Classification of Small Parts

Federal Aviation Administration



Presented to: IAMFTWG, Renton, WA

By: Robert Ochs

Date: Wednesday, March 3, 2010

Flammability requirements for interior materials in transport category aircraft apply to all materials, except for “small parts…that would not contribute significantly to the propagation of a fire….”

Objective

- **Develop a methodology for determining when a part should be considered small enough to not be tested**

Where is the part located?

- **Inaccessible area (in-flight fire threat)**
  - Pre-§ 25.856a – Thermal/Acoustic insulation tested according to 12 sec. VBB
    - Burn length of 8 inches is allowed on these materials
    - After flame time of 15 sec. allowed
  - Post-§ 25.856a – Thermal/Acoustic insulation tested according to radiant panel, other materials tested to 12 sec. VBB
    - Burn length of 2” allowed on these materials
    - After flame time of 3 sec. allowed on these materials
  - Future aircraft – Thermal/Acoustic insulation tested according to radiant panel, other materials may be tested to a radiant panel test
    - Ducting
      - After flame time shall not exceed 45 sec.
      - Burn length shall not exceed 2 in.
    - Wiring
      - After flame time shall not exceed 30 sec.
      - Burn length shall not exceed 3 in.
    - Composite fuselage
      - TBD
- **In cabin (post-crash fire threat)**
  - Aircraft with passenger capacities of 20 or more
    - Large interior panels, partitions, galleys, stowage compartments, etc. must meet OSU and NBS test criteria
    - Seats also tested according to 25.853 oil burner test for seat cushions
  - Aircraft with passenger capacities of less than 20
    - All cabin materials must meet 12 sec. VBB
    - Seats also tested according to 25.853 oil burner test for seat cushions

What is the part constructed from?

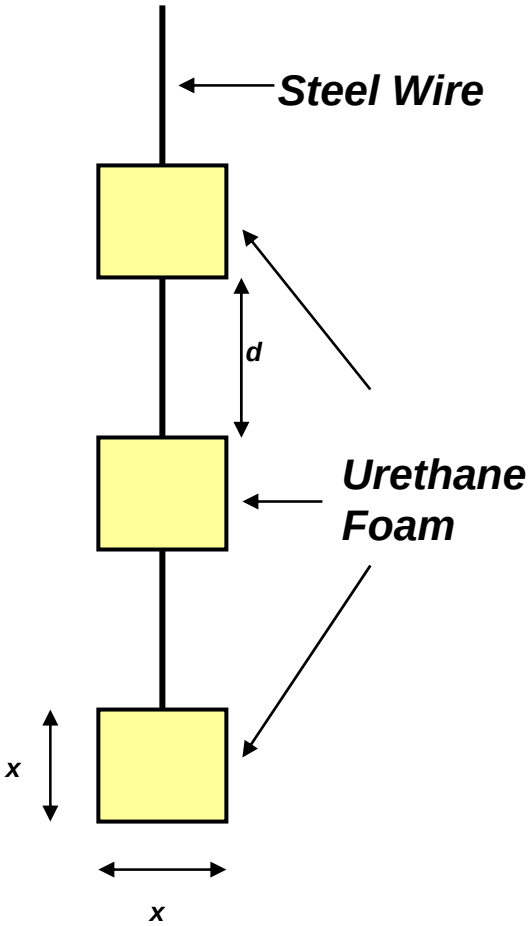
- **Material meets a flammability test**
  - UL 94 flammability standard
    - HB: slow burning on a horizontal specimen; burning rate < 76 mm/min for thickness < 3 mm.
    - V2 burning stops within 30 seconds on a vertical specimen; drips of flaming particles are allowed.
    - V1: burning stops within 30 seconds on a vertical specimen; no drips allowed.
    - V0: burning stops within 10 seconds on a vertical specimen; no drips allowed.
    - 5VB: burning stops within 60 seconds on a vertical specimen; no drips allowed; plaque specimens may develop a hole.
    - 5VA: burning stops within 60 seconds on a vertical specimen; no drips allowed; plaque specimens may not develop a hole
  - FAA Vertical Bunsen burner test
    - Burn length no more than 6 or 8 in. for 60 sec. or 12 sec., resp.
    - After flame no more than 15 sec.
- **Material is used in other means in the cabin and meets a flammability test**
  - VBB
  - OSU/NBS

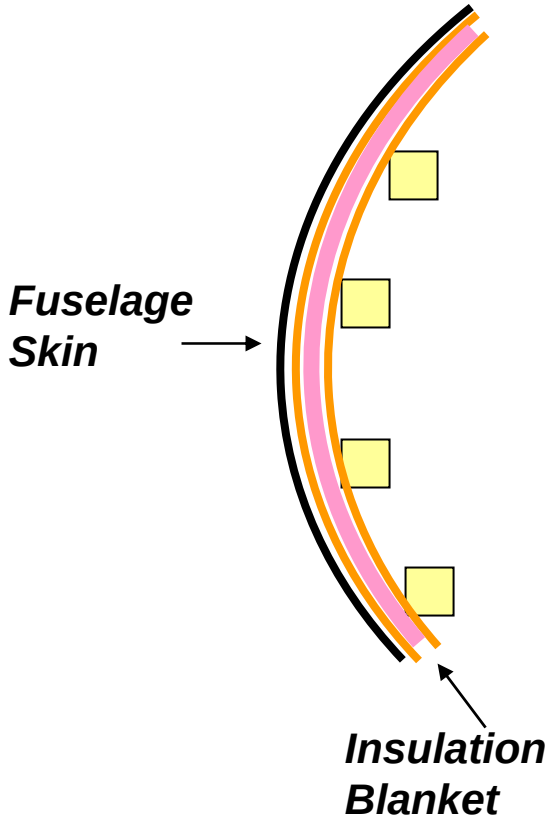
What is the part constructed from?

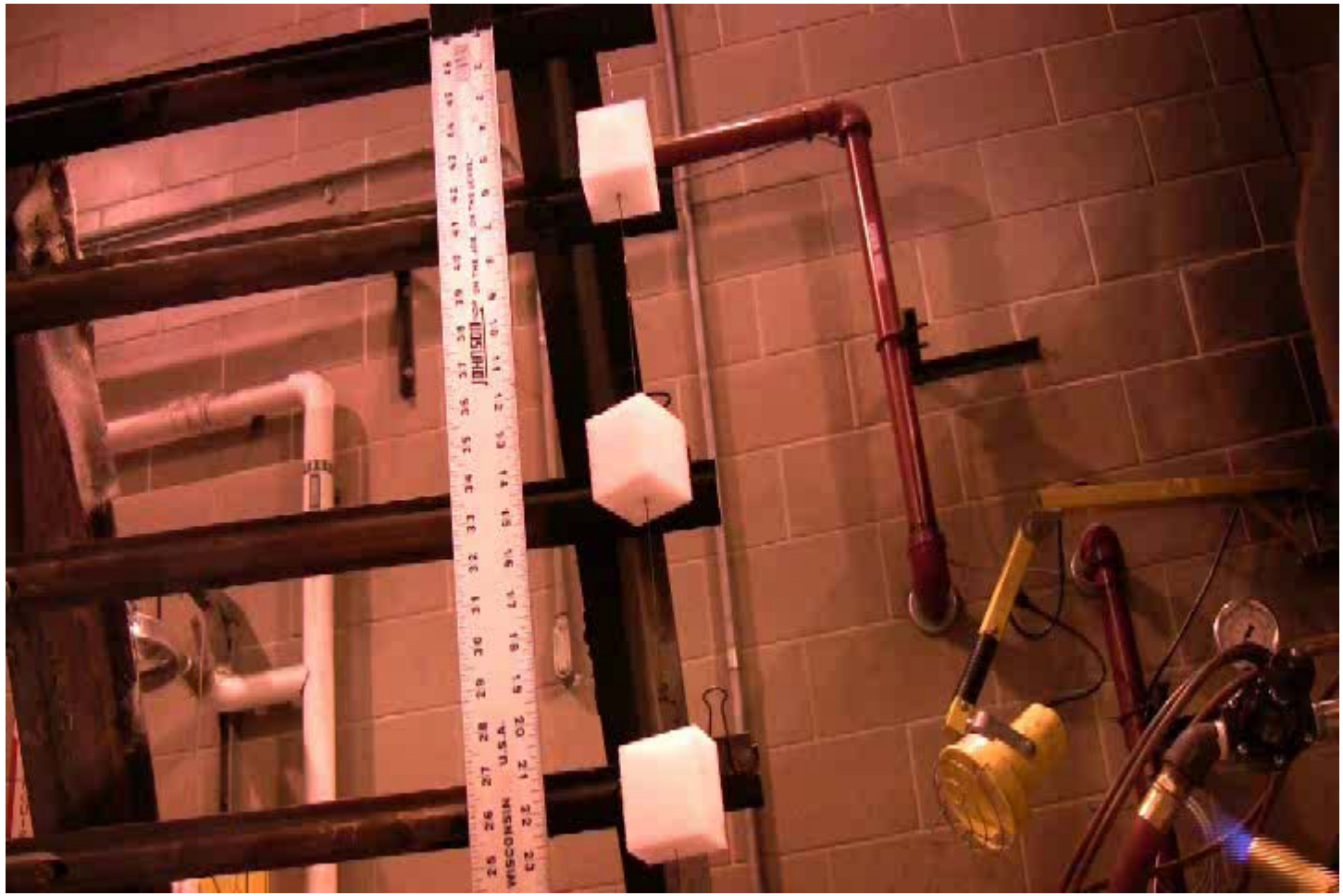
- **Material does not meet a flammability test**
  - How to determine that small part will not contribute significantly to the propagation of a fire
    - Where is the part located and what fire tests do the materials around it meet?
    - How large is the part to be considered a “small part”?
      - Example 1:
        - » The material will fit into a volume of approximately 3” x 3” x .500”, or 2” x 2” x 2”. The material and/or part may not be wadded up, compressed, or otherwise manipulated to fit within this volume.
      - Example 2:
        - » The total exposed area of the part in the Passenger Cabin is less than flammability test sample (for example; less than 3” by 12”).
    - What is the frequency of use?
      - Example 1:
        - » The material may not be used in quantities closer than 6 inch intervals and no more than 2 sq. ft. total in the aircraft.
      - Example 2:
        - » Distribution of these parts in the passenger cabin (for example; no less than 12 inches separation).

Next Steps:

- **Perform preliminary testing with small foam blocks, at various vertical distances from each other (3”, 6”, etc.) to determine if they will propagate a flame from one small part to another**
- **Place small foam blocks on thermal/acoustic insulation, both pre and post 25.856a, to determine if they can ignite the insulation, and determine at what distance the flame will travel to ignite another small foam block**
- **Visit aircraft manufacturers to investigate where small parts are located in the aircraft, learn from them what criteria they use to determine small parts**

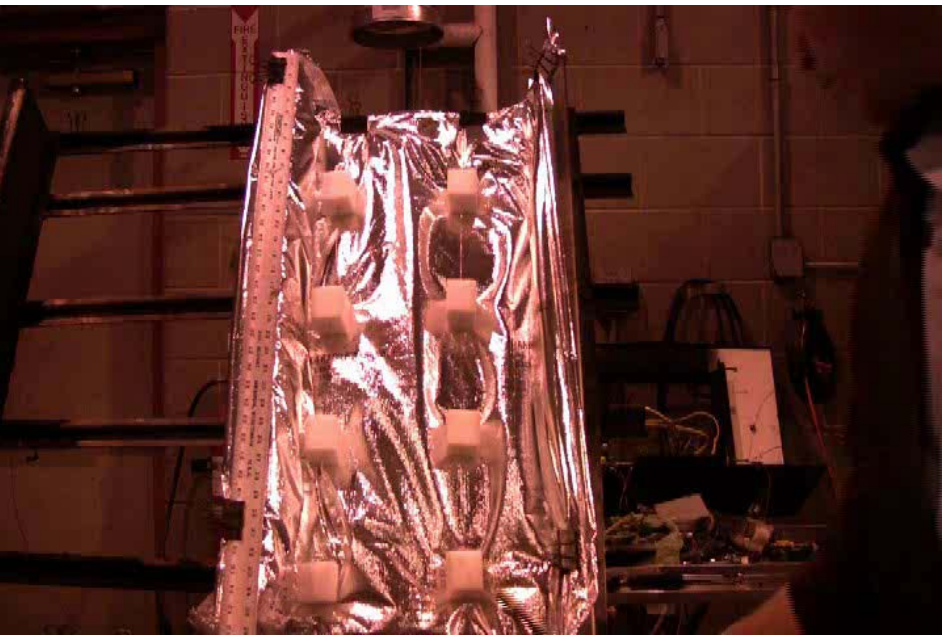

Steel Wire
d
Urethane
Foam
x
x


Fuselage
Skin
Insulation
Blanket



2” foam blocks
6” separation
spiked w/ 1 mL
heptane

Metallized Mylar

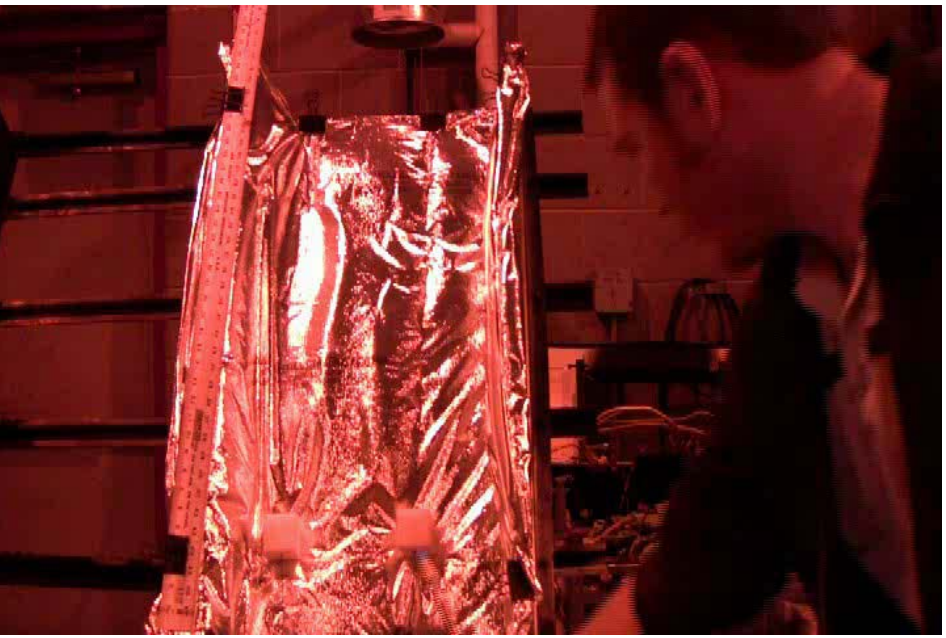


Polyimide



2” foam blocks
6” separation
spiked w/ 1 mL heptane

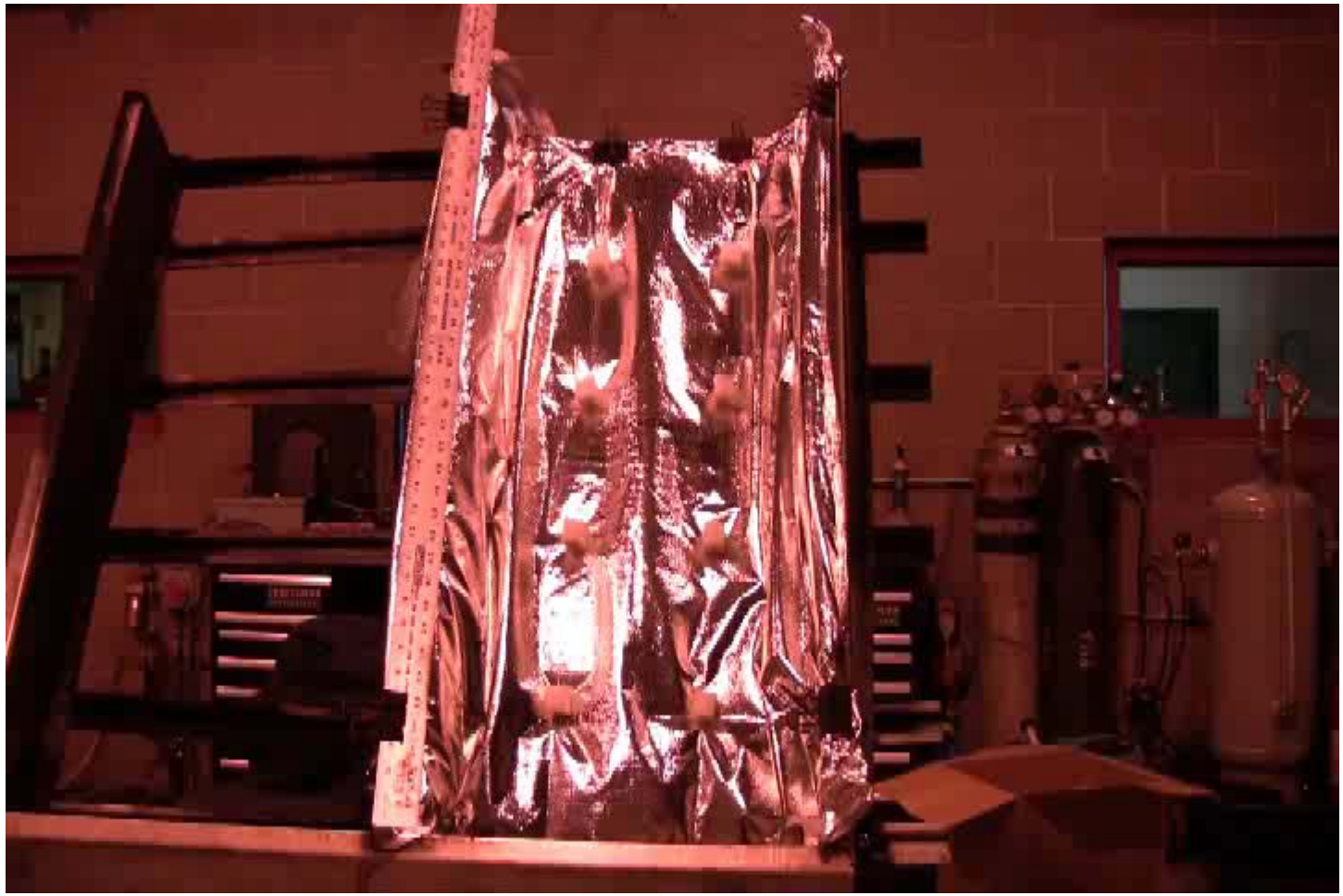
Metallized Mylar



Polyimide



1” foam blocks spiked w/ 0.1 mL heptane 6” separation on metallized Mylar film

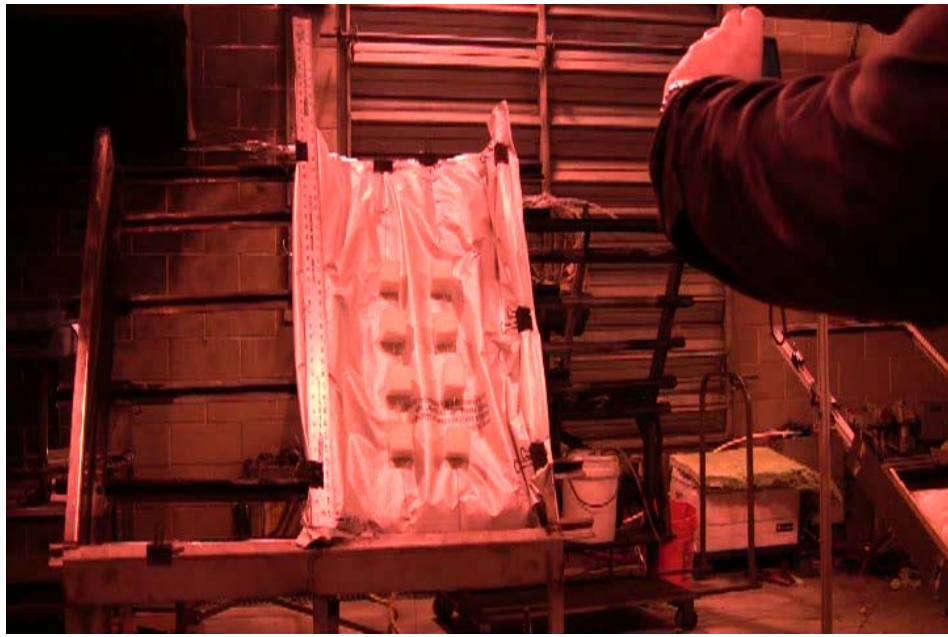


Tedlar

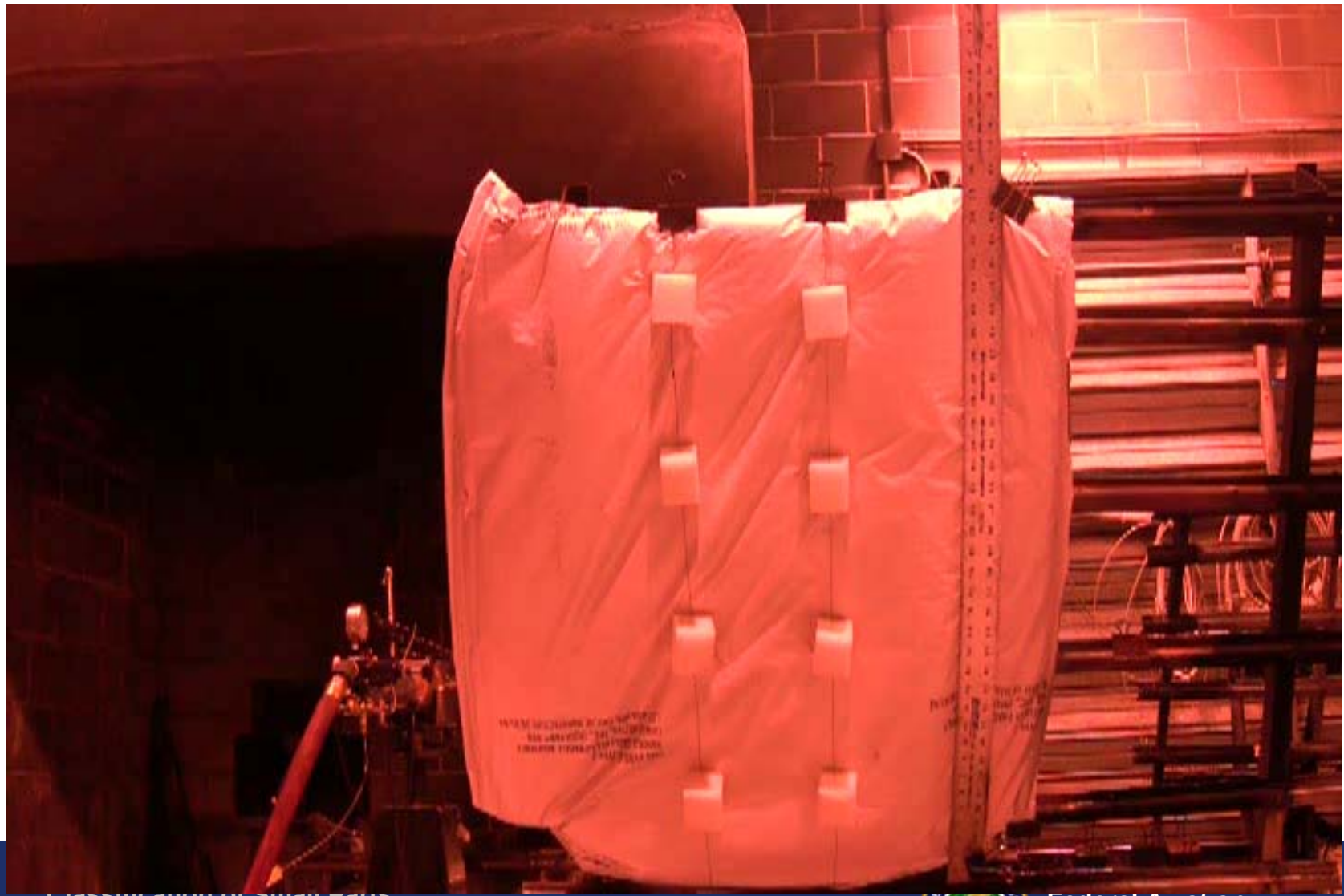
2” foam blocks
6” separation
no hepatane



2” foam blocks
3” separation
no hepatane



2” foam blocks 6” separation On front face of test rig, 30° from vertical, Tedlar film



Summary

- **Determination of a small part requires more than just a size-based criteria**
  - Tests have been performed to show that a 2” cube can propagate a fire from one small part to another
  - Severity of the flame propagation is dependent upon many factors
    - Small part material
    - Spacing and orientation
    - Adjacent materials
- **A procedure should be developed in order to determine when a part will not contribute to a fire and therefore need not be tested**

Contact:

Robert Ochs

robert.ochs@faa.gov

609-485-4651