	2011	2011 (confirmed)	2011	Not mentioned since already in SARPs
Cut-off[28] New applications	Normally unoccupied cargo	Not mentioned	Not mentioned	Not mentioned	Not mentioned (decision

[26] Amendment 16 to ICAO Annex 6 — Operation of Aircraft, Part III — International Operations — Helicopters

[27] After the end date, the use of halon would no longer be permitted; all halon fire extinguishers and fire protection systems should be replaced, converted or decommissioned by this date.

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

for Type Certificates (new design)	compartments				postponed to 2016)
	Handheld in cabins and crew compartments	2011	Not mentioned (but implicitly postponed by 2 years)	Not mentioned	Not mentioned
	Engine nacelles and APU	2011	2014	2014	Not mentioned since already in SARPs
	Lavatory waste receptacles	2011	Not mentioned (implicitly confirmed)	2014 (postponed)	

Observing Table 2 above, one could conclude that ICAO presently considers alternatives to halon:

(a) not yet mature to take any decision for cargo compartments;

(b) mature for 'cut-off' (i.e. new applications for Type Certificates) in compartments hosting engines and auxiliary power units (APU), but in this case not yet mature for forward fit;

(c) mature, but not optimal (date has been postponed) for cabin and crew compartments through handheld (portable) fire extinguishers; and

(d) mature for 'cut-off' and forward fit for fire extinguishers in lavatory waste receptacles.

Finally, since no compelling safety needs have been identified, and since this will often be technically not possible, so far ICAO has constantly excluded retrofit.

4.1.4. Agency Certification Specifications (CSs) and OPS rules

'Cut-off' dates (i.e. related to new applications for Type Certificates) are linked to Agency Certification Specifications, and in particular to CS-23, CS-25, CS-27 and CS-29.

Rulemaking Task RMT.0273 (MDM.071) already removed any mention of halon from Book 1 of CS-25[29] (Large Aeroplanes), CS-23[30] (Normal, Utility, Aerobatic And Commuter Category Aeroplanes), and CS-29[31] (Large Rotorcraft), adding in parallel Guidance Material to 'Books 2' of said CSs.

As explained in NPA 2011-14[32] no amendment was necessary to CS-27 (small rotorcraft), since this latter CS, when necessary, makes reference to CS-29.

The amendments to CS-23, CS-25 and CS-29 brought the Agency's rules in compliance with Amendment 103 to ICAO Annex 8, applicable to new applications for Type Certificates (TCs). In general:

— they do not mandate any specific fire-extinguishing agent in Book 1;

[29] http://easa.europa.eu/agency-measures/docs/certification-specifications/CS-25/CS-25%20Amdt%2012.pdf
[30] http://easa.europa.eu/agency-measures/docs/certification-specifications/CS-23/CS-23%20Amdt%203.pdf
[31] http://easa.europa.eu/agency-measures/docs/agency-decisions/2012/2012-022-R/CS-29%20Amendment%203.pdf
[32] http://easa.europa.eu/rulemaking/docs/npa/2011/NPA%202011-14.pdf

— they provide information on applicable EU law and available alternatives to halon in 'Book 2', as known in 2012.

In other words, according to the present text of mentioned 'Books 1', after the cut-off dates in Regulation (EU) No 744/2010, applicants for a TC or supplemental TC are free to propose agents different from halon providing that they satisfy the minimum performance requirements. The further evolution of the state of art for halon alternative agents is not at all constrained by mentioned CSs since no specific agent is mandated in them.

A summary of the existing EASA Certification Specifications for handheld fire extinguishers and lavatory waste receptacles, compliant with amendment 103 to ICAO Annex 8, is presented in Table 3 below:

Table 3: EASA Certification Specifications for handheld fire extinguishers and lavatory waste receptacles

<table>
<tr><th>EASA CS/ Application</th><th>CS-23</th><th>CS-25</th><th>CS-27</th><th>CS-29</th></tr>
<tr><td>Handheld fire extinguishers</td><td>CS 23.851</td><td>CS 25.851</td><td>n/a</td><td>CS 29.853</td></tr>
<tr><td>Pilot compartment</td><td>at least one hand fire extinguisher</td><td>at least one hand fire extinguisher</td><td></td><td>one hand fire extinguisher for the flight crew members</td></tr>
<tr><td>Passenger compartment</td><td>— at least one hand fire extinguisher if more than 6 passengers
— at least one hand fire extinguisher on each commuter category aeroplane</td><td><table><tr><th>Passenger capacity</th><th>Number of extinguishers</th></tr><tr><td>7 to 30</td><td>1</td></tr><tr><td>31 to 60</td><td>2</td></tr><tr><td>61 to 200</td><td>3</td></tr><tr><td>201 to 300</td><td>4</td></tr><tr><td>301 to 400</td><td>5</td></tr><tr><td>401 to 500</td><td>6</td></tr><tr><td>501 to 600</td><td>7</td></tr><tr><td>601 to 700</td><td>8</td></tr></table></td><td></td><td><table><tr><th>Passenger capacity</th><th>Number of extinguishers</th></tr><tr><td>7 to 30</td><td>1</td></tr><tr><td>31 to 60</td><td>2</td></tr><tr><td>61 or more</td><td>3</td></tr></table></td></tr>
<tr><td>Baggage compartment (Class B)</td><td>at least one dedicated fire extinguisher</td><td>CS 25.857</td><td></td><td></td></tr>
<tr><td>Built-in fire extinguishers</td><td>n/a</td><td>CS 25.854</td><td>n/a</td><td>n/a</td></tr>
<tr><td>Lavatory waste receptacles</td><td></td><td>each lavatory must be equipped with a built-in fire extinguisher for each waste receptacle for towels, paper, or waste located within the lavatory for</td><td></td><td></td></tr>
</table>

EASA CS/ Application	CS-23	CS-25	CS-27	CS-29
		aeroplanes with more than 20 passengers		

The above-mentioned Certification Specifications are harmonised with currently applicable AIR-OPS rules CAT.IDE.A/H.250, NCC.IDE.A/H.205, NCO.IDE.A/H.160 and SPO.IDE.A/H.180.

Readers should note that the Chicago Convention applies to international civil aviation, regardless whether the operation is commercial or non-commercial and regardless of the aircraft category.

Such distinction (international versus domestic) is not applicable to EU/Agency rules. Furthermore, EU/Agency rules cover also aerial work (alias 'special operations': Part-SPO), which is out of scope of current ICAO Annex 6.

Therefore, it is not possible to transpose the ICAO provisions using the word 'international', which does not fit into the EU regulatory framework.

This NPA is, hence, limited to large aeroplanes (i.e. certified against CS-25) and large helicopters (CS-29), which are the most frequently used aircraft categories for international operations.

A second NPA from the same RMT.0560 will cover some CS-23 aeroplanes and some CS-27 rotorcraft, which are likely to be employed for international civil operations.

Lighter aircraft could be legally used for cross-border international operations within the EU, but their interest for global civil aviation is marginal, and therefore they are out of scope of mentioned RMT.0560.

4.1.5. Halon reserves

According to the UNEP[33] estimation, the halon reserves in Europe have decreased and are projected to decrease furthermore after the year 2015.

Consequently, the cost of halon procurement is expected to increase as supply availability declines.

4.1.6. Development of halon alternatives

The International Aircraft Systems Fire Protection Working Group (IASFPWG) — formerly known as 'The International Halon Replacement Working Group' (IHRWG) — is tasked to develop Minimum Performance Standard (MPS) for fire-extinguishing applications regarding non-halon aircraft fire suppression agents/systems in cargo compartments, engine nacelles, handheld (portable) extinguishers, and lavatory waste receptacles.

In order to safely phase out halons from all civil aviation applications, it must in fact be ensured that the alternatives replacing them meet the stringent aircraft-specific requirements by having at least the same performance.

Particularly, in order to maintain the same level of safety:

[33] United Nations Environment Programme (UNEP) 2010 Assessment Report of the Halons Technical Options Committee, March 2011.

(a) the fire suppression efficiency shall be maintained;

(b) the non-corrosive property shall be maintained as well; and

(c) the level of toxicity shall not be increased.

Furthermore, there are a number of additional highly desirable characteristics that an alternative to halon should meet, particularly in relation to environmental matters, for example not only low Ozone-Depleting Potential (ODP), but also low Global Warming Potential (GWP), and atmospheric lifetime as short as possible.

4.1.7. Safety risk assessment

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

In other words, while it is extremely improbable that halon will prove inefficient in extinguishing a fire inside an aircraft, the consequences can be catastrophic.

Applying Minimum Performance Specifications (MPS) to halon alternatives will ensure that such effectiveness in extinguishing fires will be maintained; however, the potential consequences still remain catastrophic.

The above can be summarised in the safety risk matrix in Table 4 below:

Table 4: Safety risk matrix

Probability of occurrence	**Severity of occurrence**				
	Negligible	**Minor**	**Major**	**Hazardous**	**Catastrophic**
Extremely improbable					**X**
Improbable					
Remote					
Occasional					
Frequent					

4.1.8. Who is affected?

The following stakeholders have been identified as possibly affected:

— Approved Design Organisations (ADO) and in particular aircraft TC holders;

— in addition to ADOs, Production Organisations (in case of forward fit); and

— aircraft operators.

4.1.9. How could the issue/problem evolve?

The majority of halon presently used by civil aviation is recycled. This gas has, therefore, become a limited resource, since no longer in production. Due to this, the costs are already rising and they will continue to rise in the future. It is legitimate to assume that halon will be considered a preserved and valued commodity. Intentional releases into the environment would, hence, be extremely limited, leading to less depletion of the ozone layer.

At present, the halon demands of aviation are met by recycling agents withdrawn from applications in other industries. This source of supply will be dramatically reduced, long before the aircraft now being built and fitted with halon systems are retired.

Civil aviation operators who have not already done so are, hence, strongly advised to:

— consider whether the installed stocks of halon they own are sufficient to meet their long-term needs;

— ascertain whether these stocks are being properly managed to ensure they are available for their needs; and

— continue to implement policies that eliminate or minimise discharge of halon in testing, training, and maintenance.

4.2. Objectives

The general objectives given by the EU legislator to the Agency are listed in Article 2 of the Basic Regulation. They give priority to high safety but include in fact other tasks for the Agency, such as to:

— establish and maintain a level of civil aviation safety not only high, but also uniform across Europe;

— ensure a high uniform level of environmental protection;

— facilitate the free movement of goods, persons and services (e.g. not unduly constraining the evolution of the state of the art);

— promote cost-efficiency in the regulatory and certification processes (e.g. by mandating forward fit or retrofit only when it is absolutely necessary and mature);

— assist Member States in fulfilling their obligations under the Chicago Convention, by providing a basis for a common interpretation and uniform implementation of its provisions, and by ensuring that its provisions are duly taken into account in the Basic Regulation and in the rules drawn up for its implementation.

Based on the above general objectives, the specific objectives of this NPA are:

— to publish an Opinion amending Part-26 (which was proposed by Opinion 08/2013[34] of 18 September 2013) in order to comply with the ICAO Amendments to Annex 6 for lavatory waste receptacles and handheld fire extinguishers in cabins and crew compartments, from the date specified in the foreseen Commission Regulation and not earlier than the publication of such Regulation in the Official Journal of the EU (no retroactivity);

— once the EU Regulation amending Part-26 will be published in the EU Official Journal, to adopt an ED Decision amending CS-26;

— in doing so:

- not to mandate halon alternatives not meeting the Minimum Performance Specifications, which could jeopardise safety;
- not to promote halon alternatives which are even more detrimental (e.g. in terms of Global Warming Potential) to the environment;
- to leave manufacturers and operators free to choose different agents to follow evolution of the state of the art and market conditions; and
- not to mandate retrofit, which is not required by ICAO.

4.3. Structure of the RIA

Besides paragraphs 4.1 and 4.2 above, this RIA contains:

— Paragraph 4.4 on the methodology;

— Paragraph 4.5 on handheld portable fire extinguishers;

— Paragraph 4.6 on fire-extinguishing systems in lavatories; and

— Paragraph 4.7 summarising the conclusions of the RIA.

4.4. Methodology

For each of the two considered applications of halon in civil aviation (i.e. handheld and lavatories) a number of possible options are identified, the first of which (Option 0) is always not to introduce any new or amended rule (alias 'do nothing').

The identified options are then comparatively assessed in terms of safety, environmental, social and economic impacts, as well as proportionality and harmonisation.

All identified impacts are qualitatively assessed (RIA light) and expressed as a score, which is a numerical single digit. This is the principle of the Multi-Criteria Analysis (MCA), which allows translating any assessment (qualitative or quantitative but not in the same units of measurement) into a non-dimensional numerical score, as in the table below:

[34] http://easa.europa.eu/agency-measures/docs/opinions/2013/08/Amending%20Reg%20965-2012%20to%20Opinion%2008-2013.pdf

Table 5: RIA unweighted scores

Scale for assessment of impacts	Score
Highly positive (High)	+5
Significantly positive (Medium)	+3
Slightly positive (Low)	+1
Neutral	0
Slightly negative (Low)	-1
Significantly negative (Medium)	-3
Highly negative (High)	-5

Safety scores, since safety is the primary objective of the Agency as per Article 2 of the Basic Regulation, are assigned a weight of 3. Environmental scores, based on the same Article, have a weight of 2. Other scores' weight is 1.

Finally, all these 'weighted' scores are algebraically summed.

Significant differences in these final weighted scores support the decision on the option to be preferred.

In addition, the unweighted scores are also compared.

4.5. Analysis of impacts — Handheld (portable) fire extinguishers

4.5.1. Halon alternatives for portable fire extinguishers

Table 6: Halon alternatives for handheld (portable) fire extinguishers

Available replacements	Obstacles/ penalties	Status of implementation
HCFC Blend B **HFC-236fa** **HFC-227ea**	— considerable weight and volume penalty; — considerable GWP for HFC-236fa and HFC-227ea; — new training programme for crew; — may be subject to a future phase-out of HFCs, or, in the case of Blend B, ODS restrictions	— HFC-227ea, HFC-236fa and HCFC Blend B, all meet the MPS for UL 5BC rating; — There is at least one aircraft manufacturer having applied for approval of a HCF-236fa (= DuPont FE-36) fire extinguisher; — These alternatives have different volume and weight characteristics compared to existing halon 1211 extinguishers; new brackets and supports may be required for new airframes (new design and new production) and/or retrofit; — Aircraft manufactures are reluctant about implementing the new alternatives due to weight and size penalties; — The expected phase-out initiative due to GWP characteristics creates further uncertainties for aircraft and equipment manufacturers, and for agent suppliers; — On the market, there are already larger fire extinguishers for ratings higher than 5BC.
2-BTP	— Minor weight and volume penalty; — Uncertainties in agent and equipment availability; — Limited supply chain (Status 2014)	— Also a prototype fire extinsuisher filled with 2-BTP passed the MPS testing for UL 5BC rating; — There is no FAA MPS for higher rated fire extinguishers dedicated to accessible (e.g. Class B) baggage compartment are yet available on the market; — 2-BTP is EU REACH registered[35] and proving to be a promising agent without GWP impact and minor weight and volume penalty; — Commercialisation of the agent (not the fire extinguishers) is planned in the best case from end of 2014 onwards.

[35] http://apps.echa.europa.eu/registered/data/dossiers/DISS-fb17a354-2b1c-55c5-e043-1cdf090acd41/DISS-fb17a354-2b1c-55c5-e043-1cdf090acd41_DISS-fb17a354-2b1c-55c5-e043-1cdf090acd41.html

To evaluate the obstacles and penalties the alternatives to halon 1211 may have, the Agency, supported by the RM Group on RMT.0560, selected 2 impact scenarios:

— Worst case scenario: the use of an HFC-236fa or HFC-227ea extinguishing agent (already approved as alternative; HFC-236fa already selected on at least one new aircraft program);
— Best case scenario: the use of the 2-BTP extinguishing agent (on the way to be approved as an alternative at the time of developing this NPA);
— No scenario is under consideration for HCFC Blend B which is an ozone-depleting substance (according to Regulation (EU) No 1005/2009) and, hence, not a viable solution to replace halon.

The participating OEMs' investigations showed that the impacts may substantially vary (weight, size, environmental impact, toxicity) depending on the alternative agent. Table 4 above summarises the main impacts.

4.5.2. Summary of the worst-case scenario

Current MPS-approved halon replacements agents HCFC-Blend B, HFC-236fa and HFC-227ea have a weight and volume penalty, which makes aircraft manufacturers reluctant on implementing them (i.e. the case of handheld extinguishers). At the same time, the prices of halon 1211 and the cost of recycling processes are expected to constantly increase, while the halon 1211 supplies are in decline.

The OEMs' worst case scenario would be the consequence of a potential failure/rejection in getting 2-BTP toxicity results approval by the Environmental Protection Agency (EPA) in the USA. The European Chemical Agency (ECHA) has already registered 2-BTP in May 2014. A negative decision by EPA would have as effect that extinguishers using HFC-236fa (as an example) would have 2.5-times the weight of the standard halon 1211 fire extinguishers, and up to 1.2-times the length/1.6-times the diameter of the standard halon 1211 fire extinguishers. Requiring installation of HFC-236fa extinguishers through regulations which are effective for new production aircraft would result in significant cabin changes, including revised cabin crew training programmes.

In addition, the implementation of forward fit represents a non-interchangeable solution, which may lead to substantial economic impacts: design costs, certification costs (depending on OEM-specific certification experiences and authority-accepted procedures), maintenance and logistic costs. In particular, the substantially increased size of the fire extinguisher will impact the small aircrafts more and the weight increase may impact the firefighting procedures independent of the aircraft size. As such, using already approved extinguishing agents for handheld fire extinguishers may result in additional initial training and changes to recurrent training for both the cabin and the flight crew.

With regard to environmental impact, it has to be taken into account that two of the available MPS-approved alternatives, i.e. HFC-236fa and HFC-227ea, have significant global warming potential (GWP).

Regulation (EC) No 842/2006[36] has established management, recycling, and reporting requirements to minimise emissions of these and other fluorinated greenhouse gases.

[36] Regulation (EC) No 842/2006 of the European Parliament and of the Council of 17 May 2006 on certain fluorinated greenhouse gases (OJ L 161, 14.6.2006, p. 1).

This Regulation has been repealed by the new Regulation (EU) No 517/2014[37] published in the EU Official Journal on 20 May 2014.

This new Regulation bans one HFC (HFC-23) from use in fire protection equipment after 1 January 2016 and imposes a 'placing on the market' of a phase-down of all HFCs to 21% of 2014 levels by 2030. This phase-down is expected to limit availability and increase cost of HFCs and, as such, cause again considerable economic burden for aircraft manufacturers and operators.

Further, due to the weight penalties and increased weight for the modification of the aircraft, using HFC-236fa or HFC-227ea would result in increased fuel consumption and CO_2-emissions.

In summary, the future use of these agents must be considered as an intermediate solution as it may not be a long-term solution due to increasing regulation on greenhouse gases contributing to climate change.

Assuming that the agents HFC-236fa and HFC-227ea will be subject to new regulations and phase-out in the mid-term future, aircraft manufacturers expect to be forced to re-design and re-certify their products without any further safety benefit, but with significant economic burden, although a global, warming-neutral, halon-free fire-extinguishing agent would most probably become available in the near future (see 'best-case scenario' below).

4.5.3. Summary of the 'best-case scenario':

All the aircraft manufacturers represented in the Rulemaking Group for RMT.0560 consider the alternative agent 2-BTP the most promising agent for the future, without adverse environmental impact and low impact on design.

2-BTP passed the MPS tests with a UL 5BC rating prototype. The agent also underwent testing for toxicity and has been registered by the European Chemical Agency (ECHA) and was submitted to approval by EPA in the USA. The EPA must provide SNAP and TSCA approval of BTP before it can be manufactured for production.

Although HFC-236fa is already approved (see 'worst-case scenario' above), the expected phase-out initiative due to GWP characteristics creates further uncertainties and business risks for aircraft and equipment manufacturers, as well as for agent suppliers. On the contrary, implementation of 2 BTP would be a sustainable long-term solution.

Once available on the market, compared to today's halon 1211 fire extinguishers, the use of 2-BTP for handheld extinguishers would result in a close to a 'drop-in' solution with lower design costs (i.e. neither significant mass increase, neither in length nor in diameter).

Even if the application to EPA has been submitted, approval before end 2014 is not 100 % sure. Qualification, certification and production of a new fire extinguisher agent and equipment to allow OEMs to deliver each newly produced aircraft with 2-BTP extinguishers after 31 December 2016 (compliant with ICAO Annex 6) cannot hence be affirmed at the time of publishing this NPA, also because chemical industry may be reluctant to launch full-scale production only for the EU market.

[37] Regulation (EU) No 517/2014 of the European Parliament and of the Council of 16 April 2014 on fluorinated greenhouse gases and repealing Regulation (EC) No 842/2006 (OJ L 150, 20.5.2014, p. 195).

Any possible blockage of aircraft deliveries after 31 December 2016 due to non-availability of compliant fire extinguishers would result in significant economic burden for aircraft manufacturers and airlines, as well as in disturbances to airline operations.

The sustainable solution of using 2-BTP for handheld fire extinguishers would require an implementation deadline in Part-26, which would temporarily differ from the one mandated in current ICAO Annex 6. Differences from ICAO Standards are acceptable if the involved Contracting States notify them according to Article 38 of the Chicago Convention.

Based on the information available to date, the Agency, supported by aircraft manufactures, is convinced that postponing the deadline for forward fit on new production aircraft to 31 December 2018 (i.e. two years later than the ICAO standard) would allow the qualification completion (including higher ratings) and implementation of 2-BTP handheld extinguishers without any blockage of aircraft deliveries and would ensure safe, undisturbed and sustainable air-transport operations.

In summary, focussing on 2-BTP as a replacement agent for use in handheld cabin fire extinguishers would be a solution sustainable in the long term, without GWP increase and without substantial changes to aircraft design and cabin crew emergency procedures. The only shortcoming would be not to meet the deadline of 31 December 2018 (2016 for newly produced aircraft) as mandated by ICAO Annex 6.

4.5.4. Policy options (handheld fire extinguishers)

Based on the scenarios described above, the following three options have, hence, been identified and evaluated.

Table 7: Identified policy options (handheld fire extinguishers)

Option No	***Short title***	**Description**
0	**Do nothing**	— market forces drive the transition; — 'cut-off' date (31 December 2014) in Regulation (EU) No 744/2010 applies; — difference with ICAO Annex 6 (not transposed) for forward fit for an indefinite time; — 'end date' of 2025 for retrofit in Regulation (EU) No 744/2010 still applies; EASA to publish new ETSO-2C515[38] based on SAE Standard AS 6271 (for voluntary application).
1	**Forward fit (CS-25 and CS-29 aircraft, 2016)**	— compliant at the established date with ICAO Annex 6 Part I for large aeroplanes (CS-25), but not necessarily

[38] Already included in ToR RMT.0206: http://www.easa.europa.eu/rulemaking/docs/tor/etso/ToR%20RMT.0206%20(ETSO%20011)%20v9.pdf

		with Annex 6 Part II (international general aviation) and not completely with Part III (international helicopter operations); — EASA to publish new ETSO-2C515 based on SAE Standard AS 6271 (for voluntary application).
2	**Forward fit (CS-25 and CS-29 aircraft, 2018)**	— Compliant, but two years later, with ICAO Annex 6 Part I for large aeroplanes (CS-25), but not necessarily with Annex 6 Part II (international general aviation) and not completely with Part III (international helicopter operations); — EASA to publish new ETSO-2C515 based on SAE Standard AS 6271 (for voluntary application).

4.5.5. Analysis of impacts (handheld fire extinguishers)

4.5.5.1 Safety impact

Current halon alternatives which are allowed to be used in this application have satisfactorily passed the FAA Minimum Performance Standards (MPS) testing. Having passed such a test, they can be judged as equivalent, from the safety perspective, to the halon they replace. 2-BTP has also passed the FAA MPS tests (5BC rating).

All three identified options are, hence, considered neutral from the safety point of view (i.e. the safety remains high as in the current situation).

4.5.5.2 Environmental impact

All the agent alternatives to halon today available, or under advanced development, have an Ozone Depletion Potential (ODP) much smaller than halon.

Two of them (2-BTP and Halotron 1 — HCFC Blend B) have even a lower Global Warming Potential (GWP). But the two other possible alternatives (HFC-236fa or HFC-227ea) have a much higher GWP.

Furthermore, all alternatives (except 2-BTP which is, however, still not fully approved and commercialised) lead to a weight penalty at least twice as high as halon, which implies a significant increase of fuel burnt (and, hence, of CO_2 emissions[39]) along the aircraft life cycle, in proportion greater on smaller airframes.

Finally, an accelerated elimination of halon 1211 use could in reality increase the atmospheric impact due to devaluation and discontinuation of halon recycling. In fact, releases of halon from aircraft are very rare, and the impact to the environment could be worse if the remaining halon supplies across the world were no longer managed as a valuable commodity and were intentionally released (to avoid costly destruction).

[39] http://www.icao.int/environmental-protection/Documents/EnvironmentReport-2010/ICAO_EnvReport10-Ch1_en.pdf

The three identified options can, hence, be compared as in the table below:

Table 8: Environmental impact of options (handheld fire extinguishers)

Option	0	1	2
	Do nothing	**Forward fit (CS-25 & 29, 2016)**	**Forward fit (CS-25 & 29, 2018)**
Assessment	Halon would progressively be eliminated from the fleet (only 'cut-off' for new designs). Existing halon reserves would not lose value and, therefore, will not be intentionally discharged. However, the process would be very slow and, hence, the ODP would not decrease at a satisfactory pace.	Accelerated transition, due to devaluation and discontinuation of halon recycling, could cause an increase of releases of halon in the atmosphere. In addition, there would be more fuel consumption (and related emissions), as well as possibly a much higher GWP if currently available replacements would be used.	A slowed-down transition would allow industry to develop a better alternative (2-BTP), which reduces both the ODP and GWP in comparison to halon. This alternative also represents a much lesser weight increase. Holders of recycled halon reserves would continue to maintain this valuable commodity throughout a longer transition period, which would also facilitate an easier retrofit solution in 2025 (per Regulation (EU) No 744/2010).
Score (unweighted)	-1	-3	3
Weight	Multiply the unweighted score by 2.		
Score (weighted)	**-2**	**-6**	**6**

4.5.5.3 Social impact

The main impact from the social perspective concerns the effect of the extinguishing agent on the health of the workers or people nearby, including flight crews, cabin crews and passengers. In the concentration in which halon and its replacements are used today there is no serious harm for the health.

Any replacement agent must pass the MPS seat fire toxicity test to ensure combustion by-products do not exceed certain toxic gas emission levels. However, depending on the agent, as well as the compartment volume and air exchange rate, neat agent toxicity should also be considered. FAA AC20 42D and supporting documents should be consulted by readers desiring more information on the subject.

With the current knowledge, the 'do nothing' option has to be considered slightly negative and the two other identified options slightly positive from the social perspective.

4.5.5.4 Economic impact

The three identified options can be compared as in the table below:

Table 9: Economic impact of options (handheld fire extinguishers)

Option	0	1	2
	Do nothing	**Forward fit (CS-25 & 29, 2016)**	**Forward fit (CS-25 & 29, 2018)**
Assessment	No impact	For portable extinguishers, substantial impact is expected to implement already existing alternative agents. New equipment has a similar cost, but it is heavier and larger, which implies costly and sometimes difficult modification of the supporting structure. In turn this may require involvement of the Type Certificate holder, making the cost even higher; a new training programme is also required for all flight and cabin crews (several thousands) as the dimensions and handling of the extinguishers change. Accelerated transition would make the economic impact even greater. In this case in fact a second subsequent transition to a better new agent would be required, inevitably leading to additonal cost for this second transition.	Transition cost spread over a greater number of years and no cost for a second transition
Score (unweighted)	0	-3	-1
Weight	Multiply the unweighted score by 1.		
Score (weighted)	0	-3	-1

4.5.5.5 General Aviation and proportionality issues

The taxonomy used in the three Parts of ICAO Annex 6 is different from the taxonomy used in FAA FARs and Agency's rules (AIR OPS and CSs).

In fact ICAO Annex 6 is applicable to:

Table 10: ICAO Annex 6 Applicability

ICAO Annex 6	Applicability
Part I	operation of aeroplanes by operators authorised to conduct international commercial air-transport operations (90 % certified against FAR/CS-25)
Part II, Section 2	international general aviation operations with:

ICAO Annex 6	Applicability
	— aeroplanes with a maximum certificated take-off mass exceeding 5700 kg (i.e. CS-25); or — aeroplanes equipped with one or more turbojet engines (potentially a tiny minority of aircraft certified against FAR/CS-23).
Part III, Section 2 and Section 3	all helicopters engaged in: — international commercial air-transport operations (more often large helicopters certified against FAR/CS-29); or — international general aviation operations, except helicopters engaged in aerial work.

Options 1 and 2 only affect large aeroplanes and large helicopters normally manufactured and used by large organisations for commercial air-transport and seldom used by general aviation due to their relevant acquisition and operating cost.

The three identified options can, hence, be compared as in the table below:

Table 11: Proportionality impact of options (handheld fire extinguishers)

Option	**0**	**1**	**2**
	Do nothing	**Forward fit (CS-25 & 29, 2016)**	**Forward fit (CS-25 & 29, 2018)**
Assessment	General Aviation (GA) and SMEs are not subject to additional cost or burden caused by rules originated by the Agency, although Regulation (EU) No 744/2010 'cut-off' and 'end dates' still apply.	Option 1 will impact mainly the Design and Production Organisations which produce large aeroplanes or rotorcraft. Owners and operators are also impacted but to a smaller extent. General Aviation (GA) and SMEs are not subject to additional cost or burden. In conclusion, this Option is equivalent to Option 0.	As Option 1.
Score (unweighted)	1	1	1
Weight	Multiply the unweighted score by 1		
Score (weighted)	1	1	1

4.5.5.6 Impact on 'better regulation' and harmonisation

ICAO mandates forward fit of halon alternatives for handheld fire extinguishers from 31 December 2016 onwards on aeroplanes and helicopters involved in international aviation (commercial and non-commercial).

The three identified options can, hence, be compared as in the table below:

Table 12: Harmonisation impact of options (handheld fire extinguishers)

Option	0	1	2
	Do nothing	Forward fit (CS-25 & 29, 2016)	Forward fit (CS-25 & 29, 2018)
Assessment	Difference in respect of ICAO Annex 6, contavening Article 2.2(d) of the Basic Regulation. The EU Member States will have to notify a difference to the ICAO. Compliance with ICAO obtained later through Regulation (EU) No 744/2010 'cut-off' and 'end dates' which still apply.	Substantial compliance with ICAO Annex 6 at the established date.	Substantial compliance with ICAO Annex 6, but two years later than the established date. The EU Member States will have to notify a temporary difference to the ICAO.
Score (unweighted)	-5	1	-3
Weight	Multiply the unweighted score by 1		
Score (weighted)	-5	1	-3

4.5.5.7 Comparison of options (handheld fire extinguishers)

Using the Multi-Criteria Analysis (MCA) methodology, the 'weighted' scores assigned above are algebraically summed up and then compared to each other:

Table 13: MCA (weighted scores) comparison of options (handheld fire extinguishers)

Option	0	1	2
	Do nothing	Forward fit (CS-25 & 29, 2016)	Forward fit (CS-25 & 29, 2018)
Impacts	Weighted score		
Safety	0	0	0
Environmental	-2	-6	6
Social	-1	1	1
Economic	0	-3	-1
GA & Proportionality	1	1	1
Regulatory harmonisation	-5	1	-3
TOTAL	-7	-6	4

Option 0 (i.e. do nothing) is not a viable option, although market forces will drive transition anyway due to the decreasing halon supplies and although 'end dates' in Regulation (EU) No 744/2010 still apply. In fact Option 0 will not transpose existing ICAO SARPs which are mandatory according to the Chicago Convention (unless a difference is notified). Furthermore it will contravene Article 2.2(d) of the Basic Regulation which mandates the Agency to take in due account the ICAO provisions.

Option 1 (i.e. forward fit on large aircraft from 31 December 2016 onwards, date as standardised by ICAO), although being slightly positive for regulatory harmonisation, is, however, overall almost as negative as Option 0 and in particular significantly negative in economic terms and highly negative from the environmental perspective.

Option 2 (i.e. forward fit on large aircraft, however by 2018 and not by 2016), is the only one exhibiting a clearly positive overall score while all options are equivalent and neutral in terms of safety. It is the best (as Option 3) from the environmental perspective.

In conclusion Option 2 (i.e. forward fit on large aircraft as standardised by ICAO, however by 2018 and not by 2016) is the preferred one for this NPA, allowing for a feasible transition to either 2-BTP or, if needed, to the worst case scenario as agreed to by industry during the IHRCM/3 in 2012.

In any case Article 13 (4) of Regulation (EC) No 1005/2009 allows derogations from 'cut-off' and 'end dates', where it is demonstrated that no technically and economically feasible alternative is available,

and this is accepted by the European Commission based on a proposal by the national authority (not the aviation authority) competent for the matter.

The conclusion that Option 2 should be the preferred one is confirmed by comparing the unweighted scores.

Table 14: MCA (unweighted scores) comparison of options (handheld fire extinguishers)

Option	0	1	2
	Do nothing	Forward fit (CS-25 & 29, 2016)	Forward fit (CS-25 & 29, 2018)
Impacts	Unweighted score		
Safety	0	0	0
Environmental	-1	-3	3
Social	-1	1	1
Economic	0	-3	-1
GA & Proportionality	1	1	1
Regulatory harmonisation	-5	1	-3
TOTAL	-6	-3	1

4.6. Analysis of impacts — Fire-extinguishing systems in lavatories

4.6.1. Halon alternatives for lavatories

HFC-227ea and HFC-236fa meet the MPS as well as the criteria for space, weight, and toxicological factors in relation to applications in lavatory waste receptacles.

Although these alternative agents have a higher Global Warming Potential (GWP), implementation is progressing as summarised in Table 15 below:

Table 15: Halon alternatives for fire-extinguishing systems in lavatory waste receptacles[40]

Available replacements	Obstacles/penalties	Status of implementation
HFC-236fa HFC-227ea	— considerable GWP[41]; — require super pressurisation with nitrogen to achieve low-temperature performance.	— currently, all Airbus and Boeing new production aircraft are equipped with non-halon fire extinguishing systems in lavatories. — Bombardier and Embraer are replacing halon from the lavatory fire extinguishers on newly produced aircraft, as of January 2013. — 'drop-in' replacement kits are available for retrofit on in-service aeroplanes; — some airlines (e.g. Lufthansa) are replacing existing halon 1301 lavex systems with these alternative systems during scheduled maintenance operations.

[40] Data from: FAA Final Report: Options to the Use of Halons for Aircraft Fire Suppression Systems—2012 Update, and Report of the 3rd International Halon Replacement Coordinating Meeting (IHRCM/3).

[41] IPCC 3rd Assessment Report 'Climate Change 2001' — 100-year Global Warming Potential.

Based on the information presently available, one could conclude that:

— large transport aircraft manufacturers having certified products with lavatory waste receptacles have already introduced, or are in the process of implementing, built-in halon-free fire extinguishers in lavatories;
— it can be expected that at the time of applicability of the related Part-26 and CS-26 provisions all newly produced Brazilian, Canadian, European and US transport aircraft operated by EU-Operators will be equipped with halon-free lavatory fire extinguishers;
— at this point in time, there is no information available on aircraft designed in other countries and potentially operated in the EU (e.g. China, Russia).

In the future other alternatives may emerge even better than HFC-227ea and HFC-236fa.

4.6.2. Policy options (lavatories)

Taking into account that industry is already transitioning to halon-free solutions for lavatories, but that the date mandated by ICAO (i.e. 31 December 2011) for forward fit has already expired, the following four options have been identified and evaluated for fire-extinguishing systems in lavatory waste receptacles:

Table 16: Selected policy options

Option No	*Short title*	*Description*
0	**Do nothing**	Baseline option (**no change in rules**), risks remain as outlined in the issue analysis) which means that EU Member States should notify a difference to ICAO, valid until the 'end date' (i.e. 31 December 2020) in Regulation (EU) No 744/2010 applies.
1	**Forward fit (performance-based rule) at the date of applicability of amendment to Part-26 (CS-25,CS-29)**	**MPS-based forward fit** of halon alternative extinguishing agents (i.e. better agents could be used in the future to follow the evolution of the state of the art) used in fire extinguishers in lavatory waste receptacles, in the case of individual certificates of airworthiness issued on or after 31 December 2015, which is inevitably later than the date mandated by ICAO (i.e. 31 December 2011).
2	**Forward fit at the date of applicability of amendment to Part-26 (CS-25, CS-29) prescribing the agents**	**Prescriptive forward fit** of HFC-236fa or HFC-227ea to be used in fire extinguishers in lavatory waste receptacles, in the case of individual certificates of airworthiness issued on or after 31 December 2015, which is inevitably later than the date mandated by ICAO (i.e. 31 December 2011).
3	**Forward fit at the date of applicability of amendment to Part-26 (CS-25,CS-29) and retrofit**	As Option No 1 plus retrofit on large aeroplanes and large helicopters for which the individual certificate of airworthiness was issued for the first time on or after 31 December 2011 (i.e. **corrective action** to comply with ICAO Annex 6).

4.6.3. Analysis of impacts (lavatories)

4.6.3.1 Safety impact

Current halon alternatives which are allowed to be used in lavatories have to pass the Minimum Performance Standards (MPS) testing for the applications in which they are intended to be used. Having passed such a test, they can be judged as equal in safety to the halon they replace.

Both HFC-236fa and HFC-227ea have successfully passed such MPS testing. Any other agent will have to undergo the same process. Therefore, all the four identified alternatives can be considered neutral from the safety perspective (i.e. neither higher nor lower safety level than today in comparison to halon).

4.6.3.2 Environmental impact

Two factors have to be potentially considered in this respect:

— the impact on the atmosphere by changing from halon to a different agent; and

— the increase in weight that such a change would create in the aircraft and the associated fuel consumption and emissions.

Increase in total mass of equipment is, however, negligible for lavatory fire extinguishers. So, only Ozone Depletion Potential (ODP) and Global Warming Potential (GWP) for halon 1301, HFC-236fa, HFC-227ea and 2-BTP are compared in following Table 17:

Table 17: Environmental comparison of agents according to WMO[42]

Agent	ODP	GWP
Halon 1301	7.9	1890
HFC-236fa	0	9820
HFC-227ea	0	3580
2-BTP	0.0028[43]	0.26

[42] World Meteorological Organization Report No. 52 — 'Scientific Assessment of Ozone Depletion: 2010'. (Note that Halotron ODP was rounded up from 0.0098). http://ozone.unep.org/Assessment_Panels/SAP/Scientific_Assessment_2010/index.shtml

[43] Patten, K.O and Wuebbles, D.J, *OH reaction rate constant,IR absorption spectrum, ozone depletion potentials and global warming potentials of 2-bromo-3,3,3-trifluoropropene*, J. Geophys. Res., 116, D24307, 13 pp, 2011.(Note that ODP/GWP values vary depending on the assumed geographical distribution of BTP release. The latitudes considered include the US and EU).

Based on the above information, the four options can be compared from the environmental perspective:

Table 18: Environmental impact of options (lavatory fire extinguishers)

Option	**0**	**1**	**2**	**3**
	Do nothing	**MPS forward fit (2015)**	**Prescriptive forward fit (2015)**	**Corrective action (2011)**
Assessment	Halon replacement would continue to be driven by market forces until 2020 ('end date' in Regulation (EU) No 744/2010). However, the most relevant aircraft manufacturers are already replacing halon by HFC-236fa or HFC-227ea, which are much better in terms of ODP, but weigh twice as much as halon and are much worse in terms of GWP.	Since the key aircraft manufacturers are already replacing halon by HFC-236fa or HFC-227ea, this option is equivalent to Option 0.	Prescribing forward fit of HFC-236fa or HFC-227ea, which are not only heavier but also much worse than halon in terms of GWP, in the long temr would have a negative environmental impact.	Since today the only mature alternatives are HFC-236fa or HFC-227ea, not necessarily better than halon from the GWP perspective, this option would be even worse than Option 2.
Score (unweighted)	-1	-1	-3	-5
Weight	Multiply the unweighted score by 2			
Score (weighted)	-2	-2	-6	-10

4.6.3.3 Social Impact

The main impact from the social perspective concerns the effect of the extinguishing agent on the health of the workers or people nearby, including flight crews, cabin crews and passengers. In the concentration in which halon and its replacements are used today there is no serious harm for the health.

With the current knowledge, all the identified options, including 'do nothing,' are considered neutral from the social perspective.

4.6.3.4 Economic Impact

The economic burden on the Design and Production Organisations in case of Options 1, 2 or 3 would be negligible, since key aircraft manufacturers already install halon-free solutions in lavatory fire-extinguishing systems.

The operator will have no burden for personnel training (these fire extinguishers discharge automatically) but the economic impact of the different options would vary as summarised in Table 19 below:

Table 19: Economic impact of options (lavatory fire extinguishers)

Option	0	1	2	3
	Do nothing	MPS forward fit (2015)	Prescriptive forward fit (2015)	Corrective action (2011)
Assessment	No impact on either manufacturers or operators.	No impact on manufacturer. Very minor increase in fuel burnt for operators. Overall neutra.l	Even worse than Option 1 since the transition to other solutions would be hampered by prescriptive rules.	A significant burden will fall on the operators to implement retrofit on aircraft already in the fleet.
Score (unweighted)	0	0	-3	-5
Weight	Multiply the unweighted score by 1			
Score (weighted)	0	0	-3	-5

4.6.3.5 General Aviation and proportionality issues

All the identified options are neutral for smaller owners and operators since lighter general aviation aircraft do not have toilets on board.

4.6.3.6 Impact on 'better regulation' and harmonisation

Current ICAO Standards in Annex 6 require that any agent used in a built-in fire extinguisher for each lavatory waste receptacle for towels, paper or waste in an aircraft for which the individual certificate of airworthiness was first issued on or after 31 December 2011 shall:

(a) meet the applicable minimum performance requirements of the State of Registry; and

(b) not be of a type listed in Annex A, Group II of the *Montreal Protocol on Substances That Deplete the Ozone Layer*, 8th Edition, 2009.

Table 20: Harmonisation impact of options (lavatory fire extinguishers)

Option	**0**	**1**	**2**	**3**
	Do nothing	**MPS forward fit (2015)**	**Prescriptive forward fit (2015)**	**Corrective action (2011)**
Assessment	Significant differences continue to exist with respect to ICAO Annex 6.	Compliance is reached with ICAO Annex 6 but at a later date.	Departs from the principles of 'perfomance-based' regulation which the Agency is progressively implementing.	Fully compliant with the wording in ICAO Annex 6 although through a corrective action. Furthermore, not compliant with the policy followed so far by ICAO, which avoids retrofit.
Score (unweighted)	-3	3	-5	-3
Weight	Multiply the unweighted score by 1			
Score (weighted)	-3	3	-5	-3

4.6.4. Comparison of options (lavatories)

Using the Multi-Criteria Analysis (MCA) methodology, the 'weighted' scores assigned above are algebraically summed up and then compared with each other:

Table 21: MCA (weighted scores) comparison of options (lavatory fire extinguishers)

Option	0	1	2	3
	Do nothing	MPS forward fit (2015)	Prescriptive forward fit (2015)	Corrective action (2011)
Impacts	**Weighted score**			
Safety	0	0	0	0
Environmental	-2	-2	-6	-10
Social	0	0	0	0
Economic	0	0	-3	-5
GA & Proportionality	0	0	0	0
Regulatory harmonisation	-3	3	-5	-3
TOTAL	**-5**	**1**	**-14**	**-18**

Option 0 ('do nothing') is not a long-term viable option due to the decreasing halon supplies and the deviation from the harmonisation with the ICAO and FAA in case no action would be taken. Overall, it has a negative score.

Option 1 (MPS-based rules to mandate forward fit from 2015, which is four years later than required by ICAO) is nevertheless positive from the regulatory harmonisation point of view since based on the FAA MPS. It is the only one exhibiting a positive overall score, although minimal.

Option 2 (prescribe forward fit of HFC-236fa or HFC-227ea has a significantly negative overall score, and is in particualr negative from the economic and harmonisation point of view.

Option 3 (retrofit on aircraft delivered on or after 31 December 2011), although implementing a corrective action to comply ex-post with the ICAO standard, is the most negative in particular from the economic point of view.

Hence, Option 1 is the one to be recommended.

Option 1 remains the preferred one even using unweighted scores:

Table 22: MCA (unweighted scores) comparison of options (lavatory fire extinguishers)

Option	0	1	2	3
	Do nothing	MPS forward fit (2015)	Prescriptive forward fit (2015)	Corrective action (2011)
Impacts	**Unweighted score**			
Safety	0	0	0	0
Environmental	-1	-1	-3	-5
Social	0	0	0	0
Economic	0	0	-3	-5
GA & Proportionality	0	0	0	0
Regulatory harmonisation	-3	3	-5	-3
TOTAL	**-4**	**2**	**-11**	**-13**

4.7. General conclusions of the RIA

The information contained in this RIA and the proposals in Chapter3 above can be summarised in Tables 23 to 25 below:

Table 23: Comparison of applicable cut-off dates (i.e. new applications for Type Certificates)

Dates for halon replacement					
Purpose	**1. Location of fire extinguishers**	**ICAO**	**2. Regulation (EU) No 744/2010**	**Agency**	
				CSs	**This NPA**
Cut-off[44] New applications for Type Certificates (new design)	Normally unoccupied cargo compartments	Not mentioned (decision postponed to 2016)	2018	Halon no longer mandated by 'Book 1' of CS-23, CS-25 and CS-29 but neither prohibited until Regulation (EU) No 744/ 2010 applies	Not proposed (out of scope of Part-26 and CS-26)
	Handheld in cabins and crew compartments	Mentioned only in Resolution A36-12, which has been repealed	2014		
	Engine nacelles and APU	2014	2014		
	Lavatory waste receptacles	2014	2011		

[44] No new application for Type Certificates possible if halon is present in the design.

Table 24: Comparison of applicable forward-fit dates (i.e. newly produced aircraft based on existing TCs)

Dates for halon replacement					
Purpose	**3. Location of fire extinguishers**	**ICAO**	**4. Regulation (EU) No 744/2010**	**Agency**	
				CSs	**This NPA**
Forward fit New applications for individual Certificate of Airworthiness (CofA)	Normally unoccupied cargo compartments	Not mentioned	Out of scope of Regulation (EU) No 744/2010	Out of scope of CS-23, CS-25 and CS-29 (and of Part 21)	Not proposed
	Handheld in cabins and crew compartments	2016			2018 (two years later than set out in ICAO Annex 6)
	Engine nacelles and APU	Not mentioned			Not proposed
	Lavatory waste receptacles	2011			2015 (four years later than set out in ICAO Annex 6)

Table 25: Comparison of applicable retrofit dates

<table>
<tr><th colspan="5">Dates for halon replacement</th></tr>
<tr><th rowspan="2">Purpose</th><th rowspan="2">Location of fire extinguishers</th><th rowspan="2">ICAO</th><th rowspan="2">5. Regulation (EU) No 744/2010</th><th colspan="2">Agency</th></tr>
<tr><th>CSs</th><th>This NPA</th></tr>
<tr><td rowspan="4">End date[45]
Mandatory
Retrofit</td><td>Normally unoccupied cargo compartments</td><td rowspan="4">No retrofit mandated by ICAO</td><td>2040</td><td colspan="2" rowspan="4">Not proposed
(but the dates in Regulation (EU) No 744/2010 directly apply unless there is a case by case derogation obtained per Article 13(4) of Regulation (EC) No 1005/2009)</td></tr>
<tr><td>Handheld in cabins and crew compartments</td><td>2025</td></tr>
<tr><td>Engine nacelles and APU</td><td>2040</td></tr>
<tr><td>Lavatory waste receptacles</td><td>2020</td></tr>
</table>

[45] I.e. after which the use of halon would no longer be permitted; all halon fire extinguishers and fire protection systems should be replaced, converted or decommissioned by the end date.

5. References

5.1. Affected regulations

Draft Commission Regulation (EU) No XXX/201X of […] on additional airworthiness requirements for operations — (Part 26), as voted by the EASA Committee in July 2014

5.2. Affected Certification Specifications

Draft Certification Specification CS-26: Additional airworthiness requirements for operations

5.3. Reference documents

EASA/European Commission

Regulation (EC) No 1005/2009 of the European Parliament and of the Council of 16 September 2009 on substances that deplete the ozone layer;

Commission Regulation (EU) No 744/2010 of 18 August 2010 amending Regulation (EC) No 1005/2009 of the European Parliament and of the Council on substances that deplete the ozone layer, with regard to the critical uses of halons;

ICAO

ICAO Assembly Resolution A38-9: Halon Replacement;

State Letter 11/44 on adoption of Amendment 35 to Annex 6 — Operation of Aircraft, Part I — International Commercial Air Transport — Aeroplanes, regarding halon replacement;

State Letter 11/45 on adoption of Amendment 30 to Annex 6 — Operation of Aircraft, Part II — International General Aviation — Aeroplanes, regarding halon replacement;

State Letter 11/45 on adoption of Amendment 16 to Annex 6 — Operation of Aircraft, Part III — International Operations — Helicopters, regarding halon replacement;

HTOC

2012 Halons Technical Options Committee (HTOC) Progress Report; and

2010 UNEP Report of the Halons Technical Options Committee (HTOC) — 2010 Assessment

6. Appendices

Appendix A: Extract from AIR-OPS rules (Commission Regulation (EU) No 965/2012 (consolidated[46]) and Commission Implementing Regulation (EU) No 379/2014[47]):

CAT.IDE.A.250 Hand fire extinguishers

(a) Aeroplanes shall be equipped with at least one handheld fire extinguisher in the flight crew compartment.

(b) At least one handheld fire extinguisher shall be located in, or readily accessible for use in, each galley not located in the main passenger compartment.

(c) At least one handheld fire extinguisher shall be available for use in each class A or class B cargo or baggage compartment and in each class E cargo compartment that is accessible to crew members in flight.

(d) The type and quantity of extinguishing agent for the required fire extinguishers shall be suitable for the type of fire likely to occur in the compartment where the extinguisher is intended to be used in order to minimise the hazard of toxic gas concentration in compartments occupied by persons.

(e) Aeroplanes shall be equipped with at least a number of handheld fire extinguishers in accordance with Table 1, conveniently located to provide adequate availability for use in each passenger compartment.

Table 1: Number of handheld fire extinguishers

MOPSC	Number of extinguishers
7–30	1
31–60	2
61–200	3
201–300	4
301–400	5
401–500	6
501–600	7

[46] Commission Regulation (EU) No 965/2012 of 5 October 2012 laying down technical requirements and administrative procedures related to air operations pursuant to Regulation (EC) No 216/2008 of the European Parliament and of the Council (OJ L 296, 25.10.2012, p. 1).

[47] Commission Regulation (EU) No 379/2014 of 7 April 2014 amending Commission Regulation (EU) No 965/2012 laying down technical requirements and administrative procedures related to air operations pursuant to Regulation (EC) No 216/2008 of the European Parliament and of the Council (OJ L 123, 24.4.2014, p. 1).

MOPSC	Number of extinguishers
601 or more	8

CAT.IDE.H.250 Handheld fire extinguishers

(a) Helicopters shall be equipped with at least one handheld fire extinguisher in the flight crew compartment.

(b) At least one handheld fire extinguisher shall be located in, or readily accessible for use in, each galley not located in the main passenger compartment.

(c) At least one handheld fire extinguisher shall be available for use in each cargo compartment that is accessible to crew members in flight.

(d) The type and quantity of extinguishing agent for the required fire extinguishers shall be suitable for the type of fire likely to occur in the compartment where the extinguisher is intended to be used in order to minimise the hazard of toxic gas concentration in compartments occupied by persons.

(e) The helicopter shall be equipped with at least a number of handheld fire extinguishers in accordance with Table 1, conveniently located to provide adequate availability for use in each passenger compartment.

Table 1: Number of handheld fire extinguishers

MOPSC	Number of extinguishers
7–30	1
31–60	2
61–200	3

NCC.IDE.A.205 Handheld fire extinguishers

(a) Aeroplanes shall be equipped with at least one handheld fire extinguisher:

(1) in the flight crew compartment; and

(2) in each passenger compartment that is separate from the flight crew compartment except if the compartment is readily accessible to the flight crew.

(b) The type and quantity of extinguishing agent for the required fire extinguishers shall be suitable for the type of fire likely to occur in the compartment where the extinguisher is intended to be used in order to minimise the hazard of toxic gas concentration in compartments occupied by persons.

NCC.IDE.H.205 Handheld fire extinguishers

(a) Helicopters shall be equipped with at least one handheld fire extinguisher:

(1) in the flight crew compartment; and

(2) in each passenger compartment that is separate from the flight crew compartment except if the compartment is readily accessible to the flight crew.

(b) The type and quantity of extinguishing agent for the required fire extinguishers shall be suitable for the type of fire likely to occur in the compartment where the extinguisher is intended to be used in order to minimise the hazard of toxic gas concentration in compartments occupied by persons.

NCO.IDE.A.160 Handheld fire extinguishers

(a) Aeroplanes, except touring motor gliders (TMG) and ELA1 aeroplanes, shall be equipped with at least one handheld fire extinguisher:

(1) in the flight crew compartment; and

(2) in each passenger compartment that is separate from the flight crew compartment except if the compartment is readily accessible to the flight crew.

(b) The type and quantity of extinguishing agent for the required fire extinguishers shall be suitable for the type of fire likely to occur in the compartment where the extinguisher is intended to be used in order to minimise the hazard of toxic gas concentration in compartments occupied by persons.

NCO.IDE.H.160 Handheld fire extinguishers

(a) Helicopters, except ELA2 helicopters, shall be equipped with at least one handheld fire extinguisher:

(1) in the flight crew compartment; and

(2) in each passenger compartment that is separate from the flight crew compartment except if the compartment is readily accessible to the flight crew.

(b) The type and quantity of extinguishing agent for the required fire extinguishers shall be suitable for the type of fire likely to occur in the compartment where the extinguisher is intended to be used in order to minimise the hazard of toxic gas concentration in compartments occupied by persons.

NCO.IDE.B.125 Handheld fire extinguishers

(a) Balloons shall be equipped with at least one handheld fire extinguisher, if required by the applicable Certification Specifications.

(b) The type and quantity of extinguishing agent for the required fire extinguishers shall be suitable for the type of fire likely to occur in the balloon where the extinguisher is intended to be used in order to minimise the hazard of toxic gas concentration for the occupants of the balloon.

SPO.IDE.A.180 Handheld fire extinguishers

(a) Aeroplanes, except Touring Motor Gliders (TMG) and ELA1 aeroplanes, shall be equipped with at least one handheld fire extinguisher:

(1) in the flight crew compartment; and

(2) in each cabin compartment that is separate from the flight crew compartment except if the compartment is readily accessible to the flight crew.

(b) The type and quantity of extinguishing agent for the required fire extinguishers shall be suitable for the type of fire likely to occur in the compartment where the extinguisher is intended to be used in order to minimise the hazard of toxic gas concentration in compartments occupied by persons.

SPO.IDE.H.180 Handheld fire extinguishers

(a) Helicopters, except ELA2 helicopters, shall be equipped with at least one handheld fire extinguisher:

(1) in the flight crew compartment; and

(2) in each cabin compartment that is separate from the flight crew compartment except if the compartment is readily accessible to the flight crew.

(b) The type and quantity of extinguishing agent for the required fire extinguishers shall be suitable for the type of fire likely to occur in the compartment where the extinguisher is intended to be used in order to minimise the hazard of toxic gas concentration in compartments occupied by persons.

Appendix B: Resolution A36-12 (Halon replacement) adopted by the 36th session of the ICAO General Assembly (October 2007)

Repealed by Resolution A37-9

Whereas halons contribute to climate change and are no longer being produced by international agreement because they are ozone-depleting chemicals, and have been used as fire-extinguishing agents in commercial transport aircraft for 45 years;

Recognizing that much more needs to be done because the available halon supplies are dwindling and the environmental community is becoming more concerned with the lack of substantive progress in aviation;

Recognizing that the Minimum Performance Standard for each application of halon has been developed already by the International Aircraft Systems Fire Protection Working Group with participation by industry and regulatory authorities;

Recognizing that there are stringent aircraft-specific requirements for each application of halon that must be met before a replacement can be implemented;

Recognizing that while some progress has been made in developing a halon replacement for several aspects of aircraft operation, no real progress has been made in cargo compartment halon replacement, which is by far the largest application of extinguishing agent; and

Recognizing that any halon replacement strategy must depend on alternatives that do not pose an unacceptable environmental or health risk as compared to the halons they are replacing.

The Assembly:

1. *Agrees* with the urgency of the need to develop and implement halon replacements for civil aviation;

2. *Urges* States to advise their aircraft manufacturers, airlines, chemical suppliers and fire extinguishing companies to move forward at a faster rate in implementing halon alternatives in engine and auxiliary power units, handheld extinguishers and lavatories; and investigating additional halon replacements for engines/auxiliary power units, and cargo compartments;

3. *Requests* that the Council consider a mandate to be effective in the 2011 timeframe for the replacement of halon in:

— lavatories for new production aircraft; and

— lavatories, handheld-held extinguishers, engines and auxiliary power units for aircraft for which a new application for type certification has been submitted.

4. *Requests* that the Council consider a mandate to be effective in the 2014 timeframe for the replacement of halon in handheld extinguishers for new production aircraft;

5. *Encourages* ICAO to continue collaboration with the International Aircraft Systems Fire Protection Working Group and the United Nations Environment Programme's (UNEP) Ozone Secretariat through its Technology and Economic Assessment Panel's Halons Technical Options Committee on the topic of halon replacement for civil aviation, and

6. *Resolves* that the Council shall report to the next Ordinary Session of the Assembly on progress made with halon replacements in civil aviation.

Appendix C: Information on alternatives to halon in cargo compartments

ICAO's Assembly Resolution A37-9 (2010) regarding 'Halon Replacement' already recognised that while halon alternatives for lavatories were available, altough not necessarily optimal, and progress had been made in the development of halon alternatives in handheld (portable) extinguishers, more work was needed in the development of halon alternatives for cargo compartments, engine and APU fire-extinguishing systems.

This ICAO position was confirmed by already mentioned Assembly Resolution A38-9 (2013), which essentially postponed any decision on the date of replacement of halon in cargo compartments until the 39th session of the Assembly in 2016.

The ICCAIA has established a WG tasked to provide a recommendation for the timeframe for halon replacement in cargo compartments to the envisaged ICAO General Assembly in 2016.

No aviation authority in the world has yet mandated cut-off or forward fit. Furthermore no Certification Specifications for halon alternatives have been published.

In conclusion more research is needed in the development of halon alternatives for cargo compartments.

The current situation for the alternatives to halon in cargo compartments is summarised below:

Table C.1: Halon alternatives for fire-extinguishing systems in cargo compartments

Status	Alternative agent complying with MPS	Notes
on-going research for potential replacements	water mist/inert gas	— the water mist/inert gas system is a promising concept, but requires significant development effort and acceptance; — all other replacement agents tested so far have failed the MPS; — ICAO has not yet established a date for halon phase-out from cargo compartments and, on the basis of Assembly Resolution A38-9, the decision has been postponed to 2016.

No change in any EU law or rule is, hence, proposed by the Agency without prejudice to the right of industry to request a derogation from the National Competent Authority , based on Article 13(4) of Regulation (EC) No 1005/2009 (reproduced in Appendix K) for specific cases where the applicant for a TC can demonstrate that no technically and economically feasible alternative is available. If this request would be accepted by the European Commission, the Agency would take it into account during the concerned certification project.

Appendix D: Resolution A37-9 (Halon replacement) adopted by the 37th session of the ICAO General Assembly (October 2010)

Repealed by Resolution A38-9

Whereas halons contribute to climate change and are no longer being produced by international agreement because they are ozone-depleting chemicals, and have been used as fire-extinguishing agents in commercial transport aircraft for 45 years;

Recognizing that more needs to be done because the available halon supplies are dwindling and that the environmental community continues to be concerned that halon alternatives have not been developed for all fire extinguishing systems in civil aircraft;

Recognizing that the Minimum Performance Standard for each application of halon has been developed already by the International Aircraft Systems Fire Protection Working Group with participation by industry and regulatory authorities;

Recognizing that there are stringent aircraft-specific requirements for each application of halon that must be met before a replacement can be implemented;

Recognizing that the production and import/export of halon is prohibited by international agreement, thus halon is mainly available by recycling existing supplies. Thus recycling of halon gas needs to be rigorously controlled to prevent the possibility of contaminated halon being supplied to the aviation industry;

Recognizing that any strategy must depend on alternatives that do not pose an unacceptable environmental or health risk as compared to the halons they are replacing; and

Recognizing that while halon alternatives for lavatories are available, and that progress has been made in the development of halon alternatives in handheld fire extinguishers, more work is needed in the development of halon alternatives for cargo compartment and engine/auxiliary power unit fire extinguishing systems, and that regular reviews are necessary to evaluate and understand the implication of potential halon alternatives on the industry and the environment:

The Assembly:

1. *Agrees* with the urgency of the need to continue developing and implementing halon alternatives for civil aviation;

2. *Urges* States to **intensify development of acceptable halon alternatives for fire extinguishing systems in cargo compartments and engine/auxiliary power units and to continue work towards improving halon alternatives for hand-held fire extinguishers;**

3. *Directs* the Council to establish a mandate for the replacement of halon:

— in lavatory fire extinguishing systems used in aircraft produced after a specified date in the 2011 timeframe;
— in hand-held fire extinguishers used in aircraft produced after a specified date in the 2016 timeframe; and
— in engine and auxiliary power unit fire extinguishing systems used in aircraft for which application for type certification will be submitted after a specified date in the 2014 timeframe;

4. *Directs* the Council to conduct regular reviews of the status of potential halon alternatives to support the agreed upon implementation dates given the evolving situation regarding the suitability of potential halon alternative agents as they continue to be identified, tested, certified and implemented;

5. *Urges* States to advise their aircraft manufacturers, approved maintenance organizations, air operators, chemical suppliers, and fire-extinguishing companies to verify the quality of halon in their possession or provided by suppliers through effective testing or certification to an international or State recognized quality standard. States are also urged to require that the quality systems of air operators, approved maintenance organizations, and manufacturers provide a means for requesting from halon suppliers certification documentation attesting to the quality of halon to an established and recognized international standard;

6. *Encourages* ICAO to continue collaboration with the International Aircraft Systems Fire Protection Working Group and the United Nations Environment Programme's (UNEP) Ozone Secretariat through its Technology and Economic Assessment Panel's Halons Technical Options Committee on the topic of halon alternatives for civil aviation;

7. *Urges* States to inform ICAO regularly of their halon reserves and directs the Secretary General to report the results to the Council. Further, the Council is directed to report on the status of halon reserves at the next ordinary session of the Assembly;

8. *Resolves* that the Council shall report to the next ordinary session of the Assembly on progress made developing halon alternatives for cargo compartments and engine/auxiliary power unit fire extinguishing systems as well as the status of halon alternatives for hand-held fire extinguishers; and

9. *Declares* that this resolution supersedes Resolution A36-12.

Appendix E: Information on alternatives to halon for engine/APU compartments

The IHRCM/3 meeting organised under the aegis of ICAO in November 2012, was briefed that the following halon replacement agents underwent MPS testing and Significant New Alternatives Policy (SNAP) review:

— HCF-125;
— FK-5-1-12 (Novec 1230);
— CF3I; and
— Kidde Solid Aerosol — KSA (non-gaseous agent).

More in particular, the meeting noted that:

— HFC-125 is used by military aviation, but it has a major weight and volume penalty;
— Novec 1230 (a liquid agent) unfortunately had not passed the MPS test at low ambient temperature;
— CF3I had exhibited toxicity concerns; and
— a new non-gaseous agent (Kidde Solid Aerosol — KSA) had developed concentrations unable to extinguish live-engine fire.

At that meeting, the International Coordinating Council of Aerospace Industries Associations (ICCAIA) stated that industry was not optimistic that any agent known at the time would have been certification-ready to meet the 31 December 2014 'cut-off' date (according to both ICAO Annex 8 and Regulation (EU) No 744/2010).

ICAO, however, reiterated that the 2014 date remained applicable to aircraft for which an application for Type Certificate is submitted on or after 31 December 2014. There remain a few years after that date before the aircraft rolls out of the production line and the Secretary reiterated that ICAO was not prepared to change the established date.

In October 2013, ICCAIA reiterated its concerns in working paper A38-WP/238 presented to the 38th session of the ICAO General Assembly (extract reproduced in Appendix H), expressing once more its belief based on the previous experience of promising candidate alternatives which, although having been under investigation for several years, had in the end not fully passed the MPS and the supplementary testing. Manufacturing industry was, therefore, still not optimistic that any known agent would be certification-ready to meet the 31 December 2014 'cut-off' date.

To address the remaining challenges, the major transport airplane manufacturers agreed in early 2013 to cooperate in an industry consortium which would pool stakeholders' efforts and resources in order to identify a generic 'best choice' for a fire-extinguishing agent and system.

In conclusion, the only alternative agent available today which has passed the MPS testing (mainly checking the effectiveness on extinguishing a fire) and the SNAP assessment (mainly concerning toxicity) is HFC-125 as summarised in the table below:

Table E.1: Halon alternatives for fire-extinguishing systems in engine/APU compartments

Available replacements	Obstacles/penalties	Status of implementation
HFC-125	— major weight and volume penalty; — considerable GWP.	— used by military aviation; — all of the required MPS tests had been passed at the time when HFC was introduced in military aviation; — Significant New Alternatives Policy (SNAP) review is positively completed; — Aircraft manufacturers are expressing concerns about being able to meet the 2014 'cut-off' date since only few aircraft designers are developing solutions based on HFC-125; — no change to the 2014 'cut-off' date is planned by ICAO.

Any reference to a specific fire-extinguishing agent has been already removed from the relevant Agency's CSs; therefore, the state of the art may evolve without the need to further amend any specification in 'Book 1' of CS-23, CS-25 and CS-29.

Regulation (EU) No 744/2010 does not contain any target date for forward fit, while retrofit is established for 2040. Therefore, any possible proposal on the retrofit can be postponed to a rulemaking action after this NPA.

ICAO mandates neither forward fit nor retrofit in engine/APU compartments.

It is, hence, not relevant in this RIA to consider either forward- or retro-fit.

The only remaining issue is the 'cut-off' date of 31 December 2014 in relation to new applications for type design approval.

In the EU, the 'cut-off' date is established by Regulation (EU) No 744/2014, through which the European Commission amended Annex VI of Regulation (EC) No 1005/2009 as delegated by the legislator in said latter Regulation.

Article 13 (Critical uses of halons and decommissioning of equipment containing halons) in Regulation (EC) No 1005/2009 delegates the European Commission at the request of the competent authority of a Member State to possibly grant derogations from the 'cut-off' dates for new applications for specific cases where it is demonstrated that no technically and economically feasible alternative is available.

This article, of course, applies to any halon application and not just to APU/engine compartments.

No change in any EU law or rule is, hence, proposed by the Agency without prejudice to the right of industry to request to the national competent authority a derogation based on Article 13(4) of Regulation (EC) No 1005/2009 (reproduced in Appendix K) for specific cases where the applicant for a TC can demonstrate that no technically and economically feasible alternative is available. If this request would be accepted by the European Commission, the Agency would take it into account during the concerned certification project.

Appendix F: Extract from ICAO State Letter (type II) AN 3/5.8-11/43 of 11 July 2011 (Adoption of Amendment 103 to Annex 8)

AIRWORTHINESS OF AIRCRAFT
ANNEX 8
TO THE CONVENTION ON INTERNATIONAL CIVIL AVIATION

PART II
PROCEDURES FOR CERTIFICATION AND CONTINUING AIRWORTHINESS
…
CHAPTER 1. TYPE CERTIFICATION

1.1 Applicability

The Standards of this chapter shall be applicable to all aircraft of types for which the application for certification was submitted to a Contracting State on or after 13 June 1960, except that:

a) the provisions of 1.4 of this part shall only be applicable to an aircraft type for which an application for a Type Certificate is submitted to the State of Design on or after 2 March 2004; and

b) the provisions of 1.2.5 of this part shall only be applicable to an aircraft type for which an application for a Type Certificate is submitted to the State of Design on or after 31 December 2014.

…

1.2.5 The approved design of an aircraft under Parts IIIB, IVB and V of this Annex shall use extinguishing agents that are not listed in Annex A, Group II of the *Montreal Protocol on Substances That Deplete the Ozone Layer*, 8th Edition, 2009 in the aircraft fire suppression or extinguishing systems in the lavatories, engines and auxiliary power unit.

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 G: Extract from ICAO State Letter (type II) AN 11/1.3.24- 11/44 of 11 July 2011 (Adoption of Amendment 35 to Annex 6, Part I)

OPERATION OF AIRCRAFT
ANNEX 6
TO THE CONVENTION ON INTERNATIONAL CIVIL AVIATION

PART I
INTERNATIONAL COMMERCIAL AIR TRANSPORT — AEROPLANES
CHAPTER 6. AEROPLANE INSTRUMENTS, EQUIPMENT AND FLIGHT DOCUMENTS

...

6.2 All aeroplanes on all flights

...

6.2.2.1 Any agent used in a built-in fire extinguisher for each lavatory waste 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 Annex A, Group II of the *Montreal Protocol on Substances That Deplete the Ozone Layer*, 8th Edition, 2009.

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 H: Extract from ICAO State Letter (type II) AN 11/6.3.24-11/45 of 11 July 2011 (Adoption of Amendment 30 to Annex 6, Part II)

OPERATION OF AIRCRAFT
ANNEX 6
TO THE CONVENTION ON INTERNATIONAL CIVIL AVIATION

PART II
INTERNATIONAL GENERAL AVIATION — AEROPLANES

SECTION 2
GENERAL AVIATION OPERATIONS

CHAPTER 2.4 AEROPLANE INSTRUMENTS, EQUIPMENT AND FLIGHT DOCUMENTS

2.4.2 Aeroplanes on all flights

…

2.4.2.3 Any agent used in a built-in fire extinguisher for each lavatory waste 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 Annex A, Group II of the *Montreal Protocol on Substances That Deplete the Ozone Layer*, 8th Edition, 2009.

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 I: Extract from ICAO State Letter (type II) AN 11/32.3.8-11/46 of 11 July 2011 (Adoption of Amendment 16 to Annex 6, Part III)

OPERATION OF AIRCRAFT
ANNEX 6
TO THE CONVENTION ON INTERNATIONAL CIVIL AVIATION

PART III
INTERNATIONAL OPERATIONS — HELICOPTERS

SECTION II
INTERNATIONAL COMMERCIAL AIR TRANSPORT

CHAPTER 4 HELICOPTER INSTRUMENTS, EQUIPMENT AND FLIGHT DOCUMENTS

4.2 All helicopters on all flights

…

4.2.2.1 Any agent used in a built-in fire extinguisher for each lavatory waste 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 Annex A, Group II of the *Montreal Protocol on Substances That Deplete the Ozone Layer*, 8th Edition, 2009.

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.

SECTION III
INTERNATIONAL GENERAL AVIATION

4.1 All helicopters on all flights

…

4.1.3.2 Any agent used in a built-in fire extinguisher for each lavatory waste 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 Annex A, Group II of the *Montreal Protocol on Substances That Deplete the Ozone Layer*, 8th Edition, 2009.

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 J: Resolution A38-9 (Halon replacement) adopted by the 38th session of the ICAO General Assembly (October 2013)

Recognizing the importance of aircraft fire extinguishing systems to the safety of flight;

Recognizing that halogenated hydrocarbons (halon) have been the main fire extinguishing agent used in civil aircraft fire extinguishing systems for over fifty years;

Whereas halons are no longer being produced by international agreement because their release contributes to ozone-depletion and climate change;

Recognizing that more needs to be done because the available halon supplies are decreasing and unsure and that the environmental community continues to be concerned that halon alternatives have not been developed for all fire extinguishing systems in civil aircraft;

Recognizing that the Minimum Performance Standard for each application of halon has been developed already by the International Aircraft Systems Fire Protection Working Group with participation by industry and regulatory authorities;

Recognizing that there are stringent aircraft-specific requirements for each application of halon that must be met before a replacement can be implemented;

Recognizing that the aircraft manufacturing industry has established mechanisms for stakeholder engagement in the development of common solutions for halon replacement in engine/auxiliary power unit (APU) fire suppression applications and a realistic timeframe for such replacement in cargo compartment applications;

Recognizing that the production is prohibited by international agreement, halon is now exclusively obtained from recovery, reclaiming and recycling. Therefore, recycling of halon gas needs to be rigorously controlled to prevent the possibility of contaminated halon being supplied to the civil aviation industry; and

Recognizing that any strategy must depend on alternatives that do not pose an unacceptable environmental or health risk as compared to the halons they are replacing;

The Assembly:

1. *Urges* States and their aviation industries to intensify development and implementation of acceptable halon alternatives for fire extinguishing and suppression systems in cargo compartments and engine/auxiliary power units, and to continue work towards improving halon alternatives for hand-held fire extinguishers;

2. *Urges* States to determine and monitor their halon reserve and quality of halon;

3. *Encourages* ICAO to continue collaboration with the International Aircraft Systems Fire Protection Working Group and the United Nations Environment Programme's Ozone Secretariat through its Technology and Economic Assessment Panel's Halons Technical Options Committee on the topic of halon alternatives for civil aviation;

4. *Encourages* States to collaborate with the Industry Consortium for engine/APU applications and the Cargo Compartment Halon Replacement Working Group established by the International Coordinating Council of Aerospace Industries Associations;

5. *Urges* States to inform ICAO regularly of their halon reserves and directs the Secretary General to report the results to the Council;

6. *Directs* that the Council shall report to the next ordinary session of the Assembly on a timeframe for the replacement of halon in cargo compartment fire suppression systems; and

7. *Declares* that this resolution supersedes Resolution A37-9.

Appendix K: Extract from working paper A38-WP/238 (Halon replacement) presented by the International Coordinating Council of Aerospace Industries Associations (ICCAIA) to the 38th session of the ICAO General Assembly (October 2013)

...

2.3 Engine and APU

2.3.1 In 2010, ICCAIA agreed with the proposed 2014 timeframe for engine and APU halon replacements. Although it was noted that "no alternatives have yet been fully tested, certified and Implemented on commercial transport aircraft," two promising agents were being developed by fire protection system suppliers. Both agents successfully passed FAA's MPS testing (Novec1230 in 2006, a powder agent in 2011). However, while both were being considered for certification approval, the FAA required additional testing to address concerns unique to the physical properties of these agents: one a liquid agent subjected to cold storage fire testing conditions; the other a dry chemical agent subjected to a full scale live engine fire test (July 2012). Both agents, unfortunately, did not perform as expected during these additional tests..

2.3.2 Since that time, the aircraft manufacturers are continuing to monitor and support the candidate/system suppliers but are dependent on those suppliers and the FAA to address the testing results and to determine the next steps. No schedule has been provided on when the situation will be resolved.

2.3.3 In the meantime, investigation on other agents has re-opened and information has been solicited from over fourteen different suppliers on other possible candidates. It has to be noted that none of these possible candidates have yet successfully passed FAA MPS testing. Moreover, the suppliers of any new agent will have to demonstrate that all other performance, certification, and environmental requirements can be met. This will take coordination with FAA, other governmental agencies, and other stakeholders such as the engine manufacturers, aircraft operators, etc. Based on the experience of the previous two candidates which have been under investigation for several years, the industry is not optimistic that any known agent will be certification ready to meet the 31 December 2014 date. As this date pertains to an aircraft type for which an application for a type certificate is submitted to the State of Design, sufficient additional time should be available after this date for actual implementation of non-halon engine and APU fire suppression systems, pending certification by regulatory authorities.

2.3.4 To address the remaining challenges, in early 2013 the major transport airplane manufacturers agreed to cooperate in an Industry consortium to bundle stakeholders' efforts and resources to identify a generic "best choice" for a fire extinguishing agent and system.

Appendix L: Article 13 of Regulation (EC) No 1005/2009

Critical uses of halons and decommissioning of equipment containing halons

1. By way of derogation from Article 5(1), halons may be placed on the market and used for critical uses set out in Annex VI. Halons may only be placed on the market by undertakings authorised by the competent authority of the Member State concerned to store halons for critical uses.

2. The Commission shall review Annex VI and, if appropriate, adopt modifications and time-frames for the phasing out of the critical uses by defining cut-off dates for new applications and end dates for existing applications, taking into account the availability of technically and economically feasible alternatives or technologies that are acceptable from the standpoint of environment and health.

Those measures, designed to amend non-essential elements of this Regulation, inter alia, by supplementing it, shall be adopted in accordance with the regulatory procedure with scrutiny referred to in Article 25(3).

3. Fire protection systems and fire extinguishers containing halons applied in uses referred to in paragraph 1 shall be decommissioned by the end dates to be specified in Annex VI.

4. The **Commission may, at the request of the competent authority of a Member State** and in accordance with the management procedure referred to in Article 25(2), **grant derogations** from end dates for existing applications or **cut-off dates for new applications**, provided those dates have been specified in Annex VI in accordance with paragraph 2, for specific cases **where it is demonstrated that no technically and economically feasible alternative is available**.