

International Aircraft Systems Fire Protection Working Group

User Preference Survey for Agents used in Hand Held Extinguishers on board aircraft

Organization: International Aircraft Systems Fire Protection Working Group (IASFPWG)

Objective: This survey requests very important information from the user community on extinguishing agent properties that should be considered for use in hand held extinguishers on board aircraft in the flight deck, cabin, crew rests and accessible cargo compartments. The timely responses will help guide airlines, airframe manufactures and post production facilities to select the most preferred agent(s) to replace Halon 1211.

Dates: Comments must be received by May 30, 2003

Address: Comments on this survey should be sent to:

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or

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Supplementary Information: The U.S. Federal Airworthiness Regulation (FAR/JAR 25.851) requires a minimum quantity of hand held extinguishers on commercial passenger aircraft that “must contain Halon 1211 or equivalent, as the extinguishing agent,” and in addition “each hand fire extinguisher must be listed or approved” by a testing organization such as the Underwriters Laboratory or its equivalent. Halon 1211 has been identified as a chemical that destroys the ozone layer and as a result has been banned from production by the Montreal Protocol in 1994. Sale and use restrictions of Halons were imposed by EC2037/00.

Previous FAA sponsored (IASFPWG) meetings identified the need for clarifying the method of showing the equivalent level of safety to Halon 1211. Two tests defined in the FAA published document “The Development of a Minimum Performance Standard for Hand Held Fire Extinguishers as a Replacement for Halon 1211 on Civilian Transport Category Aircraft”, (DOT/FAA/AR-01-37) (referred to as the MPS), are to be used as the method of showing fire suppression equivalence to Halon 1211. “The Purpose of the MPS is to ensure that there

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is no reduction in safety, both in terms of effectiveness in fighting on board fires and toxicity to the passengers and crew.”¹

Minimum Performance Tests

“The first test in the MPS evaluates the “flooding” characteristics of the agent against a hidden in-flight fire.” The second test evaluates the performance of the agent in fighting a burning seat fire and the associated toxicity hazard.¹

Section 2.5.3 of the MPS identifies results of 3 candidate replacement agents in the hidden fire test. Agent manufacturers Dupont, American Pacific Corp. and Powsus each provided currently manufactured or experimental models of hand held extinguishers for this test.

Section 2.6.2 of the MPS identifies results of 7 candidate replacement agents and Halon 1211 in the fire fighter extinguished triple seat/gasoline fire test. Agent manufacturers Dupont, American Pacific, Powsus, Great Lakes Chemical and North American Fire Guardian each provided currently manufactured or experimental models of hand held extinguishers. Note: 3M's Novec 1230 has not been tested to date but is considered a candidate agent.

Some bottle/agent combinations are still in development and bottle suppliers are in various stages of testing to the FAA MPS (DOT/FAA/AR-01-37) or equivalent. Only agents meeting the MPS will be approved for use.

Human Interaction

A major difference between the hand held extinguishers used on board aircraft as opposed to built in automatic extinguishers used in cargo compartments and aircraft engines is that human activation and deployment plays a major role in the successful discharge of the agent and subsequent suppression of the fire threat. This critical human interaction with hand held extinguishers necessitates additional information for the end users besides agent fire fighting equivalence to Halon 1211. Ergonomic factors should also be considered in the selection of a replacement agent for hand held extinguishers.

Prior to making a selection of which replacement agent(s) to implement on board a commercial aircraft, the MPS fire test performance data as well as resultant toxicity, the agent’s chemical characteristics and the extinguisher’s physical size and weight should be presented to the end users for them to make an informed decision as to which agent(s) they prefer most to use.

Airline Industry Survey

A suggestion was made and accepted at the October 29-30, 2002 of the International Aircraft Systems Fire Protection Working Group held in Atlantic City New Jersey to query the airline industry as to which attributes of extinguishing agents would be most preferred. A task group was formed at this meeting. Membership of this task group is comprised of airframe manufactures, agent manufacturers, airlines representatives and fire and toxicity experts from the FAA. The task group is assigned to:

- 1) Assemble information on specific candidate replacement extinguishing agents identified to date.
- 2) Contact users of hand held extinguishers in the aircraft industry to determine which agent attributes would or would not be preferred for use in the flight deck, main cabin and accessible cargo compartments of their airplanes.
- 3) Prepare a report summarizing the industry's responses at the following (IASFPWG) meeting.

¹ The MPS can be found at the following link. <http://www.fire.tc.faa.gov/pdf/01-37.pdf>

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User Preference Survey Attributes of Hand Fire Extinguishers with Replacement Agents

Please return this questionnaire no later than May 30, 2003.

Please rank the following attributes from (1) to (11). (1) is most important. (11) is least important.
Please rank all attributes with no attributes ranked equally.

_____ Toxicity	Minimal adverse effects on passengers or crew after use
_____ Ergonomics	Minimal crew retraining, 1 hand operation, intuitive operation
_____ Ozone Depletion Potential (ODP)	Lowest practical now and in future
_____ Global Warming Potential (GWP)	Lowest practical now and in future
_____ Weight	Least impact to dynamic mounting loads and user fatigue (all current crew can use extinguisher without restrictions)
_____ Size, Interchangeability	No impact to existing location, mounting brackets, surrounding equipment and spares storage (drop in replacement)
_____ Cleanup	No additional effort over current procedure for cleanup after a fire
_____ Material Compatibility	No corrosion of airplane structure, contamination of sensitive equipment or food preparation surfaces after use
_____ Visual Obscuration	No impairment of vision during or after use (i.e. in flight deck during landing)
_____ Maintenance	Longest possible inspection/replacement interval
_____ Cost	Lowest cost differential to Halon 1211.

Your Name _____
Please Print

Company Name _____

Telephone # _____

e-mail address _____

Please Return To:

Richard Mazzone (for Boeing airplanes)

or

Gilles Weyland (for Airbus airplanes)

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Halon 1211 Comparison Chart
(Information only, not an endorsement)

	Halon 1211 (Baseline)	American Pacific Corp. Halotron I HCFC Blend B	DuPont Corp. HFC236fa FE36	Great Lakes Chemical HFC 227ea FM200	Powsus Inc. FE36/Sodium Bicarbonate	North American Fire Guardian NAFG P-IV	NOT TESTED to MPS 3M Novec 1230
Chemical description	CF ₂ BrCl	>93% 2,2-dichloro 1,1,1- trifluoroethane	C ₃ F ₆ H ₂	C ₃ F ₇ H	C ₃ F ₆ H ₂ /NaHCO ₃	No info	C6-Perfluoroketone
Ozone Depletion Potential (CFC11=1)	4.0	0.014	0.0	0.0	0.0	No info	0.0
Global Warming Potential (CO ₂ =1) (4)	1300.0	120 ⁽³⁾	6300.0	3500.0	6300.0	No info	6-100
Atmospheric Lifetime (yrs)	25.0	1.4	209.0	33.0	209.0	No info	0.014
SNAP Approved	No	Yes	Yes	Yes	Yes	No info	Yes
UL Approved	Yes 5-B:C	Yes 5-B:C	Yes 5-B:C	No	No	No	No
NOAEL/ LOAEL (%)	.05/1.0	1.0/2.0	10.0/15.0	9.0/10.5	10.0/15.0	No info	10/10
MPS Seat Fire Test (1)	Pass	Pass	Pass	Pass	Pass	Pass	No info
Weight of Bottle (lbs.) (1)	4.75	8.3	9.5	8.9	3.3	10.0	No info
Net Weight of agent (lbs) (1)	2.50	5.50	4.75	5.75	2.50	8.60	No info
MPS Hidden Fire Test (# of cups)(2)	Pass	Pass	Pass	No info	Pass	No info	No info
Dimensions H, W, D (3)	17.5inx4.25in x3.25in	15.5 in x 5.25in x 5in	17in x 8.5in x 4.44in	No info	15in x 4in x 3.3 in	No info	No info
Effective range (3)	8-15 ft.	9-15 ft.	10 - 12 ft	No info	8-12ft.	No info	No info

(1) Data extracted from Seat Fire Test in FAA MPS (DOT/FAA/AR-01/37) performed by FAA Tech Center.

(2) Data extracted from Hidden Fire Test in FAA MPS (DOT/FAA/AR-01/37) performed by FAA Tech Center.

(3) Info provided by agent/bottle manufacturer.

(4) IPCC Intergovernmental Panel on Climate Change Method 100 Year