



**Federal Aviation  
Administration**

# International Aircraft Materials Fire Test Working Group Meeting

## Development of Advisory Material for Cargo Liner Test

Presented to: International Aircraft Materials Fire  
Test Working Group, Indianapolis,  
Indiana

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# •Cargo Liner AC

- Background
- General Guidance
- Acceptable Means of Compliance
- Repairs
- Use of Sonic Burner



## •Task Group Today:

1. Agree on outline
2. Assign tasks to Develop Draft



# Development of Advisory Material for Testing Cargo Liner Design Features

Part III of Appendix F “*Test Method to Determine Flame Penetration Resistance of Cargo Compartment Liners*” describes the laboratory testing procedure for measuring the capability of cargo compartment lining materials to resist flame penetration with a 2 GPH #2 grade kerosene or equivalent burner fire source.

“Each specimen tested must simulate the cargo compartment sidewall or ceiling liner panel, including any design features such as joints, lamp assemblies, etc., the failure of which would affect the capability of the liner to safely contain a fire.”

FAA Technical Report DOT/FAA/CT-TN88/33 “Burnthrough Test Procedures for Cargo Liner Design Features”, September 1988, describes a very basic methodology for testing butt joints, corners and lighting fixtures.

**Problem:** Insufficient information contained in Rule and Technical Report to make a determination in many cases. This has lead to a variety of interpretations as to what is required for certification testing.



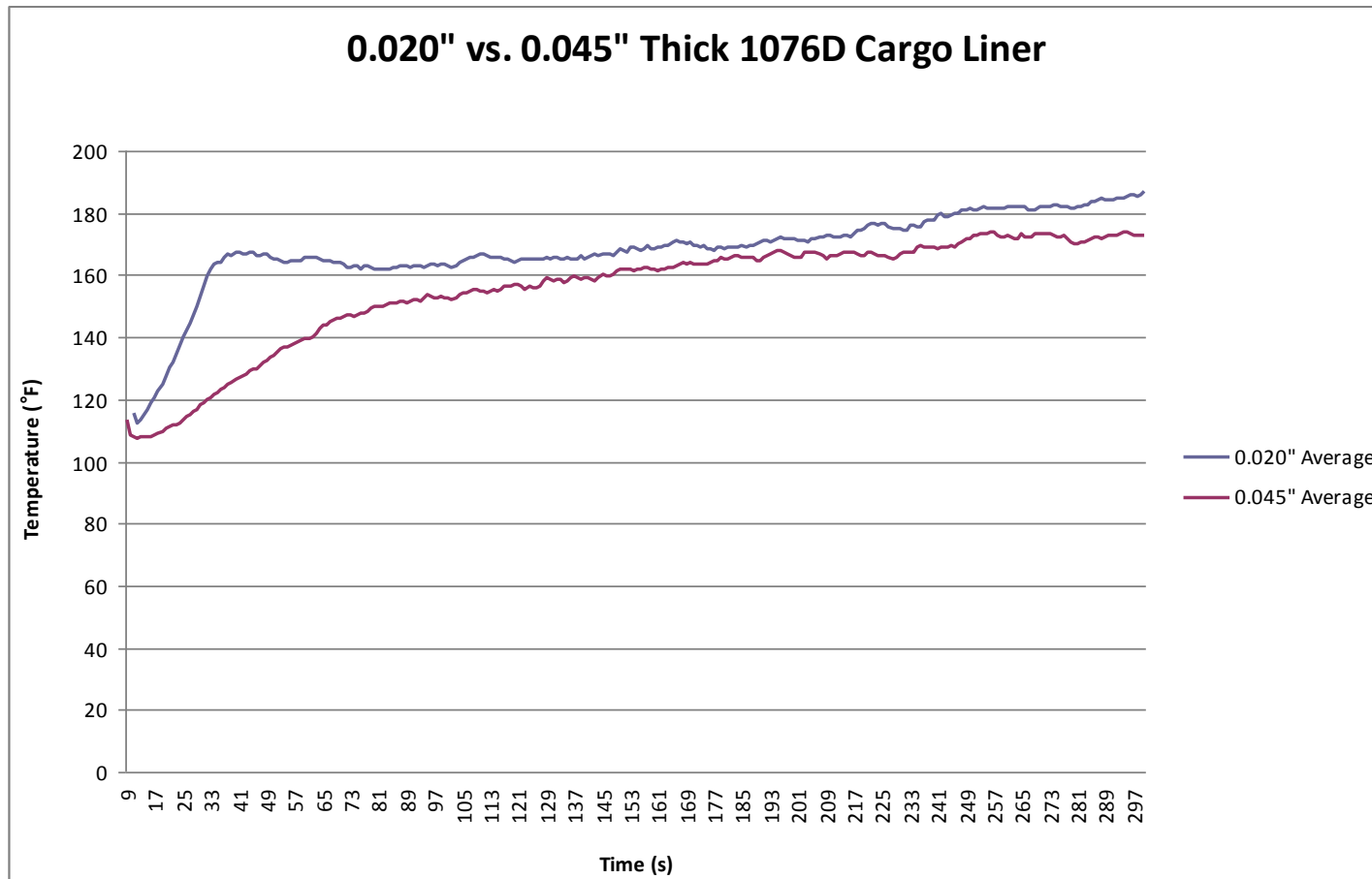
# Cargo Liner Sample Testing

- **AC related testing is currently underway**
- **Items tested so far:**
  - Thickness comparison
  - Pitch vs. Overlap
  - Overlap Order
  - Clamp vs. Pegged
- **Only performed initial tests at this point**
  - All items will require further testing

# Thickness Comparison

- **Item Being Addressed:**
  - Thin liners substantiate thicker liners if constructed of the same material.
- **Test Method:**
  - Test thin and thick liners and compare temperatures measured 4 inches from the backside of the sample.
- **Expectation:**
  - The temperatures measured 4 inches from the backside of thick liner should be less than temperatures measured while testing thin liner.

# Thickness Comparison



- Temperatures measured 4 inches above back-side of sample during testing

# Thickness Comparison

- **Result:**

- Thick liners show reduced measured temperatures compared to thin liners constructed of the same material.

- **Conclusion:**

- Thin liners are suitable to substantiate thick liners constructed of the same material.

- **Additional Items:**

- Scenario must also be substantiated in cases where auto ignition of the sample backside occurs.
- Thick liners may burn longer than thin liners.



# Pitch Vs. Overlap

- **Item Being Addressed:**

- Test the maximum fastener pitch and minimum material overlap. A successful test will substantiate all other configurations that are the same except have a smaller fastener pitch and/or greater overlap.

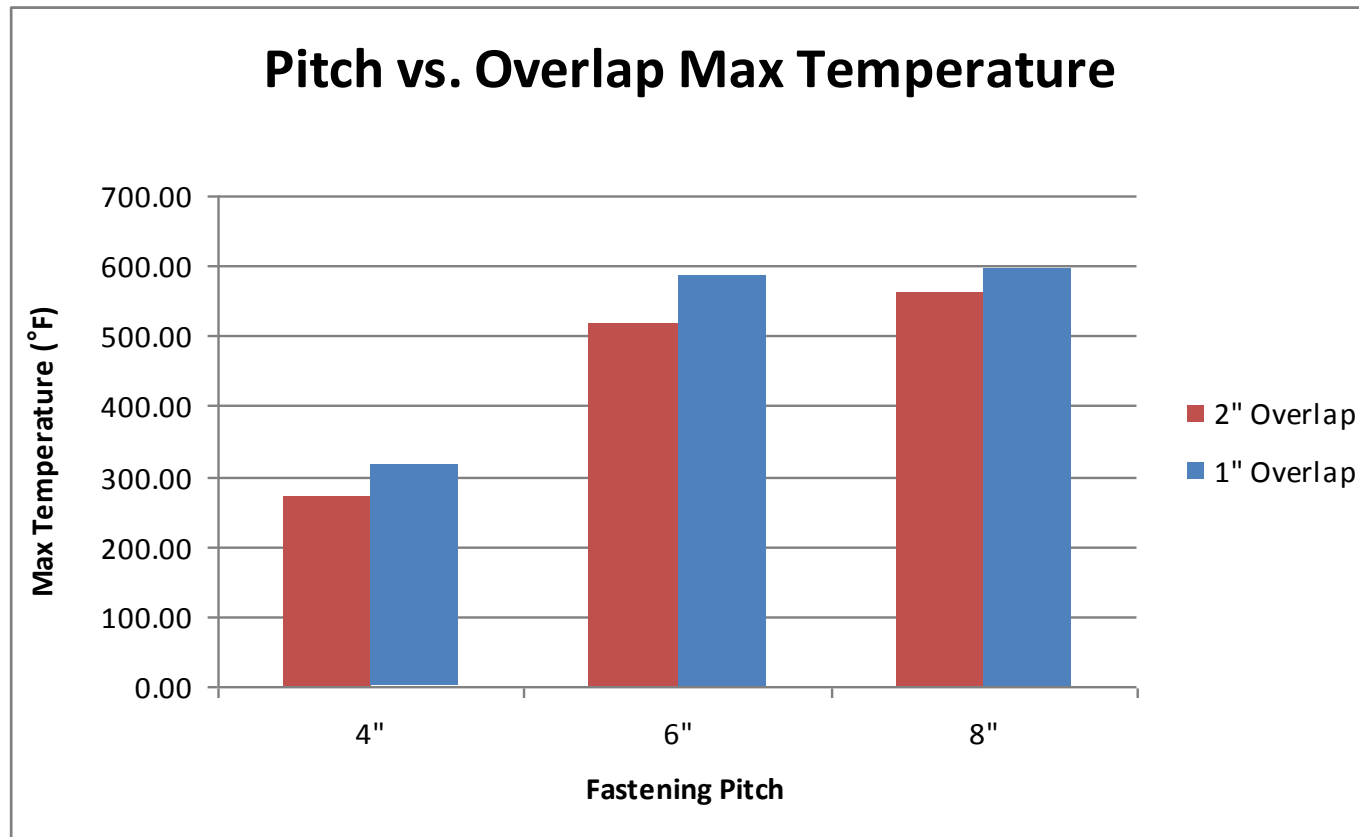
- **Test Method:**

- Measure temperature 4 inches from backside of sample and/or look for flame penetration of joint.

- **Expectation:**

- Determine minimum joint overlap and maximum fastener pitch combination capable of passing cargo liner test method.

# Pitch Vs. Overlap



- Temperatures measuring above 400°F indicates a sample failure

# Pitch vs. Overlap

- **Result:**

- Joints using fastener pitch 6 inches and greater do not pass cargo liner test. Larger overlap less likely to fail test.

- **Conclusion:**

- Greater overlap and smaller fastener pitch less likely to fail test.

- **Additional Items:**

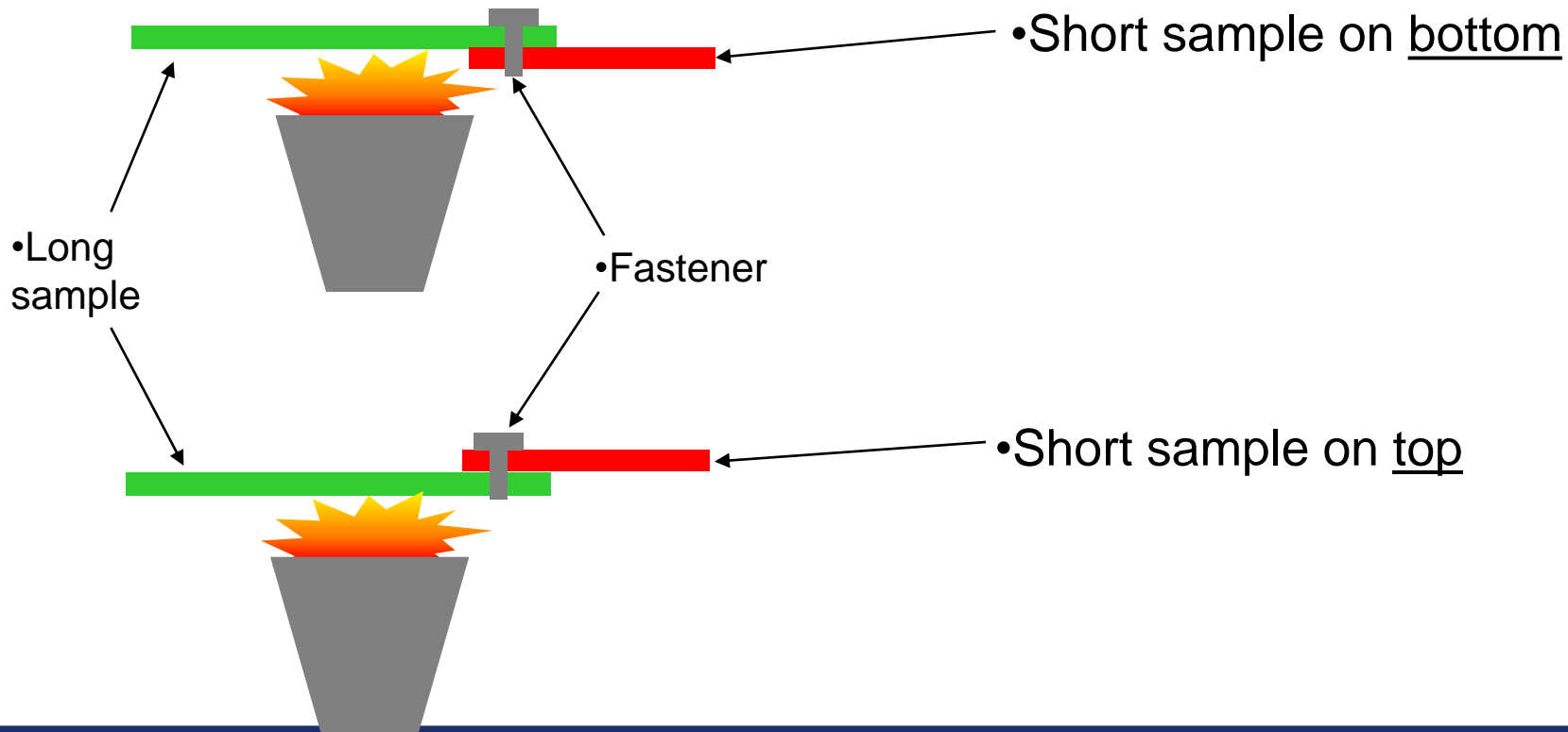
- Further testing of different overlap and fastener pitch required.

# Overlap Order Comparison

- **Item Being Addressed:**
  - Order of sample overlap (short and long samples) has an impact on the test result.
- **Test Method:**
  - Test using short and long samples overlapped in both orders.
- **Expectation:**
  - Overlapping order may have an impact on test result.

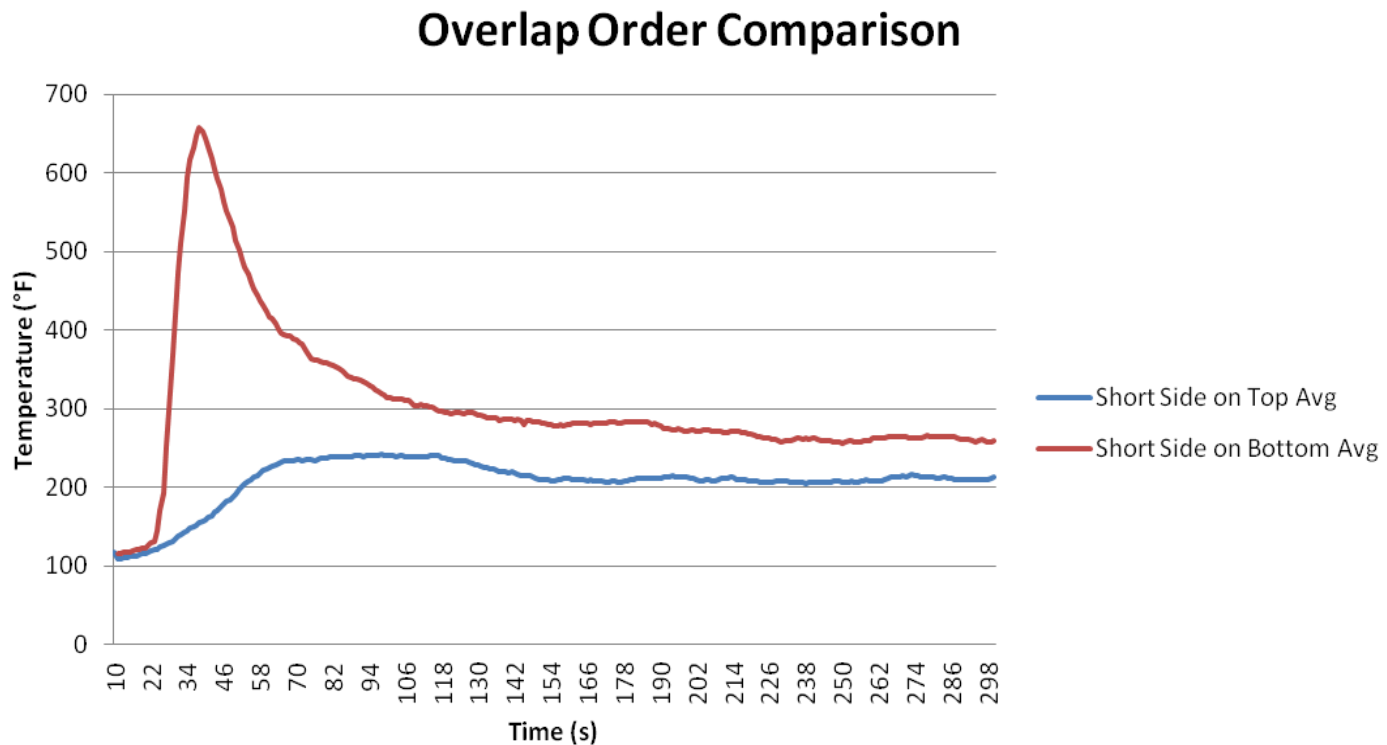
# Overlap Order Comparison

- Side view of sample arrangement used during testing



# Overlap Order Comparison

- Material: 0.032" woven fiberglass/epoxy
- 1" overlapping of two cargo liner samples
- 8" fastener pitch



# Overlap Order Comparison

- **Result:**
  - Testing with short sample side on bottom increases likelihood of failure.
- **Conclusion:**
  - Further testing required to make determination.
- **Additional Items:**
  - None

# Clamped vs. Pegged

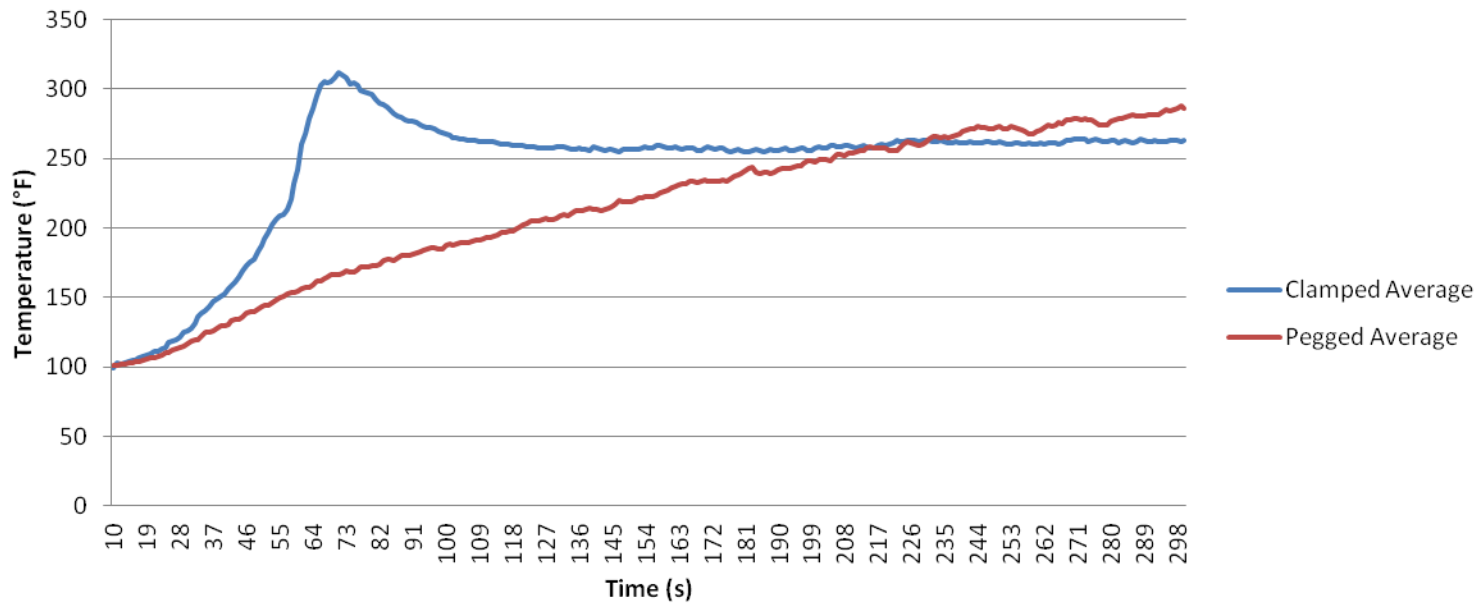
- **Item Being Addressed:**
  - Using clamps in place of pegs/studs is an acceptable means of restraining sample on burner sample test rig.
- **Test Method:**
  - Test samples using pegged and non-pegged sample rig and compare results.
- **Expectation:**
  - There should be no difference in test results using pegged or non-pegged sample test rig.



# Clamped vs. Pegged

- Material: Gillfab 1367A 0.040"
- 1" Overlap
- 4" Fastening Pitch

4" Pitch, 1" Overlap, Clamped vs. Pegged



- Backside burned for an average of 66s when clamped, did not burn when pegged

# Clamped vs. Pegged

- Material shown used to demonstrate shrinking of sample during testing

Pegged



Flame penetrates bolt holes as the material shrinks.

Clamped



Flame does not penetrate if there are no holes in the sample for pegs.

# Clamped vs. Pegged

- **Result:**
  - Method of restraint does have an impact on test result.
- **Conclusion:**
  - Material should be restrained using pegs/studs to ensure proper test result.
- **Additional Items:**
  - Testing without the use of pegs holes in material sample can allow an otherwise “failing” material to pass cargo liner burner test.

# Questions?

