International Aircraft Materials Fire Test Working Group Meeting

Short Takes and Current Projects

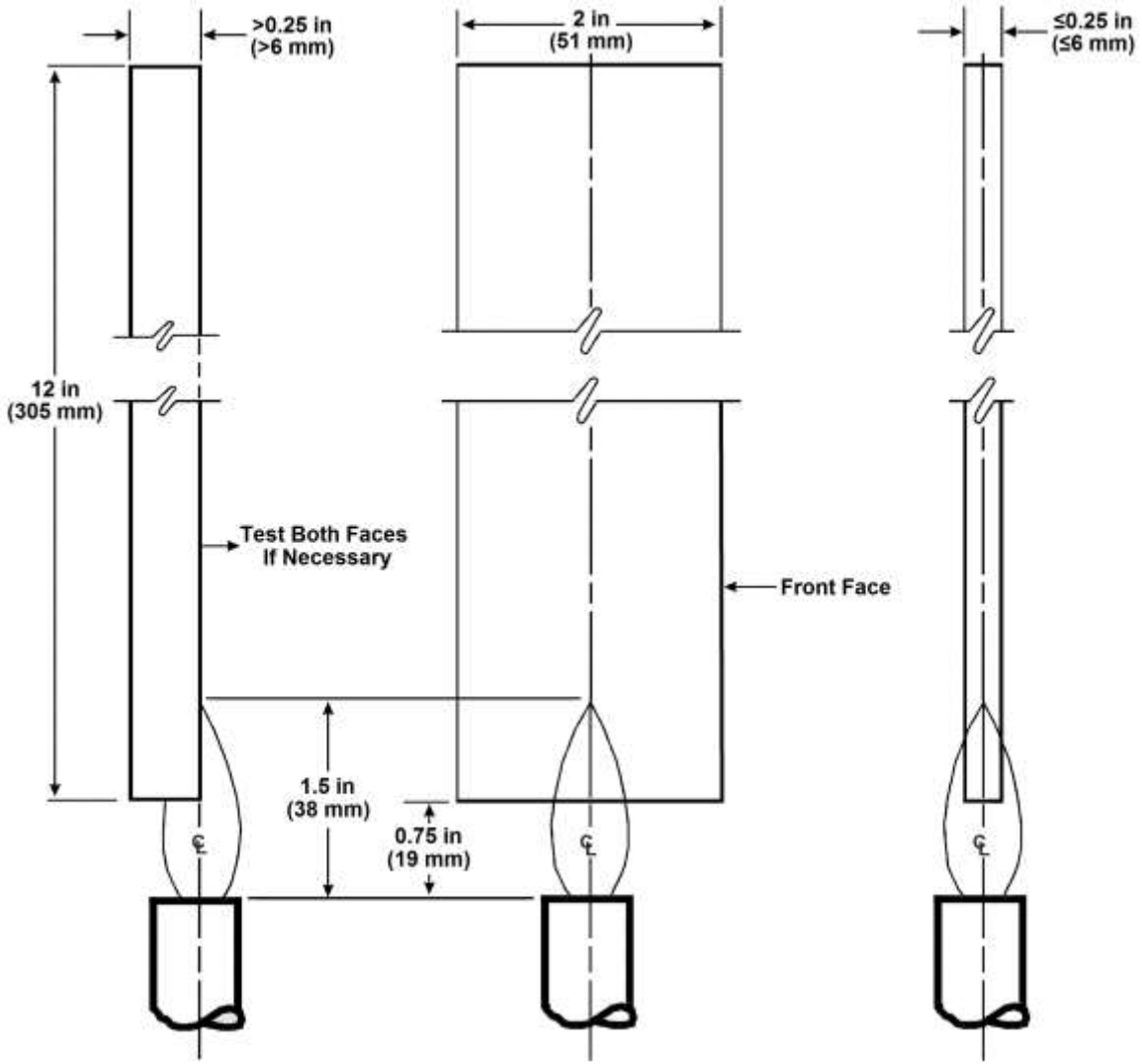
Presented to: International Aircraft Materials Fire Test Working Group, Savannah, GA

By: Tim Marker, FAA Technical Center

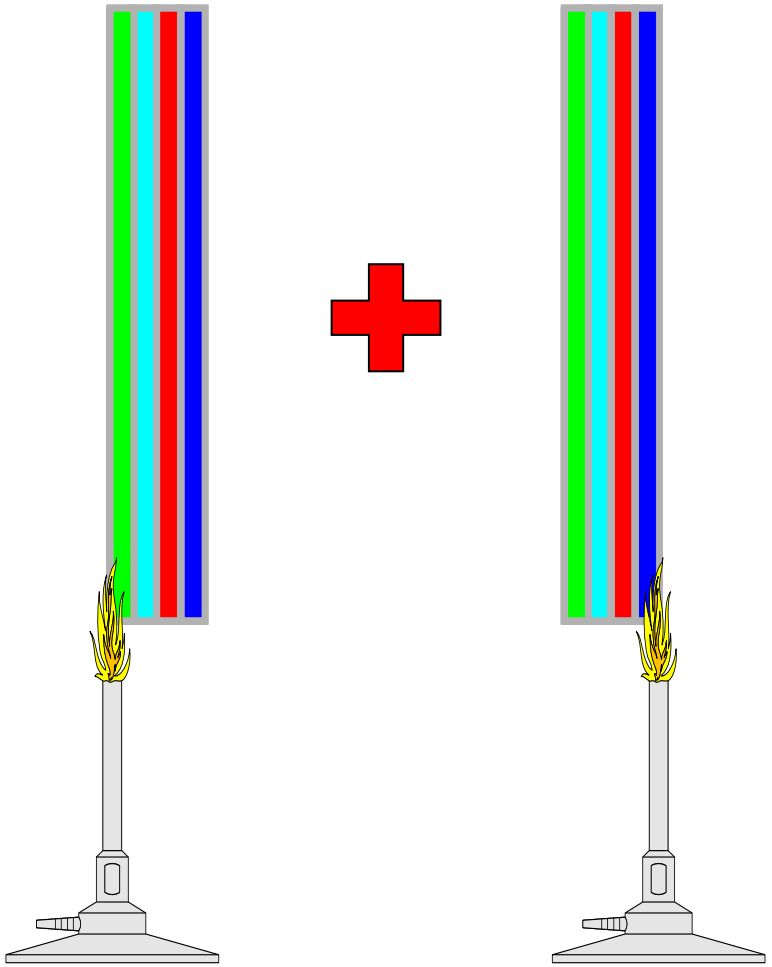
Date: March 6-7, 2018

Federal Aviation Administration

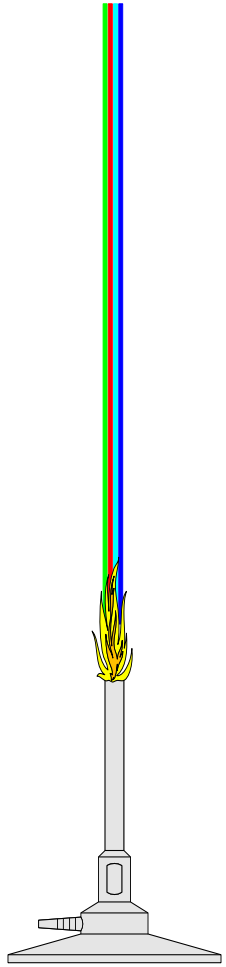
Update to Chapter 1, Bunsen Burner Location



Update to Chapter 1, Bunsen Burner Location



Greater Than ¼ inch



Less Than or = ¼ inch

FSTG Formulation, Development of Policy Statement

Industry/FAA Concern over Lack of Standardization in MOCs for Flammability

Draft Policy Memo ANM-115-09-XXX (2009)

Part I: Acceptable Methods of Compliance

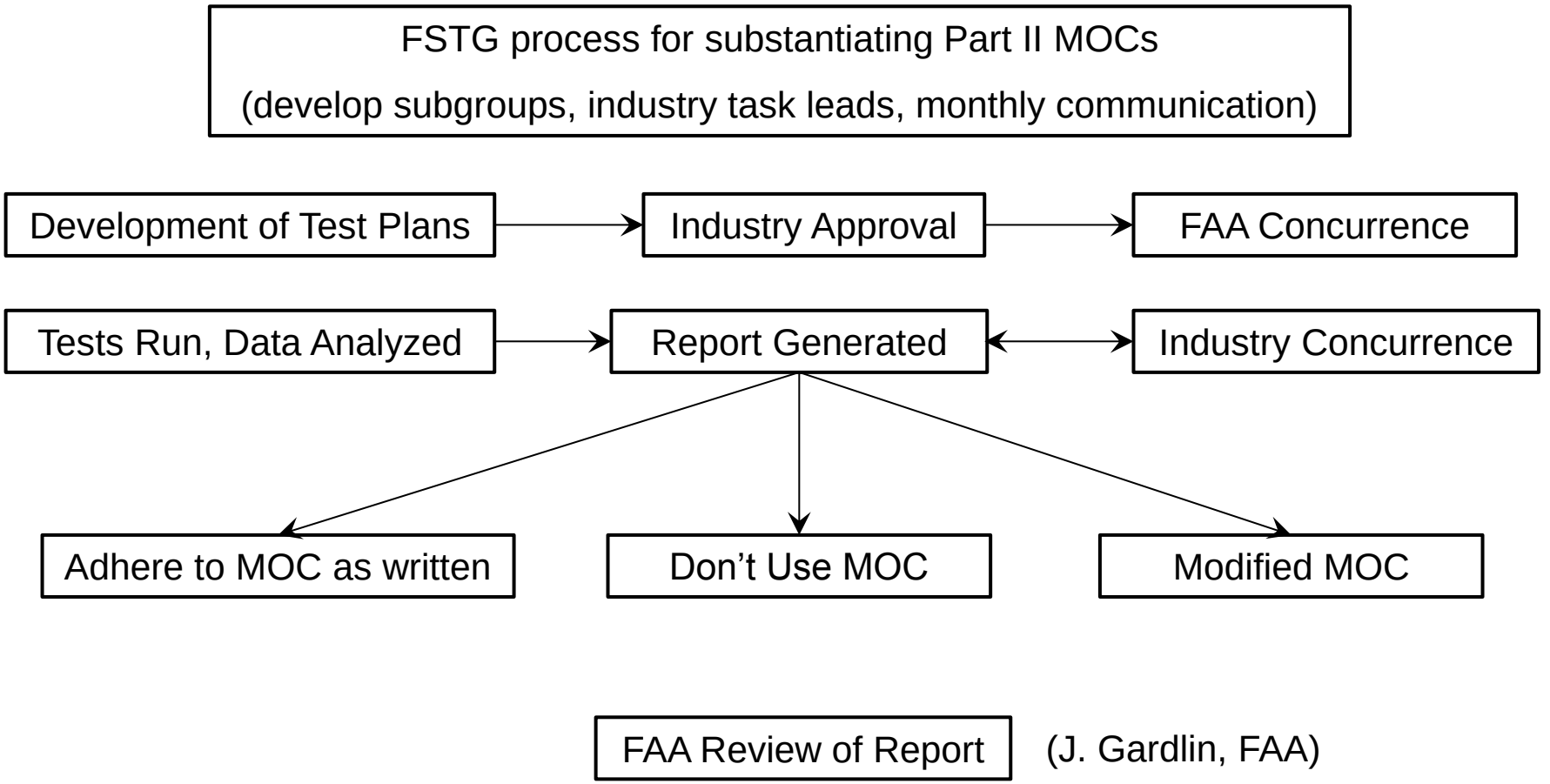
Part II: Methods of Compliance Requiring Substantiation

Flammability Standardization Task Group (FSTG) Formed

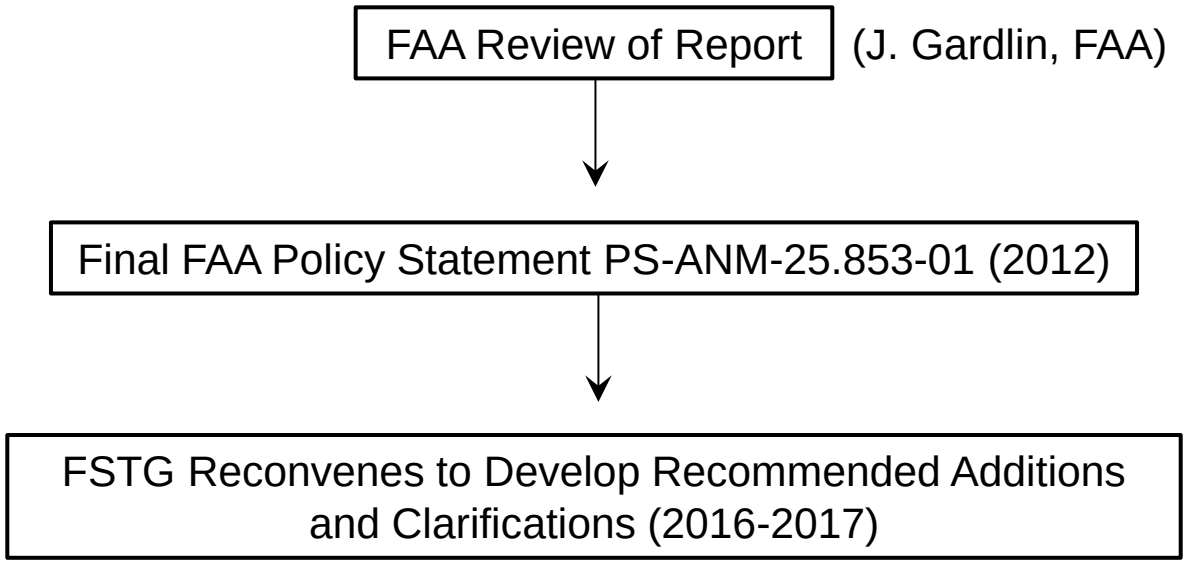
(Michael Jensen & Scott Campbell)

2-Year Validation Activity- standardize and simplify compliance

FSTG Formulation, Development of Policy Statement



FSTG Formulation, Development of Policy Statement



3D Printer Stratasys 450mc

- **FAA Fire Safety Branch recently procured commercial-grade 3D printer for evaluation of flammability of 3D printed parts**
  - 16 x 14 x 16 inch (406 x 355 x 406mm) build envelope
  - Ultem 9085 option
  - 0.01 inch layer thickness
  - Produces finish-quality parts for use in cabin interiors

Fire Safety R&D on AM Parts

- **Additive Manufacturing (AM) becoming more common in aerospace applications, particularly cabin interiors**
  - Drink tray
  - Duct and duct components
  - Panels

Figure1. Fold Down Cocktail Tray Produced with Additive Manufacturing

Figure2. Air Duct Produced with AM in the Inaccessible Area of the Orbis MD 10-30.

Fire Safety R&D on AM Parts

- **Components can be manufactured with varying levels of fill density, depending on where strength is needed**

Figure 3. AM-manufactured cabin sidewall panel from Ultem 9085.

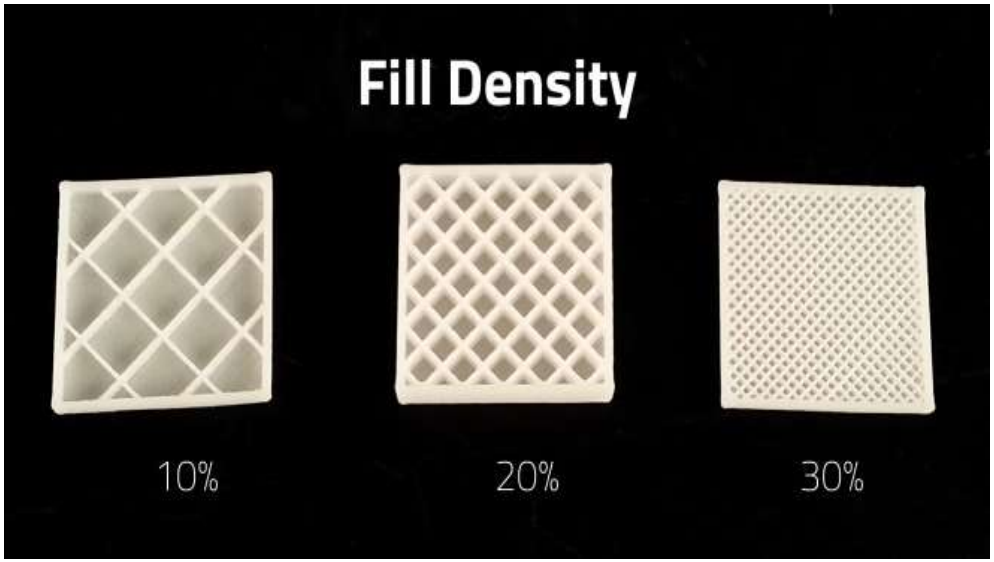


Figure 4. Example of varying levels of infill density for AM parts.

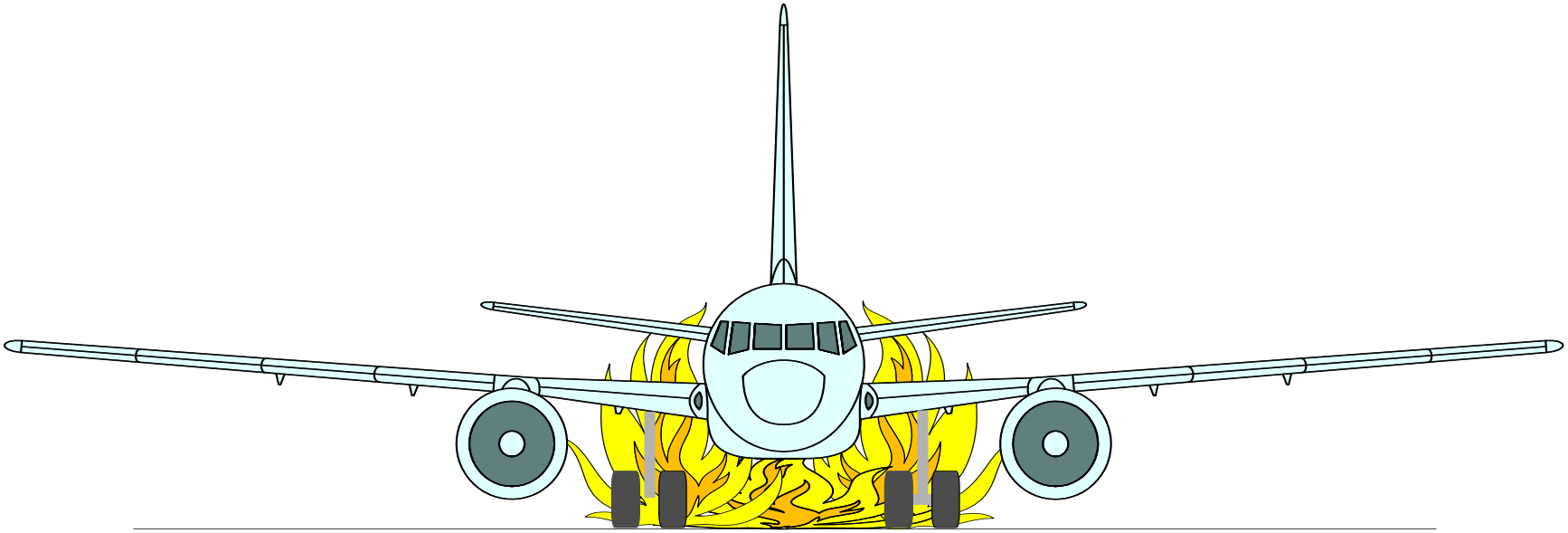
Future Testing on AM Parts

- **Other variables may have an influence on part or sample flammability**
  - Material type
  - Layer thickness
  - Varying tool path
  - Varying oven temperature

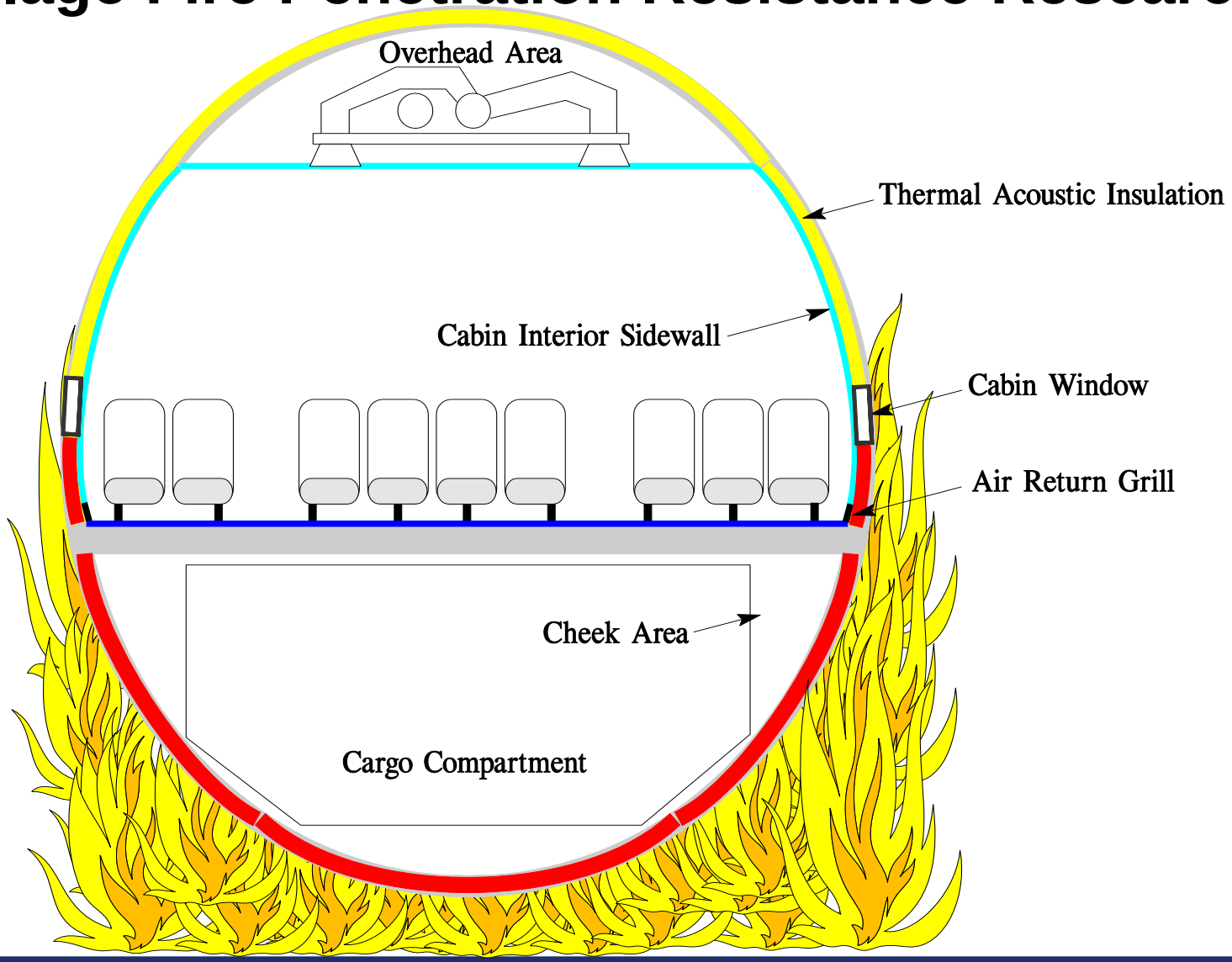
- **Develop test matrix to evaluate each of these (and other) parameters to determine influence on flammability in FAA tests**
  - Bunsen burner
  - OSU

- **Can use MCC to measure material properties of filament and compare to samples taken from post-AM part**

Fuselage Fire Penetration “Burnthrough” Resistance Research

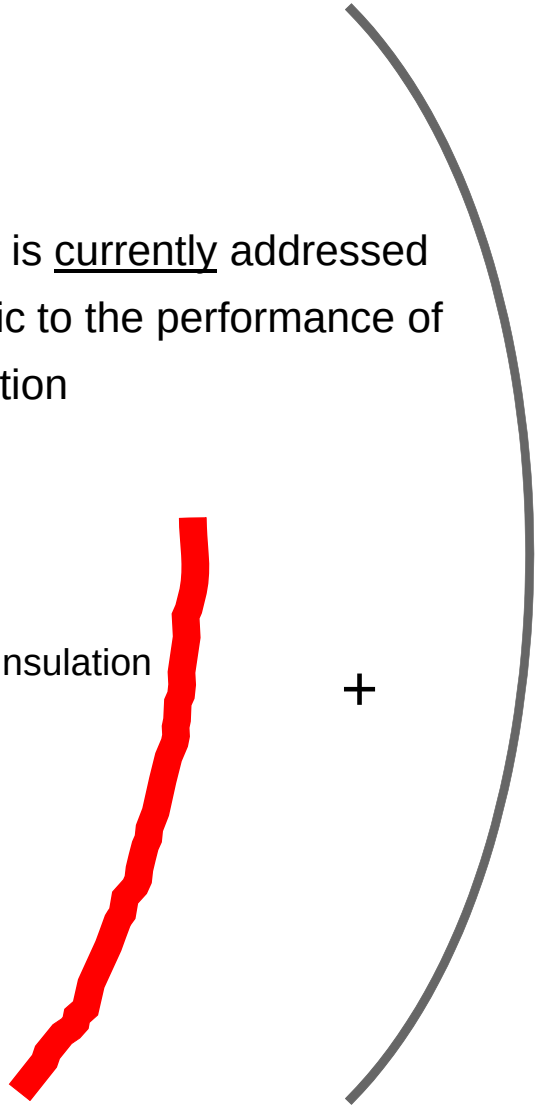


Fuselage Fire Penetration Resistance Research



Fuselage Fire Penetration Resistance Research

Burnthrough protection is currently addressed by requirements specific to the performance of thermal acoustic insulation



Burnthrough-Resistant Insulation (4 Minutes) + Aluminum Skin (1 Minute) = Protection (5 Minutes)

Fuselage Fire Penetration Resistance Research

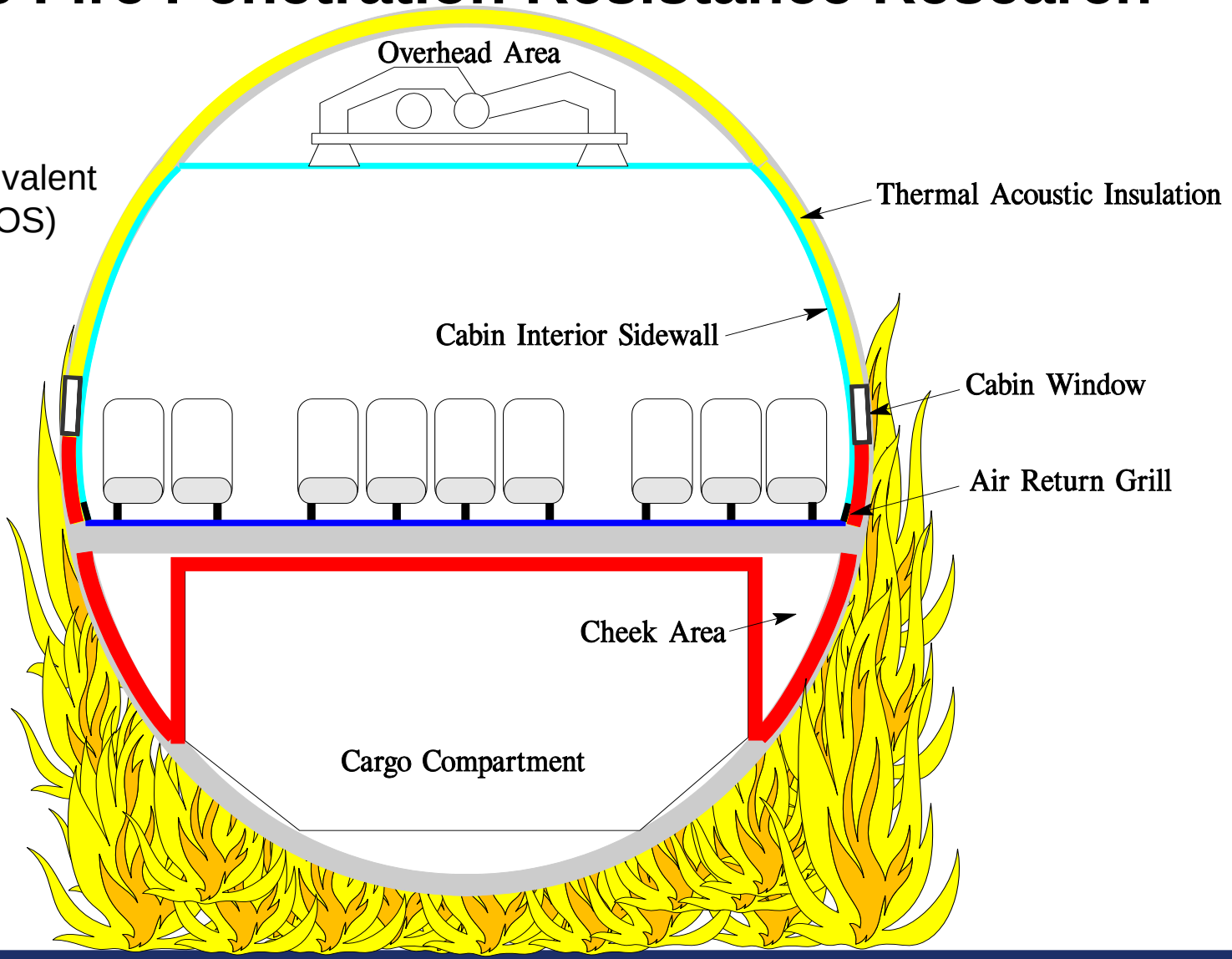
ARAC (2012) Final Report, with respect to Fuselage Fire Penetration:

“capture any alternate means of compliance for flame penetration resistance such as new fuselage material /manufacturing technologies that have the ability to delay fire entry into the occupied compartments of the aircraft during a post crash fire event.”

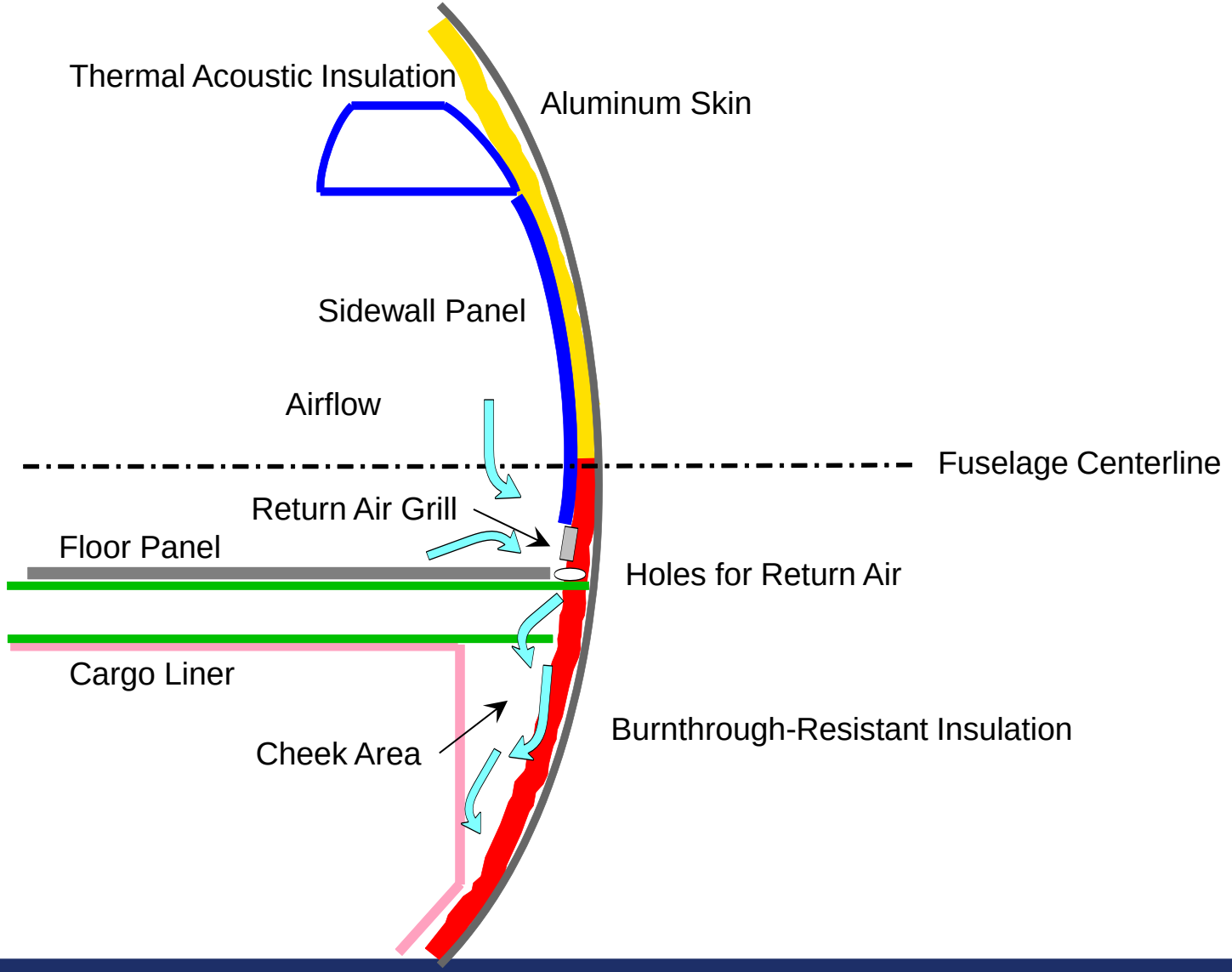
“New systems of protection might allocate penetration resistance between various systems. The net penetration resistance must add up to five or more minutes.”

Fuselage Fire Penetration Resistance Research

Example of an Equivalent Level of Safety (ELOS)



Fuselage Fire Penetration Resistance Research



Fire Penetration Resistance Test Fuselage

Questions?