Federal Aviation Administration

International Aircraft Materials Fire Test Working Group Meeting

Sonic Burner Cargo Liner and Seat Cushion Test Update

Presented to: International Aircraft Materials Fire Test Working Group

By: Tim Salter, FAA Technical Center

Date: March 7-8, 2017, Mobile, AL

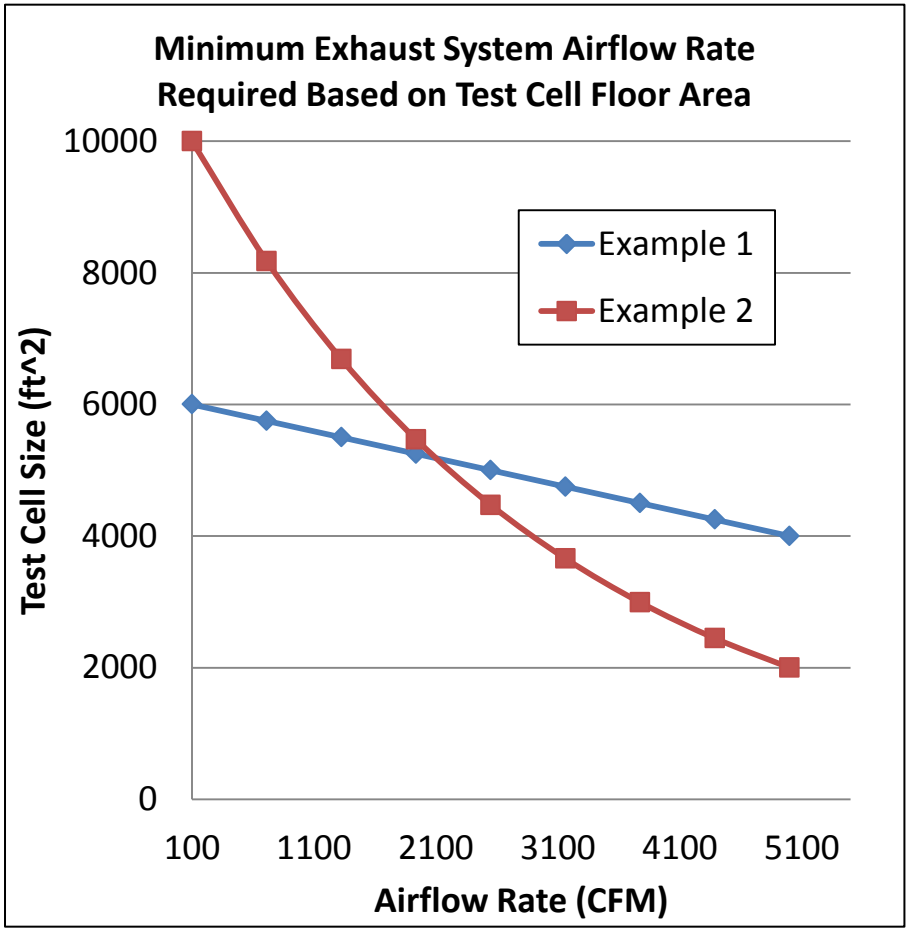
Introduction

- **Test Cell Airflow Interlab Study 2016**
  - Review
  - Study Results
  - Outcome of Interlab Study Results
- **Fire Test Handbook Updates**
  - Chapter 7: Oil Burner Test for Seat Cushions
  - Chapter 8: Oil Burner Test for Cargo Liner
- **Seat Cushion Sonic Burner Video**
  - Overview
  - Timeline for production and release for viewing

Test Cell Airflow Interlab Study

Test Cell Airflow Interlab Study

- **Purpose**
  - Determine correlation between test cell size and exhaust airflow
    - Example graph shown →
  - Produce guidance information regarding recommended exhaust airflow rate based on size and design of lab test cell
    - May help reduce disparities in test results among labs



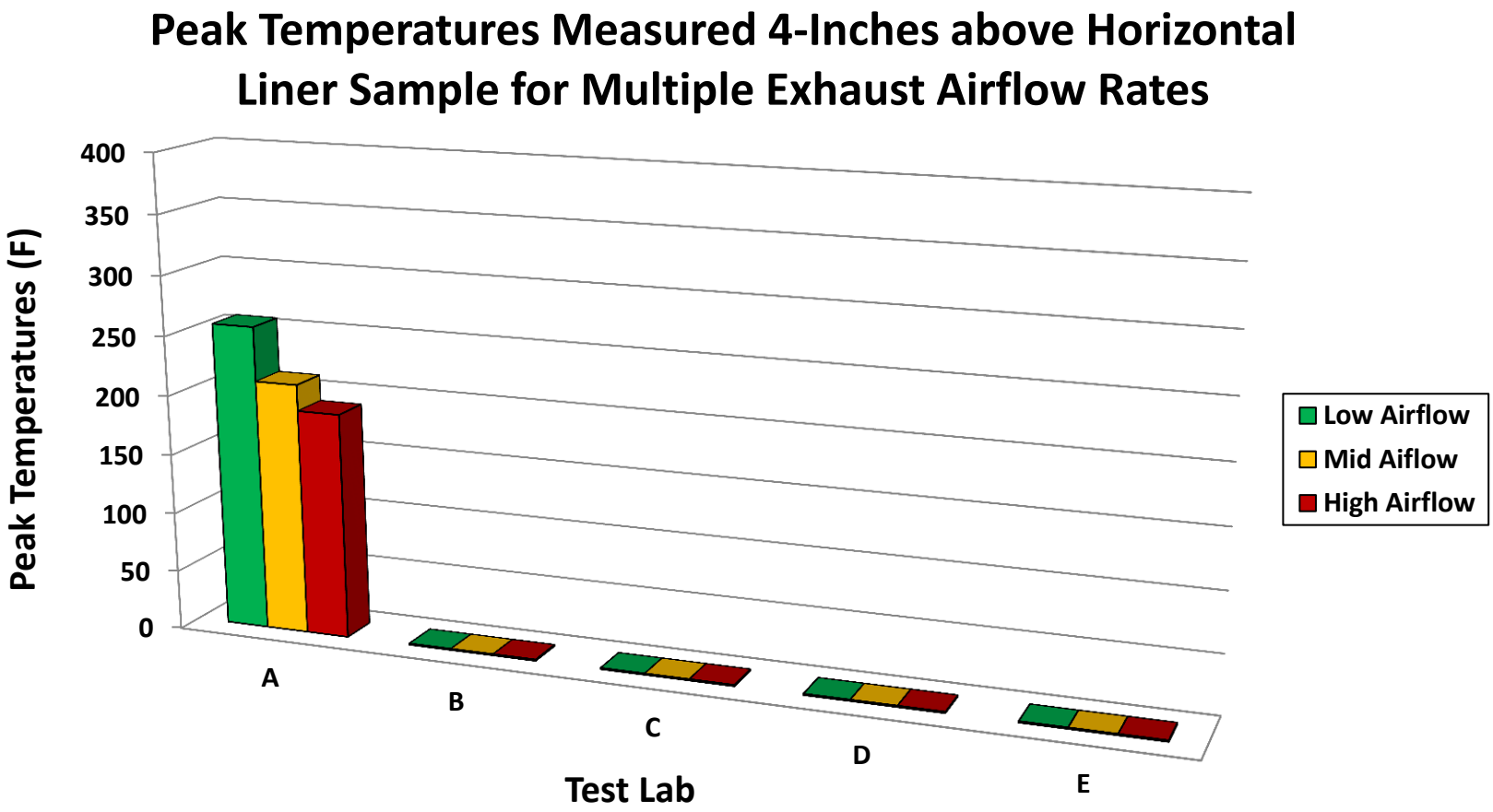
Test Cell Airflow Interlab Study

- **Same liner type provided to all labs**
- **Conduct tests using Sonic Burner**
  - Fire Test Handbook: Chapter 8
- **Replicate provided FAA TC test results**
  - Begin by testing a sample using typical lab configuration/airflow to establish baseline data
  - Attempt to reproduce FAA test results by adjusting exhaust airflow through trial and error
  - Report back with test sample burn data, measured airflow rates, and test cell configuration details

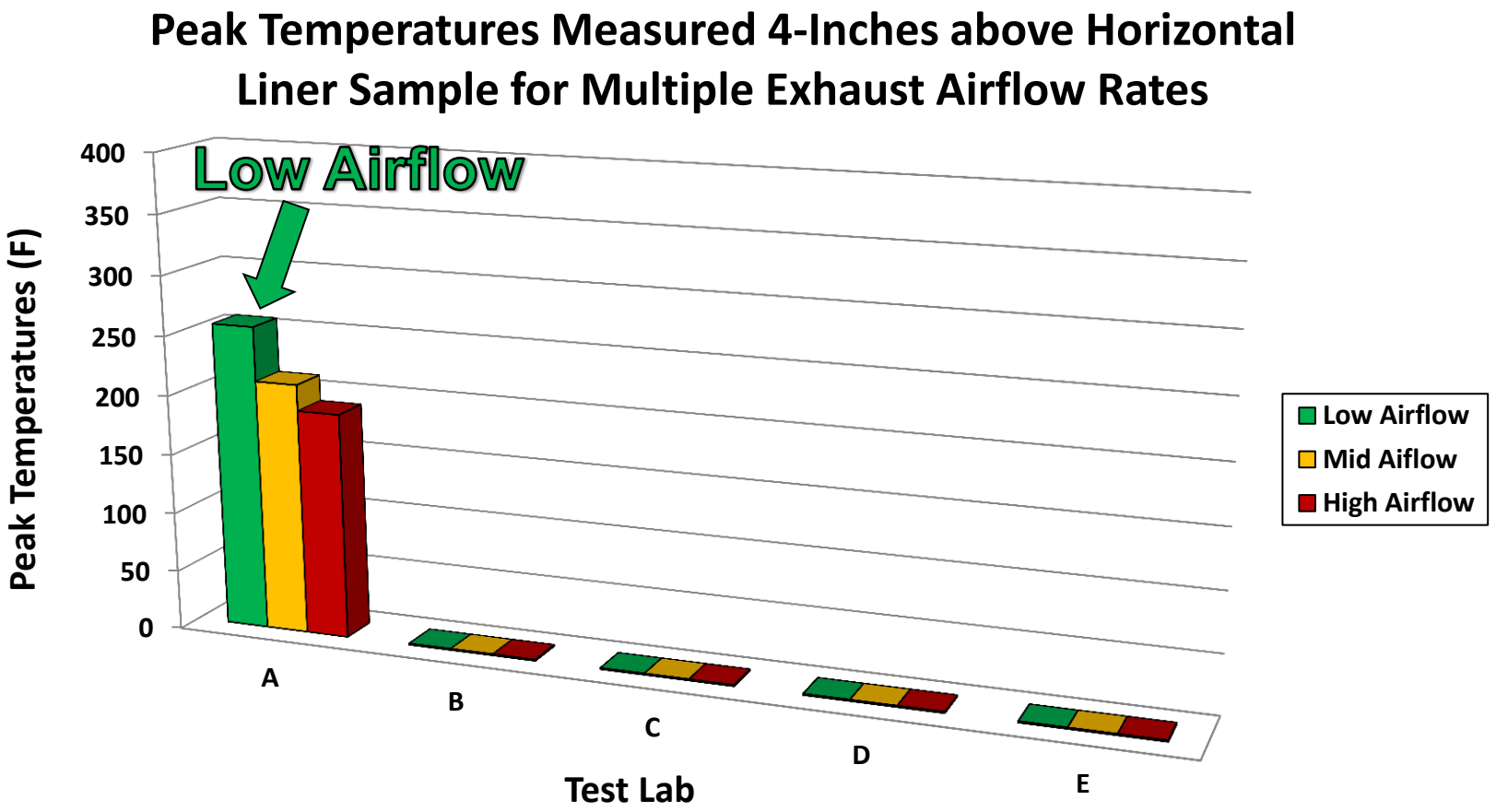
Test Cell Airflow Interlab Study

- **Assumption**
  - Increasing the exhaust airflow rate inside the test cell will result in lower temperatures measured above the horizontal liner sample
- **Reduction in test cell ambient temperature**
  - Low airflow can turn a test cell into an oven
- **Increase test sample localized air velocity**
  - Combustion byproducts lingering above test sample contributes to increased TC temperature readings

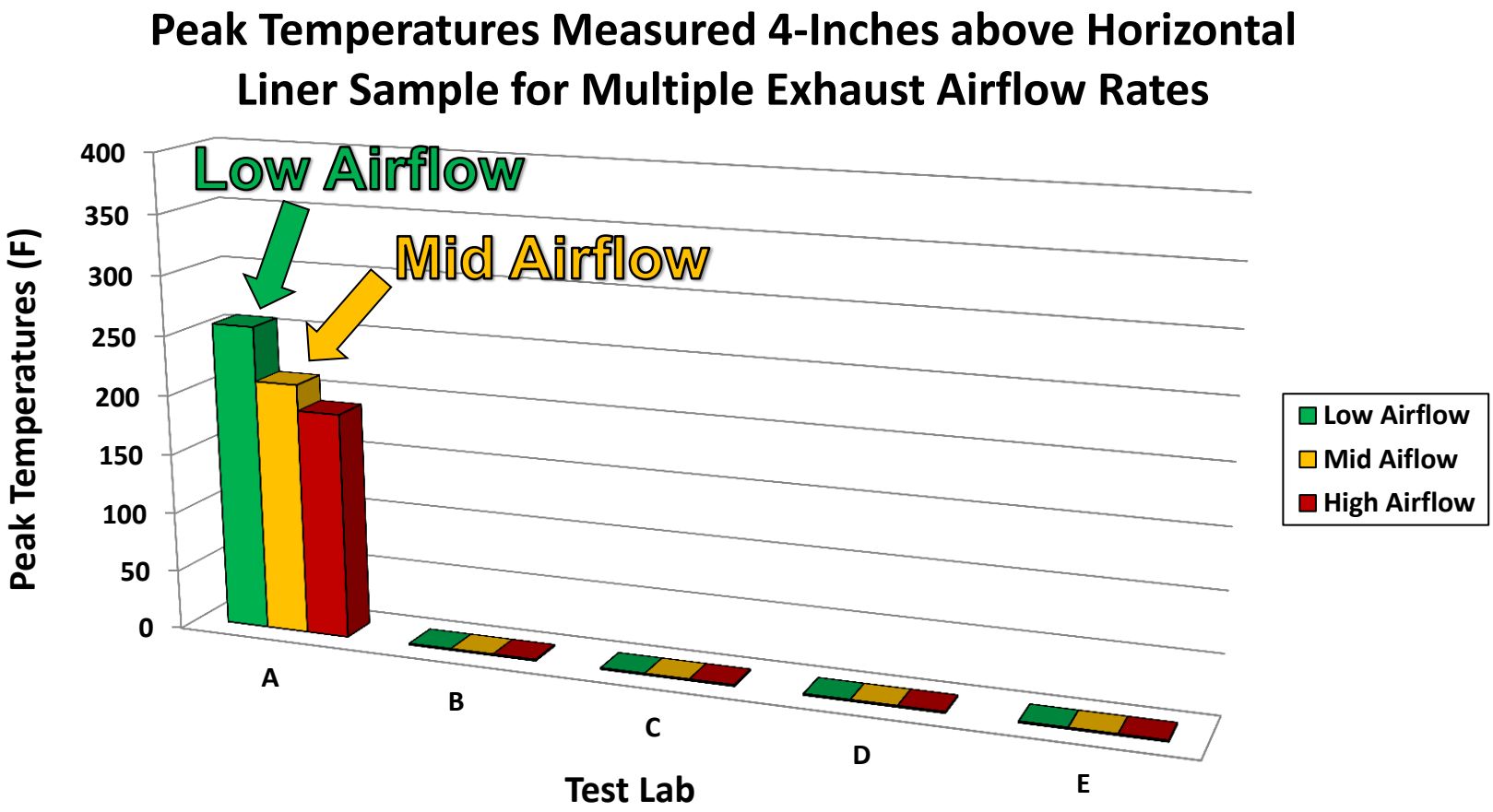
Test Cell Airflow Interlab Study



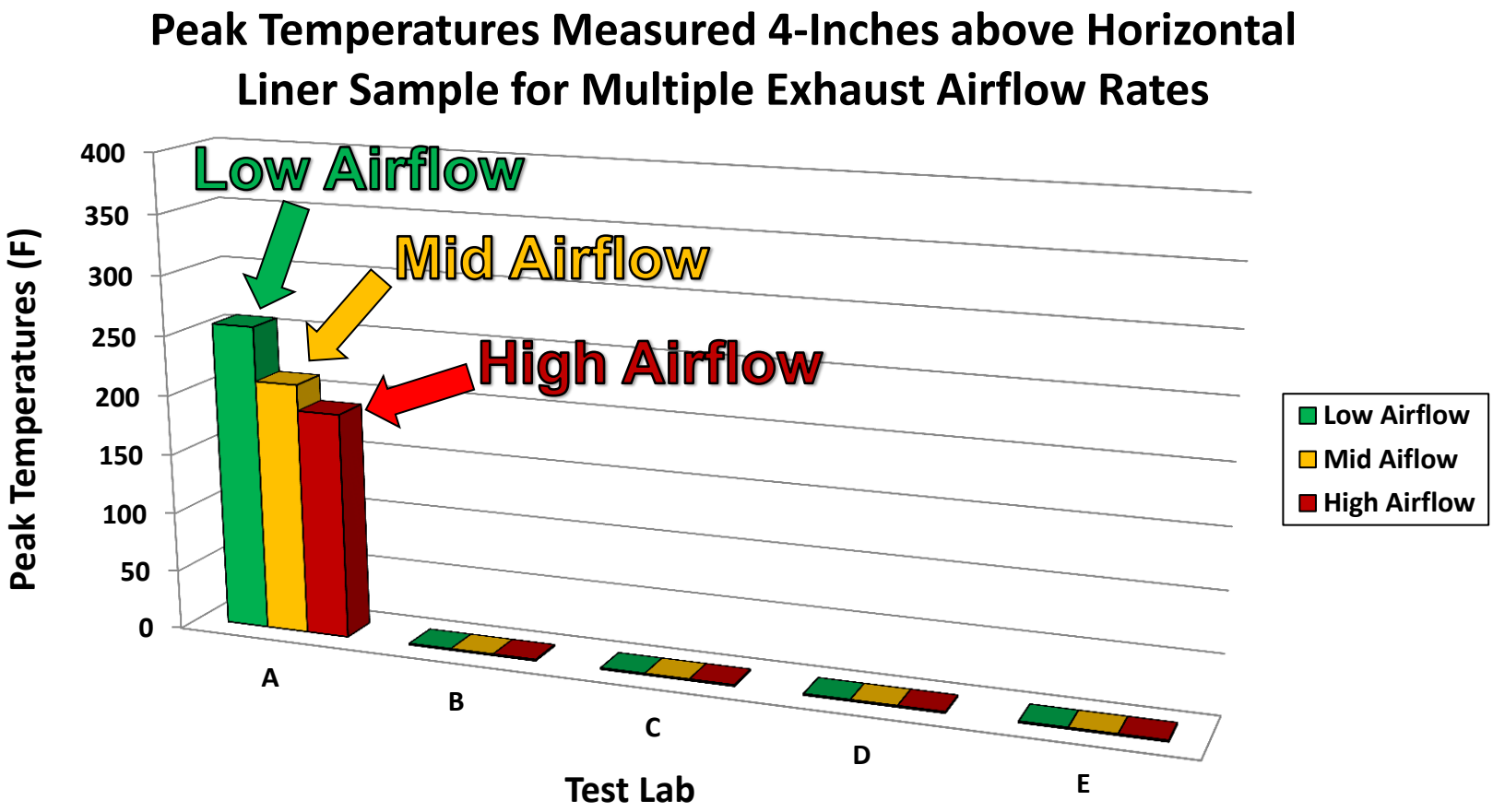
Test Cell Airflow Interlab Study



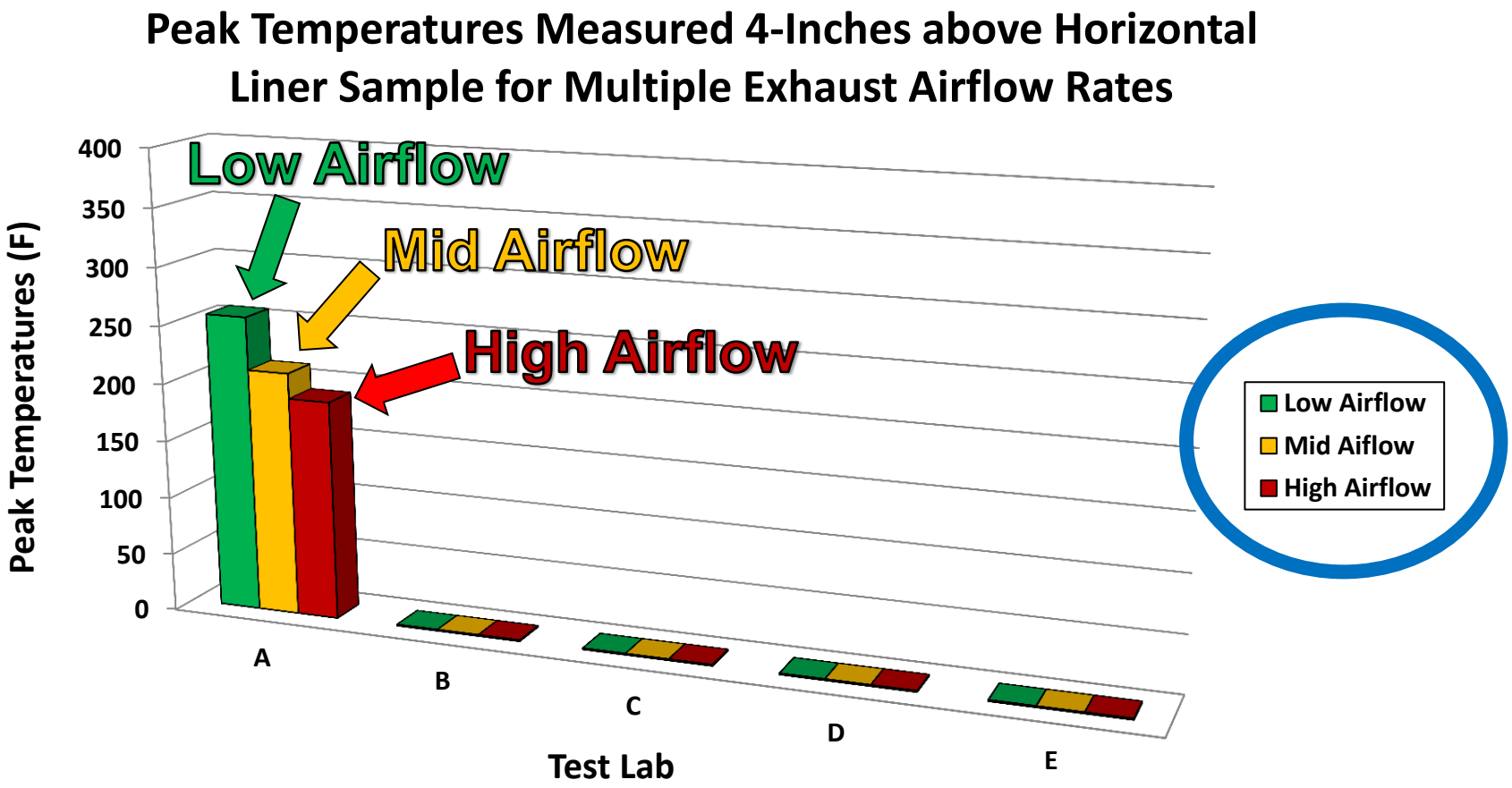
Test Cell Airflow Interlab Study



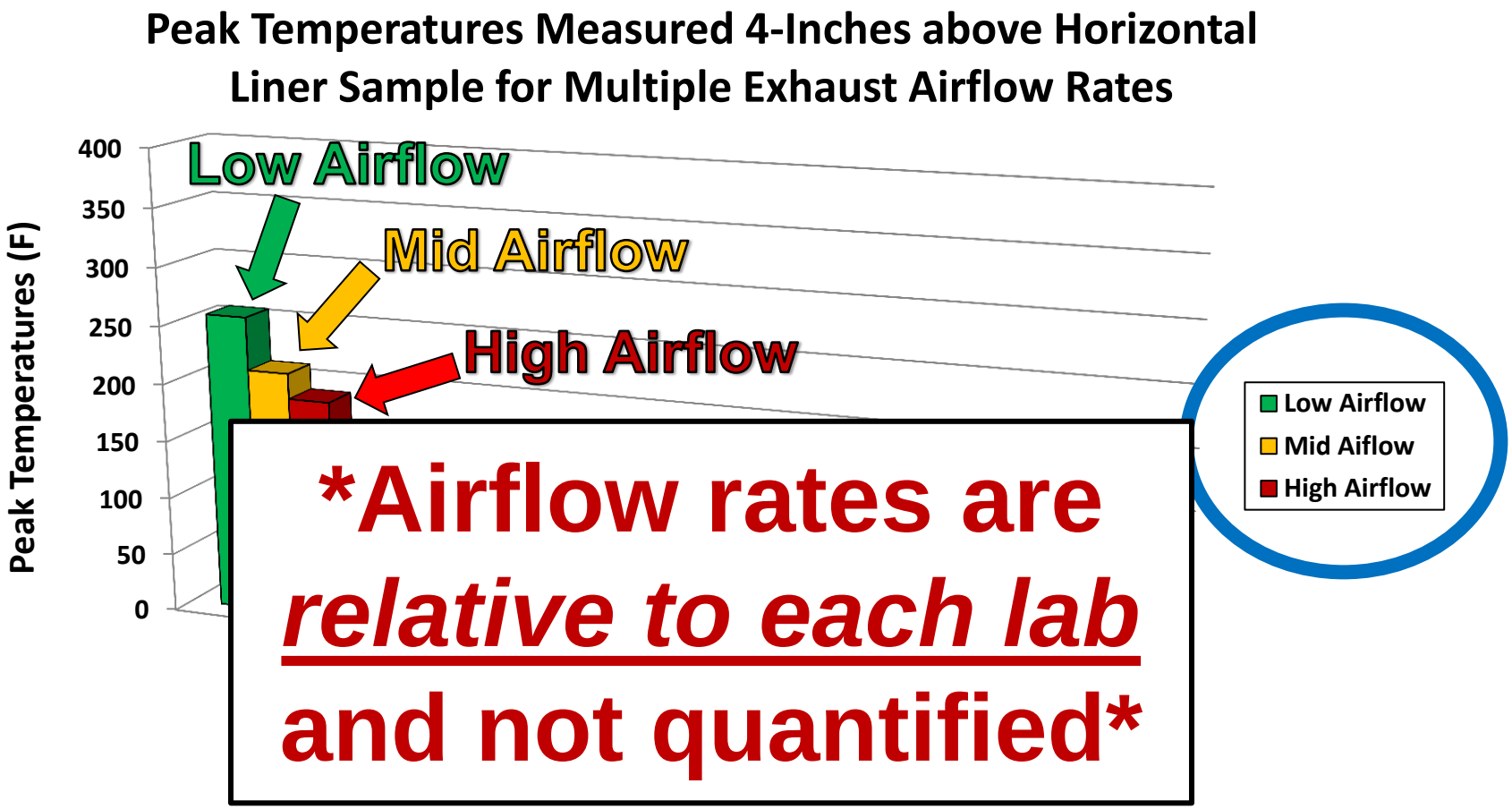
Test Cell Airflow Interlab Study



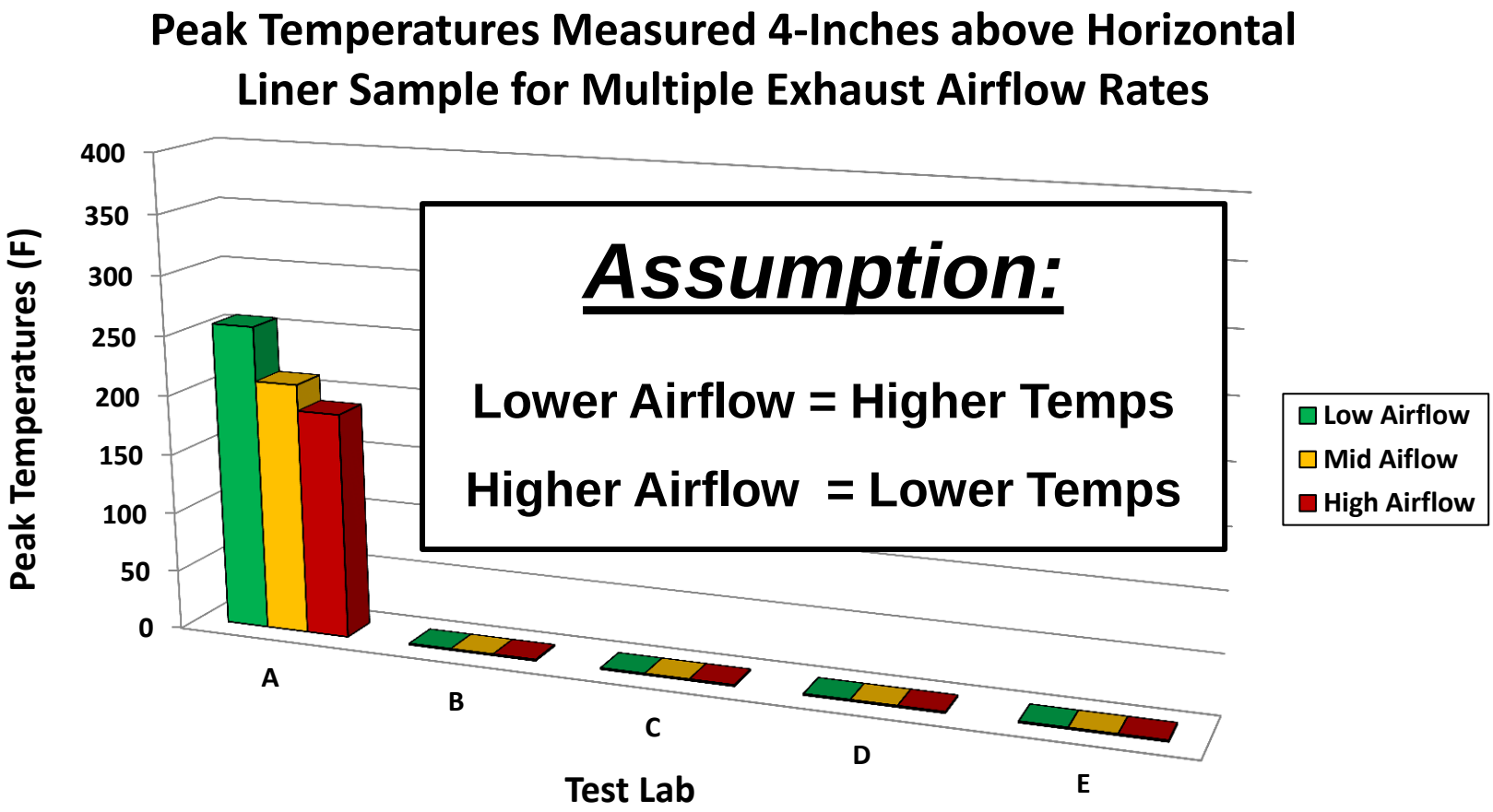
Test Cell Airflow Interlab Study



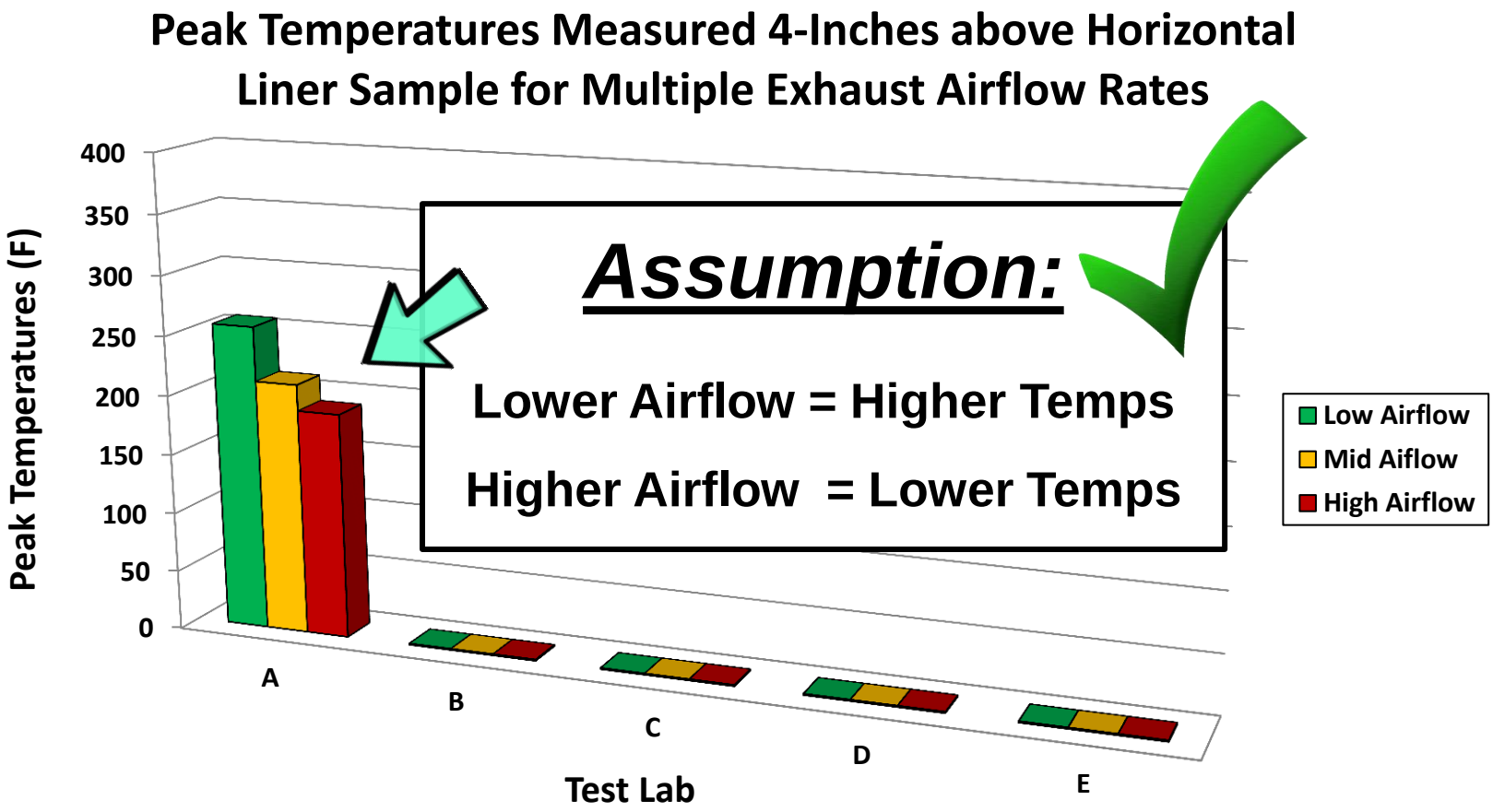
Test Cell Airflow Interlab Study



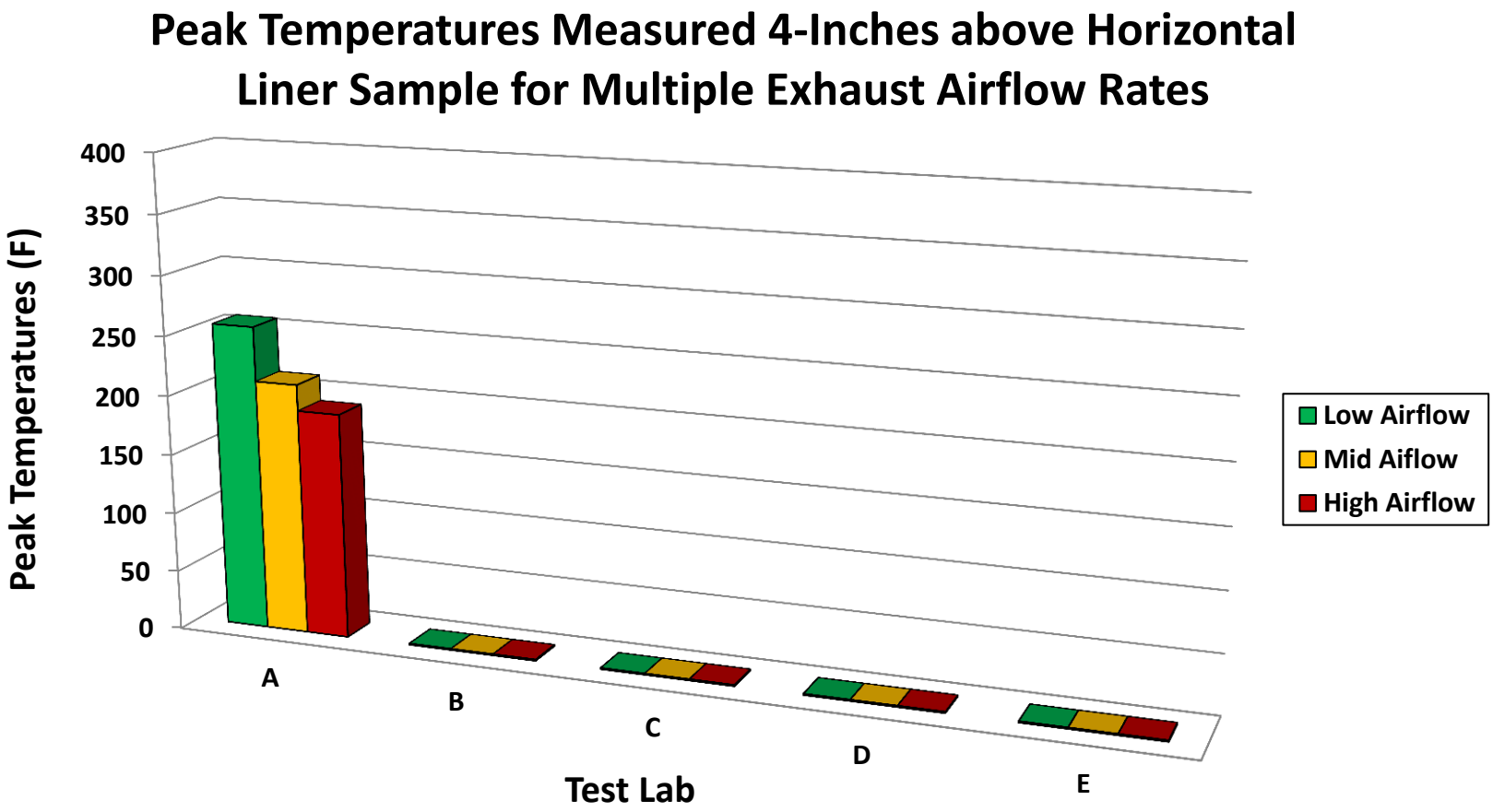
Test Cell Airflow Interlab Study



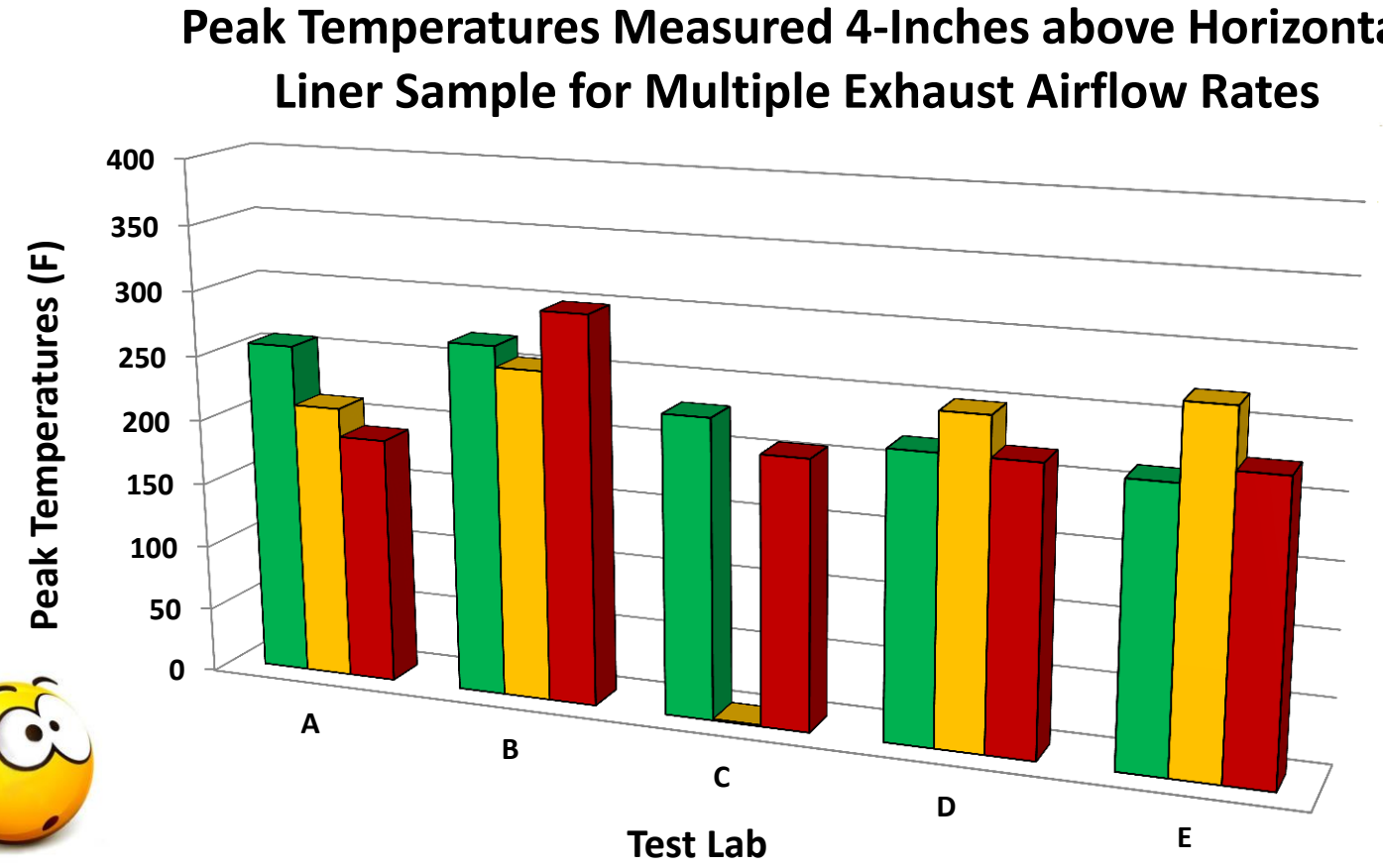
Test Cell Airflow Interlab Study



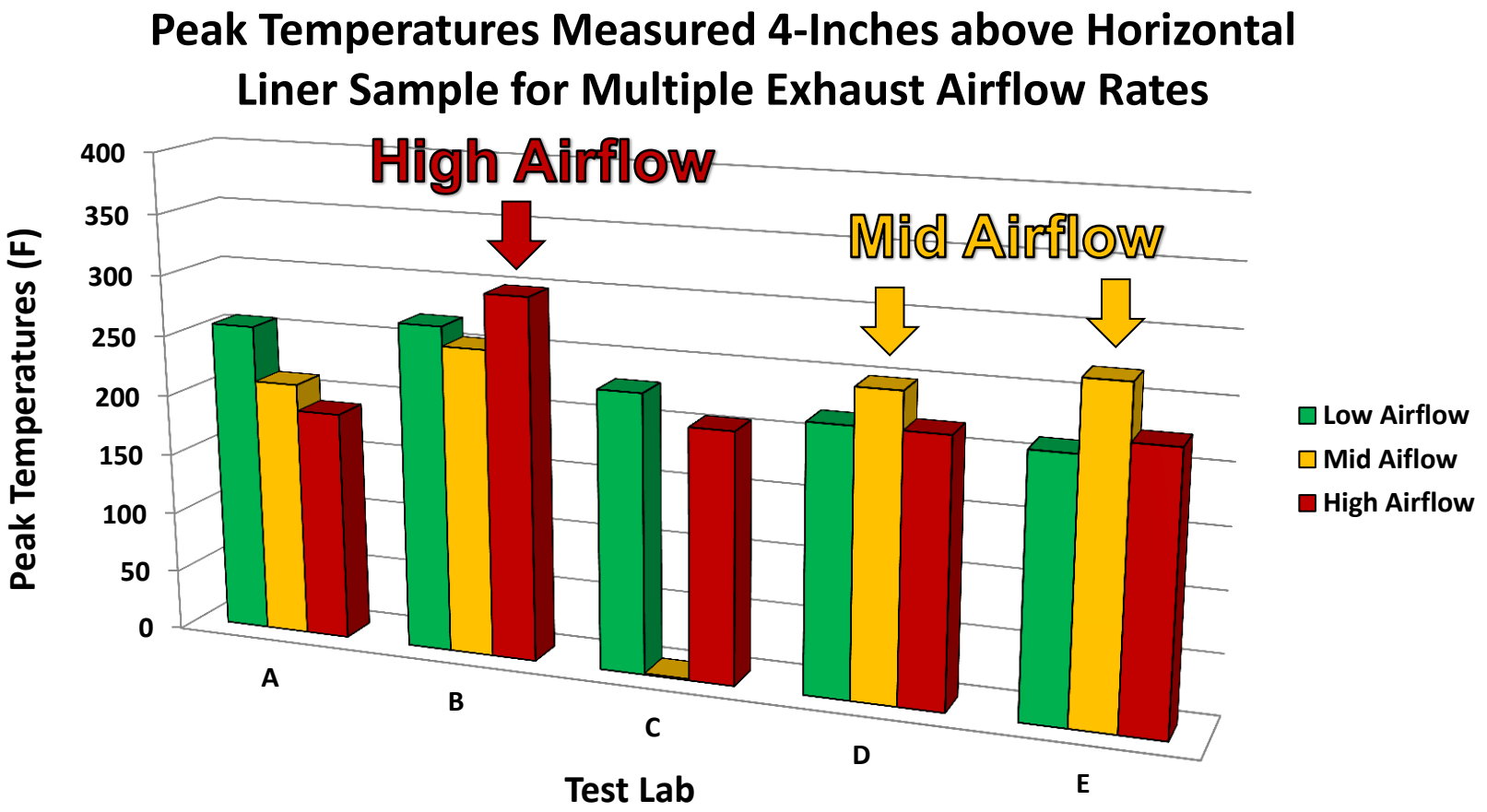
Test Cell Airflow Interlab Study



Test Cell Airflow Interlab Study



Test Cell Airflow Interlab Study



Test Cell Airflow Interlab Study

- **Final Outcome**
  - Inconclusive
    - Unable to determine direct correlation between airflow rate and test cell size
- **Multiple Unanticipated Variables**
  - Method of airflow rate adjustment
  - Intake and exhaust air locations
  - Inconsistent data collection methods (airflow)
  - Insufficient data or vague in some cases
  - Some labs did not report back!

Test Cell Airflow Interlab Study

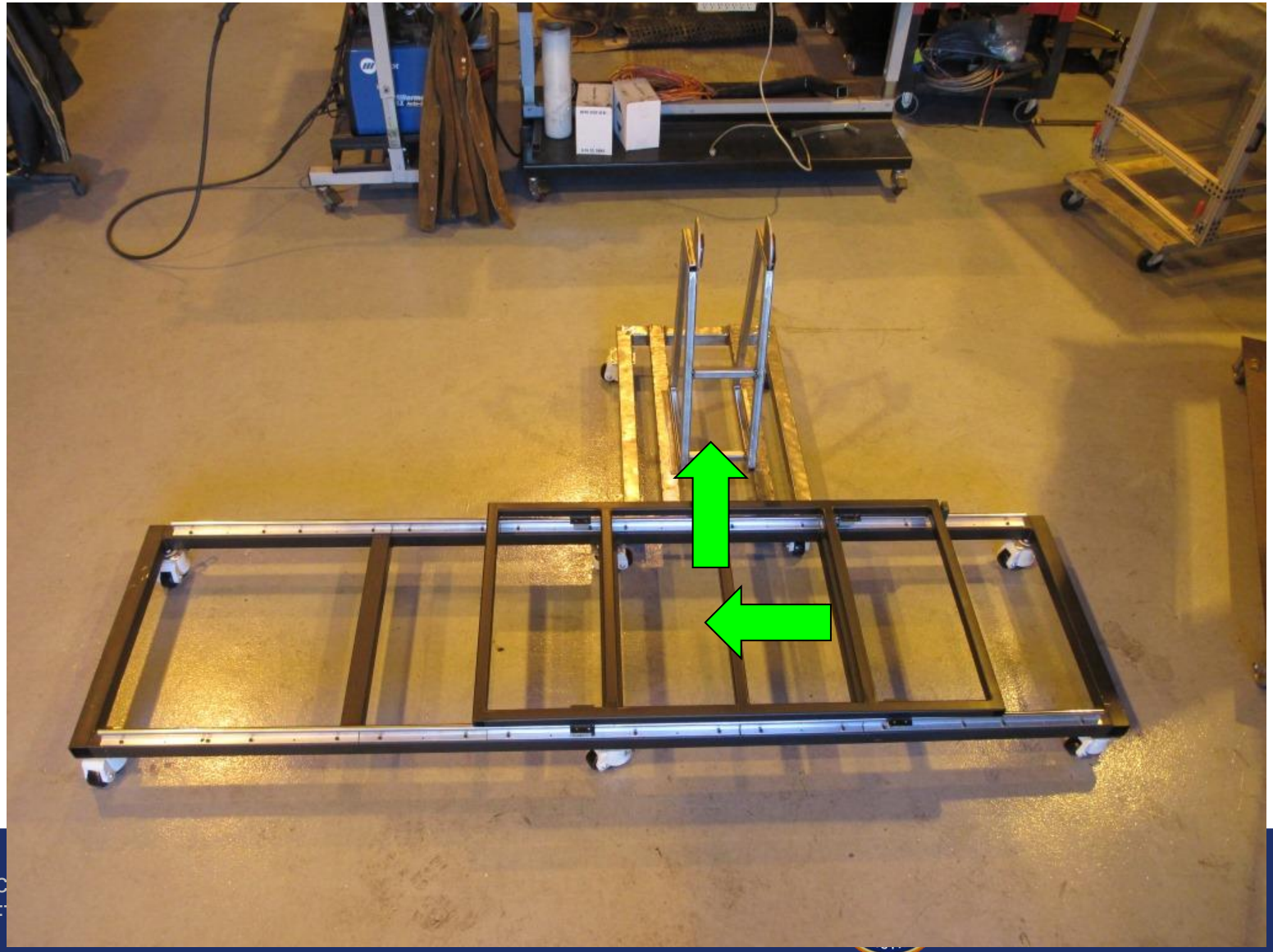
- **Lessons Learned**
  - More variables to consider than test cell size and airflow rate in test cell and around sample
  - Study of this nature requires tighter control and a reduction in the number of variables
  - Gained knowledge of test result contributing factors that were previously not considered
  - Limited lab resources and time to participate in study
  - Several months or more for some labs to return data
  - Interlab study impractical for this research

Test Cell Airflow Interlab Study

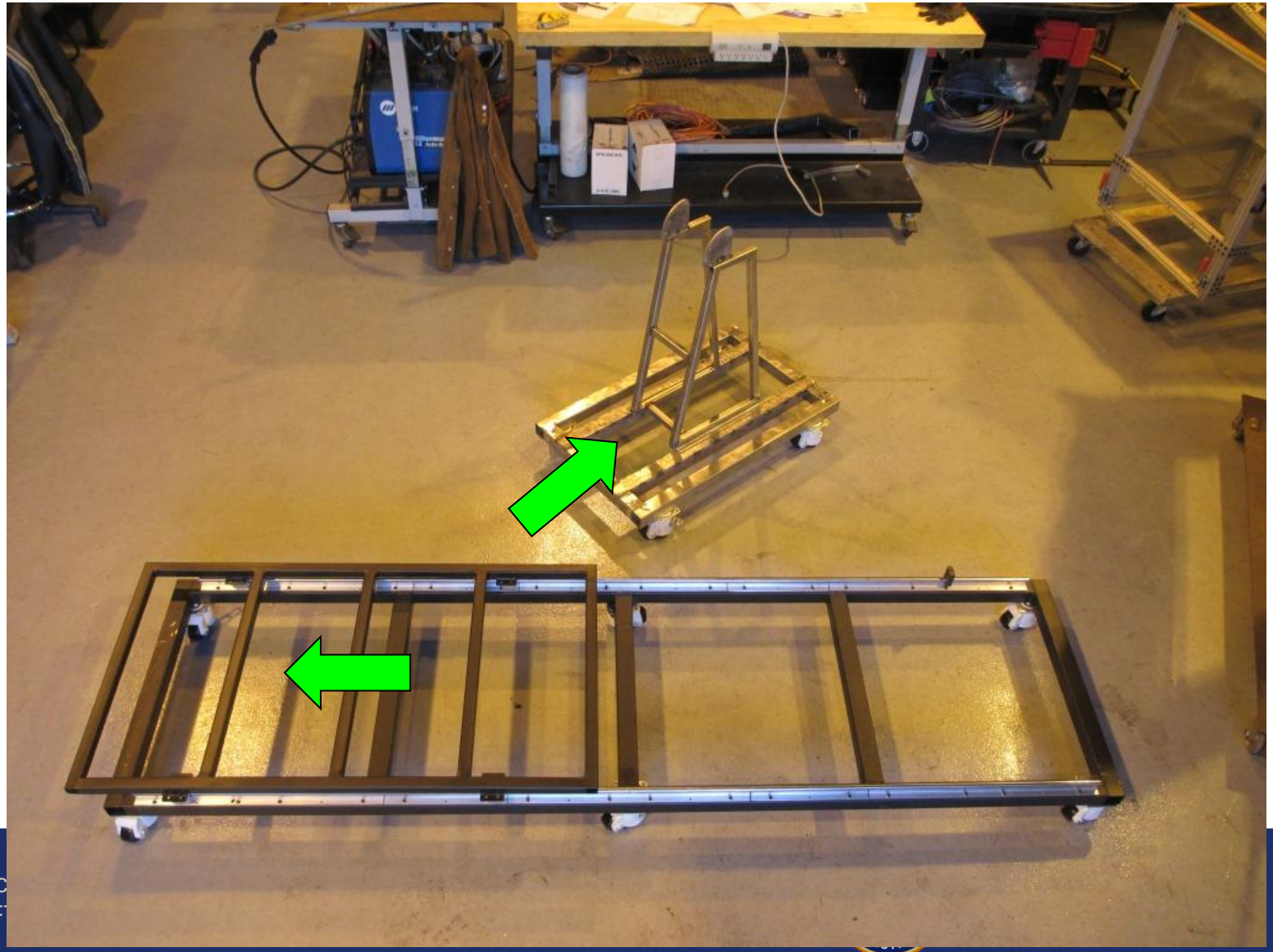
- **Solution**
  - Perform interlab study at FAA Technical Center
- **Multiple test cell environments**
- **Reconfigure equipment as needed**
- **Exhaust hoods with variable airflow rate capabilities**
- **Numerous data collections and measurement devices**
- ***How can this be accomplished?***

Adaptable R&D Sonic Burner Test Rig

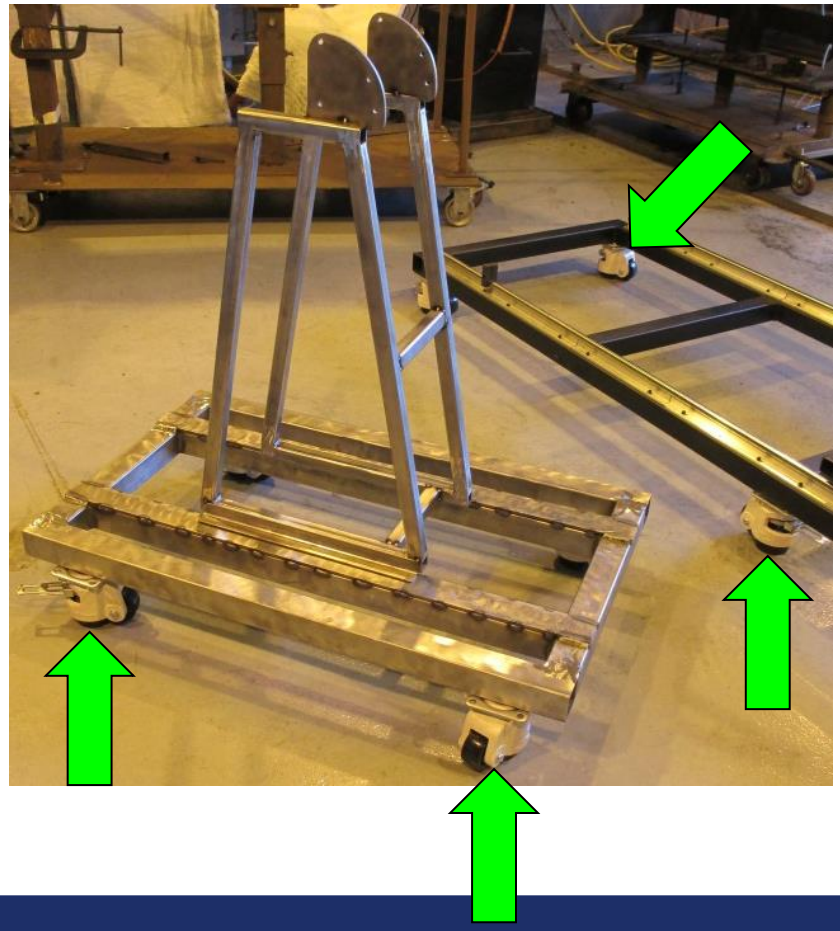
Adaptable R&D Sonic Burner Test Rig



Adaptable R&D Sonic Burner Test Rig



Adaptable R&D Sonic Burner Test Rig



Adaptable R&D Sonic Burner Test Rig

- **Burner Capabilities**
  - All Sonic burner test methods
  - Easily relocated to different test environments
  - Adaptable for research purposes
  - Generate interlab study data at the FAA TC
  - Reduce need to rely on outside labs for data
  - Saves time and resources
- **Complete construction of burner and resume testing as per original study**
  - Produce guidance material (TBD)

Fire Test Handbook Updates

Fire Test Handbook Updates

- **Chapter 7: Seat Cushion Test Method**
  - Update air velocity measurements near sample to 100 ft./min vertical and 50 ft./min horizontal
    - Dependent upon on approval of working group
  - Information pertaining to use of Park-type oil burners previously found in supplemental information section of Chapter 7 now located in main chapter
    - Clarify this is supplemental information and not required

Fire Test Handbook Updates

- **Chapter 8: Cargo Liner Test Method**
  - Information pertaining to use of Park-type oil burners previously found in supplemental information section of Chapter 8 now located in main chapter
    - Clarify this is supplemental information and not required
  - Other items addressed during task group meeting

Seat Cushion Sonic Burner Video

Seat Cushion Sonic Burner Video

- **Sonic Burner Seat Test Instruction Video**
  - Based on Chapter 7 of the Fire Test Handbook
    - "Oil Burner Test for Seat Cushions"
- **Instructions specific to *Sonic* burner**
  - Burner and test sample apparatus
  - Sample construction
  - Test procedures and acceptance criteria
- **Same format as recent cargo liner video**
  - "Cargo Liner Test Procedures Training Video"

Aircraft Materials Fire Test Handbook

This section will provide links to updated versions of the Aircraft Materials Fire Test Handbook as well as the early versions. A segmented version is also available for those who are having trouble downloading the full version.

FAA Policy on U

Federal Register

www.fire.tc.faa.gov

Links for Regula

- FAR's and other Regulatory Documents
- Dockets for Pending Rule

Individual Chapters and Appendixes (Latest Update)

09/29/09: In an effort to provide a constant for simplifying the calibration factor calculation in FAR 25, Appendix F, a long standing error was noted in Chapter 5 (Heat Release Rate Test for Cabin Materials) of the Handbook. The constant value located in the equation (Paragraph 5.6.6) is currently 23.55 and should actually be 25.31.

Last update to the Handbook was made on 5/18/06 in accordance with Policy Letter on use of Handbook above.

Chapter	Title
Chapter 1	Vertical Bunsen Burner Test for Cabin & Cargo Compartment Materials Burn Length Determination Lab Test Form - Bunsen Burner Test
Chapter 2	45-Degree Bunsen Burner Test for Cargo Compartment Liners and Waste Stowage Compartment Material Lab Test Form - Bunsen Burner Test
Chapter 3	Horizontal Bunsen Burner Test for Cabin, Cargo Compartment, and Miscellaneous Materials Lab Test Form - Bunsen Burner Test
Chapter 4	60-Degree Bunsen Burner Test for Electric Wire Lab Test Form - Bunsen Burner Test
Chapter 5	Heat Release Rate Test for Cabin Materials Lab Test Form - OSU Heat Release Test Heat Release Rate Calibration Factor
Chapter 6 Updated	Smoke Test for Cabin Materials Lab Test Form - NBS Smoke Burner Test Report on the Smoke Chamber Furnace New Furnace
Chapter 7	Oil Burner Test for Seat Cushions Advisory Circular on Flammability Requirements for Aircraft Seat Cushions. Lab Test Form - Oil Burner Seat Cushion Test
Chapter 8	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 Slides, Ramps, and Rafts
Chapter 10	Fire Containment Test of Waste Stowage Compartments
Chapter 11	Powerplant Hose Assemblies Test
Chapter 12	Powerplant Fire Penetration Test

Aircraft Materials Fire Test Handbook

This section will provide links to updated versions of the Aircraft Materials Fire Test Handb[illegible] well as the early versions. A segmented version is also available for those who are having trouble downloading the full version.

FAA Policy on U[illegible]

Federal Register[illegible]

www.fire.tc.faa.gov

Links for Regula[illegible]

- FAR's and other Regulatory Documents
- Dockets for Pending Rule

Individual Chapters and Appendixes (Latest Update)

09/29/09: In an effort to provide a constant for simplifying the calibration factor calculation in FAR 25, Appendix F, a long standing error was noted in Chapter 5 (Heat Release Rate Test for Cabin Materials) of the Handbook. The constant value located in the equation (Paragraph 5.6.6) is currently 23.55 and should actually be 25.31.

Last update to the Handbook was made on 5/18/06 in accordance with Policy Letter on use of Handbook above.

Chapter	Title
Chapter 1	Vertical Bunsen Burner Test for Cabin & Cargo Compartment Materials Burn Length Determination Lab Test Form - Bunsen Burner Test
Chapter 2	45-Degree Bunsen Burner Test for Cargo Compartment Liners and Waste Stowage Compartment Material Lab Test Form - Bunsen Burner Test
Chapter 3	Horizontal Bunsen Burner Test for Cabin, Cargo Compartment, and Miscellaneous Materials Lab Test Form - Bunsen Burner Test
Chapter 4	60-Degree Bunsen Burner Test for Electric Wire Lab Test Form - Bunsen Burner Test
Chapter 5	Heat Release Rate Test for Cabin Materials Lab Test Form - OSU Heat Release Test Heat Release Rate Calibration Factor
Chapter 6 Updated	Smoke Test for Cabin Materials Lab Test Form - NBS Smoke Burner Test Report on the Smoke Chamber Furnace New Furnace
Chapter 7	Oil Burner Test for Seat Cushions Advisory Circular on Flammability Requirements for Aircraft Seat Cushions. Lab Test Form - Oil Burner Seat Cushion Test
Chapter 8	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 Slides, Ramps, and Rafts
Chapter 10	Fire Containment Test of Waste Stowage Compartments
Chapter 11	Powerplant Hose Assemblies Test
Chapter 12	Powerplant Fire Penetration Test

Aircraft Materials Fire Test Handbook

This section will provide links to updated versions of the Aircraft Materials Fire Test Handb well as the early versions. A segmented version is also available for those who are having trouble downloading the full version.

FAA Policy on U

Federal Register

www.fire.tc.faa.gov

Links for Regula

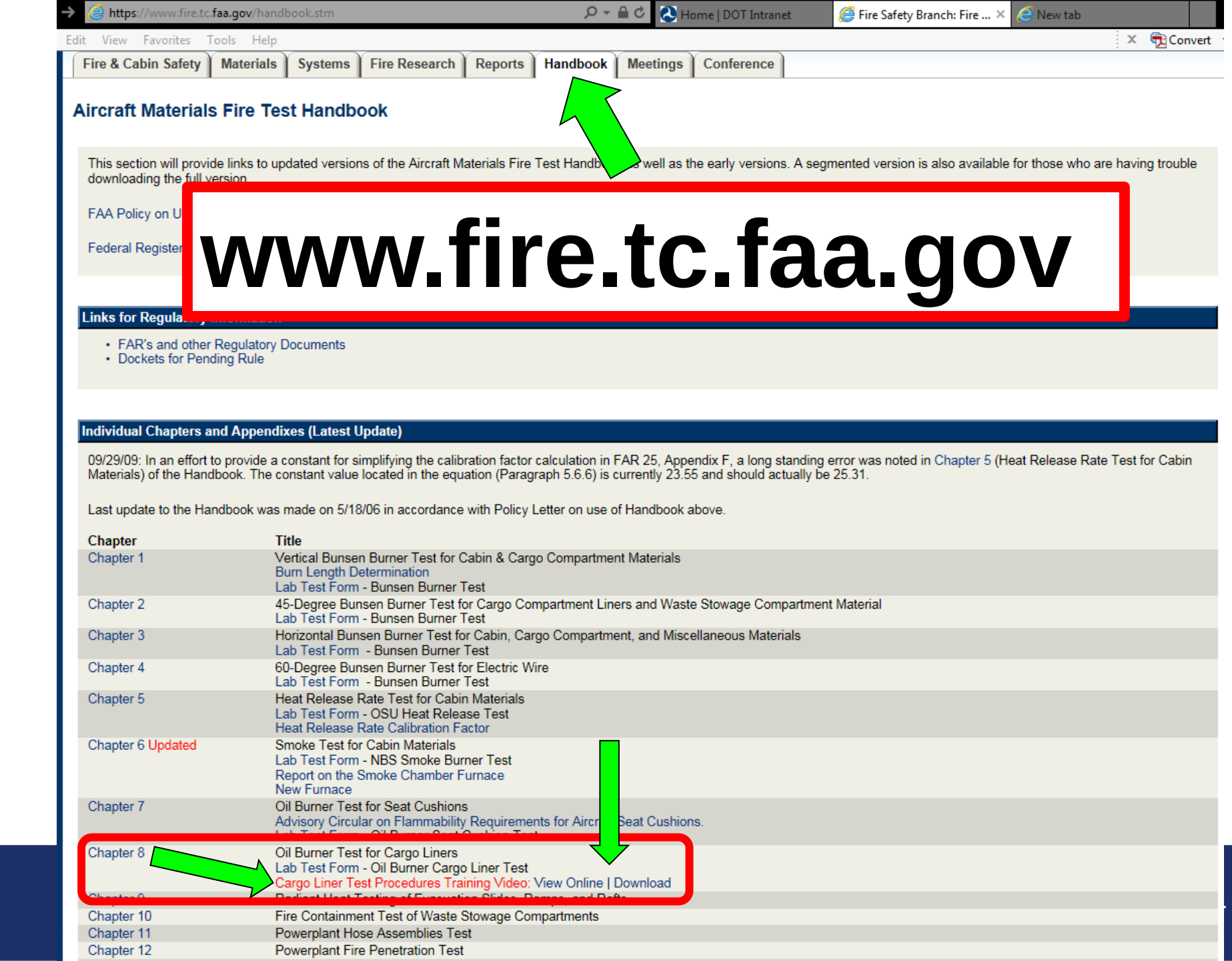
- FAR's and other Regulatory Documents
- Dockets for Pending Rule

Individual Chapters and Appendixes (Latest Update)

09/29/09: In an effort to provide a constant for simplifying the calibration factor calculation in FAR 25, Appendix F, a long standing error was noted in Chapter 5 (Heat Release Rate Test for Cabin Materials) of the Handbook. The constant value located in the equation (Paragraph 5.6.6) is currently 23.55 and should actually be 25.31.

Last update to the Handbook was made on 5/18/06 in accordance with Policy Letter on use of Handbook above.

Chapter	Title
Chapter 1	Vertical Bunsen Burner Test for Cabin & Cargo Compartment Materials Burn Length Determination Lab Test Form - Bunsen Burner Test
Chapter 2	45-Degree Bunsen Burner Test for Cargo Compartment Liners and Waste Stowage Compartment Material Lab Test Form - Bunsen Burner Test
Chapter 3	Horizontal Bunsen Burner Test for Cabin, Cargo Compartment, and Miscellaneous Materials Lab Test Form - Bunsen Burner Test
Chapter 4	60-Degree Bunsen Burner Test for Electric Wire Lab Test Form - Bunsen Burner Test
Chapter 5	Heat Release Rate Test for Cabin Materials Lab Test Form - OSU Heat Release Test Heat Release Rate Calibration Factor
Chapter 6 Updated	Smoke Test for Cabin Materials Lab Test Form - NBS Smoke Burner Test Report on the Smoke Chamber Furnace New Furnace
Chapter 7	Oil Burner Test for Seat Cushions Advisory Circular on Flammability Requirements for Aircraft Seat Cushions.
Chapter 8	Oil Burner Test for Cargo Liners Lab Test Form - Oil Burner Cargo Liner Test Cargo Liner Test Procedures Training Video: View Online | Download
Chapter 10	Fire Containment Test of Waste Stowage Compartments
Chapter 11	Powerplant Hose Assemblies Test
Chapter 12	Powerplant Fire Penetration Test


https://www.fire.tc.faa.gov/handbook.stm
Home | DOT Intranet
Fire Safety Branch: Fire ...
New tab
Edit View Favorites Tools Help
Convert
Fire & Cabin Safety
Materials
Systems
Fire Research
Reports
Handbook
Meetings
Conference
Aircraft Materials Fire Test Handbook
This section will provide links to updated versions of the Aircraft Materials Fire Test Handb
well as the early versions. A segmented version is also available for those who are having trouble downloading the full version
FAA Policy on U
Federal Register
www.fire.tc.faa.gov
Links for Regula
FAR's and other Regulatory Documents
Dockets for Pending Rule
Individual Chapters and Appendixes (Latest Update)
09/29/09: In an effort to provide a constant for simplifying the calibration factor calculation in FAR 25, Appendix F, a long standing error was noted in Chapter 5 (Heat Release Rate Test for Cabin Materials) of the Handbook. The constant value located in the equation (Paragraph 5.6.6) is currently 23.55 and should actually be 25.31.
Last update to the Handbook was made on 5/18/06 in accordance with Policy Letter on use of Handbook above.
Chapter
Title
Chapter 1
Vertical Bunsen Burner Test for Cabin & Cargo Compartment Materials
Burn Length Determination
Lab Test Form - Bunsen Burner Test
Chapter 2
45-Degree Bunsen Burner Test for Cargo Compartment Liners and Waste Stowage Compartment Material
Lab Test Form - Bunsen Burner Test
Chapter 3
Horizontal Bunsen Burner Test for Cabin, Cargo Compartment, and Miscellaneous Materials
Lab Test Form - Bunsen Burner Test
Chapter 4
60-Degree Bunsen Burner Test for Electric Wire
Lab Test Form - Bunsen Burner Test
Chapter 5
Heat Release Rate Test for Cabin Materials
Lab Test Form - OSU Heat Release Test
Heat Release Rate Calibration Factor
Chapter 6 Updated
Smoke Test for Cabin Materials
Lab Test Form - NBS Smoke Burner Test
Report on the Smoke Chamber Furnace
New Furnace
Chapter 7
Oil Burner Test for Seat Cushions
Advisory Circular on Flammability Requirements for Aircr
Seat Cushions.
Chapter 8
Oil Burner Test for Cargo Liners
Lab Test Form - Oil Burner Cargo Liner Test
Cargo Liner Test Procedures Training Video: View Online | Download
Chapter 10
Fire Containment Test of Waste Stowage Compartments
Chapter 11
Powerplant Hose Assemblies Test
Chapter 12
Powerplant Fire Penetration Test

https://www.fire.tc.faa.gov/handbook.stm

Home | DOT Intranet | Fire Safety Branch: Fire ... | New tab

Edit View Favorites Tools Help

Convert

Fire & Cabin Safety | Materials | Systems | Fire Research | Reports | Handbook | Meetings | Conference

Aircraft Materials Fire Test Handbook

This section will provide links to updated versions of the Aircraft Materials Fire Test Handb[illegible] well as the early versions. A segmented version is also available for those who are having trouble downloading the full version.

FAA Policy on U[illegible]

Federal Register[illegible]

www.fire.tc.faa.gov

Links for Regula[illegible]

- FAR's and other Regulatory Documents
- Dockets for Pending Rule

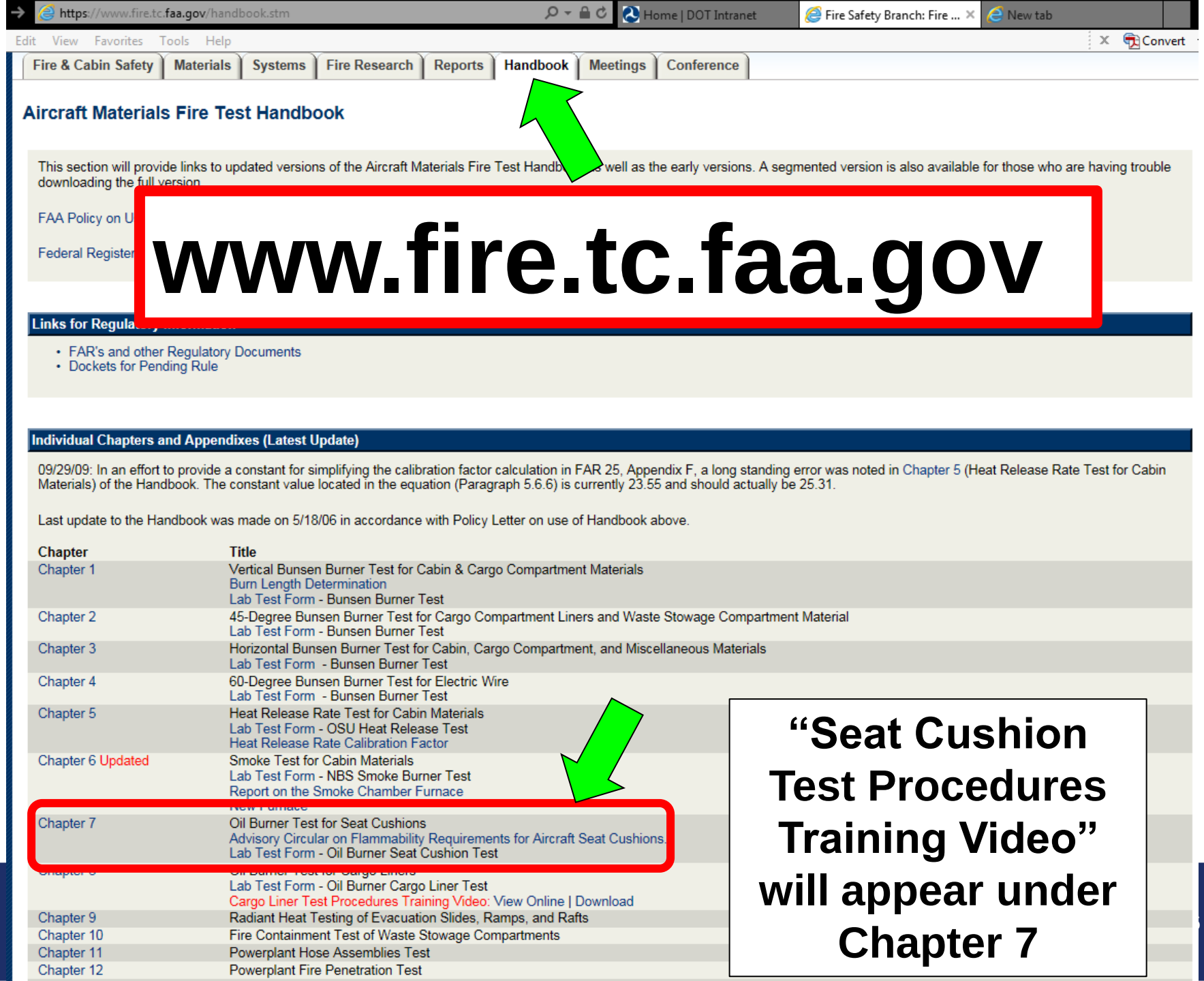
Individual Chapters and Appendixes (Latest Update)

09/29/09: In an effort to provide a constant for simplifying the calibration factor calculation in FAR 25, Appendix F, a long standing error was noted in Chapter 5 (Heat Release Rate Test for Cabin Materials) of the Handbook. The constant value located in the equation (Paragraph 5.6.6) is currently 23.55 and should actually be 25.31.

Last update to the Handbook was made on 5/18/06 in accordance with Policy Letter on use of Handbook above.

Chapter	Title
Chapter 1	Vertical Bunsen Burner Test for Cabin & Cargo Compartment Materials Burn Length Determination Lab Test Form - Bunsen Burner Test
Chapter 2	45-Degree Bunsen Burner Test for Cargo Compartment Liners and Waste Stowage Compartment Material Lab Test Form - Bunsen Burner Test
Chapter 3	Horizontal Bunsen Burner Test for Cabin, Cargo Compartment, and Miscellaneous Materials Lab Test Form - Bunsen Burner Test
Chapter 4	60-Degree Bunsen Burner Test for Electric Wire Lab Test Form - Bunsen Burner Test
Chapter 5	Heat Release Rate Test for Cabin Materials Lab Test Form - OSU Heat Release Test Heat Release Rate Calibration Factor
Chapter 6 Updated	Smoke Test for Cabin Materials Lab Test Form - NBS Smoke Burner Test Report on the Smoke Chamber Furnace New Furnace
Chapter 7	Oil Burner Test for Seat Cushions Advisory Circular on Flammability Requirements for Aircr[illegible] Seat Cushions.
Chapter 8	Oil Burner Test for Cargo Liners Lab Test Form - Oil Burner Cargo Liner Test Cargo Liner Test Procedures Training Video: View Online | Download
Chapter 10	Fire Containment Test of Waste Stowage Compartments
Chapter 11	Powerplant Hose Assemblies Test
Chapter 12	Powerplant Fire Penetration Test

"View Online" has higher quality video and optional closed caption


https://www.fire.tc.faa.gov/handbook.stm
Home | DOT Intranet
Fire Safety Branch: Fire ...
New tab
Edit View Favorites Tools Help
Convert
Fire & Cabin Safety
Materials
Systems
Fire Research
Reports
Handbook
Meetings
Conference
Aircraft Materials Fire Test Handbook
This section will provide links to updated versions of the Aircraft Materials Fire Test Handb well as the early versions. A segmented version is also available for those who are having trouble downloading the full version.
FAA Policy on U
Federal Register
www.fire.tc.faa.gov
Links for Regula
FAR's and other Regulatory Documents
Dockets for Pending Rule
Individual Chapters and Appendixes (Latest Update)
09/29/09: In an effort to provide a constant for simplifying the calibration factor calculation in FAR 25, Appendix F, a long standing error was noted in Chapter 5 (Heat Release Rate Test for Cabin Materials) of the Handbook. The constant value located in the equation (Paragraph 5.6.6) is currently 23.55 and should actually be 25.31.
Last update to the Handbook was made on 5/18/06 in accordance with Policy Letter on use of Handbook above.
Chapter
Title
Chapter 1
Vertical Bunsen Burner Test for Cabin & Cargo Compartment Materials
Burn Length Determination
Lab Test Form - Bunsen Burner Test
Chapter 2
45-Degree Bunsen Burner Test for Cargo Compartment Liners and Waste Stowage Compartment Material
Lab Test Form - Bunsen Burner Test
Chapter 3
Horizontal Bunsen Burner Test for Cabin, Cargo Compartment, and Miscellaneous Materials
Lab Test Form - Bunsen Burner Test
Chapter 4
60-Degree Bunsen Burner Test for Electric Wire
Lab Test Form - Bunsen Burner Test
Chapter 5
Heat Release Rate Test for Cabin Materials
Lab Test Form - OSU Heat Release Test
Heat Release Rate Calibration Factor
Chapter 6 Updated
Smoke Test for Cabin Materials
Lab Test Form - NBS Smoke Burner Test
Report on the Smoke Chamber Furnace
Chapter 7
Oil Burner Test for Seat Cushions
Advisory Circular on Flammability Requirements for Aircraft Seat Cushions
Lab Test Form - Oil Burner Seat Cushion Test
Lab Test Form - Oil Burner Cargo Liner Test
Cargo Liner Test Procedures Training Video: View Online | Download
Chapter 9
Radiant Heat Testing of Evacuation Slides, Ramps, and Rafts
Chapter 10
Fire Containment Test of Waste Stowage Compartments
Chapter 11
Powerplant Hose Assemblies Test
Chapter 12
Powerplant Fire Penetration Test
“Seat Cushion Test Procedures Training Video” will appear under Chapter 7

Seat Cushion Sonic Burner Video

- **Scheduled to begin shooting next week**
- **Input for video during task group meeting**
- **Updates at next IAMFTWG**
- **Will send out for industry review and feedback before final release**
- **Should be completed by September 2017**

Planned Research and Work

Planned Research and Work

- **Continue Airflow Study**
  - Test with new R&D Sonic Burner Rig
- **Updated Handbook Chapters**
  - Based on feedback from task groups
- **Seat Cushion Sonic Burner Video**
  - Filming begins upon return to FAA TC
- **Task Group Meeting Items**
  - Based upon feedback from task group attendees

Questions?

timothy.salter@faa.gov

(1)-609-485-6952