



**Federal Aviation
Administration**

International Aircraft Materials Fire Test Forum Meeting

Short Takes and Current Projects

Presented to: International Aircraft Materials Fire Test
Forum, Cologne, Germany

By: Tim Marker, FAA Technical Center

Date: June 18, 2019



The Ninth Triennial International Aircraft Fire and Cabin Safety Research Conference

October 28-31, 2019

Resorts Casino-Hotel, Atlantic City, New Jersey, USA



Sponsored by International Aviation Authorities

No Fall 2019 Materials or Systems Forum meetings

How Can I register for this Conference?

Online Conference Registration will be available on the FAA Fire Safety website (<https://www.fire.tc.faa.gov/Meetings/meetings.asp>) in early-to-mid July.

April will send an email when Conference Registration opens.

Is this Conference free?

yesssssssssss



Hotel Information

Special conference rate: \$59, plus taxes and fees
(currently: 14% sales tax and \$5.00 fees)

Book online:

https://resortsaac.reztrip.com/classic/en/special_offer?action=show&controller=landings&locale=en&rate_code%5B%5D=VFAFSM9&rate_code%5B%5D=VFAFSM9&starting_page=special_offer&vr=3

Book by phone: (U.S.) 1-888-979-7700, Use Group Code: VFAFSM9

Conference Schedule

An overview of topics scheduled for each day will be available on the FAA Fire Safety website when online conference registration opens.



Materials Flammability Session

18 Planned Presentations (20 min + 10 min Q & A)

Session 1: Material Flammability Testing – New Challenges

New Frontier for Flammability Testing

Andrea Scialpi (Testori Aero Supply)

MCC as a Characterization Tool for Fire Resistant Adhesives

Dr. Patrick Zimmerman (3M)

Waste Compartment Fire Containment (TBD)

S. Campbell (SAFRAN) / J. Davis (Accufleet)

Additive Manufacturing and the Relationship to Flammability Testing

Steve Rehn (FAATC)

Air Baffles Used to Minimize Air Current Influence during Cargo Liner Testing

Tim Salter (FAATC)

Influence of Printing Parameters on the Flammability Behavior of 3D Printed Polyetherimide

Thomas Krause (Airbus)

Materials Flammability Session

18 Planned Presentations (20 min + 10 min Q & A)

Session 2: Technological Advancements and New Discoveries in Heat Release Testing

Revised Rate of Heat Release Test Method (HR2)	<i>Mike Burns (FAATC)</i>
Discovery of Supply Voltage Variation Effect on Material Heat Release Results	<i>Brian Johnson (Boeing)</i>
Discussion on the Effect of Airflow Variation on Material HR Results	<i>Theodoros Spanos (Boeing)</i>
OSU Voltage Round Robin	<i>Yaw Agyei (Boeing)</i>
Paint Effect on Heat Release of Aircraft Materials	<i>Michael Yue (Safran Seats)</i>
Flow Visualization in the OSU	<i>Tina Emami (FAATC)</i>

Materials Flammability Session

18 Planned Presentations (20 min + 10 min Q & A)

Session 3: Heat Flux Influence on Flammability Testing

Development of a Vertical Flame Propagation Test (VFP)	<i>Tina Emami/Rick Whedbee (FAATC)</i>
Development of Radiant Heater for the Vertical Flame Propagation Test	<i>Martin Spencer (Marlin)</i>
Calibration of Heat Flux Transducers	<i>Mike Burns (FAATC)</i>
Evaluation of Input Power Measurement for Calibrating the Evacuation Slide Test	<i>Steve Rehn (FAATC)</i>
RTCA: Development of a New Flammability Test for Electronic Boxes	<i>Steve Rehn (FAATC)</i>
Development of Flammability Test for Magnesium Components in Inaccessible Areas	<i>Tim Marker (FAATC)</i>

Questions on Conference?



Fire Safety Website Search Function



Federal Aviation Administration
Fire Safety

[Fire & Cabin Safety](#) [Materials](#) [Systems](#) [Fire Research](#) [Handbook](#) [Reports](#) [Meetings](#) [Conference](#)

What's New

Date	Section	Description
05/23/19	Handbook	Updated Chapter 23.
05/23/19	Systems	May meeting meeting presentations, minutes and attendee list posted.
05/22/19	Materials	June meeting info posted and registration opened.
05/13/19	Reports	Posted report DOT/FAA/TC-18/14.
04/02/19	Materials	March meeting minutes posted.
04/02/19	Systems	May meeting info posted and registration opened.
03/18/19	Materials	March meeting presentations posted.
02/27/19	Aircraft Cargo Compartment Minimum Performance Standard	Updated section.
02/11/19	Handbook	Updated Chapter 26.
02/05/19	Materials	March meeting agenda posted and registration opened.
01/22/19	Handbook	Updated Appendix F.

Announcements

Federal Register: Notice of Meetings; A Notice by the Federal Aviation Administration

SAFO: Risks in Transporting Lithium Batteries in Cargo by Aircraft

Final Policy: Policy Statement on Flammability Testing of Interior Materials Issued (link opens small window)

UPDATED 11/15: Statement on the Use of Magnesium in Airplane Cabins

Released: AC 20-42D - Hand Fire Extinguishers for Use in Aircraft

Cabin Safety Research Technical Group: Accident Database now available online.

InFO: Availability of a Federal Aviation Administration (FAA) In-flight Firefighting Training Video (see VIDEOS below)

SAFO: Fighting Fires Caused By Lithium Type



Fire Safety Website Search Function



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Search Results burnthrough



Results 1-10 of 179

[Burnthrough Topics for general guidance](#) (PDF)

www.fire.tc.faa.gov/pdf/materials/burnthrough-add_general_guidance.pdf

Mar 27, 2006 - **Burnthrough** Topics for future general guidance 3/17/06 Lowe lobe cargo doors: lower lobe cargo doors ... improved **burnthrough** protection (lower half only). Fasteners (not already covered in AC 25.856-2): Fasteners ... contribute to **burnthrough** protection in some cases. However, the variation in design is too great to generalize ...

[Burnthrough Workshop : FAA Fire Safety](#)

www.fire.tc.faa.gov/materials/burnthrough/workshop

... Materials: Thermal / Acoustic Insulation: Fuselage **Burnthrough Burnthrough** Workshop ... **Burnthrough** Background ... **Burnthrough** Background ...

[Burnthrough Update](#) (PDF)

www.fire.tc.faa.gov/pdf/materials/june09meeting/ochs-0609-burnthroughupdate.pdf

Jun 26, 2009 - ... Administration **Burnthrough** Update International Aircraft Materials Fire Test Working Group Meeting June 17, 2009 ... Germany



Red Line Process for Updating Fire Test Handbook

Posted 4/10/18

The Fire Test Handbook can be considered a living document, which can be edited and updated as new information becomes available. Some of these updates are simple corrections that are discovered with wording, terminology, or unit conversions. Other updates are procedural in nature, in which the execution of the test or the test arrangement or apparatus is improved.



Red Line Process Example

7.2.6 Percent Weight Loss

The percentage weight loss for a seat test sample is the pretest weight of the seat test sample less the posttest weight of the seat test sample expressed as the percentage of the pretest weight. All droppings falling from the seat test sample and test sample mounting frame are to be discarded prior to determining the posttest weight.

7.3 Apparatus

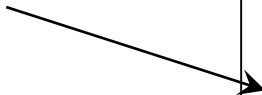
7.3.1 Test Sample Apparatus

The test sample apparatus includes the seat test sample mounting frame and drip pan. The arrangement of the test sample apparatus is shown in figures 7-1 and 7-2.

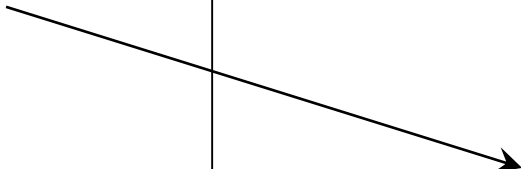
7.3.1.1 Test Sample Mounting Frame

Fabricate the sample mounting frame for the seat test sample from 1- by 1- by 0.125-inch steel angle and 1- by 0.125-inch steel flat stock as shown in figure 7-1. The dimensions listed for the test sample mounting frame are all inside measurements. The frame's upright section used for mounting the vertical assembly must be 33 ± 0.125 inches high and 18.125 ± 0.125 inches wide. The frame's bottom section used for mounting the horizontal assembly must be 18.125 ± 0.125 inches wide and 22.125 ± 0.125 inches long. The vertical and horizontal mounting surfaces should have two supporting braces made from 1- by 0.125 inch steel flat-stock. The centerlines of the flat stock braces are 6 ± 0.125 inches measured from the outer edges of the steel angle on the left and right sides of the frame. Four legs fabricated of 1- by 1- by 0.125-inch steel angle, and 12 ± 0.125 inches tall, are located below the four corners of the horizontal assembly mounting section of the frame. All connecting joints of the stand are welded and the flat stock components are butt-welded. The test sample mounting frame is used for mounting the seat test sample horizontal and vertical assemblies. The position of the test sample mounting frame relative to the burner cone during testing must be positioned as shown in figure 7-2.

Revised Text



Date



Chapter 7

7-2
(October 2017)

Chapter 7	October Update	Oil Burner Test for Seat Cushions Advisory Circular on Flammability Requirements for Aircraft Seat Cushions. Lab Test Form - Oil Burner Seat Cushion Test Seat Cushion Test Procedures Training Video: View Online Download
Chapter 8	October Update	Oil Burner Test for Cargo Liners Lab Test Form - Oil Burner Cargo Liner Test Cargo Liner Test Procedures Training Video: View Online Download
Chapter 9		Radiant Heat Testing of Evacuation Slider, Ramps, and Rafts
Chapter 10		Fire Containment Test of Waste Stowage Compartments
Chapter 11	Updated	Powerplant Hose Assemblies Test
Chapter 12		Powerplant Fire Penetration Test
Chapter 13		Test for Electrical Connectors used in Firewalls
Chapter 14		Test for Electrical Wire used in Designated Fire Zones
Chapter 15		Two Gallon per hour Oil Burner Certification Testing for Repaired Cargo Compartment Liners
Chapter 18		Recommended Procedure for the 4-Ply Horizontal Flammability Test for Aircraft Blankets Lab Test Form - Bunsen Burner Test
Chapter 19		Smoke test for Insulated Aircraft Wire
Chapter 20		Dry Arc Tracking Test Procedure
Chapter 21		Dry Arc-Propagation Resistance
Chapter 22		Cotton Swab Test for Thermal Acoustic Insulation Blankets
Chapter 23	May Update	Test Method To Determine the Flammability and Flame Propagation Characteristics of Thermal/Acoustic Insulation Materials Advisory Circular on Thermal/Acoustic Insulation Flame Propagation Test Method Details Radiant Panel Procedures Training Video: View Online Download
Chapter 24	September Update	Test Method To Determine the Burnthrough Resistance of Thermal/Acoustic Insulation Materials

indicates if/when chapter has been updated



Chapter 23: Test Method to Determine the Flammability and Flame Propagation Characteristics of Thermal/Acoustic Insulation Materials - Updated in May

Most notable change was reduction in tolerance of zero position heat flux, from $\pm 5\%$ to $\pm 1\%$ (1.485 to 1.515 Btu/ft² sec range)

Tolerance reduction *does not change the test*

All labs in most recent round robin have demonstrated the capability of meeting this tolerance

RTCA

RTCA, Inc., formerly known as Radio Technical Commission for Aeronautics, is a United States volunteer organization that develops technical guidance for use by government regulatory authorities and by industry. It was founded in 1935, and was re-incorporated in 1991 as a private not-for-profit corporation. It has over 200 committees and overall acts as an advisory body to the FAA to develop comprehensive, industry-vetted and endorsed standards that can be used as a means of compliance with FAA regulations.

RTCA

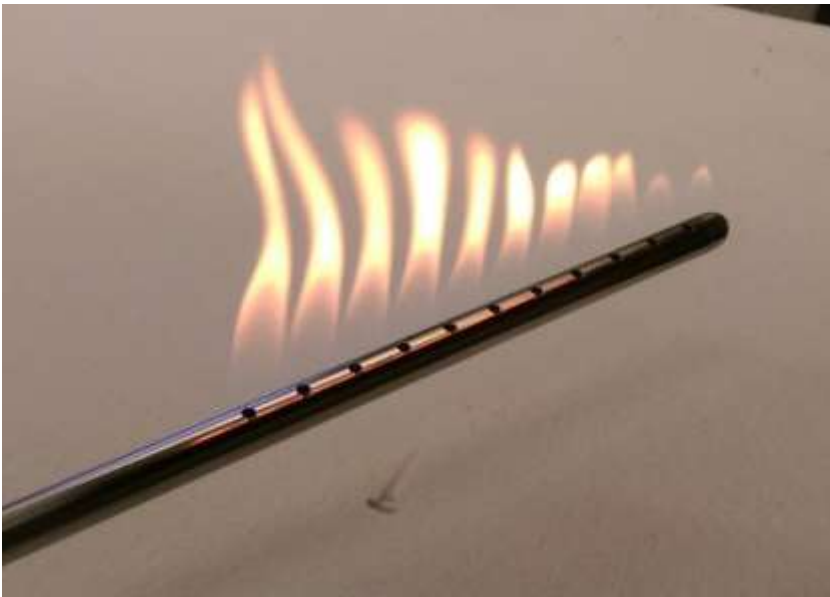
One such standard, RTCA/DO-160G, Environmental Conditions and Test Procedures for Airborne Equipment, provides a laboratory means to determine the performance characteristics of airborne electronic equipment. Chapter 26 of this standard defines test conditions and procedures for flammability and fire resistance. A task group formed within the International Aircraft Materials Fire Test Forum has been the primary conduit for discussion and information exchange on revising Chapter 26 of the standard. The main focus of this task group is on flammability testing of electronic boxes in commercial aircraft, with specific emphasis on test simplification and reducing testing redundancy.

RTCA

New test methodology: test electronic boxes whole, rather than test individual components in VBB

Test method based on Telecom Industry test ANSI T1.319

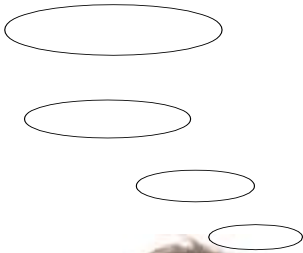
Will be added to RTCA-DO160H



Draft test method due to committee in Spring 2020

OSU and HR2 Refinement Work

How can we make this better?



Research on Updating Heat Release Test (HR2)

TRL5 repeatability testing to validate findings of study conducted in Fall 2018

TRL5 purpose: repeatability within a lab

TRL5 testing complete

FAA SME traveled to Boeing Everett to witness tests (May 7-8, 2019)

Boeing SMEs traveled to FAATC to witness tests (May 21-23, 2019)

350 samples tested between Boeing and FAATC apparatuses

Research on Updating Heat Release Test (HR2)

Next steps: TRL6 (reproducibility) testing?

reproducibility is the key! Lab-to-lab equivalence is the goal

Obstacles to completing TRL6?

Only 1 HR2 machine currently operational

Other FAATC machine needs software update and voltage controller ($\pm 1\%$)

What is status of Airbus machine?

Does Boeing plan to purchase equipment and participate?

Need 4 independent machines operational to conduct reproducibility study

Evacuation Slide Test



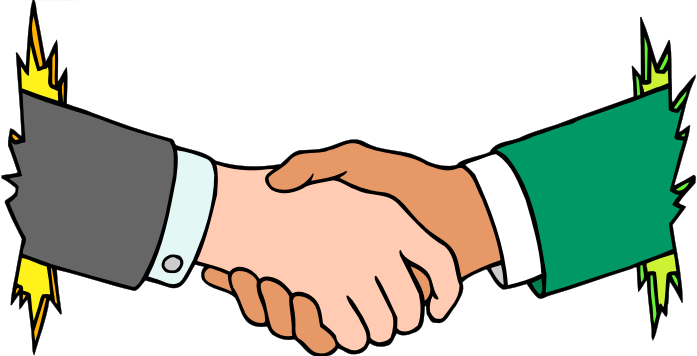
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VFP Test Update



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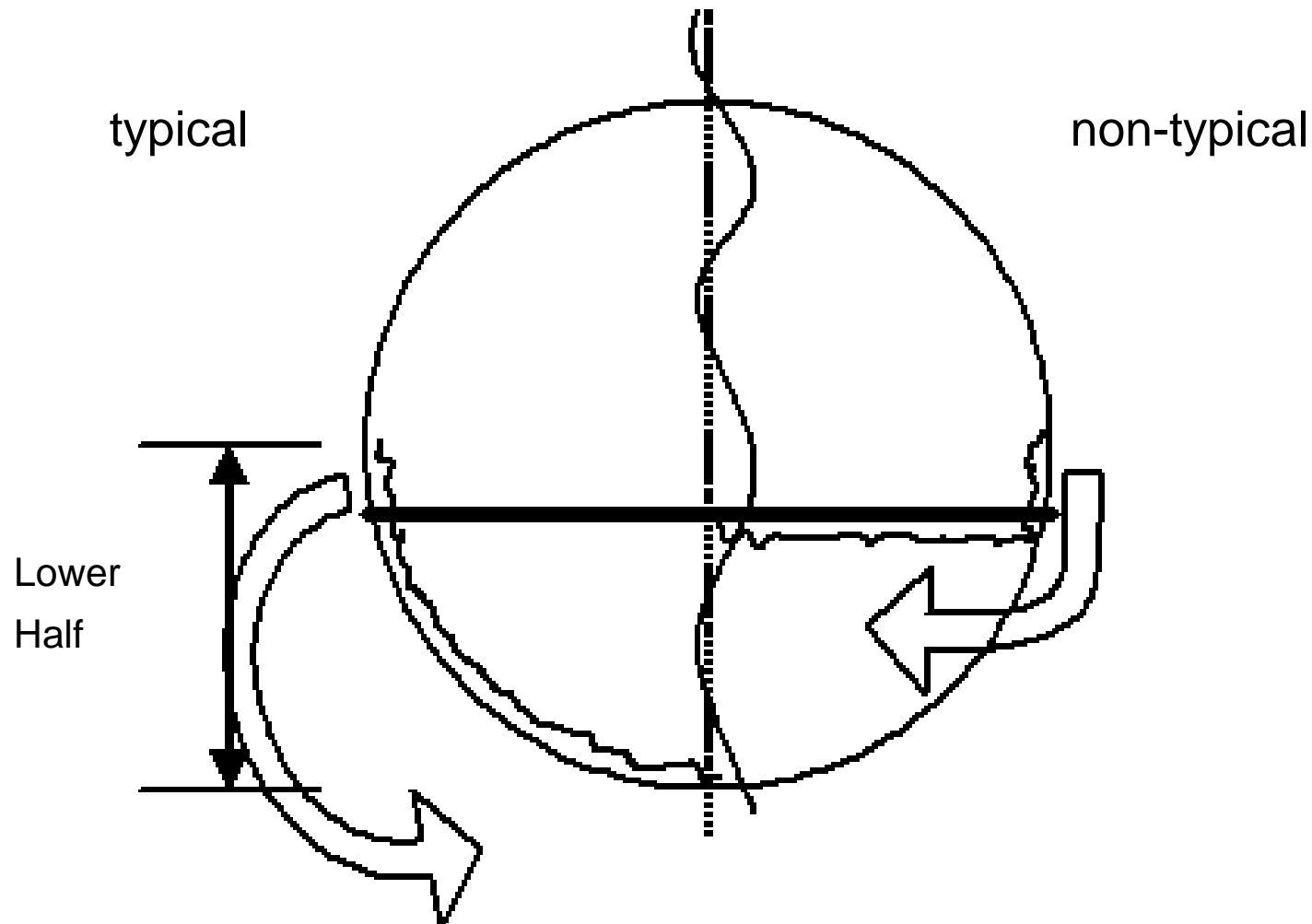


Fuselage Fire Penetration Resistance Research



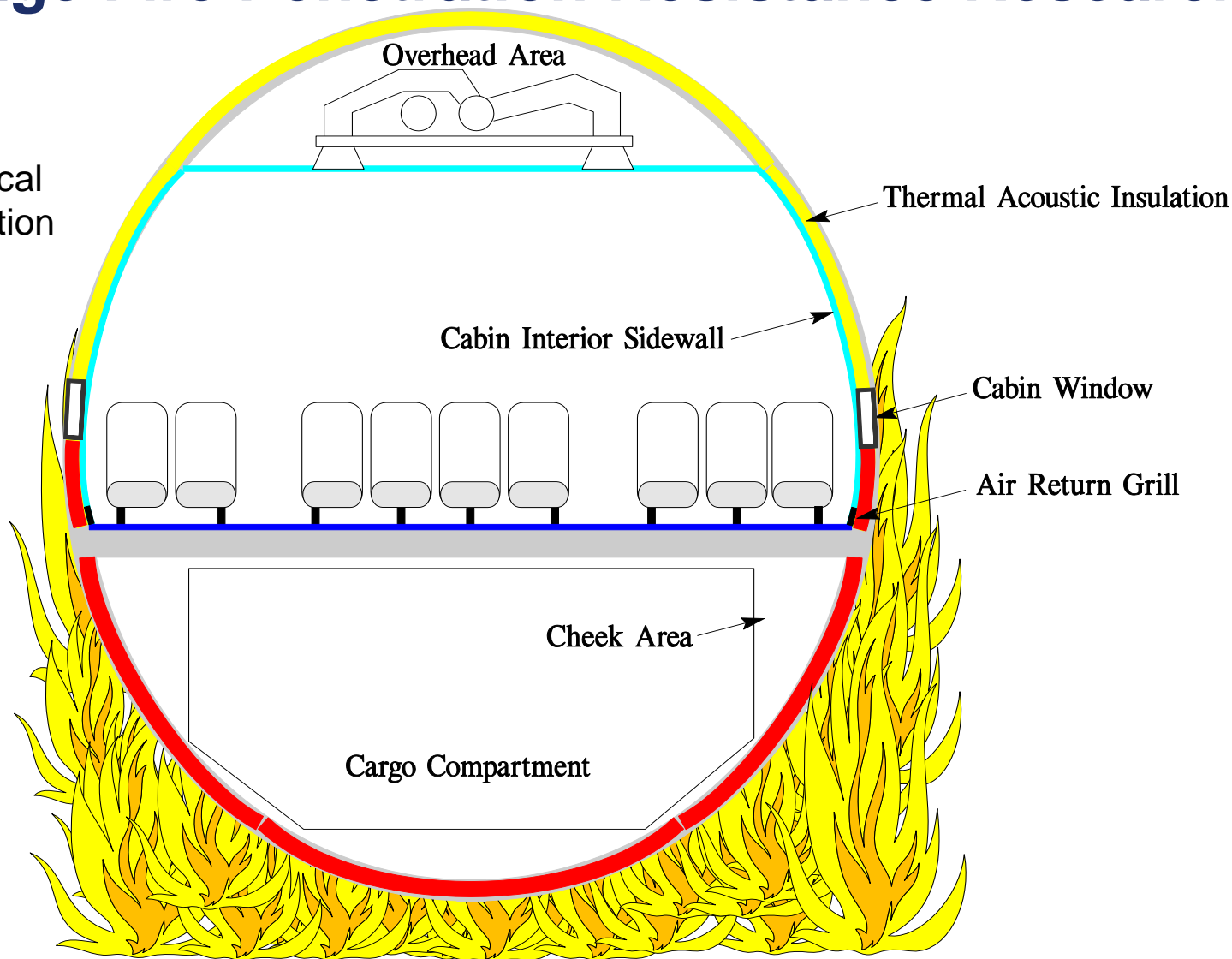
Fuselage Fire Penetration Resistance Research

...from AC 25.856-2A



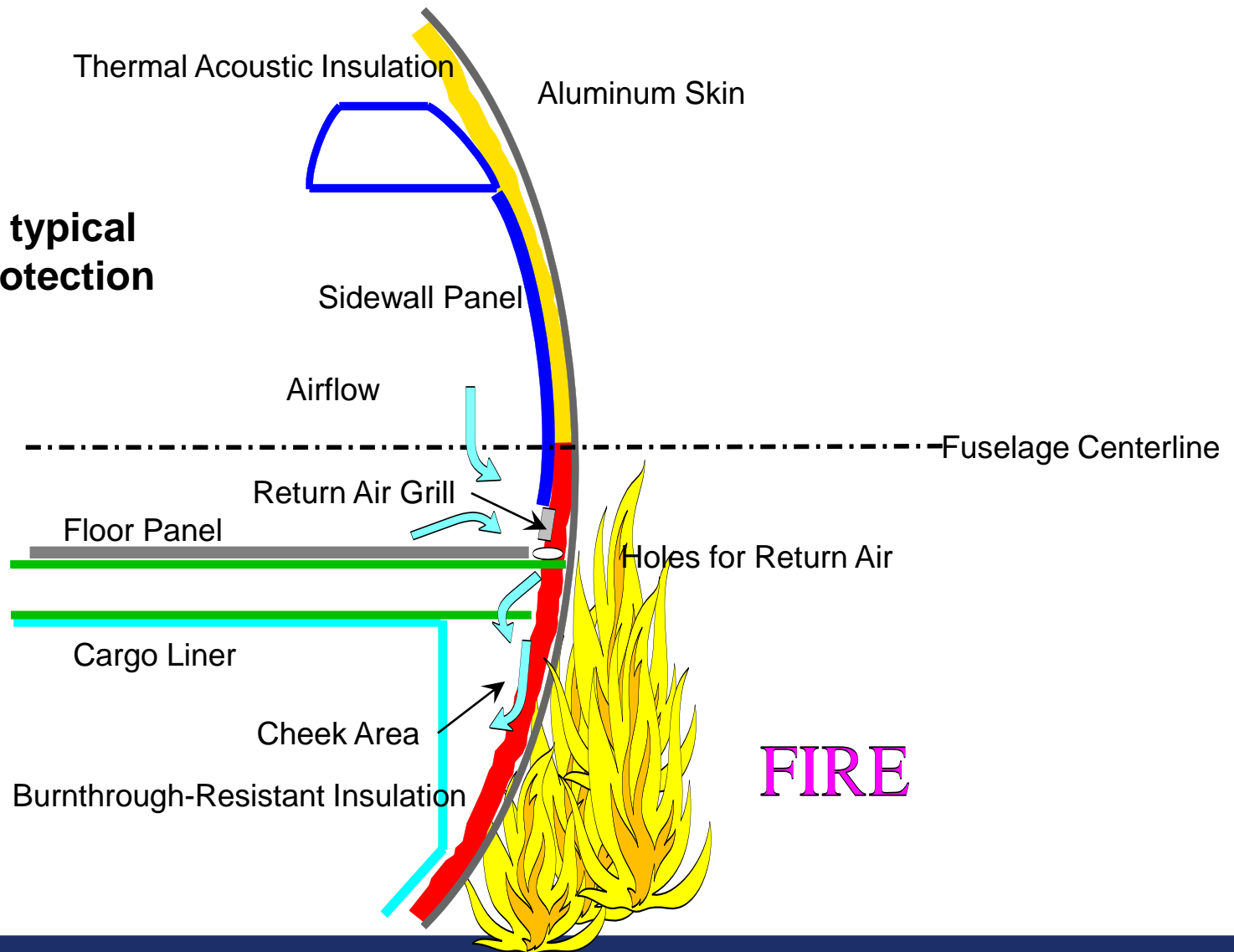
Fuselage Fire Penetration Resistance Research

Example of typical fuselage protection



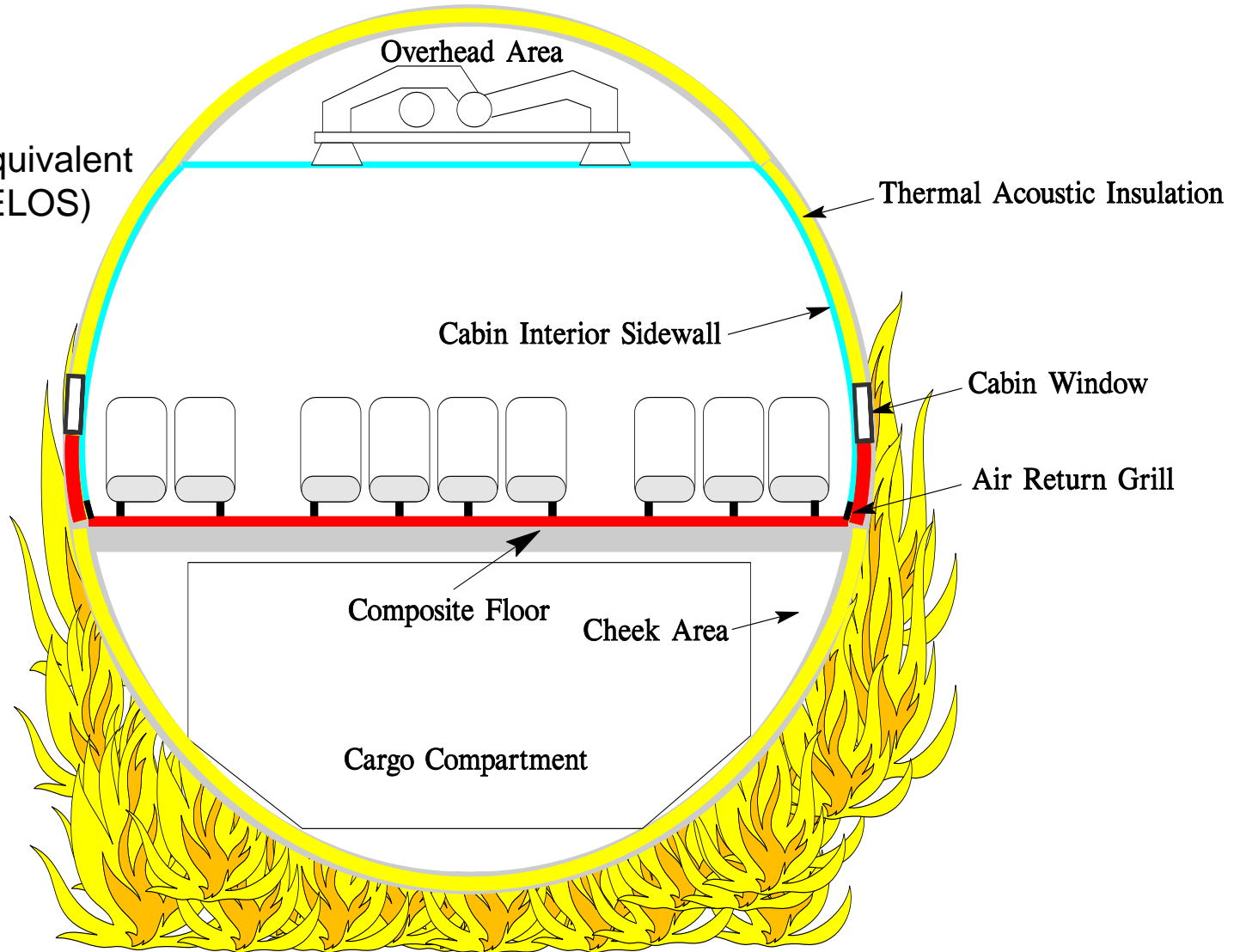
Fuselage Fire Penetration Resistance Research

Example of typical fuselage protection



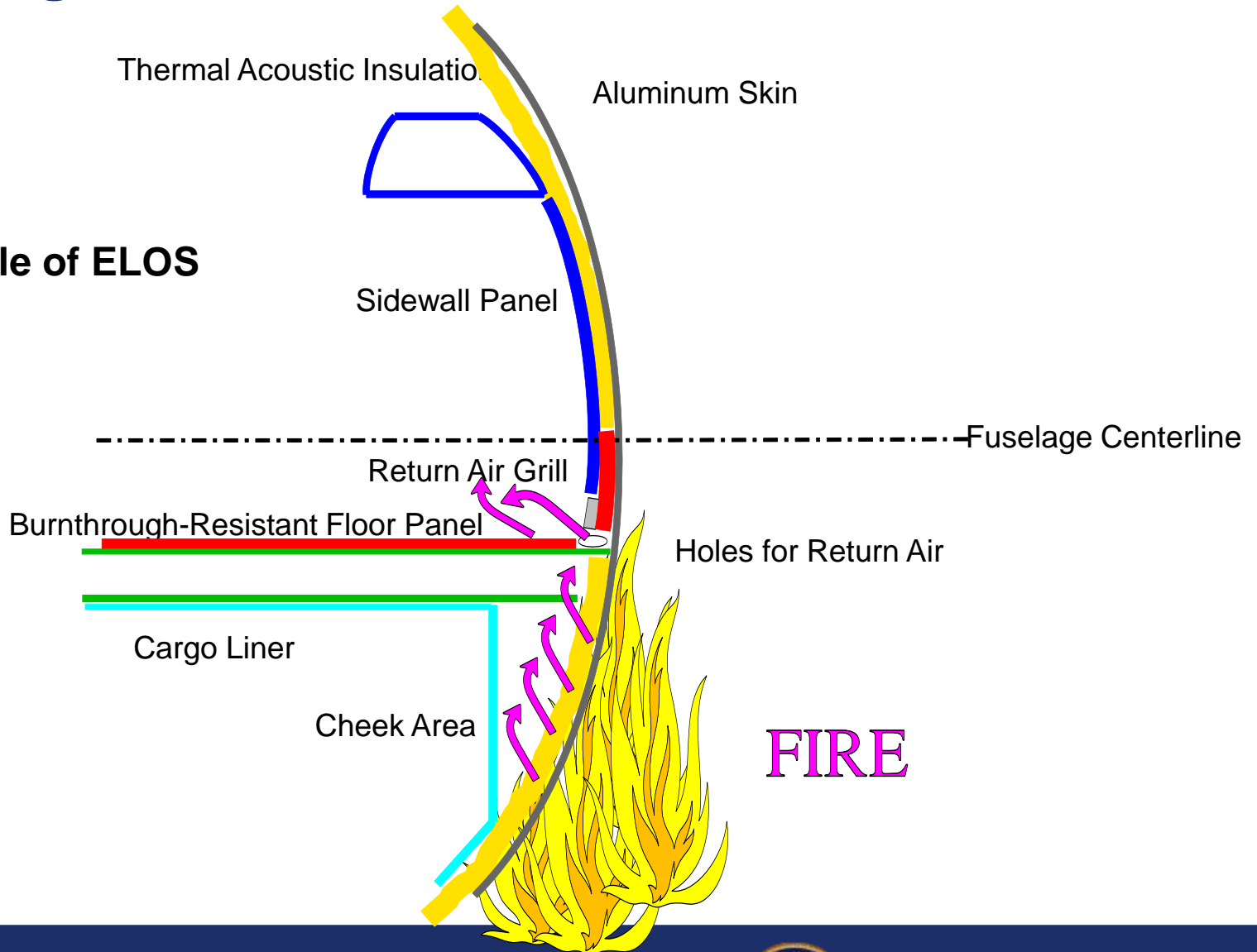
Fuselage Fire Penetration Resistance Research

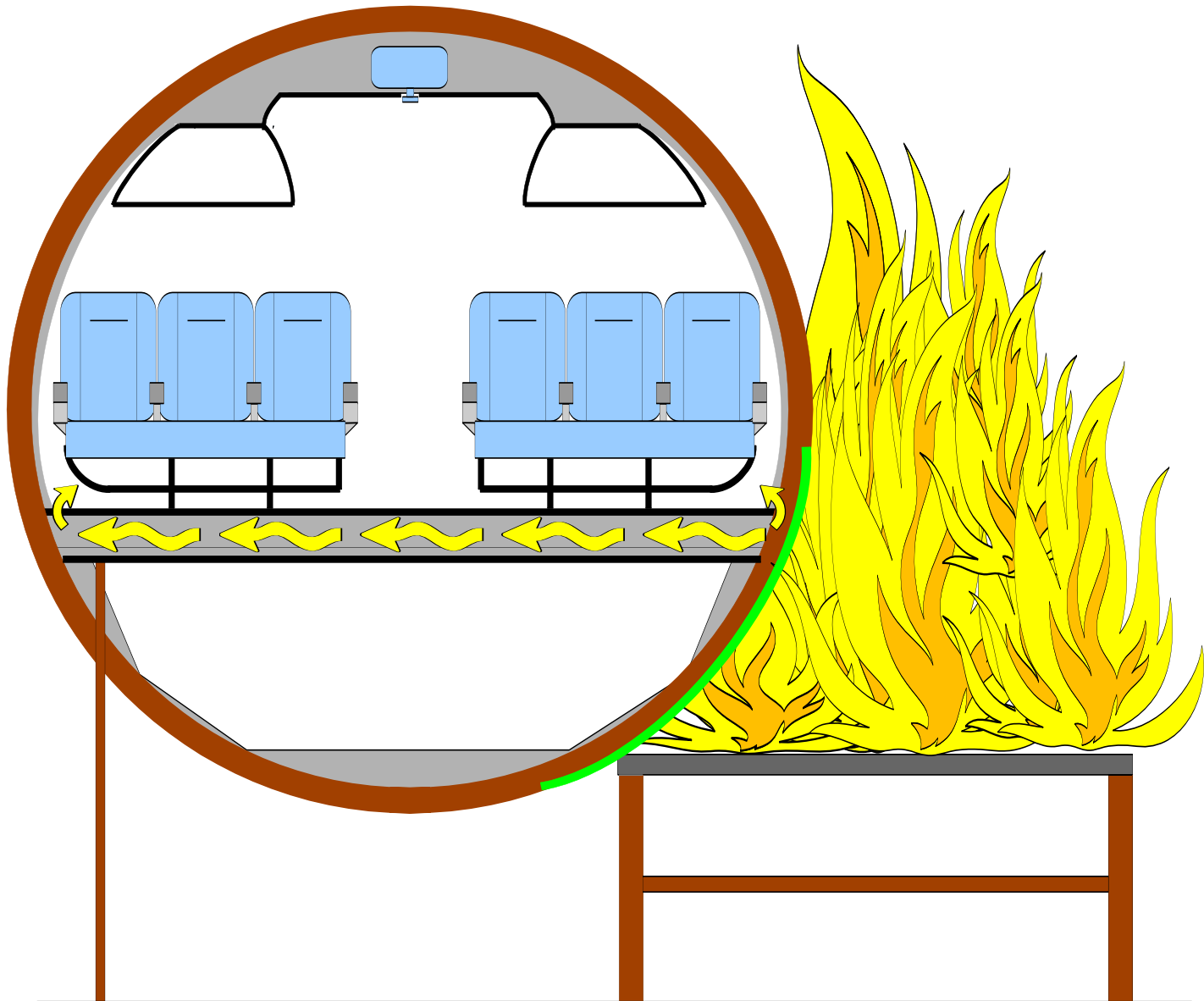
Example of an Equivalent Level of Safety (ELOS)



Fuselage Fire Penetration Resistance Research

Example of ELOS





Fuselage Fire Penetration Resistance Research



Full Scale Test on 5/9/19

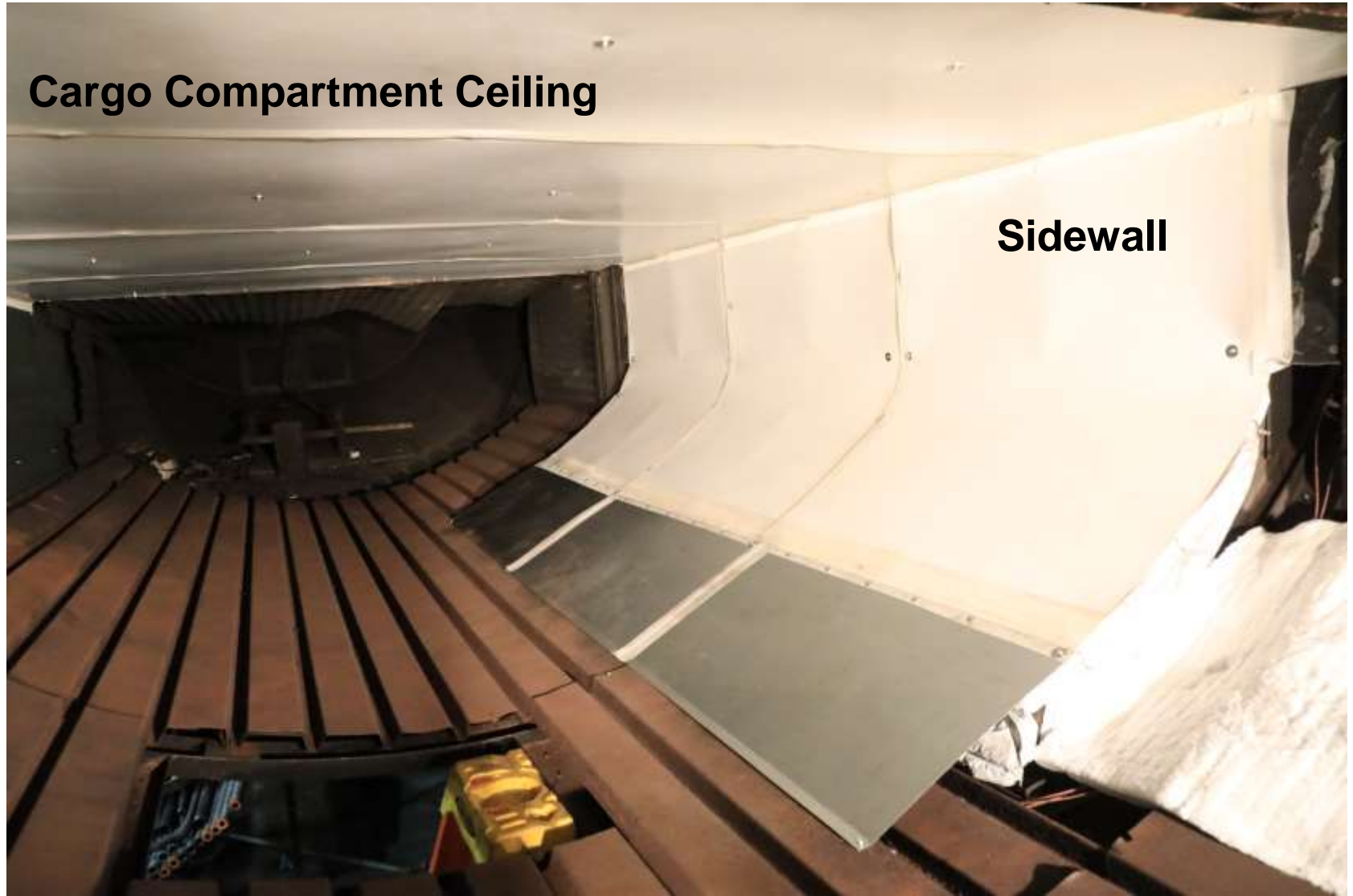
Aluminum Skin Area



Full Scale Test on 5/9/19

Cargo Compartment Ceiling

Sidewall



Insulation Blankets Installed



Full Scale Test on 5/9/19



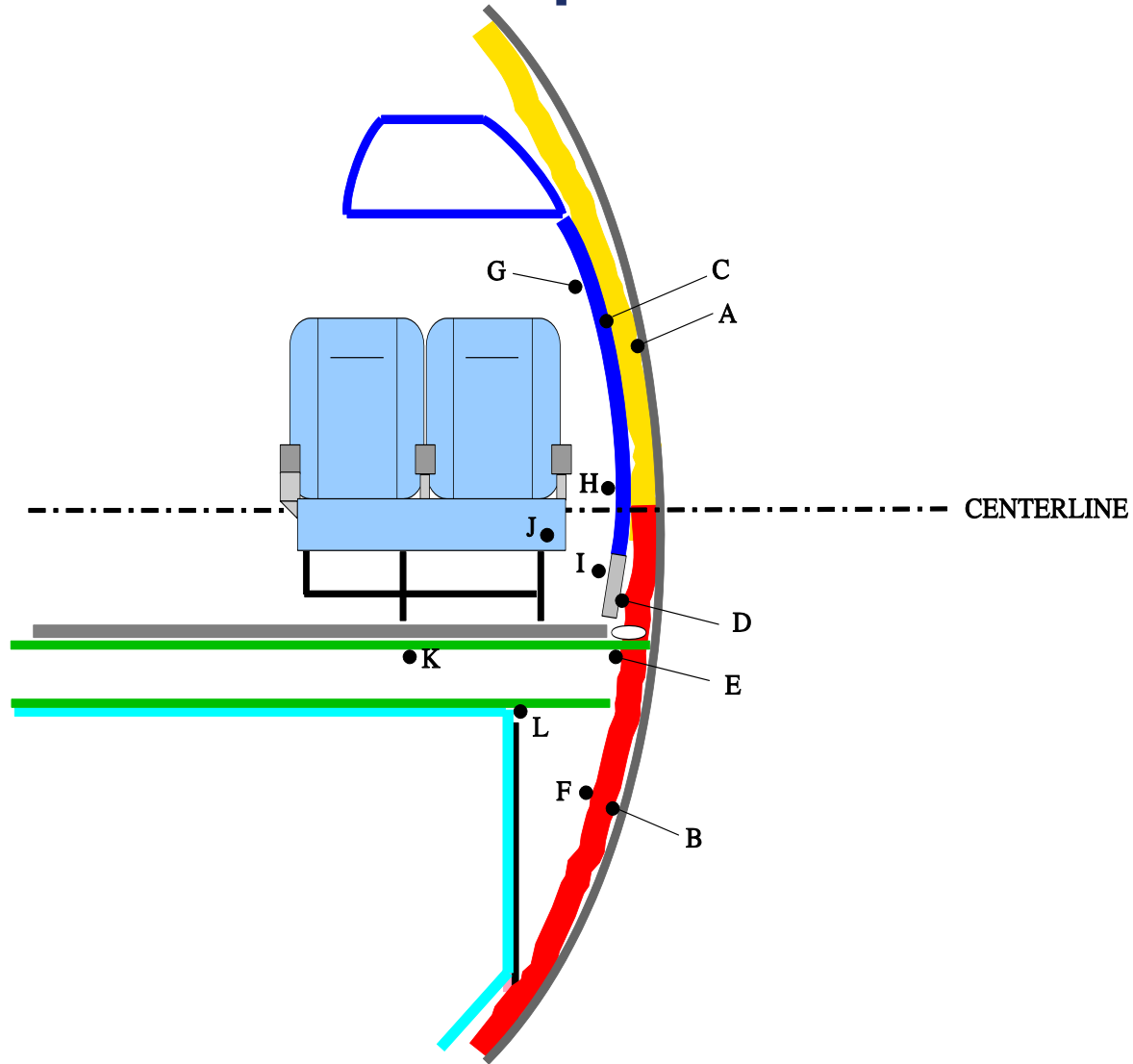
Full Scale Test on 5/9/19



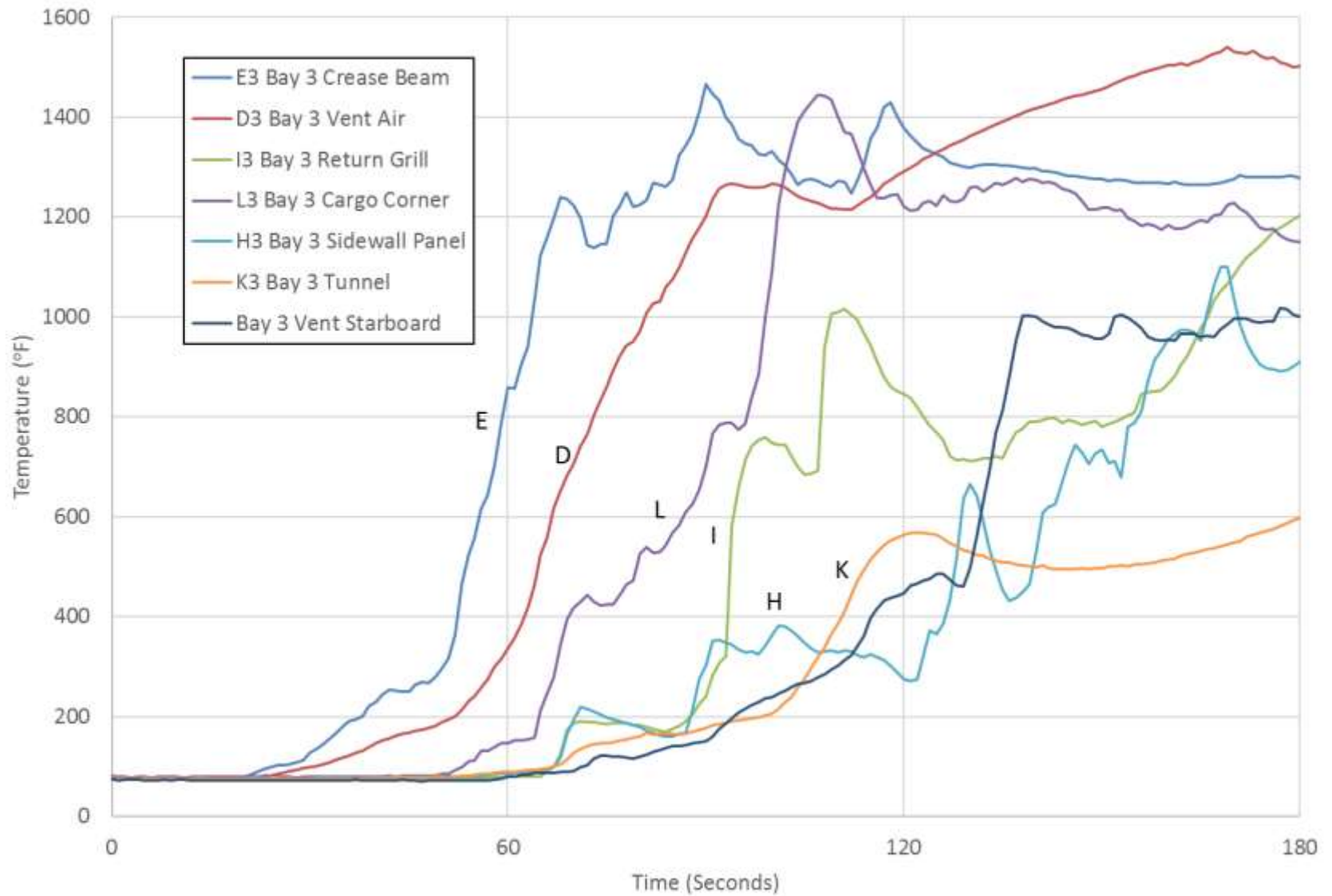
Full Scale Test on 5/9/19



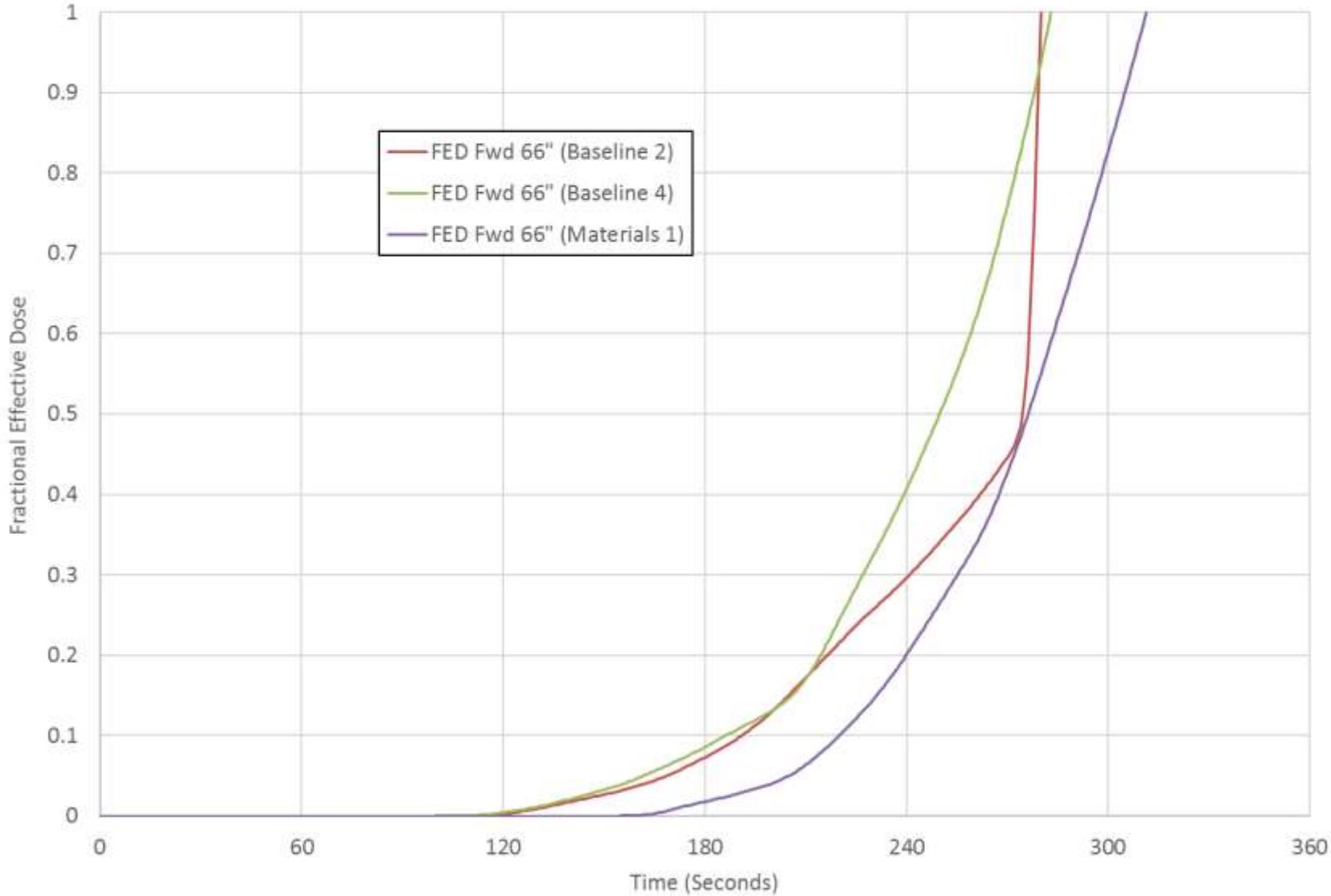
Thermocouple Locations



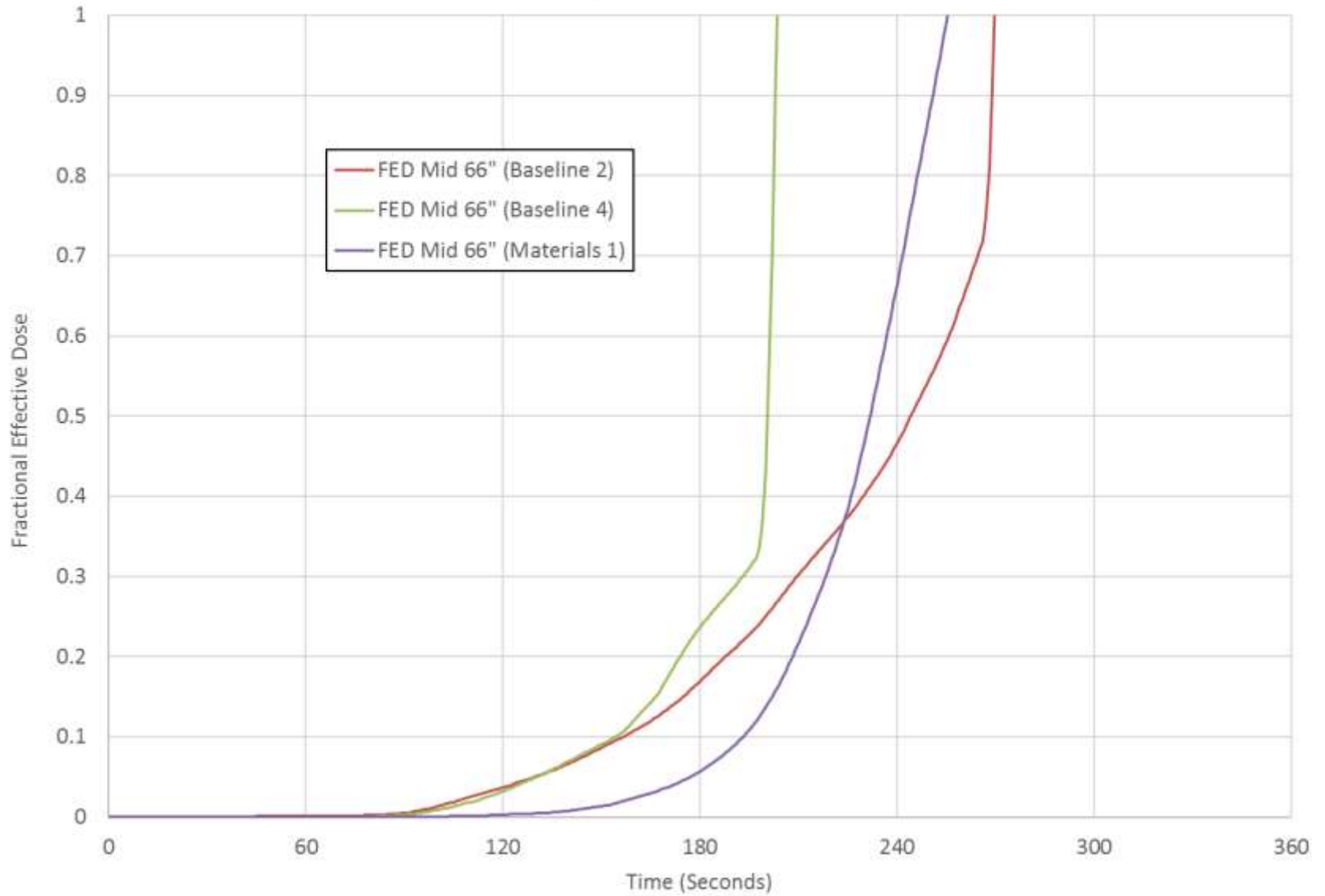
Fire Progression Into Fuselage



FED Comparison Fwd Cabin



FED Comparison Mid Cabin



Aeroflot Sukhoi Superjet 100-95 Accident, 5/5/19



Aeroflot Sukhoi Superjet 100-95 Accident, 5/5/19



Aeroflot Sukhoi Superjet 100-95 Accident, 5/5/19



Questions?

