SAE/ISO Fire Containment Covers (FCCs) and Fire Resistant Containers (FRCs) Standards Development

Presented to: International Aircraft Systems Fire Protection Working Group

By: Dave Blake, FAA Fire Safety

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Federal Aviation Administration

Fire Containment Covers

- Standards SAE AS6453 and ISO/CD 14186 are in the final approval phase and should be published shortly.
- The SAE and ISO standards are essentially identical.
- Suggested changes to these standards have been generally accepted and will be incorporated in the next revisions.
- FAA intends to issue a revision to TSO C90 that will reference the new SAE AS6453 standard.

Fire Resistant Containers

- ISO TC20/SC9 committee has approved a new project to develop a standard for FRCs and the effort has commenced.
- Preliminary discussions indicate the new FRC standard will be very similar to the FCC standards.
- SAE will formally begin its version of the standard development at a meeting in Montreal in September 2013.
- ISO will continue its development work at a meeting in Stockholm? in October 2013. (Not certain of meeting details)
- FAA intends to issue a TSO for FRCs that will reference the new SAE standard.

Class-B Fires in AAY Containers

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AAY Container Tests

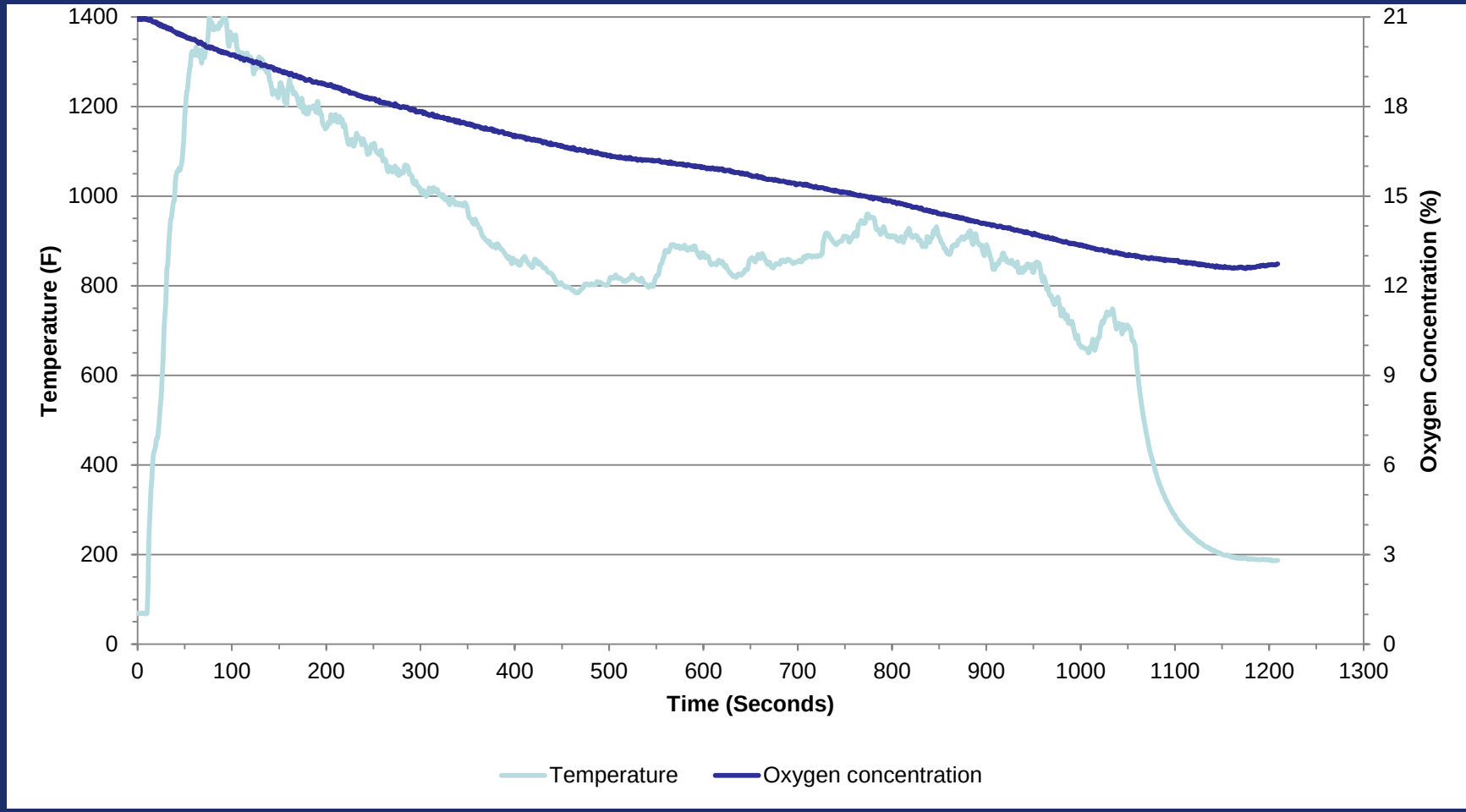
- Volume of Container: 12.8 m^3 (452 ft^3)
- Initial Oxygen quantity: 2.7 m^3
- Quantity of fuel burned to consume all available oxygen: 1.3 L
- Heat release of 1.3L of JP-8 = 45.17 MJ

Test Conditions

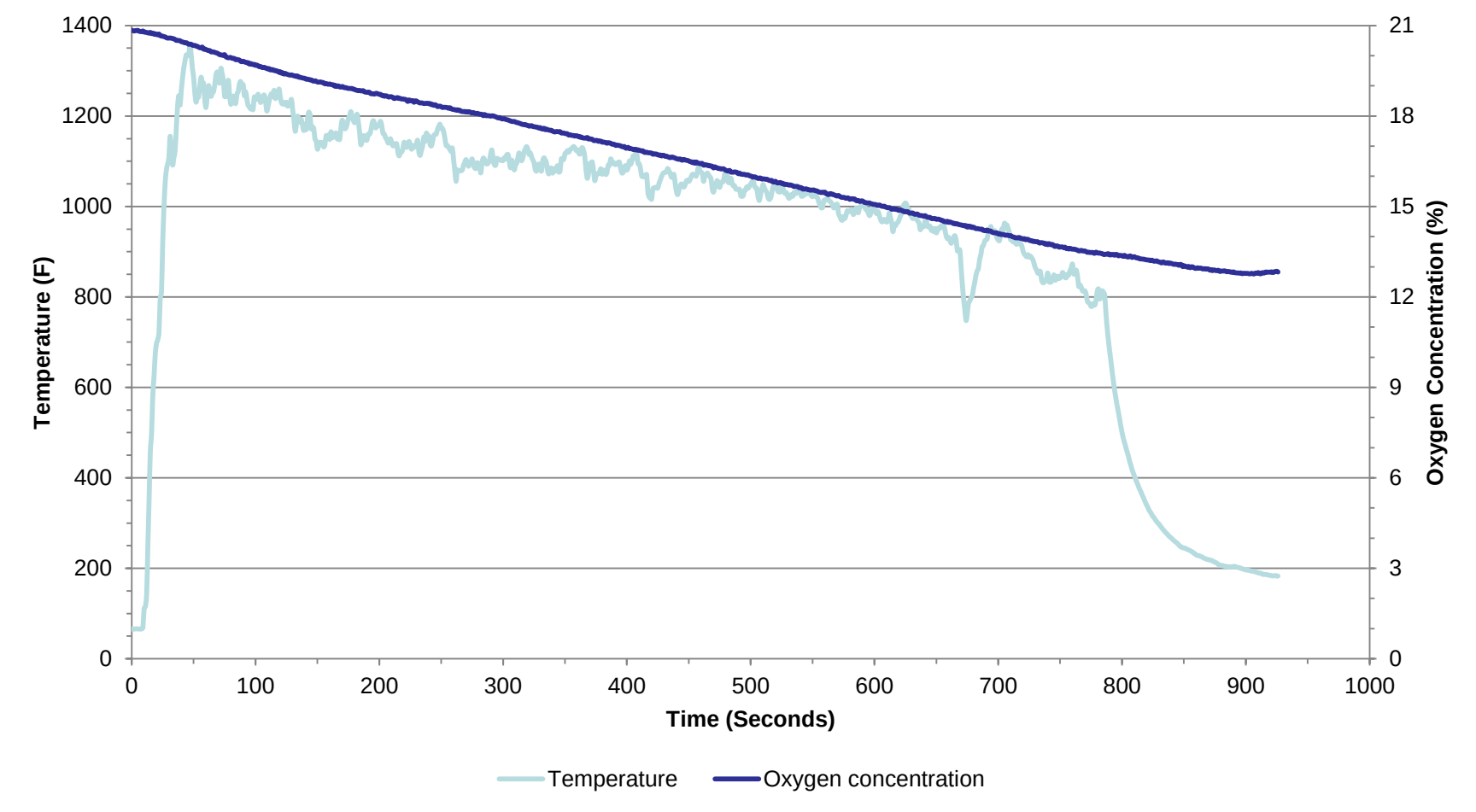
- 8”x8”x3” Fuel pan instrumented with igniters and a thermocouple.
- Test 1: Empty 12.8 m^3 container with pan in the middle of the container holding 1.3 L of JP-8. 30 mL of Heptane used to ignite the fuel.
- Test 2: 12.8 m^3 container filled with 60 boxes filled with 2.5 lbs of shredded paper each. Pan holding 1.3 L of JP-8 with 30 mL of Heptane to ignite the fuel.

Fuel Pan Setup

Test within an Empty Container



Test within a Loaded Container



Observations

- **Test 1: Empty Container. ~500 mL consumed.**
  - Total Heat release = 0.5L*0.8 kg/L*43.1 MJ/kg=17.2 MJ
  - Heat Release Rate = 17.2 MJ/1050 secs=16.4 kW
- **Test 2: Loaded Container. ~400 mL consumed.**
  - Total Heat release= .4L*0.8 kg/L*43.1 MJ/kg=13.8 MJ
  - Heat Release Rate = 13.8MJ/780 secs=17.7 kW
- **Calculations show burning 500mL of JP-8 in the empty container at ideal stoichiometric conditions would leave ~13% oxygen within the container.**

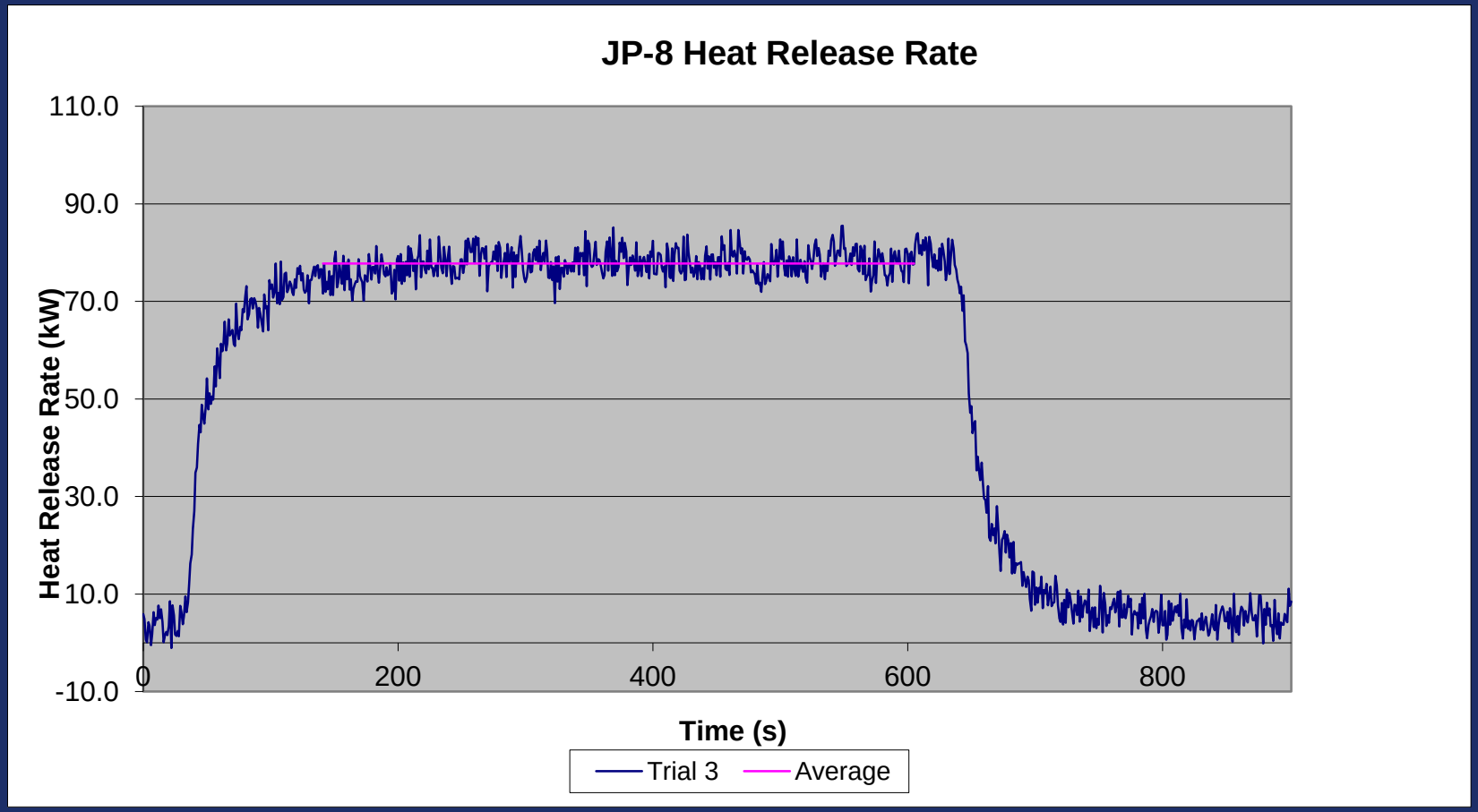
Oil Burner Heat Release Rate by Heat of Combustion (Appendix F Part III Test)

- **Calculated using the following conditions**
  - Burner runs at 2 gals/hr for 5 minutes (0.63L JP-8)
  - Total Heat Release

    0.63L*0.8 kg/L*43.2 MJ/kg= 21.7MJ
  - Average Heat Release Rate

    21.7MJ/300 seconds= 72.3 kW

Oil Burner Heat Release by Oxygen Consumption Calorimetry Hood



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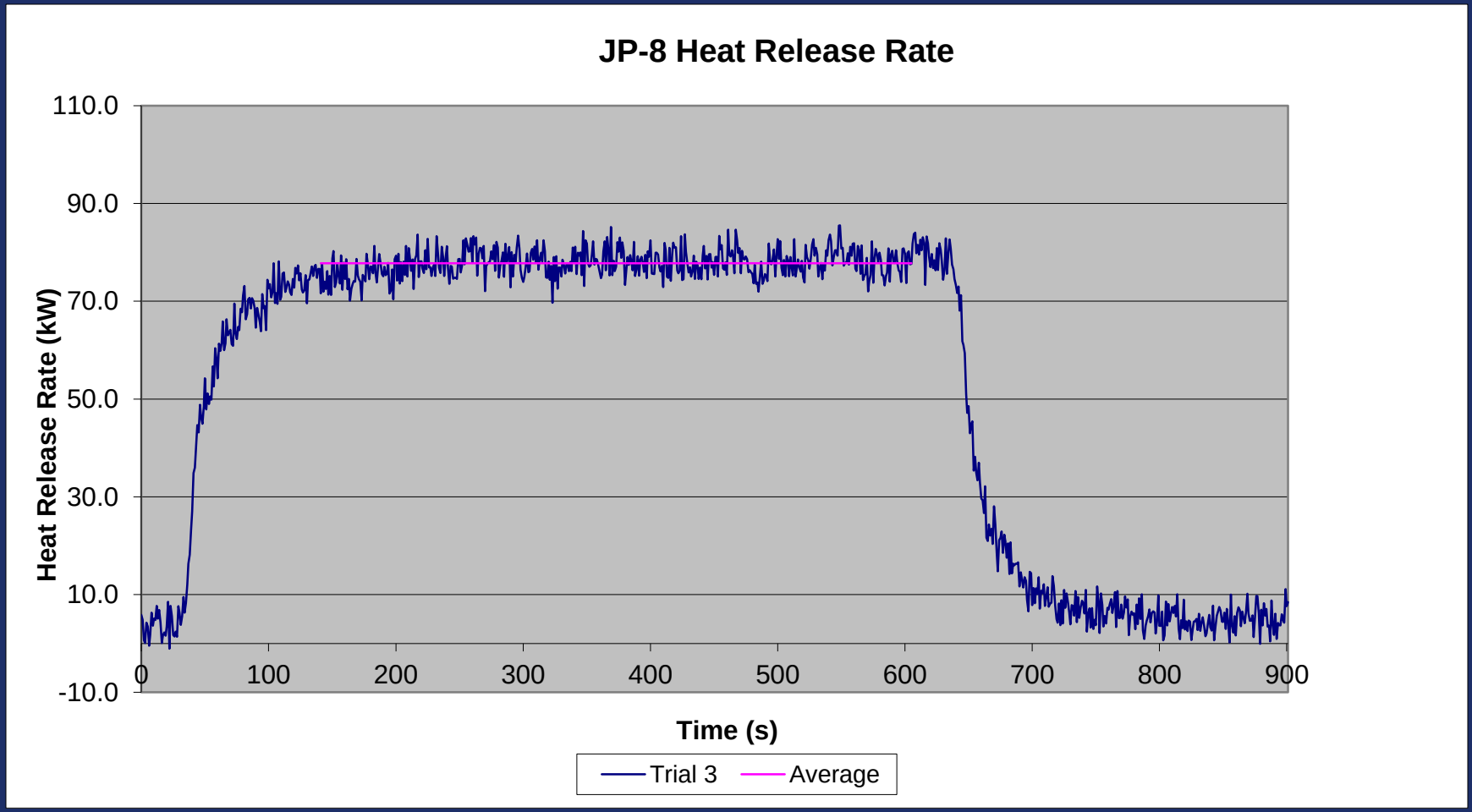

Heat Release by Oxygen Consumption

- Average heat release rate = 77.7kW
- Total Heat Release over a 5 minute test duration
- 77.7kW*300 secs = 23.3MJ

Summary

	Time of Burning (seconds)	Total Heat Release (MJ)	Heat Release Rate (KW)	Fuel Consumption Rate
Oil Burner Heat of Combustion	300	21.7	72.3	2.1 mL/sec
Oil Burner Oxygen Consumption Calorimetry	300	23.3	77.7	2.1 ml/sec
Pan in an empty AAY	1050	17.2	16.4	0.47ml/sec
Pan in loaded AAY	780	13.8	17.7	0.51 ml/sec

Conclusion: The Appendix F Part III oil burner test represents a more severe fire exposure condition than an internal flammable fluid (Class B Fire) within a FCC or FRC due to the limits of available oxygen to sustain an internal fire.

Unresolved Issues:

- **Possible delayed smoke detection from a fire originating in either a FCC covered pallet or inside a FRC.**
- **Certification requirements if an FRC also contained a fire suppression system.**
- **Intumescent coating effectiveness assurance after time in service.**