Cargo Compartment Halon Replacement Working Group (CCHRWG) Update

13 May, 2015
International Aircraft Systems Fire Protection Working Group Meeting
Dresden, Germany

By
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CCHRWG Terms of Reference
Commit Industry to Broad Stakeholder Approach

Task:

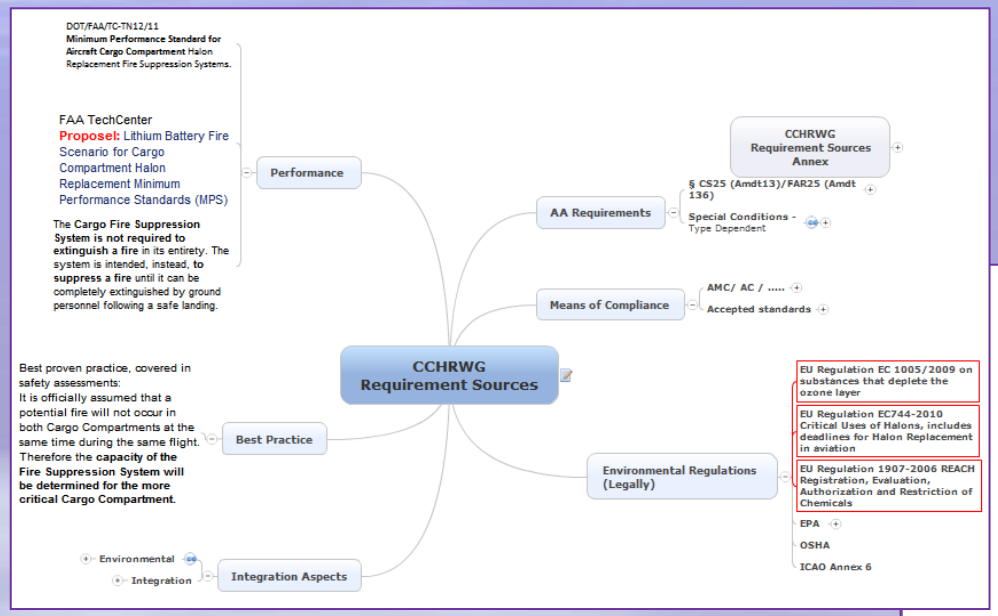
ICCAIA shall establish a working group tasked to work on Halon Replacement issues for Cargo compartments.

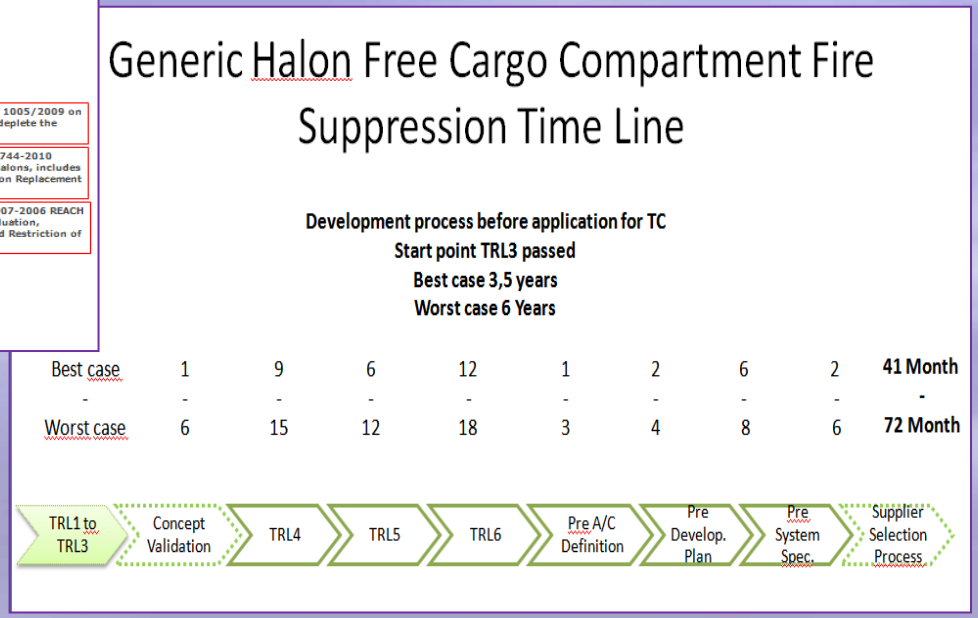
Under the ICCAIA-AC authority, the working group shall establish and coordinate a process to:

- Develop an industry recommendation to ICAO for a cargo compartment halon replacement deadline for new design (new aircraft types) taking into account progress towards identification of an alternative agent and/or approach to fire suppression in cargo compartments, including the state of research (available agent, viability), supply chain readiness, testing, qualification, and certification.
- To enable this deliverable, the work group will encourage/support timely research, testing and approval of a halon alternative for cargo compartments, in coordination with the relevant industry and governmental/certification entities, including:
  - Inviting non-member industry associations to participate as appropriate.
  - Facilitating the exchange of non-proprietary research data.
  - Collecting information and reporting to the ICCAIA-AC.
  - Continuing dialogue with government/certification entities.

CCHRWG recommendation process

- Good input during the October 31st Meeting! Thank you!
- Requirements defined
- Timeline developed





2015 CCHRWG PLAN

DATE	DELIVERABLE	ASSIGNED TO:
1st Qtr 2015	Review of status and available information, internal discussions (2 teleconferences/month)	CCHRWG Core Group
11 March 2015	Request support on 2015 Plan	CCHRWG/Stakeholders
March 2015	Conclusion on recommended deadline & argumentation approach	CCHRWG Core group
March/April 2015	Formulation of final Draft recommendation & Working Paper (WP)	CCHRWG Core Group
April 2015	CCHRWG Update to ICCAIA Airworthiness Committee (AC) Report	CCHRWG Core Group
11 May 2015	Draft WP/Recommendation CONCEPT presented to Stakeholders	CCHRWG Core Group & Stakeholders
13 May 2015	**CCHRWG Update to IASFPWG Meeting in Dresden**	**CCHRWG Core Group**
June 2015	Draft WP/Recommendation ready for review in CCHRWG Member companies	CCHRWG Core group members to home companies
June/July 2015	Draft WP/Recommendation, CCHRWG Member Companies for approval	CCHRWG Core group members to home companies
July/August 2015	Draft WP/Recommendation, CCHRWG to national associations for approval	CCHRWG Core group members to appropriate nat'l associations
July/August 2015	Draft WP/Recommendation, CCHRWG to Stakeholders for concurrence (face-to-face meeting?)	CCHRWG Core group members to Stakeholders
August 2015	➔ Draft WP/Recommendation, CCHRWG to ICCAIA Council for Approval	Distribution by Chairpersons
Early Sept 2015	➔Formal WP and Recommendation, Submittal to ICAO	Postal Distribution by ICCAIA AC
October 2015	➔ Goal: ICAO's 1st Comments on CCHRWG Recommendation	IASFPWG/CCHRWG-f2f meeting

CCHRWG Stakeholder Meeting

Logistics

Date/Time: May 11, 2015, 2 – 6 PM

Location: Dormero Hotel Königshof, Dresden, Germany

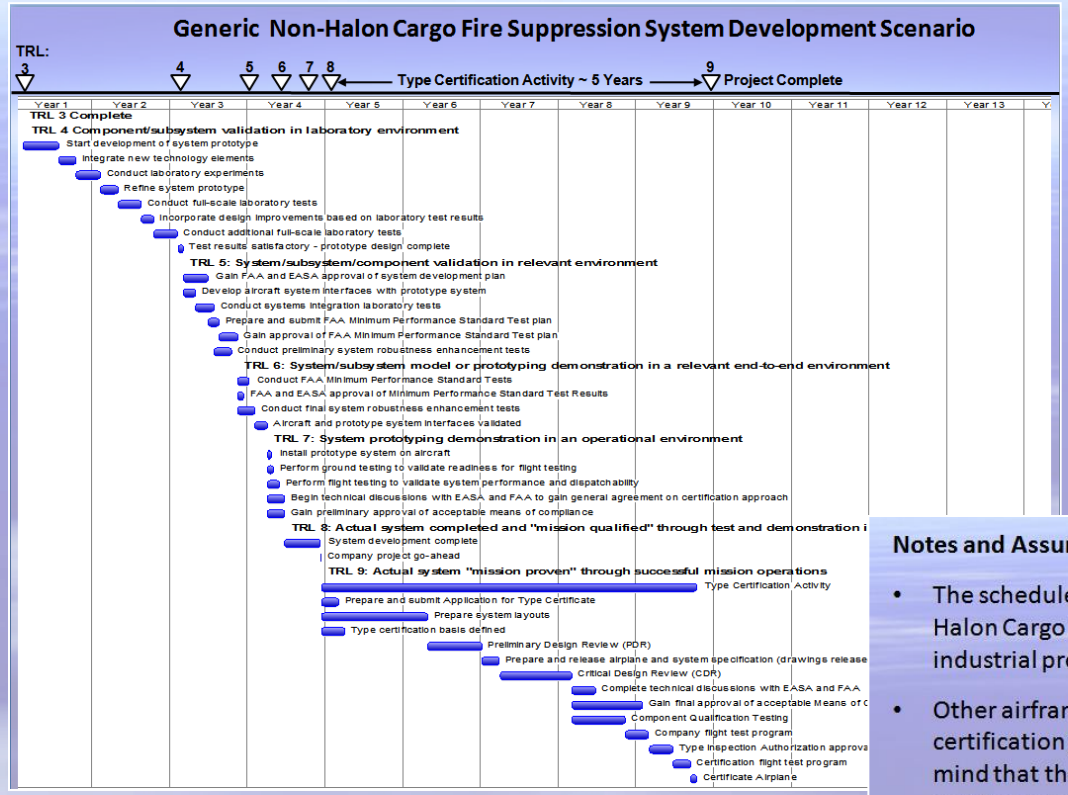
Objectives:

1. Explain basis for cargo deadline recommendation.
2. Explore scenarios & technical capabilities to support the recommendation.

Agenda:

- Introductions *(All)*
- Confirm Antitrust & Intellectual Property Discussion Guidelines *(All)*
- CCHRWG Recommendation *(Core Team)*
- Review Halon Replacement Scenarios *(Specialists)*
- Questions & Answers *(All)*
- Adjourn

Generic Scenario: Supports Recommendation to ICAO



Notes and Assumptions:

- The schedule developed for this scenario is considered to be reasonable for a Non-Halon Cargo Fire Suppression System, and is based on one airframe manufacturer's industrial processes and experiences with the regulatory authorities.
- Other airframe manufacturers are expected to have similar industrial and certification processes, and similar prerequisites; however, it should be kept in mind that the terminology may vary, and the individual steps to qualify and to certify a new system may be organized differently.
- The schedule follows the Technology Readiness Level (TRL) approach used by the National Aeronautics and Space Administration (NASA). TRLs are a type of measurement system used to assess the maturity level of a particular technology. Each technology project is evaluated against the parameters for each technology level and is then assigned a TRL rating based on the project's progress. There are nine technology readiness levels. TRL 1 is the lowest and TRL 9 is the highest.
- Candidate replacement systems are assumed to be at Technical Readiness Level (TRL) 4 at the beginning of the schedule.

NIST Workshop Outcome: Future Research Opportunity

(as reported in 11th March 2015 CCHRWG Stakeholder Teleconference)

Technical Note 1871

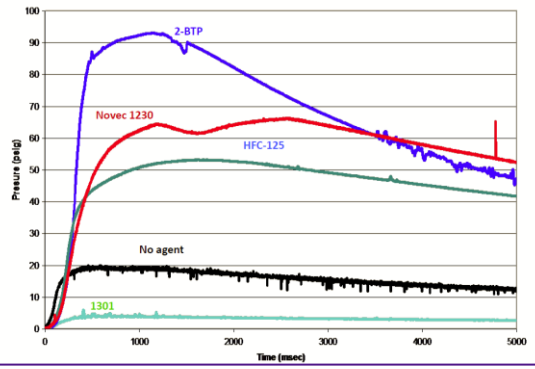
Workshop on the Research Needs Concerning the Exothermic Reaction of Halogenated Hydrocarbons

Gregory Linteris
Jeffrey Manion

This publication is available free of charge from:
http://dx.doi.org/10.6028/NIST.TN.1871

FAA-Aerosol Can Test (FAA-ACT)

When added at sub-inerting concentrations, pressure rise is higher than with no agent.



NIST
National Institute of Standards and Technology
U.S. Department of Commerce

1. ABSTRACT

A workshop was held at NIST Gaithersburg on October 27 and 28, 2014 to discuss the exothermic reaction of halogenated hydrocarbons. The industries that gathered to discuss the topic were the fire suppression industry with both ground-based and aircraft applications, and the Heating, Ventilating, Air Conditioning, and Refrigeration industries. In the former, the compounds of interest are used as fire suppressants, and in the latter, as working fluids for vapor compression heating/cooling equipment. The purpose of the workshop was to identify the important parameters controlling the flammability of the compounds, and identify research needs for overcoming the obstacles to their safe and effective use.

9. SUMMARY/CONCLUSIONS / FOLLOW-UP

The research needs in the above section are the core outcome of the workshop. There was a general consensus that the problems in both industries (related to the exothermic reaction of halogenated hydrocarbons) are complex and more research would help to delineate the problem and aid in designing around any adverse properties of the materials (when that is possible). The results of two the breakout groups are summarized separately below.

9.1 Aircraft Fire Suppression Summary

The research recommendations developed in the Aircraft Fire Suppression breakout group (described in the previous section) are listed in Table 1 below. As the table (and the previous section) describes, most of the recommended work involves improving the understanding of the behavior of potential new compounds and blends of existing compounds. For the FAA Aerosol Can Test, the needed information involves understanding how the molecular structure (or combination of compounds) affects the tradeoff between inhibition and enhancement of the explosion, and how this is affected by other parameters. For other aircraft fire suppression applications, this same information would be useful, as well as an understanding of how the different flame environments affect the overpressure/inhibition tradeoff. In particular, it would be useful to understand if the overpressure caused by some agents in the FAA-ACT can possibly occur in other configurations (e.g., diffusion flames).

Table 1 - List of research needs developed in the Aircraft Fire Suppression breakout group.

1. Improve the understanding of the parameters (e.g., humidity, temperature, pressure, active chemical moiety) affecting agent chemical inhibition and enhancement, to provide guidance on the necessary properties of new compounds, or blends, for effective suppression of the FAA-ACT.
2. Develop a better understanding of why 2-BTP behaves so differently in different flame types.
3. Perform a comprehensive exploration of all the possible molecules which might meet the system requirements (vapor pressure, toxicity, over pressure, flame suppression, etc.) in the FAA-ACT.
4. Determine if blends of agents can work in the FAA-ACT.
5. Understand the flammability behavior of halogenated hydrocarbon fire suppressants in non-premixed flames representative of fire threats (i.e., diffusion flames).
6. Improve the understanding of the fluid mechanics of agent dispersion and distribution.

ICCAIA Working Paper

International Civil Aviation Organization

WORKING PAPER

A38-WP/238
TE/100
6/9/13
English only

ASSEMBLY — 38TH SESSION

TECHNICAL COMMISSION

Agenda Item 31: Aviation Safety — Emerging Issues

HALON REPLACEMENT – CHALLENGES AND SOLUTIONS

(Presented by the International Coordinating Council of Aerospace Industries Associations)

EXECUTIVE SUMMARY

Action has been taken by the aerospace industry to introduce halon alternatives for fire suppression in aircraft and engage with all relevant stakeholders to find solutions. The industry has been active in researching halon alternatives and in working with suppliers and regulatory agencies to address all associated safety, environmental, and operational requirements. Mechanisms for broad stakeholder engagement, essential to achieve safe, environmentally responsible and cost-effective solutions for replacement of halon, have been established. Although good progress has been made, implementation of halon replacement in engine/APU fire suppression applications is dependent upon further testing and certification by regulatory authorities. While challenges remain for cargo compartment fire suppression applications, a concerted effort is underway to determine a realistic target date for halon replacement in good time for the 39th Session of the Assembly in 2016.

Action: The Assembly is invited to:

a) *recognize* the mechanisms established by the aerospace industry for stakeholder engagement in the development of common solutions for halon replacement in engine/APU fire suppression applications and a realistic timeframe for such replacement in cargo compartment applications; and
b) *include* two additional clauses, as contained in the Appendix, when adopting the Resolution on halon replacement presented in A38-WP36, TE/2.

Strategic Objectives:	This working paper relates to Safety, and Environmental Protection and Sustainable Development of Air Transport Strategic Objectives
Financial implications:	See A38-WP/36,TE/2
References:	Doc 9958, *Assembly Resolutions in Force* (as of 8 October 2010) A38-WP/36, TE/2

1. NEED FOR HALON REPLACEMENT

1.1 The aviation industry has long recognized the need for replacement of halon with safe, reliable and effective alternative agents that do not pose undue environmental or health risks. In fact, the aviation industry is committed to applying environmentally progressive solutions in all its products, services and operations. The industry has expedited research and development on halon alternatives for its various aircraft applications since the late 1990s, and is actively promoting cooperation among all stakeholders to arrive at cost-effective and safe solutions for halon replacement in different applications.

1.2 As the industry works to meet the mandates for implementing halon replacements, there are multiple requirements that must be considered and balanced. Adequate time is required to ensure aircraft safety, design, testing, qualification, in-service reliability and certification standards can be met for all planned halon replacement applications. Suitable halon replacements have not yet been identified for cargo compartment and engine/APU applications that meet other current and potential environmental requirements, are technically achievable, and are economically reasonable.

1.3 There are multiple requirements that must be considered and balanced, including effectiveness, environmental trade-offs, installation and operational impacts of alternatives. Some elements of these factors are under the purview of national regulatory agencies and not within industry control.

2. HALON ALTERNATIVES

2.1 Lavatory systems

2.1.1 Industry is implementing halon replacement in lavatory waste receptacle fire extinguishers in new aircraft. It should be noted that while simple installation of alternatives in new aircraft was almost a simple "drop-in" replacement, it still required several years of OEMs to ensure that a replacement met all safety, performance and certification requirements for aircraft installation once the alternative underwent successful FAA minimum performance standard (MPS) testing.

2.2 Hand-held fire extinguishers

2.2.1 Industry has committed to phase out halon for handheld fire extinguishers in line with the dates published in ICAO Annex A and B. However, there are numerous challenges ahead, like size and weight of replacement extinguishers requiring adapted cabin design, extinguishing procedures and crew training. As noted in A38-WP/36, development and testing are underway for a promising replacement agent, 2-bromo-3,3,3-trifluoropropene (BTP). Extensive toxicology and environmental testing, environmental approvals, extinguisher design and supplier qualifications are still in-work. Despite the number of different stakeholders having to do their part, in coordinating and timing the different activities, we are optimistic the 31 December 2016 deadline can be met.

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 [illegible] fire suppression system, 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.

2.4 Cargo compartment

2.4.1 In November 2012, ICCAIA reiterated its position that it was still premature to specify timeframes for cargo compartment applications. However, that does not mean that transport airplane OEMs are not assiduously working with potential suppliers for halon alternatives for cargo compartments. One of the aircraft manufacturers is sponsoring research by the US National Institute of Standards and Technology (NIST) to understand the physical and chemical properties necessary for passing the FAA's MPS aerosol can test. Interim results have been shared previously at both the FAA International Fire Protection Systems Working Group and ICAO International Halon Replacement Coordinating Meetings (IHRCM) in 2011 and 2012.

2.4.2 In the November 2012 IHRCM, it was accepted that it was premature to fix deadlines for halon replacement in cargo compartments. There was still no halon-free fire suppression agent and system which would satisfy in parallel environmental, fire-fighting and aviation safety requirements. ICCAIA offered to coordinate research and development activities, involving all affected stakeholders.

2.4.3 In early 2013, ICCAIA established the Cargo Compartment Halon Replacement Working Group (CCHRWG) involving fire suppression system and agent suppliers, authorities and research institutions to develop a recommendation for a cargo compartment halon replacement deadline, applicable for new aircraft types. While the aircraft OEMs fully support the CCHRWG, involvement of further industry stakeholders requires proper consideration of intellectual property and competition aspects. The CCHRWG, driven by the aircraft OEMs, Authorities and research community, is committed to deliver its recommendation in good time for the 2016 ICAO Assembly.

3. STAKEHOLDER ENGAGEMENT

3.1 Halon replacement will continue to require full cooperation of all stakeholders and coordination to achieve uniform and orderly implementation of optimal alternative solutions for engine/APU and cargo compartment systems that provide adequate technical performance, certification, and long-term environmental benefit. To this end, the Industry consortium (paragraph 2.3.4) and CCHRWG (paragraph 2.4.3) provide the requisite basis for addressing the remaining challenges and developing such solutions.

4. CONCLUSION

4.1 The aircraft manufacturing industry has established mechanisms for stakeholder engagement, essential to achieve safe, environmentally responsible and cost-effective solutions for replacement of halon. While much work has been done, implementation of halon replacement in engine/APU fire suppression applications is dependent upon further testing and certification by regulatory authorities.

4.2 While challenges remain for cargo compartment fire suppression applications, a concerted effort involving all stakeholders under ICCAIA leadership is underway to determine a realistic target date for halon replacement in good time for the 39th Session of the Assembly in 2016.

4.3 The industry-led efforts to achieve common solutions and realistic timeframes are worthy of recognition and collaboration/support by States. To this end, two additions to the draft Resolution in A38-WP/36, TE/2 are proposed at the Appendix.

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Update-in-work

Questions & Answers

Thank you!

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