

Cargo MPS Task Group

7/17/2019

10:00 AM

WEBEX

Type of meeting: Task Group Meeting

Note taker: Dhaval Dadia

Attendees: Dhaval Dadia, Robert Ochs, Stephen Happenny, Enzo Canari, George McEachen, Pat Baker, Konstantin Kallergis, Terry Simpson, Ian Campbell, Calvin Ko, Antonio Chiesa, Samir Tambe.

Minutes

Agenda item: Meeting Minutes

Discussion:

The meeting minutes for this task group will be available on the Fire Safety Branch website at the link mentioned below.

<https://www.fire.tc.faa.gov/Systems/Cargo/TaskGroup>

Conclusions:

Have meeting minutes available on the Fire Safety Branch website.

Action items	Person responsible	Deadline
✓ Update Meeting Minutes	Dhaval Dadia	July 25, 2019

Agenda item: Next Meeting

Discussion:

Next meeting will be a Webex on Aug 20, 2019.

Conclusions:

Setup next Webex meeting for Aug 20, 2019

Action items	Person responsible	Deadline
✓ Setup Webex Meeting	Enzo Canari	August 19, 2019

Agenda item: Agenda for the meeting

Discussion:

Test Method	Issue	Discussions	Status
Aerosol Can Explosion Simulation	Size of pressure Vessel	None	In Progress
	Simulator valve opening timing	None	Completed
	Pressure Transducer	Boeing to present data FAA to show PT data from failed tests	In Progress
	Test Methodology	None	In Progress
	Test Criteria	Present "Final" version of criteria	In Progress

	Short Version Vs. Long Version	FAA/EASA Presentation	In Progress
Surface Burning Fire Scenario	Placement of pan	None	In Progress
	Miscalculation of std. deviation for acceptance criteria	None	Completed
Containerized Fire Scenario	Galvanized steel specifications in LD3 containers	None	Completed
Other Topics	Analysis of Test Results	None	In Progress
	Challenge Fire	Presentation from FAA	In Progress
	Toxicity	None	In Progress
	Units of acceptance criteria	Talk about issue	New Topic

The items tabulated above were the topics of discussion at the meeting.

Conclusions:

Summary of the agenda items for the Webex meeting.

Action items	Person responsible	Deadline
✓ None	N/A	N/A

Agenda item: Aerosol Can Explosion Simulation

Discussion:

George McEachen presented data conducted at Boeing’s Cargo MPS facility. The data was from pressure transducers for the aerosol can explosion simulation test scenario. Their data showed the pressure rise in the compartment from the opening of the simulator valve. The data also showed a fluctuation in the data when a flash event occurred slightly after the opening of the valve. Boeing’s recommendation from these tests is to not enforce running the baseline tests without igniters. Their data suggests the opening of the valve is captured in live tests and the data can be used to generate a maximum pressure value. Any event following the opening of the valve should be captured in the data. This would result in saving the agent that would be used to run the non-ignited tests.

There was a proposal to run baseline tests without the agent. Based on this proposal, the tech center will conduct some tests to compare results with and without the agent present in the compartment.

Tech center presented data from failed tests conducted with Halon that show the rise in pressure within the compartment after the pressure rise from the opening of the valve. The first chart shows the pressure chart from a 0-5 bar pressure transducer placed at the ceiling of the compartment. The second chart shows the pressure chart from a 0-20 inches of water pressure transducer placed on the sidewall of the compartment.

The charts showed that the range and placement of the pressure transducers matter in the measurement of the pressure pulse. There was a recommendation to place a pressure transducer within the compartment near the location of the gas sampling probe.

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The acceptance criteria for the aerosol test explosion simulation test was finalized and a consensus was reached. The proposal is as follows *“The criterion for the aerosol can explosion and reaction simulation scenario is that there is no evidence of an explosion or unacceptable reaction. Evidence of an explosion is that there shall be no pressure rise more than the measurement of the baseline simulator pressure release into a compartment. The baseline test shall be conducted at least three times in the presence of the agent being tested without an ignition source. The baseline pressure will be calculated as the maximum value of the conducted tests and one standard deviation. The criteria of an unacceptable reaction is based on the observed performance with Halon 1301. With Halon 1301 it is typical to see evidence of a local flame or illumination near the ignitor in most tests and to see a small flash in 1 of 5 tests. The small flash involved a flame that separated from the ignitor and spread about 2 feet and self-extinguished in 2 seconds. In the event of more than one test having a "small flash" event, it is acceptable to perform additional tests to demonstrate that the frequency of these events is not greater than 20%. In addition, when the agent concentration is below its inert concentration, the explosion intensity and peak pressures shall not be greater than the values exhibited during an*

explosive event when no suppression agent is present in the compartment. To find more information on this subject, refer to reference 2.”

FAA and EASA presented their combined stance on the circumstances of when the short version or the long version of the aerosol can explosion simulation test can be conducted. The stance is summarized in the statement below.

“This scenario addresses the hazards of an exploding aerosol can during an aircraft cargo compartment fire. This test protocol uses a modified version of the bulk-load fire test scenario to determine the activation time of the aerosol can simulator. Based on experiments with aerosol cans subjected to fires, the FAA William J. Hughes Technical Center developed an aerosol can simulator (figures 8 and B-1 in appendix B) that releases a mixture of propane and alcohol through a large-area valve and across sparking electrodes [1]. The short-test protocol version is the primary test protocol version for conducting this test. The long-test protocol version of the test will be allowed only on a case by case basis after the authorities have reviewed the measurement capabilities applicable for the halon replacement agent.”

The statement was accepted via consensus and will be added into the next revision of the MPS document.

Conclusions:

The acceptance criteria for the aerosol can explosion simulation test was agreed upon. The FAA and EASA presented their stance on the circumstances of when the short version or the long version of the aerosol can explosion simulation test can be conducted.

Action items	Person responsible	Deadline
✓ Conduct aerosol can tests to compare the opening of the simulator valve without agent present in the compartment. Place a pressure transducer within the compartment during these tests.	Dhaval Dadia	Sept. 18, 2019
✓ Edit the acceptance criteria in the revised MPS document.	Dhaval Dadia	Sept. 18, 2019
✓ Edit the statement of when the long version of the aerosol can test can be conducted.	Dhaval Dadia	Sept. 18, 2019

Agenda item: Challenge Fire

Discussion:

FAA presented the fire load that has been used for a previous MPS campaign and described it as a test for fires likely to occur in the cargo compartment. The discussion boiled down to the point that there is still work that needs to be done in defining the need for the test, test method, and an acceptance criteria for the test.

An issue paper could be used as means of compliance (MOC) for the challenge fire test. Boeing would rather address the issue through the MPS instead of writing an issue paper for every airplane on which the agent would be installed.

Conclusions:

FAA / EASA need to define the need for the test, the test method, and an acceptance criteria.

Action items	Person responsible	Deadline
✓ Define the need for the test, the test method, and an acceptance criteria	FAA / EASA	Aug. 20, 2019

Agenda item: Units of acceptance criteria

Discussion:

The unit conversion methodology for the time-temperature integral for the test methods is unknown. There was concern that the time-temperature integral is calculated as the area above 0°F and when it is converted to the Celsius scale the value might not represent the same value as calculated as the area above 0°C. There is a need to perform the unit conversions for one scenario and observe the differences. Also a recommendation was made to convert the temperatures to the Kelvin scale and calculate the integral.

Conclusions:

Conduct an example set of calculations for the time-temperature integral and convert it to the Celsius scale to observe any irregularities.

Action items	Person responsible	Deadline
✓ Perform time-temperature integrals on a particular scenario for 3 different temperature scales.	Dhaval Dadia	August 20, 2019

Agenda item: Toxicity in the MPS

Discussion:

Boeing suggested we add the details of how acid gases are measured during the MPS tests and document the entire process. The process would include the need, the methodology, and a sample set of results for acid gas testing.

Conclusions:

The Tech Center and Boeing can collaborate to develop the material to include within the MPS document.

Action items	Person responsible	Deadline
✓ Add details of toxicity analysis in the MPS	Tech Center, Boeing	January 20, 2020

Agenda item: MPS task group meeting in Seattle.

Discussion:

Boeing presented the opportunity to host a task group meeting in Seattle to demonstrate their MPS facility as well as hold the talks in person. Task group members will check their availability for Sept 25th as a possible day.

Conclusions:

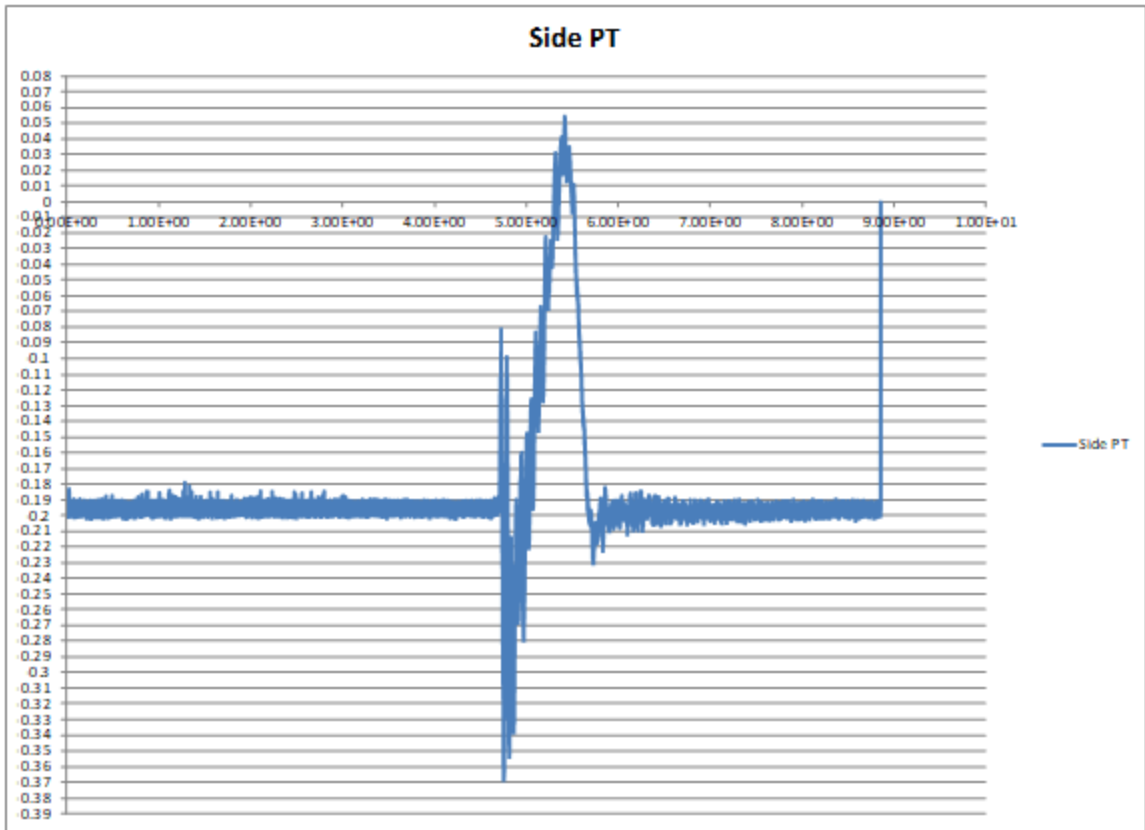
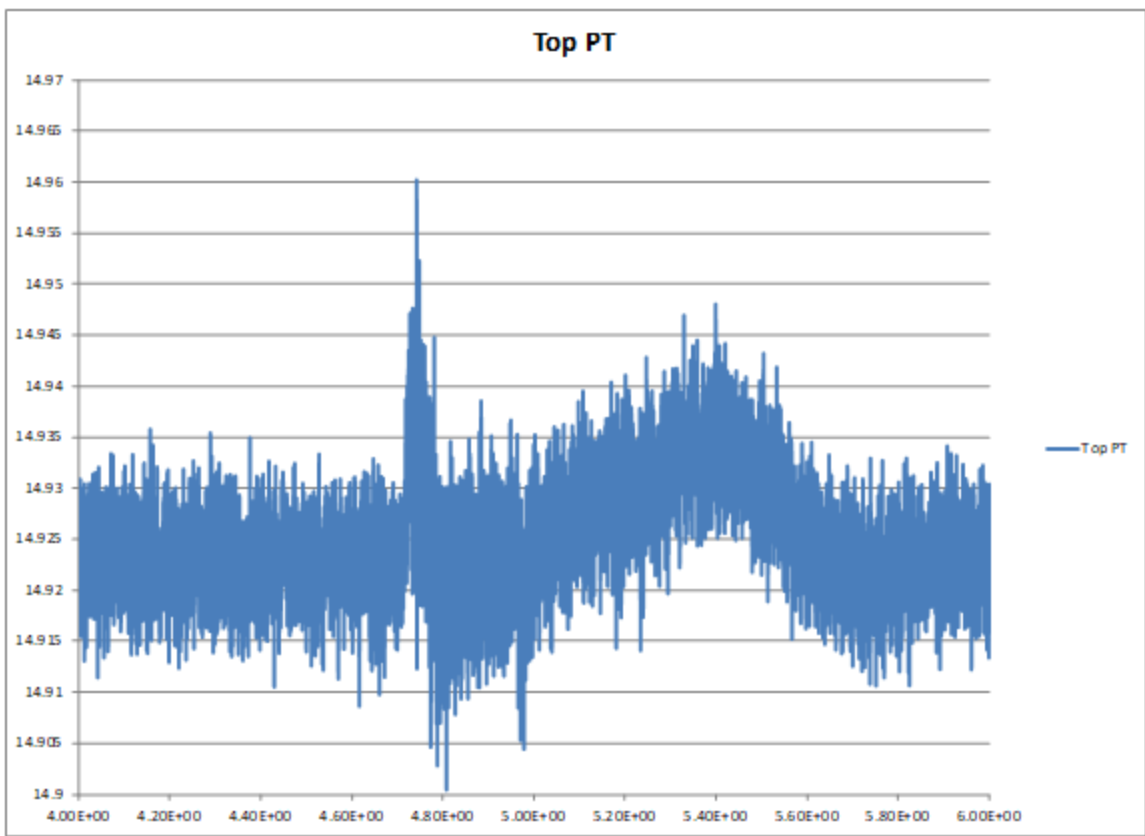
Task members will check their availability to attend a task group meeting in Seattle for the 25th of September.

Action items	Person responsible	Deadline
✓ Check availability to travel to Seattle on the 25 th of Sept.	Task Group members	August 20, 2019

Appendix

Special notes: Raw information used during discussions

Pressure Transducer	Performed Baseline tests as well as with ignitor on. Not necessary to perform baseline tests Kistler and Kulite PT perform similarly. Response back to ambient is approx 5 seconds Theories - Cooling in the chamber when simulator is released Water droplets might be condensing and evaporating in the 5 seconds Enzo - Proposal? Take highest of the Std. dev. From either igniter tests or non-igniter tests, Not to run baseline test. Not opposed to running non-ignited tests. Samir proposal - run baseline tests without agent. Run comparison with the agent vs non-agent non-igniter tests
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- Range of PT matters

	<ul style="list-style-type: none"> • Placement of PT matters <p>Boeing has observed similar events Criteria relative to the valve opening pressure rise 1.5 psi Kistler PTs being used at Boeing Recommendation to place a PT within the chamber near the gas sampling probe Conduct test with PT within the compartment.</p>
<p>Test Criteria</p>	<p><<Revised Cargo Compartment MPS.ppt>> <i>The criterion for the aerosol can explosion and reaction simulation scenario is that there is no evidence of an explosion or unacceptable reaction.</i> Evidence of an explosion is that there shall be no pressure rise (in addition to its standard deviation) more than the measurement of the baseline simulator pressure release into a compartment. The baseline test shall be conducted at least three times in the presence of the agent being tested without an ignition source. The baseline pressure will be calculated as the maximum value of the conducted tests and one standard deviation. The criteria of an unacceptable reaction is based on the observed performance with Halon 1301. With Halon 1301 it is typical to see evidence of a local flame or illumination near the ignitor in most tests and to see a small flash in 1 of 5 tests. The small flash involved a flame that separated from the ignitor and spread about 2 feet and self-extinguished in 2 seconds. In the event of more than one test having a "small flash" event, it is acceptable to perform additional tests to demonstrate that the frequency of these events is not greater than 20%. <i>In addition, when the agent concentration is below its inert concentration, the explosion intensity and peak pressures shall not be greater than the values exhibited during an explosive event when no suppression agent is present in the compartment. To find more information on this subject, refer to reference 2.</i></p> <p>Consensus: Pat, Samir, Dhaval, George, Enzo, Steve, Boris, Andre, Xavier,</p> <p>Proposal: Boeing to amend criteria, obtain non-agent test data</p>
<p>Short Version Vs. Long Version</p>	<p><i>This scenario addresses the hazards of an exploding aerosol can during an aircraft cargo compartment fire. This test protocol uses a modified version of the bulk-load fire test scenario to determine the activation time of the aerosol can simulator. Based on experiments with aerosol cans subjected to fires, the FAA William J. Hughes Technical Center developed an aerosol can simulator (figures 8 and B-1 in appendix B) that releases a mixture of propane and alcohol through a large-area valve and across sparking electrodes [1].</i> The short-test protocol version is the</p>

	<p>primary test protocol version for conducting this test. The long-test protocol version of the test will be allowed only on a case by case basis after the authorities have reviewed the measurement capabilities applicable for the halon replacement agent.</p> <p>Consensus: George, Enzo, Steve, Dhaval, Rob, Pat.</p>
<p>Challenge Fire</p>	<p>Current requirements (14 CFR Part 25.851(b) - (2) <i>The capacity of each required built-in fire extinguishing system must be adequate for any fire likely to occur in the compartment where used, considering the volume of the compartment and the ventilation rate.</i></p> <p>What types of material are likely to be present in today's cargo compartments? FAA has requested testing with material that results in a complex fire (i.e., surface burning fire; flammable liquids; portable energy devices – lithium batteries). A test for a cargo compartment included the following fire threat:</p> <ul style="list-style-type: none"> ▪ Palletized load of boxes with shredded paper ▪ Some boxes with lithium ion batteries ▪ Some boxes with flammable fluids ▪ Pallet load to be covered in rain wrap <p>Antonio - Is it limited to replacement agents only? Yes It affects future certification of agents MPS was established to maintain equivalence to Halon. George - Would Halon fail the challenge fire? Run the test once, P/F criteria not based on Halon. Run a Halon Baseline and establish a time-temp criteria similar to other scenarios. Antonio - Is it an upgrade on design standard? Not MPS, use NPRM. Enzo - "Fires likely to occur" - batteries are present in the cargo compartment. Is it a concern? Antonio - fires likely to occur are evolving. Standard for design of fire suppression system is an evolving standard. Enzo - EASA introduce test through special conditions. Antonio - Special condition is new standard. There is no mention of Halon in standards.</p> <p>E -Additional test that is required, because of changes in the carriage of cargo. Batteries weren't a concern when the MPS developed.</p> <p>G - Has there been any documentation on P/F criteria. D - No criteria. It is data development. G - Anxiety on agent might fail in the future. Write down what we believe passing looks like, E - haven't made progress on data and criteria. Writing down procedure and criteria would help process. Will try to present something next meeting. Need to have a definition of the test setup, P/F criteria.</p>

	<p>Steve - Will work on discussion and acceptable criteria. Regulation is broad, never defined "fires likely to occur". Changes in cargo materials. Methods of compliance issue paper could be used to address challenge fire.</p> <p>George - Prefer run it once during MPS. Publish the result rather than address it through MOC issue paper when applying to each type of airplane.</p>
<p>Units of Acceptance Criteria</p>	<p>Time Temperature Integrals Bulk Load 9850°F-min (4974°C-min) Containerized Fire 14,520°F-min (7,569°C-min) Surface Burning Fire 1190°F-min (608°C-min). Perform the Math and present at the next meeting. (think about the Kelvin scale.)</p>