

# Cargo MPS Task Group

6/12/2019

10:00 AM

WEBEX

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**Type of meeting:** Task Group Meeting

**Note taker:** Dhaval Dadia

**Attendees:** Dhaval Dadia, Robert Ochs, Stephen Happenny, Enzo Canari, George McEachen, Doug Ferguson, Pat Baker, Robin Bennett, Karsten Kirbach, Rainer Beuermann, Konstantin Kallergis, Terry Simpson, Ian Campbell, Mark Petzinger, Adam Chattaway, Calvin Ko, Antonio Chiesa, Samir Tambe, Cris Sevilla, Nels Olson, Sidney Teixeira

## Minutes

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**Agenda item:** Size of pressure vessel in aerosol can simulator

### Discussion:

The internal volume of the simulator vessel was measured to be 700 ml. The rest of the dimensions will be measured once the simulator is done being used for testing.

### Conclusions:

Obtain dimensions of simulator vessel.

### Action items

✓ Measurement of dimensions

### Person responsible

Dhaval Dadia

### Deadline

July 10, 2019

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**Agenda item:** Placement of pan for surface burning fire scenario

### Discussion:

Needs to be updated in MPS document.

### Conclusions:

Use top edge of pan as the height frame of reference. Remove "maximum horizontal distance" from the most difficult location definition. Compare data from Boeing MPS test cell as well as run no-agent tests in the DC-10.

### Action items

✓ Add edge of pan as frame of reference

✓ Remove wording from criteria

✓ Compare Data

### Person responsible

Dhaval Dadia

Dhaval Dadia

Dhaval Dadia

### Deadline

Enter deadline here

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**Agenda item:** Miscalculation of standard deviation in surface burning fire.

### Discussion:

Needs to be updated in the MPS document

### Conclusions:

Update table with correct standard deviation value.

### Action items

✓ Correct Value

### Person responsible

Dhaval Dadia

### Deadline

July 10, 2019

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**Agenda item:** Galvanized steel in LD3 containers

**Discussion:**

Update needs to be made in the MPS document.

**Conclusions:**

Provide alternate sheet metal information. Change annotation used for the thickness of the material.

Action items	Person responsible	Deadline
✓ Alternate sheet metal information	Dhaval Dadia	July 10, 2019
✓ Thickness annotation of the sheet metal	Dhaval Dadia	July 10, 2019
✓ Correct spelling errors "gage"	Dhaval Dadia	Jul 10, 2019

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**Agenda item:** Aerosol Can Simulator – Compartment Pressure Transducer

**Discussion:**

During some testing conducted at the Technical Center, a pressure transducer with the range of 20 in of water was used alongside the pressure transducer with a range of 5 bar. The data from the two transducers were shown to display the disparity in measurement capabilities of the two transducers. There was an order of magnitude difference in the measurements. It was shown that the 20 in of water pressure transducer was capable of more accurate measurements and hence was recommended to be used as the pressure transducer for the aerosol can tests. Dhaval Dadia will present the specifications for the two pressure transducers at the next meeting. There was a recommendation to use a Validyne P55 pressure transducer for this test. There was also some mention that a Voltage output instrument is more susceptible to noise than a milliamp output instrument. A recommendation was also made to mention specifications and accuracy among other specifications in the document rather than singling out a specific pressure transducer. Boeing will present more details regarding the importance of positioning a pressure transducer relative to the simulator as well as within the compartment at the next meeting. Boeing mentioned some preliminary results which included that the location is not as important as the mounting method of the transducer to the compartment.

**Conclusions:**

Recommendations or using a pressure transducer with a range of 20 in of water was made. Other recommendations included a Validyne P55 pressure transducer, and to specify specifications in the document rather than an instrument.

Action items	Person responsible	Deadline
✓ Produce specifications for the 20 in of water pressure transducer.	Dhaval Dadia	July 17, 2019
✓ Present studies of the positioning of a pressure transducer Boeing Co. in the test compartment.		July 17, 2019
✓ Change the pressure transducer specifications once the pressure transducer is agreed upon.	Dhaval Dadia	Enter deadline here

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**Agenda item:** Aerosol Can Simulator Test Results Using Halon 1301

**Discussion:**

1 tests still need to be conducted using the new test methodology. The results from the tests will be presented at the next meeting.

**Conclusions:**

Awaiting testing to be conducted and analyzed.

Action items	Person responsible	Deadline
✓ Perform tests and analyze result to present to task group	Dhaval Dadia	August 17, 2019

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**Agenda item:** Discussion of pressure data without flash / deflagration

**Discussion:**

A discussion regarding whether the pressure data should be looked at when there is no flash or deflagration during an aerosol can test was conducted. Boeing data shows that when a flash occurs in the compartment, a pressure rise is observed after the recorded pressure rise of the simulator valve releasing the contents of the simulator. There were talks to establish a timeframe where the pressure data should be recorded. FAA and EASA are to have internal talks to establish an acceptable result for the test.

**Conclusions:**

FAA and EASA to have internal talks to establish an acceptable criteria and add details to understand the pressure data captured during the test.

Action items	Person responsible	Deadline
✓ FAA and EASA to have internal talks	FAA/EASA	July 17, 2019

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**Agenda item:** Meetings recurrence

**Discussion:**

Follow up meeting will be on July 17, 2019.

**Conclusions:**

Next Webex meeting on July 17, 2019

Action items	Person responsible	Deadline
✓ Setup WebEx meeting	Enzo Canari	July 11, 2019

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**Agenda item:** Aerosol Can Explosion Simulation Acceptance Criteria

**Discussion:**

Steve Happenny had some recommendations to add to the criteria that was developed in the last meeting. Mentioned below are the changes and the explanation for the changes.

Aerosol can explosion and reaction simulation:

*"The criterion for the aerosol can explosion and reaction simulation scenario is that there is no evidence of an explosion or reaction ~~that would be a threat to the integrity of the cargo compartment~~. 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 ~~three~~ **five** 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 ~~three~~ **five** 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 ~~reaction 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 \_ 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."*

(1) Minor point. I believe that the correct nomenclature to use regarding this test is "aerosol can explosion **and reaction** simulation". While the major concern is to avoid explosion, as the task group understands the test also is to address "reactions" that may occur. [However, this is a minor point to me and I could agree with retaining the current language if that is the consensus of the Task Group.]

(2) Major Point. I object to the phrase "*that would be a threat to the integrity of the cargo compartment,*" because this could result in further interpretation and result in non-standardized interpretation. As this paragraph provides the pass/fail criteria, I would like the criteria to be clear and not open to further interpretation. [This is a major point to me and I could not recommend to FAA management to accept the current statement without significant changes. I believe that it is easier to remove the statement.]

(3) Minor Point. I recommend that the testing associated with the phrase "*The baseline test shall be conducted ~~three~~ **five** 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 ~~three~~ **five** tests and one standard deviation.” Due to the criticality of the results of this testing (establishment of baseline delta pressure), and my limited review of some data from present testing (i.e., I have noted some large variations in measured pressure for back-to-back testing.) I recommend that this be increased to five tests. [However, I am not an expert on pressure instrumentation and I could agree with retaining the current language if that is the consensus of the Task Group.]

(4) Major Point. I recommend that we remove “**reaction**” in the sentence and replace with **illumination**. “*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 ~~reaction~~ illumination near the ignitor in most tests and to see a small flash in 1 of 5 tests.*” The intent of this sentence is to define “unacceptable reaction” and we should not use “reaction” within the definition.

Suggestions were made to add “unacceptable reaction” to the first sentence, and to change the wording requiring the number of time to conduct the baseline tests to “at least three”.

**Conclusions:**

Developed a potential criteria that needs to be created into a statement that will be presented to the FAA. The task group has agreed upon this criteria.

Action items	Person responsible	Deadline
✓ Write a statement mentioning the new criteria to be submitted to the FAA	Pat Baker	July 17, 2019

**Agenda item:** Long Version vs Short Version of Aerosol Can Test

**Discussion:**

We briefly discussed the option of conducting the long version or the short version of the aerosol can test. FAA and EASA are still in the process of discussing their stance internally. The parties will present their stance at the following meeting.

**Conclusions:**

FAA and EASA to hold internal talks and present their stance at the next meeting.

Action items	Person responsible	Deadline
✓ Continue discussions	Task Group	July 17, 2019

## **Appendix**

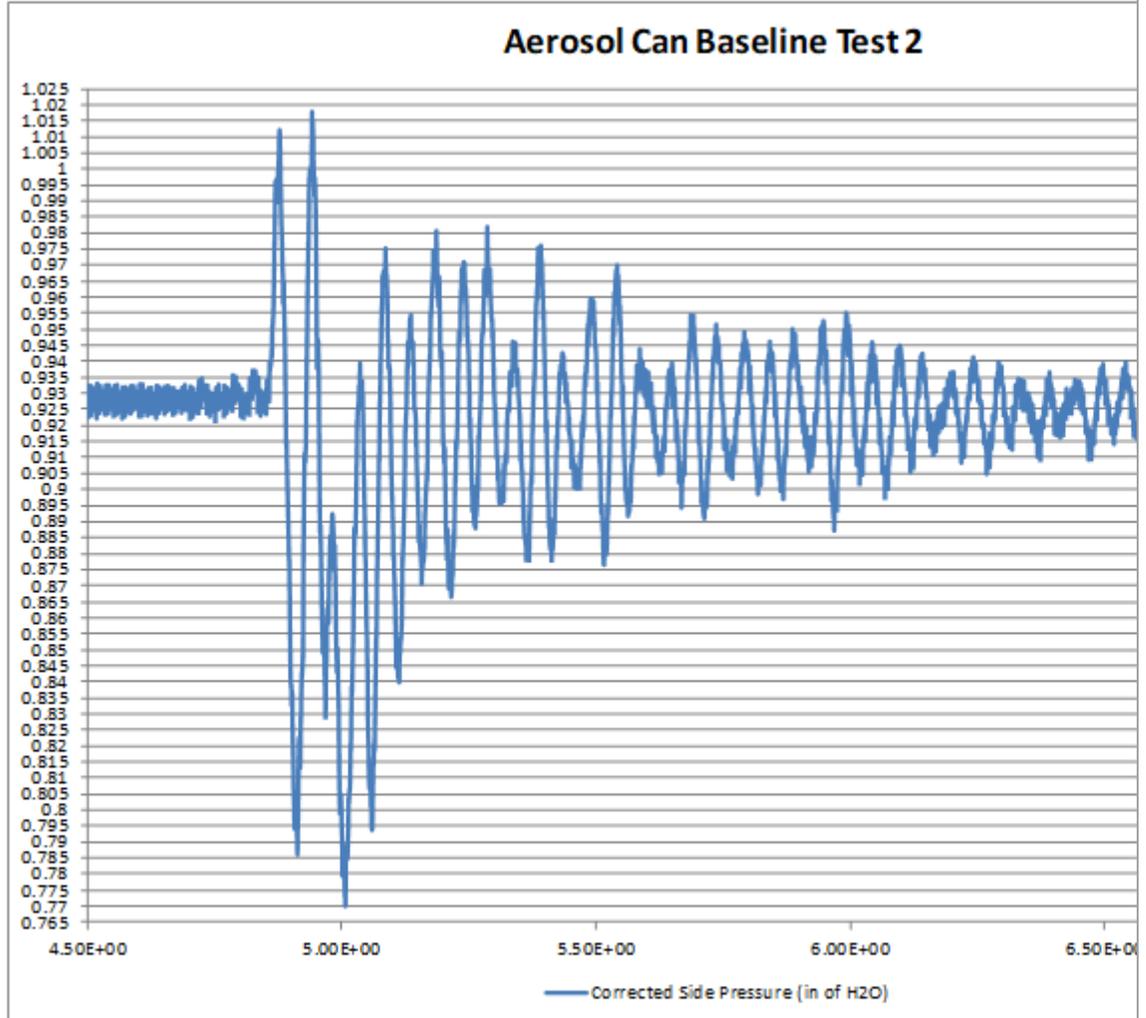
**Special notes: Raw information used during discussions**

Koln meeting minutes	<a href="https://www.fire.tc.faa.gov/pdf/systems/May19Meeting/0519-Minutes.pdf">https://www.fire.tc.faa.gov/pdf/systems/May19Meeting/0519-Minutes.pdf</a>
Written statement	<p>The following revised acceptance criteria is proposed for the Minimum Performance Standard for Aircraft Cargo Compartment Halon Replacement Fire Suppression Systems, FAA Document DOT/FAA/TC-TN12/11. This criteria was developed by the task group formed during the 2019 International Aircraft Systems Fire Protection Working Group Meeting in Cologne, Germany.</p> <p>Existing Criteria per FAA Document DOT/FAA/TC-TN12/11:</p> <p><i>The criterion for the aerosol can explosion simulation scenario is that there is no evidence of an explosion or reaction. Evidence of an explosion or reaction includes deflagrations, flashes, and overpressures, etc. There shall be no overpressures (zero pressure rise). 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</i></p>

	<p><i>suppression agent is present in the compartment. To find more information on this subject, refer to reference 2.</i></p> <p>Proposed Revision to Criteria:</p> <p>The criterion for the aerosol can explosion simulation scenario is that there is no evidence of an explosion or reaction that would be a threat to the integrity of the cargo compartment. Verification of no explosion is that there shall be no pressure rise greater than the measured baseline simulator pressure caused by the release of the simulator into the compartment. The baseline test shall be conducted 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 three tests plus 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 reaction near the igniter in most tests and to see a small flash in approximately 1 of 5 tests. The small flash involved a flame that separated from the igniter and spread approximately 2 feet and self-extinguished in approximately 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.</p> <p>This list includes all persons who have participated in the development of the revised acceptance criteria and have also concurred with the revised acceptance criteria:</p>							
Action Items	<p>Aerosol Can measurement (700 ml internal volume. Dimensions to follow after testing is complete.)</p> <p>Change part number of pneumatic valve</p> <p>Edge of pan as frame of reference</p> <p>Remove "maximum horizontal distance" from surface burning criteria</p> <p>Correct value for surface burning peak temperature criteria</p> <p>LD3 container - thickness of galvanized steel and alternate metal information</p> <p>Aerosol can compartment pressure transducer (see below)</p> <p>Aerosol can acceptance criteria</p> <p>Aerosol can long version information</p>							
Aerosol can compartment pressure transducer	<ul style="list-style-type: none"> <li>• Conducted baseline pressure for the agent being tested.</li> <li>•</li> </ul> <table border="1" data-bbox="389 1764 1461 1869"> <thead> <tr> <th>Test</th> <th>Top PT (psig)</th> <th>Side PT (in of H2O)</th> <th>Side PT (psig)</th> <th>Std. Dev. Top PT (psig)</th> <th>Std. Dev. Side PT (in of H2O)</th> <th>Std. Dev. Side PT (psig)</th> </tr> </thead> </table>	Test	Top PT (psig)	Side PT (in of H2O)	Side PT (psig)	Std. Dev. Top PT (psig)	Std. Dev. Side PT (in of H2O)	Std. Dev. Side PT (psig)
Test	Top PT (psig)	Side PT (in of H2O)	Side PT (psig)	Std. Dev. Top PT (psig)	Std. Dev. Side PT (in of H2O)	Std. Dev. Side PT (psig)		

Baseline 1	0.035	0.07	0.0025	0.005773503	0.036055513	0.001345362
Baseline 2	0.025	0.09	0.0032	<b>Criteria Top PT</b>	<b>Criteria Side PT</b>	<b>Criteria Side PT</b>
Baseline 3	0.035	0.14	0.0051	0.040773503	0.176055513	0.006445362

- Order of magnitude difference in the pressure transducer measurements



- Recommend using 20 in of water pressure transducer.
- Follow up next webex meeting by Boeing. PT that measure accurately.
- Provide spec sheet for the used PTs.
- 0-5 bar is out of range as per the MPS document.
- 0-50 psig requirement would have to be changed in the document.
- Validyne - 1e-5 psi noise level range 0.5 psi P55 model. 4-20 mA output (2.2 in of H2O available)
- Accuracy on mA output vs V output (need to research) (V is more susceptible to noise)
- Refrain from using a specific PT. rather mention range, accuracy and other specs.
- Positioning of PT is also important.
- Position relative to simulator

<p>Aerosol can test pressure transducer testing (Boeing)</p>	<ul style="list-style-type: none"> <li>• Results presented by Boeing regarding testing conducted at their test facility</li> <li>• Boeing conducted tests with various PTs.</li> <li>• Location is not as important as the mounting method.</li> <li>• Absolute value of the signal changes in mounting on the wall vs to a pipe.</li> <li>• Will present at the next meeting.</li> <li>• Diehl observed similar pressure curves</li> </ul>	
<p>Aerosol can test using Halon at Tech Center</p>	<ul style="list-style-type: none"> <li>• Show presentation with Halon test data to note similar observations as the Boeing facility. There is a pressure rise observed for the simulator opening as well as the flash.</li> <li>• Steve recommendation to increase baseline tests to 5 instead of 3.</li> </ul>	
<p>Aerosol can pressure transducer data</p>	<ul style="list-style-type: none"> <li>• Discussion regarding whether the pressure data should be looked at if there is no flash/deflagration observed?</li> <li>• Not suggesting remove criteria</li> <li>• Pressure data doesn't line up with what you are seeing.</li> <li>• Different frequencies of chamber, pipes, mountings - convoluted into data. FFT to figure out each freq.</li> <li>• Timeline of valve opening pressure rise vs pressure rise that occurs 0.5 sec after opening of valve. (Compare pressure rise in what portion of the timeline/ no pressure rise throughout test as mentioned in MPS)</li> <li>• If peak is not accurate require more baseline tests.</li> <li>• Can we run without agent to establish a baseline</li> <li>• Look at pressure time history to look at a peak not caused by the opening of the simulator.</li> <li>• Mention time duration of the pressure transducer measurement.</li> <li>• Write a P/F criteria with all the little details?</li> <li>• Could have a discussion amongst FAA/EASA to go over the acceptability of results.</li> <li>• Explanation of slight* overpressure would be considered by the authorities....</li> <li>• Propose a write-up next meeting (Pat Baker)</li> </ul>	
<p>Aerosol can test acceptance criteria</p>	<ul style="list-style-type: none"> <li>• Steve Happenny's suggestions  Aerosol can explosion <u>and reaction</u> simulation:  <i>"The criterion for the aerosol can explosion <b>and reaction</b> simulation scenario is that there is no evidence of an explosion or reaction <del>that would be a threat to the integrity of the cargo compartment.</del>  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 <del>three</del> <b>five</b> 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 <del>three</del> <b>five</b> 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 <del>reaction</del> <b>illumination</b> 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 _ 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</i></li> </ul>	<p>The first statement shouldn't be taken at face value without the explanation provided.</p> <p>Add "unacceptable reaction" to the first statement.</p> <p>"Three or more times" / "at least three"</p> <p>Use "illumination"</p>

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."

instead of reaction.

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- Potential Criteria "The criterion for the aerosol can explosion simulation scenario is that there is no evidence of an explosion or reaction that would be a threat to the integrity of the cargo compartment. 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

	<p>release into a compartment. The baseline test shall be conducted 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 three 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 reaction 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 _ 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."</p>	
<p>Aerosol Can Long Version</p>	<p>Information in 2003 report. Still have to find data.</p>	
<p>Aerosol Can Long version vs Short Version</p>	<ul style="list-style-type: none"> <li>• Discussions regarding long version vs short version of the aerosol can test.</li> <li>• Should there be a statement mentioning that a gaseous agent needs to be tested against the short version</li> <li>• Gaseous agent must perform a short version or option to run a long version <ul style="list-style-type: none"> <li>• Still in talks. Will postpone to next meeting.</li> </ul> </li> <li>• Halon would easily pass the long version compared to the short version</li> <li>• Consider the effect on other halon replacement agents.</li> </ul>	

Next meeting - 17th July 2019 10 AM EST  
Challenge Fire Test  
Toxicity Concerns