Cargo Compartment Halon MPS

Water Mist / Nitrogen Fire Suppression System Update

Presented to: International Aircraft Systems Fire Protection Forum Meeting
By: Dhaval Dadia
Date: May 14, 2019
Background

• MPS for Halon replacement in cargo compartment was conducted at the Tech. Center in 2017.
• Results presented at the November 2017 and May 2018 Systems meetings.
• An error was observed in the way the results were analyzed.
• Reporting the updated analysis of the results.
Old Analysis

**MPS Bulk Load Fire Test 1**

Ceiling Temperatures

- **1st peak**: TC #7, 682.1 °F
- **2nd peak**: TC #4, 599.7 °F
- **3rd peak**: TC #5, 574.9 °F
- **4th peak**: TC #1, 474.3 °F
- **5th peak**: TC #11, 434.8 °F

Average of Test #1: 553.1 °F
Acceptance Criteria: 710.0 °F

**Comparison**: Average vs. Criteria is done for average of highest 5 peaks of each individual Test out of the total of 5 Tests.

New Analysis

**MPS Bulk Load Fire Test 5**

- **1st peak**: TC #1, 682.1 °F
- **2nd peak**: TC #2, 444.3 °F
- **3rd peak**: TC #3, 485.4 °F
- **4th peak**: TC #4, 314.3 °F
- **5th peak**: TC #5, 304.9 °F

Average over all Tests: 446.2 °F
Acceptance Criteria: 710.0 °F

**Comparison**: Average vs. Criteria is done for average of highest single peak of each Test over all Tests.
### New Analysis

<table>
<thead>
<tr>
<th>Test Scenario</th>
<th>Bulk Load Fire Scenario</th>
<th>Containerized Fire</th>
<th>Surface Burning (Pan) Fire</th>
<th>Aerosol Can Simulation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Units</td>
<td>Peak Temp (°F)</td>
<td>Time-Temp (°F-min)</td>
<td>Peak Temp (°F)</td>
</tr>
<tr>
<td>Test 1</td>
<td></td>
<td>682.08</td>
<td>8346.14</td>
<td>535.22</td>
</tr>
<tr>
<td>Test 2</td>
<td></td>
<td>444.25</td>
<td>7081.32</td>
<td>409.05</td>
</tr>
<tr>
<td>Test 3</td>
<td></td>
<td>485.38</td>
<td>7633.35</td>
<td>543.13</td>
</tr>
<tr>
<td>Test 4</td>
<td></td>
<td>314.26</td>
<td>5737.17</td>
<td>610.6</td>
</tr>
<tr>
<td>Test 5</td>
<td></td>
<td>304.90</td>
<td>6132.39</td>
<td>432.39</td>
</tr>
<tr>
<td>Average</td>
<td></td>
<td>446.17</td>
<td>6986.07</td>
<td>506.11</td>
</tr>
<tr>
<td>Std. Dev.</td>
<td></td>
<td>137.52</td>
<td>955.65</td>
<td>74.87</td>
</tr>
<tr>
<td>Acceptance Criteria</td>
<td></td>
<td>710</td>
<td>9850</td>
<td>650</td>
</tr>
<tr>
<td>Std. Dev.</td>
<td></td>
<td>78.9</td>
<td>438.1</td>
<td>44.8</td>
</tr>
<tr>
<td>Performance Margin</td>
<td></td>
<td>37%</td>
<td>29%</td>
<td>22%</td>
</tr>
</tbody>
</table>

- Peak temperatures and time-temperature integral were calculated as averages of 5 highest results of each test and then compared to the scenario criteria.
- Actual method is to average the top result from each test and then compare to the scenario criteria.
- * The standard deviation in the 2012 Cargo MPS document was calculated incorrectly. This will be brought up in the Cargo MPS Task Group meeting.
System Performance

• The Water mist / Nitrogen system still passes the MPS’ acceptance criteria.
• The system performs better than Halon as defined by the peak temperature and time-temperature integral criteria.
• The performance margins for each of the fire test scenarios are smaller than previously reported.
Questions?

Contact Info:
Dhaval Dadia
dhaval.dadia@faa.gov
609-485-8828 (W)