

International Aircraft Materials Fire Test Working Group Meeting

March 1-2, 2005

Hosted by the FAA Technical Center Fire Safety Branch
at the
Trump Taj Majal, Atlantic City, New Jersey, USA

Tuesday, March 1, 2005

Heat Flux Transducer Presentation – R. Hill

For the past 20 years in looking at the various test methods one of the problems we have had is measuring heat flux. In the radiant panel test regulation we specify the calorimeter (type) that has to be used and how it has to be calibrated (method). We would like to see consistency throughout the test methods.

Burnthrough Presentation and Discussion – T. Marker

Background

Round Robin VI – results from 4 labs presented

There was a big gap between the FAATC lab and the other labs with the materials tested in RR-VI. Ran some tests on current specification for nozzle depths and obtained heat flux at these depths. FAATC investigated the possible reasons for the discrepancies between FAATC burner and Boeing's burner at FAATC test lab. FAATC investigated the effect of differences in draft tubes? FAATC compared measurements/dimensions of FAATC burner to those of Boeing's burner. The Boeing fuel nozzle was determined to be causing the differences in heat flux and burnthrough times. More tests will be conducted.

Further thought on the development of a "Non-Park Oil Burner" (originally discussed in previous Working Group meetings). At some point in the future, it will be extremely difficult for new labs coming on line to obtain a Park Oil Burner.

Discussion and Comments on "AC 25.856-2X Installation of Thermal/Acoustic Insulation for Burnthrough Protection" – R. Hill

Dick reviewed the comments received on this Advisory Circular.

General:

1. Metric units.
2. Reproducibility.
3. No burnthrough or .25 diameter hole?

Purpose:

1. Should not be a total flame proof barrier

Applicability

Related Regulations & Documents

Background

Explanation of Terms:

1. Add overlap definition

Installation of Thermal/Acoustic Insulation:

1. Not all blankets are fiberglass blankets, refer to those that don't have fiberglass as insulation blankets.
2. Consider when overlap is not possible.
3. Questions on the use of tape and the word "sealed". What kind of tape can be used? Define the word "sealed".
4. Overlapping needs more definition.
5. Figures need more dimensions.

Other Thermal/Acoustic Insulation Concepts:

1. Question on ballooning and cutting slits/holes in the film.
2. Question on use of calorimeters when testing overlap.
3. Three dimensional figures needed for some.
4. Mapping not relevant. Why is it included?

Rob Ayerst asked if altitude would be addressed? Dick indicated that the nozzle issue would first be addressed and solved. The Task Group can discuss other issues further.

OSU and Smoke Test Round Robin Results – D. Slaton for M. O'Bryant

This was the 2004-2005 Round Robin Report. Two different process materials were tested. Graphs of results were presented. This presentation will be available at www.fire.tc.faa.gov.

Aircraft Seats Worldwide Round Robin Testing – P. Cahill

Three sets of 3 different types of materials will be tested.

The samples have been sent and the testing has been started.

Currently, 9 labs in the United States have oil burners set up for seat testing.

The FAATC will request a test plan and some photos from each participating lab prior to making travel arrangements and coordinating with the ACO to witness that lab's tests, since a couple of the labs already visited have been running the tests by what is stated in the rule but including some instruction from the Aircraft Materials Fire Test Handbook, when tests should be run entirely according to one or the other not from some parts of the rule and some parts of the Handbook in combination.

What about the labs outside the United States? The FAA certification group will coordinate with other international aviation authorities to expand this round robin program throughout the world. There were enough materials ordered for the international lab test program. The intent is to have participation from every lab in the world that conducts this test.

Radiant Heat Panel Discussion – P. Cahill

Damping System:

Definition of damping system

The weakest link appears to be the PSA (adhesion to the aircraft skin)

The intermediate scale tests were completed in late summer/early fall 2004.

Photos of tests.

Radiant Panel Testing of damping system on honeycomb panels interface testing:

Photos of tests

Radiant Panel Testing of honeycomb panels only:

Photos of tests

They had after-flames that ranged anywhere for 8 to 15 seconds.

The honeycomb panel is what causes the failure of the damping/honeycomb panel systems.

Videos of tests were shown.

Round Robin VII Analysis – M. Shumate

The material tested was Polyimide Film-Metalized Tedlar Tape (varying heat flux).

Task Group Discussion for March 2, 2005, Task Group meeting:

Test Data Form

Sample Preparation

Composite Samples

Propane Nozzles

Slitting Samples

Artificial Aging Studies Conducted by Boeing – D. Slaton

Test Status – PET Cover Film Material (aged 24 months)

Update to July 2004 Presentation

A copy of this presentation is available at www.fire.tc.faa.gov.

Actual in-service degradation mechanisms much more complex and involves contamination and service environment. What should Contamination/Aging Task Group do next?

Recommendations: Task Group should focus on evaluating condition of fleet. What are the test methods for evaluating in-service blankets against the safety risk criteria?

Discussion and Comments on “AC 25.856-1X Thermal/Acoustic Insulation Flame Propagation Test Method Details” – R. Hill

General:

1. Metric Units
2. Absence of sound damping materials advisory material
3. Absence of ducting materials advisory material

Purpose

Applicability

Related Regulations & Documents

Background:

1. Define thermal/acoustic insulation materials
2. Rouge sample
3. Thinnest/thickest – minimize testing.

Test Sample Construction:

1. Question on cutting hole in film: where, when, size.
2. Unclear information on tape positioning.
 - a. Figures need improving
 - b. Need to say three strips.
3. Double-sided tape – how do you test?
4. OEM should test as installed?
5. Hook & Loop
 - a. All or only on insulation?
 - b. Need tolerances
 - c. Adjusting height may change heat flux
 - d. Show in frame to show alignment, etc.
 - e. How many tests?
 - f. “Mated” – “Unmated”?
 - g. With each cover?

Retaining Frame Size:

1. Diagram not clear and needs better dimensions.
2. How to test layered entities.

Test Conduct Considerations:

1. Test melting vs. burning unclear.

Applicability to Certain Materials & Installations:

1. Heater tape?
2. What about in occupied compartment?
3. What determines inside fuselage?
4. Size of small parts?
5. Testing with substrate when glued on.

Other:

1. How will the FAA ensure lab repeatability?
2. Are there DERs?

Wednesday, March 2, 2005

Task Group Reports

Seat Task Group – R. Hill

Round Robin discussion – participating labs.

Foreign lab participation was discussed. FAATC was asked to contact European authorities to request list of labs and contact information for each lab; also, the authorities in Canada, Brazil, and Asia Pacific region.

Lightweight seat cushions were also discussed. There will be a few more full-scale tests conducted at the FAATC later this year. FAATC is considering developing a sliding scale for lightweight seat cushions for cushions as installed in the test method (3 lbs. or less seat weight). This sliding scale would be for weight loss of the very lightweight seat cushions. This will be followed by recommendations to the FAA Transport Aircraft Directorate.

Effects on Flammability of Changes in Seat Component Compounds – P. Cahill

Pat Cahill: various brominated compounds used in seat components are being phased out. However, the changes are not always been reported (ie: brominated compounds are being reformulated/changed without notification to the end user. The main question is: How does this affect the flammability issues of the seats that contain these reformulated/changed brominated compounds. How is the system impacted or does it make a difference when these compounds are changed or is there a difference? Suppliers do not always notify their customers of the changes in these compounds. There are other materials used in aircraft in similar situations.

Radiant Panel Task Group – P. Cahill

The test data form was discussed. Task Group members made suggestions for modifications. Members will send their modifications to Pat for review/consideration/possible addition to form.

Martin Spencer of Marlin Engineering has been assisting the Task Group with the nozzle situation. The Task Group is evaluating a high-pressure nozzle?

Pulsation of propane flame has been a concern that is being researched within the group.

The propane used is from the basic home project stores (no special type) no specification is in the rule for any specific grade of propane.

Composite samples were not discussed, but the next Round Robin will investigate these.

Sample sealing of film-fiberglass assemblies was discussed. Some labs tape the samples. The FAATC lab staples their samples. Pat will review the data of the labs that tape their samples. There were a few questions regarding the tape adhesive, so the Round Robin will include a taped-prepared sample.

Slitting of samples: polyimide samples to be tested are slitted for ventilation. In the rule, it states, make the slit approximately 2 inches in length. Pat will review and correct the information on slitting in the Advisory Circular. Slitting the sample before or after it is put in the environmental chamber. This will be investigated in the Round Robin. The FAATC lab has only tested single layer foams to date, however, the Round Robin will include multiple layer foams.

Burnthrough Task Group – T. Marker

Fuel nozzle was discussed: position of fuel nozzle will be investigated at the FAATC using F80 nozzle. The FAATC will also search for more F80 nozzles. Tim will also contact Monarch to look into possible reengineering of the nozzle the FAATC is using in its burner. If the nozzle is reengineered, the FAATC will check each nozzle by running it through its burner. Boeing created some tools to check calibration settings of burners. Boeing will send the engineering drawings to all the participating labs to produce their own tools. Tex Tech will produce and ship some more felt to send to Boeing for testing in various configurations.

Tests will be conducted after nozzles are sent to the participating labs. Socket style and flange style castings will be investigated. The results will be reviewed to determine if the flange or socket makes a significant difference.

Request to Tim to ask Monarch about the nozzle for the oil burner used for the seat test as well. Tim: the seat burner test is set up a bit more loosely. Pat: the Aircraft Materials Fire Test Handbook provides information on the various nozzles that can be used for the aircraft seat test. Pat offered to send any lab that tests seats an 80° CC nozzle for their seat test burner.

Contamination/Aging Task Group – D. Slaton

Contamination: Airbus has been working on some controlled contamination testing and it will be presented at the June Materials Meeting. Mexmil has also been doing some testing with results to be presented at a later meeting. Peter Short is going to write up a proposal on how to conduct testing on cleaners/cleaning products involvement.

Aging: summarize aging methodologies from the airframe manufacturers.

Criteria for in-service insulation evaluation: the Task Group will evaluate test methods for in-service insulation including the 12-second, intermediate scale, cotton swab tests will be evaluated for in-service materials.

Fire in Hidden Areas

The Aircraft Systems fire Protection Working Group is investigating systems in hidden areas and will produce a training film related to this topic.

Aircraft Wire Flammability Test Development Update – P. Cahill

The Technote was published in December 2004 on the intermediate scale tests conducted at the FAATC during 2004. It is available on www.fire.tc.faa.gov. FAA is still in the early stages of test development for aircraft wiring. Wire holders have been fabricated and are being evaluated for use in the Radiant Heat Panel test apparatus. There is a large span of wire gauges that must be considered in developing the wire holders. Chris Bresciano: will more time be dedicated to discussion of this topic at future meetings?

Evaluation of the 12-Second Vertical Bunsen Burner Test for Ducting Materials – J. Reinhardt

Objective: to determine if the current FAA compliance test is appropriate for aircraft ducting materials.

The materials used in these tests were samples from a narrowbody aircraft that had been in-service since 1980. These samples were tested in the 12-second vertical Bunsen burner test, OSU, the smoke chamber test, the radiant panel test, and the new micro-scale calorimeter. Results of the samples tested in these test methods were presented. The air conditioning duct from the narrowbody aircraft was tested in the intermediate scale test developed at the FAATC. Video of this test was shown.

Conclusion: the 12-second Bunsen burner test required is not robust enough to test ducting materials by today's standards. Recommendation: FAATC recommends a new test method be developed to certify these materials. Ongoing FAATC work: John presented a list of the materials that have been or will be tested at the FAATC. Test results of the materials not yet tested will be available at the next Working Group meeting after all the materials have been tested. R. Hill – considering the early results of the tests John has conducted to date, industry should strongly consider getting involved in this program early as the test method for these materials is developed.

Ranking Flammability of Aircraft Cabin Materials Using Microscale Combustion Calorimetry – R. Lyon

Flammability: Ignition resistance and fire behavior

Microscale combustion calorimeter was developed to test a 5-gram of material (especially important for testing materials under development that are only available in very small sizes as they are developed). The microscale combustion calorimeter measures heat release in a 5-gram sample. The test takes 15 minutes to conduct. How the microscale combustion calorimeter compares to the OSU Heat release test. Rich explained how various data results collected from this test correlates with other FAA and internationally known test methods. Rich showed results of hidden materials tests conducted by John Reinhardt in the microscale combustion calorimeter. He also showed results of commercially available plastics tested in this apparatus.

Conclusions: it is at least a qualitative predictor of fire performance and flammability of aircraft materials.

Time allotted for Task Group Meetings – R. Hill

Let us know ahead of time (as far in advance as possible) if Task Groups need longer time for their meetings. Task Group members should bring this to the attention of your Task Group leader as far in advance as possible so time and meeting space can be scheduled.

Industry Involvement is Important – R. Hill

Two new test methods are being developed by the FAA for aircraft wire and for aircraft ducting materials used in hidden areas. There is an opportunity for industry to be involved in this test development program. The FAATC contacts for these programs are:

Wire Test Development - contact Pat Cahill: Phone: 609-485-6571,

Email: Patricia.Cahill@faa.gov.

Aircraft Ducting Test Development - contact John Reinhardt: Phone: 609-485-5034,

Email: John.Reinhardt@faa.gov.

Anything Else??

Is there a way to get ACO representatives to attend the Materials Working Group meetings, because that is the link that seems to be missing? R. Hill: Jeff Gardlin of the FAA Transport Directorate attends these meetings and is the link on the FAA regulatory side to the ACOs, since the FAA Transport Directorate oversees the ACOs. Foreign aviation authorities are also represented at the Working Group meetings.

Discussion on Cleaning effects on aircraft materials. There was an attempt to investigate affects of cleaning on seat materials (excluding leathers) in the past through this Working Group. FAATC would be interested in data on in-use leather seats. Fire-hardened foams were not investigated previously just fire blocking materials.

FAATC will be researching and investigating development of a test for composite aircraft fuselage materials and hidden areas materials in the future, but the work will not start until later.

Next Meeting

June 28-29, 2005
Civil Aviation Authority (CAA) Aviation House
Gatwick, United Kingdom

A notification/information/registration form email will go out to all those who signed the attendance list at the March 1-2, 2005, Working Group meeting during the week of March 14, 2005. The information will also be available at www.fire.tc.faa.gov on the "Materials Group" page under "Meetings", after March 14, 2005.

Important Note: The meeting room at the CAA Aviation House has a maximum capacity. Therefore, it is important to send in your registration form by the Meeting Registration Deadline as seating will be on a first-come, first-serve basis due to space limitations of the facility.

Fall 2005 Working Group Meeting

The fall 2005 meeting will be co-hosted by Delta Airlines and Orcon Corporation in Atlanta, Georgia, October 19-20, 2005. Meeting details/information, etc., will be posted to www.fire.tc.faa.gov closer to the meeting dates.