

INTERNATIONAL AIRCRAFT SYSTEMS FIRE PROTECTION (IASFPF) MEETING

Virtual Meeting

August 3-6, 2020

The notes included in this document for the August 3-5, 2020, webinars capture some of the questions asked after each of the presentations. Minutes for the August 6, 2020, Question and Answer Session are also included.

AUGUST 3, 2020:

Halon Replacement Handbook: Contact FAA Fire Safety to get involved. Email: 9-ACT-FIRESAFETY-INFO@faa.gov.

MPS for Aircraft Cargo Compartment Halon Replacement for Fire Suppression – Meggitt Verdagent - D. Dadia

Challenge Fire Test Blend D presentation: Cortina: what agent is Blend D? Dadia: Blend D is the same as Verdagent. It is 50/50 mixture of 2BTP with Carbon Dioxide.

Question & Answer Period:

When were those tests performed? Dadia: The tests were performed in 2019 from March-September.

Teixeira: Reason for separated plumbing? Dadia: high leakage rate. Systems originally designed to have just one plumbing.

Klieger: what was quantity of batteries and SOC? Dadia: 150 cells, each box had 50 cells and all cells were at 50% SOC.

B. Philipp: would you have passed the new flame criteria suggest by Enzo? Dadia: I will have to get back to you on Thursday during live Q&A session.

Cargo Compartment Halon Replacement Advisory Group (ICCAIA CCHRAG) – Dr. André Freiling (Airbus)

Question: With all the impact on research/development activities due to COVID-19 are the 2024 dates still feasible? Chiesa: Is ICAO taking this into consideration? Freiling: we have not discussed that in the CCHRAG yet. ICAO is very busy with COVID-19 issues around bringing aircraft back online. We will discuss this with ICAO when they have completed their top priority items.

EASA Rulemaking Update - Enzo Canari (EASA)

Questions:

Deaderick: Did NAAs require additional training for crewmembers for Cargo in the cabin? Canari: we have received comments that go in that direction. It is very important to carry out. Deaderick: Were additional fire extinguishers required...for cargo

in the passenger cabin? Canari: we mandated the addition of water extinguishers and 2 B C rated extinguishers.

Learning from Others – Update on LIBRIS Project – Jonathan Buston (UK HSE)

Questions:

Colton: for the same watt-hours, say 160 Wh, how do we see the comparison between 18650 and 21700 cells where perhaps you have 14 18650s and 9 21700s, how do you see comparison between the two hazards? Buston: I have not proven this yet, but I think you will get a bigger fire with the 21700s.

AUGUST 4, 2020:

Horizontal Smoke Velocity Characterization for Artificial Smoke Generators – Dr. André Freiling (Airbus)

Questions:

Chiesa: To do a round robin you need more than one facility, which facilities are you aiming at? Freiling: first FAATC and University of Duisburg. Afterwards we will move to a larger number of RR participants. We can discuss this in the Task Group.

Strategies for Improved Fire Detection Response Times in Aircraft Cargo Compartments - Jennifer Wood (University of Maryland)

Questions will be answered on Thursday.

AUGUST 5, 2020:

Engine/APU Halon Replacement Industry Consortium – Halon Alternatives for Aircraft Propulsion (HAAPS) Update – Alan Macias (Boeing)

Questions:

Laborie: What are the key candidate agents? Macias: we cannot divulge that yet because we are still working with the suppliers. Chiesa: what about the ICAO 2014 deadline? Macias: as new products come along those will have to meet that. Chiesa: are you working with ICAO to move that deadline (2014)? Macias: no, we are not.

Sonic Burner Study Follow Up – Mary Kelly (Resonate)

Questions:

Pugliese: what was the TC size used to measure the temps shown in this presentation? Kelly: brand new 1”.

Pugliese: did you try attaching a bolt on the aluminum panel like Serge did? Kelly: no, we have not tried the bolt on the aluminum panel.

Study into Flame Ingression through Holes in Firewall – Tom Mallon (Resonate)

Questions:

Laborie: what is the direction of the negative pressure differential? Will you try negative psid? Mallon: it is negative pressure inside the box. S. Johnson: do you see this work benefiting SAE A22 groups F and G? Mallon: we are open to suggestions of what this might benefit in the future.

Trinidad: will there be a zero differential pressure condition along with the the negative pressure conditions? Mallon: yes, we are intending to do that.

Developing the 1st Edition of the Standard for Safety for Battery fire Containment Products, UL 5800 – Alex Klieger (UL LLC), Susan Malohn (UL)

Questions:

Pereira: Did you evaluate the hazardous constituents of the resultant gas? Klieger: addressing toxic and flammable gas is currently outside the scope of our standard.

Handheld Extinguishers Effectiveness in Mitigating Thermal Runaway of Lithium Ion Cells – Aeon Brown (FAATC)

Questions:

J. Davis: Once thermal runaway is initiated, is the heater turned off? Brown: Yes, once TR was achieved from 1st cell.

Colton: If no agent was applied, how long does it take for the ignition of all 5 cells?
Brown: with no agents introduced, the time varied. Average of the time would probably be a minute or so.

Pereira: after the 3rd cell went into TR, was the heating continued for 4th and 5th cell?
Brown: the heat from the third cell did propagate from the other cells. The heater was turned off after TR of 1st cell.

Chiesa: 14 CFR 25.851(a)(6) and (7) state that the type and quantity of extinguisher agent used on hand fire extinguishers must be appropriate to the kinds of fires likely to occur where used. Due to the increasing number of equipment with lithium batteries being brought on-board by passengers, lithium battery fires are likely to occur in passenger cabins. Considering this, should the FAA revise the MPS for hand-held fire extinguishers (DOT/FAA/AR-01/37) to include additional test to assess the agent capability to extinguish lithium battery fires when incorporating it into the new Handbook (consistent with what is being done for the cargo compartment MPS)? Ochs: we do recognize these fires are more likely to occur now than in the past. We are going to continue this work. Aeon is working with our chemistry lab to look at the analysis of the gases that come off the fires as well as ability of agent to extinguish the fires.

Colton: can you discuss the holes in the lid again? Brown: the lid was .25" thick. The casing was lined or insulated with ceramic micro board which was .25" thick. The cover

was thinner than the sides, so it could open. Ochs: these were drawn up and printed on our 3D printer.

Chattaway: Did you just run one test per agent? Brown: Multiple tests were run per agent.

AUGUST 6, 2020 (Question and Answer Session):

TOPIC: Halon Replacement Handbook

Colton: the Handheld MPS needs updating mainly for the 2BTP. Speitel: We have not done any HF on lithium battery fires. I believe the direction we will wind up heading is to try to lean towards more appropriate extinguishers such as water because that will eliminate the hazard from the lithium battery and will be effective in cooling off the hazard. I agree with Rob that the program is just trying to show if there is any additional hazard posed by 2BTP vs. halon. For the upcoming tests, we are looking at the additive hazards that the agent would pose. I feel that the hazards that the lithium battery fire would pose are much greater than the agent will pose. Colton: PEDs: For handhelds extinguishing lithium battery fires, there are already certain requirements for handhelds: liquid pan fire and hidden fire. Flight attendants should be instructed to not discharge an entire halon bottle on a PED fire in case it flares back up (they can use remaining agent in handheld on it). Chiesa: you could say the same thing about the cargo compartment, but now the MPS is being revised to add the challenge fire, correct? Ochs: that's a good point. Dhaval: batteries in Cargo MPS Challenge fire were at 50% SOC. We are still evolving the Challenge Fire method and will include multiple SOCs for undeclared cargo. Speitel: right now for toxicity, we are not really touching on the toxicity for lithium battery fires. There are all types of fluorinated gases coming off the batteries. Some are toxic and extremely difficult to quantify. It will be a major effort to measure what is coming off these batteries. We are currently not equipped for this. Canari: you have to define a certain kind of fire scenario. The difference with cargo compartment MPS is that halon 1301 can suppress the kinds of fires you create in challenge fire. Toxicity is a very complex issue. I think we have special conditions. Ochs: it is going to be very complicated as Louise mentioned. I think we should do the most thorough measurements we can. Pereira: There is a major evaluation for installed equipment. We look at fire, toxic gas, and smoke. There is no way one size fits all. We actually have to test all of the equipment that is going to be installed on the airplane. Colton: Aeon, when you did the water test was that with TSO 1.3 L extinguishers was it water? Brown: it was one 8 oz. bottle of water.

Contact FAA Fire Safety if you are interested in participating in the Halon Replacement Handbook effort: 9-ACT-FIRESAFETY-INFO@faa.gov.

TOPIC: Cargo Fire Suppression/FCCs/FRCs

Dadia: How did we select the quantity of batteries and SOC for challenge fire? Answer: There were incidents of hover board fires around an aircraft, so we chose one hover

board as an example and chose 50 cells in a package and as if there were 3 of these in a shipment. At that time, they were still trying to enforce the 30% SOC, but they were still being shipped at 50% SOC, so we tested them at 50% SOC.

Boris Philipp's question from Monday: at that time we did not have the flame criteria. I will have to take a closer look at the video. It is hard to tell if there are any flames or not. The only other thing we can compare is the peak temperature. Kirbach: we had a discussion during one of the Task Group meetings, once we had better cameras in place, we could see more flames than we could in the past. We should consider rephrasing this just in case we have better cameras in the future. Task Group conclusion: a flame itself does not pose a threat itself, there are better criteria to be used as well. Dadia: extended version of aerosol can there is no way of looking at the igniters because there is a lot of smoke in the environment. We can make sure we address that visual threat. Canari: SOC: we want to have some type of simulation of PEDs in the passenger checked baggage. I am more concerned about the acceptance criteria. Dadia: Stephane Pugliese's question: how is the agent concentration measured and is there any blend separation issue? Answer: We used the measured CO separately and it gave us a combined concentration of the agent, and we used the Halonyzer during the concentration test. When we measured it, we saw that there was no stratification effect. It was equally measured throughout the entire compartment. Cortina: Agent Blend D – is it under serious consideration. If it is, there is a series of questions it raises: safe handling, servicing, etc. Dadia: I would open that question for aircraft manufacturers to answer. McEachen: Verdagent is definitely something we are considering. I cannot divulge details. We are looking at the issues Tom Cortina mentioned. We are mindful with other agents we are considering as well. McEachen: During the tests you had both the Emerson Real Time gas analyzer and Halonyzer, right? Dadia: yes. Mallon: Is there a drive that the new agent would be interchangeable with existing halon 1301 employed in existing fleets. Is this new agent for new aircraft only? Ingerson: yes, retrofit will likely be very difficult for something that is not 1 to 1. Mallon: is the plan to retrofit this back? Dadia: I would defer this question to the aircraft manufacturers. McEachen: there is a mandate in Europe to retrofit by 2040, so we have to plan for retrofits. Cargo holds, engine APUs, these will be significant retrofit programs for airlines if that mandate holds. Chiesa: the ICAO 2024 cargo compartment date is only for new designs. EASA: in Europe, we have already reached the limit for new models. In 2040, halon must disappear from Europe, so it is sort of a retrofit deadline (end of 2040).

TOPIC: FCCs/FRCs Any question? No.

TOPIC: Cargo Smoke Detection

Matt Karp addressed questions from Jennifer Wood's presentation. What is the brand of wireless smoke detector? Answer: Besda, Wes by Space Age Electronics, Whittaker model 601. C1E compliant? Answer: I don't think they are certified yet. I would have to ask the manufacturers. What was the quantity of fuel sources contained? Answer:

20ml heptane, urethane foam 100 g, suitcases: entire suitcase standing up filled with 10 cotton x-large t-shirts., shredded paper: 1.5 oz tamped down into metal tube – 100 g woodchips for the wood, 4 lithium ion batteries. Humidifier, smoke generator, baby powder. Jenn's recent report is on FAA Fire Safety website (www.fire.tc.faa.gov) "Strategies for Improved Fire Detection Response Times in Aircraft Cargo Compartments".

Question for Haiqing Guo: how do you prevent smoke from getting into ventilation system that goes directly to flight deck? Guo: This is a very good question. Backflow is possible from main deck to flight deck. At the current stage, we do not have much information on B737 ventilation systems. It is hard for us to compare to other smoke leakage tests. We can investigate this. If the smoke backflow into air conditioning is an issue, that is worth looking into. If anyone has information, I would appreciate you sharing it with us.

Are there other smoke detection questions for André Freiling? No.

TOPIC: G27 Lithium Battery Packaging Standard No additional questions.

TOPIC: Powerplant Fire Suppression

(Halon Replacement) Cortina: The testing in Phase III (HAAPS), is that independent testing you will do yourself or in conjunction with FAA. Macias: It will likely be a combination of the two.

Powerplant Fire Testing (NexGen burner, SAE A22, etc.): Pereira: have you thought about electrical power units that are coming online in the future – will these be applicable for electric propulsion engines? Ochs: it comes back to the type of fire that will be likely to occur in the powerplant. I don't know if anywhere else in the FAA they have addressed it. Steve Summer did some work with the hydrogen a few years ago. Pereira: just to keep in mind, because more are coming online. Chiesa: it would be a lithium battery fire. Ochs: yes. S. Johnson: SAE A22, do you see industry testing in cooperation with the FAATC in the future? Ochs: I have a historical presentation. We are open to collaboration once we are back online. The NexGen burner has been adopted on the Materials side. On the powerplant side, it is a bit of a different story because there are different failure methods and different components are being tested in different ways (different pass/fail criteria). We are open to discussing anything we can provided it agrees with what we have done on the Materials side. Sordi: Are there any plans in FAA to address 25.867? S. Johnson: the only thing I can really say about it that is it would fall under the Transport Standards Branch. They are not well-represented today. Anna, you can email me and I will work with you to try to get you some answers scott.r.johnson@faa.gov.

TOPIC: Powerplant Fire Test (Any questions for Mary Kelly/Tom Mallon): no.

TOPIC: PEDs and Handheld Extinguishers (videos being developed by Tom Maloney): No additional questions.

Ochs: Any additional questions? No.

Future IASFPF Meetings: We will keep everyone informed on future virtual and in-person meetings.