

INTERNATIONAL AIRCRAFT MATERIALS FIRE TEST WORKING GROUP MEETING

JUNE 26-27, 2007

Hosted by Jehier-Hutchinson Group, Paris, France

TUESDAY, JUNE 26, 2007

Proposed Radiant Heat Panel Test for the Evaluation of Aircraft Duct Materials "Status Report" – R. Hill (for J. Reinhardt)

Test Procedure Outline (current as of this meeting)

Radiant Heat Panel Acceptance Criteria

Example: Radiant Heat Panel Measurement

Videos of Tests Conducted

Dick provided the explanation of the flame propagation after the Working Group viewed the videos.

There were several suggestions of the direction of the ribbed materials in the test apparatus.

WG Member Question: Is it worthwhile to resurrect the Ducting Task Group to discuss the new findings that may impact the eventual rule? Dick: We will probably review these findings in a few years before the rule comes out. Dick suggested that Task Group members talk to John during the October 2007 conference in Atlantic City regarding this. Dick explained that the eventual rule will be a combination of rules for several areas including ducting and other materials found in the hidden areas of the aircraft.

Draft Final Report is due to the FAA Transport Directorate in September 2007: it will be available for Task Group members after it passes initial FAA internal review.

WG Member Question: what about when you have the same material used as insulation and in ducting and one passes one test and fails another? Dick: It is not uncommon for this to happen. It has happened with other materials.

International Seat Test Round Robin: Interim Results – R. Hill (for P. Cahill)

The Seat Test Round Robin was conducted a few years ago in the United States. It is now in process in other labs around the world. Samples were shipped to Europe, Asia, and Canada. A list of the participating labs is available in the presentation. 44.4% of labs using the test method in the rule and 55.6% of labs using the test method in the Aircraft Materials Fire Test Handbook. Labs must use the complete test method from either the rule or the Handbook. A table indicating the test method, lab equipment, and fuel differences used by each lab was reviewed (available in this presentation at www.fire.tc.faa.gov). The results received to date from the participating labs were presented for the following materials: fire hardened foam 1, fire-blocking layer, and fire-hardened foam 2. All the data will be reported, tabulated and presented during the October 2007 Fire and Cabin Safety Research Conference in Atlantic City.

Dan Slaton suggested that Pat do more data analysis of fuel source, nozzle type, etc., since she has received a lot of this type of information from the participating international labs.

Radiant Panel Round Robin 9 Test Results – R. Hill (for P. Cahill)

Overall, the FAATC was pleased with the results from the labs participating in this Round Robin.

A future Round Robin is in the works and is scheduled for late Fall 2007.

OSU & NBS Discussion – R. Hill (for M. Burns)

2006 OSU/NBS Round Robin Participants

Results of the 2006 Round Robin have been posted to the FAATC Fire Safety website

Lab codes can be obtained by contacting Michael Burns at mike.burns@faa.gov or by calling Mike at 609-485-4985.

Preparations are being made to conduct another Round Robin in the future.

A problem with replacement furnaces of the NBS Smoke chamber has recently been observed.

A “dark” eye in the center of the furnace has been observed on some coils after being calibrated to the 2.5 W/cm² value. A photo of a properly functioning furnace was shown next to one with a cold spot in the center.

NBS Smoke Chamber:

Some observations:

Use of alternative equipment by manufacturers in some NBS Smoke Chambers.

Such changes include:

IL 1700 Research Radiometer from International Light (USA)

SED033/WBS465 or SED038/WBS465 system (photomultiplier tube replacement)

If a manufacturer is going to change any equipment in the test apparatus, they should inform the FAA to assure comparisons are made.

FAA is currently in the process of procuring material to be used in the next Round Robin.

Contact Mike Burns if your lab would like to participate in the next Round Robin.

FAA will continue to evaluate how to proceed due to the results of the most recent Round Robin.

Contamination & Aging Task Group Report and Recommendations – D. Slaton

Topics discussed by Task Group since its establishment:

Airline Contamination Survey

In-service Insulation Blanket Evaluation

Flammability Testing of Contaminants

Aging Methodologies

Contamination Risk Mitigation Methodology and Roadmap

Dan reviewed each of these topics and explained the Task Group Recommendations for each topic (pending Task Group review and approval).

Development of a Lab-Scale Test for Evaluating Toxic Gas Decomposition Products Generated Inside a Fuselage during a Postcrash Fire – T. Marker

A diagram of this test apparatus was displayed and described.

Burner configuration according to 25.856(b) Appendix F, Part VII.

An FAA Technical Note has been drafted.

Photos of the steel enclosure were presented.

Several preliminary lab-scale tests completed using various burnthrough resistant materials.

Some WG members seem to believe that this is not representative of a real airplane configuration. This test is to determine if toxic gases will be produced causing a non-survivable environment in the aircraft cabin.

Composite Fuselage In-Flight Fire/Flammability Resistance Notice No. 25-07-09-SC:

Composite fuselage structure must be shown to be resistant to flame propagation under the fire threat use for insulation rule. Large-scale block of foam test.

Develop lab test:

Radiant Panel?

Heat flux?

Duration?

How to test configuration?

Pass-Fail?

What about smoke and toxic gas?

WEDNESDAY, JUNE 27, 2007

Task Group Reports

Burner Task Group – R. Ochs

NextGen burner was discussed. Calibration materials performance.

Magnesium Task Group – R. Hills

This group discussed possible test scenarios, test set-ups, the test method. One suggestion was to conduct a full-scale test first in order to determine how an oil burner test would be set-up, etc.

Possibly run a Bunsen burner test on some very thin materials. The configuration of the Bunsen burner test may determine if the material passes or fails.

Contamination Task Group – C. Lewis/D. Slaton

The Task Group is at a crossroads. Dan Slaton has prepared a status paper. Action Plan: We are trying to come to a conclusion and put together some recommendations that can be elevated to the next level for action.

International Aircraft Fire and Cabin Safety Research Conference – R. Hill

This conference will be held October 29-November 1, 2007, at the Tropicana Casino-Resort in Atlantic City, New Jersey, USA. The conference will take the place of the next Materials Working Group meeting. If Task Groups would like to meet before, during or after the conference, we need to know within the next two months (no later than August 15, 2007), so we can arrange for meeting space for the Task Group.

We are seeking Refreshment Break Sponsors for the conference coffee breaks. There is a sponsor form on the Fire Safety website at www.fire.tc.faa.gov.

The Use of Magnesium in Airplane Cabins – T. Marker

Possible locations of magnesium use:

Seat components
Overhead ducts
Floor components, seat track

Potential Threats:

In-flight:
Electrical arc to magnesium component
Hidden fire adjacent to magnesium component
Terroristic threat

Postcrash:

External fuel fire entering cabin
Primary concern – safety of passengers
Secondary concern – safe of firefighters

Development of Test Protocol based on threats:

Full-scale then lab-scale test based on findings of full-scale test

Informal tests were conducted recently at the FAATC using magnesium bar samples provided by Magnesium Elektron. Diagram of test configuration for these tests was presented. Photo of test set-up. Photos of test were shown. Twenty tests were conducted. Test results were discussed. Videos of a couple of the tests were shown.

Development of Magnesium Test Requirements – R. Hill

In-flight:

High energy localized ignition?
Require flight crew training/extinguishing agent

Postcrash:

Seat test burner?
Require CFR crew training/extinguishing agent

Study on Time Needed for Wing Tanks – R. Hill

Ray Cherry has completed this project, and it has been delivered to the UK CAA for publication. Relates to Special Conditions - Composite Wing and Fuel Tank Structure – Fire Protection Requirements (Notice No. 25-07-09-SC).

Ray investigated effects from various scenarios where fuel spilled out of wing tank including explosion, fire, etc.

Flame Penetration Through Holes in Pool Fires – T. Marker

Development of suitable mock-up for evaluating discontinuity. The diagram of mock-up box configuration used in test was displayed and described.

Summary: This test demonstrated that a fairly small hole would allow the fire to enter the area.

Full-Scale Testing of Intumescent-Coated Aluminum Skin – T. Marker

This test program has not begun yet at the FAATC.

Advantages:

Complete and continuous coverage of lower fuselage half, no discontinuities.
No disruption of present thermal acoustic insulation system design.

Diagram of planned test configuration was presented.

Difficulty testing intumescent using present burnthrough test rig: the intumescent grows when heated and chokes out the oil burner flame. Rolling the burner back means the substrate is not hit with the heat flux, so rolling back the burner is not an option.

Proposed Testing of Intumescent Coated Aircraft Skin:

Conduct full-scale proof-of-concept test at FAATC
Conduct lab-scale tests using burnthrough apparatus at FAATC
Adjust or revise test protocol as necessary

Part I: Description of NextGen Burners – R. Ochs

Rob reviewed: proof of concept of NextGen burner and described its design, provided components list, and compressor minimum requirements, etc.

Quantification of Fuel Temperature Effects

General Fuel Temperature Observations

Fuel Density Study

Fuel Nozzle Study

Air Velocity Observations

Effect of Air Temperature on Exit Velocity

Problems found with original NextGen burners sent out: Nozzle indexing

Burner Setup Checklist

Adaptability to Other Test Methods

The fuel and airflow rates can be adjusted for each different test method

NextGen Burner Distribution: CEAT, FAATC, Airbus, Boeing,

One burner will be used for testing seat cushions, another one for burnthrough tests

Part II: NextGen Burner Comparative Testing Results – R. Ochs

Initial Comparative Testing, Winter 2006

Observations from Boeing – FAATC Comparison, Take 2: burners performed better than initial comparisons in late 2006, burnthrough times were still quicker

Original Blanket Holder: it has been suspected for some time now that the differences in lab-to-lab comparison testing may be influenced or exaggerated by the blanket holder. The Picture Frame Blanket Holder was then designed. The first iteration used 32"x36" pan blanket. Diagram of Picture Frame Blanket Holder was presented and explained (including technical drawings). This information will be available on the Fire Safety Website at www.fire.tc.faa.gov if any lab would like to make one. Overall, the picture frame test method was useful in determining if burners are performing properly at different locations. It is in no means intended to replace the original test method. Questions still remain...

Comparisons with Boeing Lab: Thermal Acoustic Insulation Blanket Testing Summary: very similar results were obtained on all three burners; backside heat flux profiles were found to be in agreement across all three burners.

Comparisons with Airbus Lab: Thermal Acoustic Insulation Blanket Testing Summary: the burner was a consistent performer, and gave similar results from test to test, the burner gave burnthrough times that were slightly quicker than when tested at the FAATC, the burner distance from the sample was found to be critical, and a new method of alignment was suggested, and after adjusting the burner to the proper distance, based on a limited number of samples the burner seemed to be performing properly.

Part III: Future Burner Research and Development

Analysis: further insight into the fundamental physical problem is necessary, although the current burner will suffice for now, advances in material science may require a burner that can be highly accurate, literature search- review papers on droplet studies, swirl flow, soot formation, etc., will be necessary, separate physical analyses of the airflow and fuel spray of the current burner configuration, parametric study – determination of parameters that have the most significant effects on burnthrough, and use this knowledge to design an optimally configured burner that can be used accurately anywhere in the world. Rob discussed the techniques that can be used in these analyses.

Sonic Burner Use for Seat Tests – R. Hill

One of the NextGen burners will be configured for the seat test. The FAATC plans to have this set up and have some results by the time of the conference this fall.

H.P. Busch: when will you set up the NextGen burner for the cargo liner test? Dick: We won't start working on that until after the NextGen for seats is up and running and giving comparable results to the Park oil burner.

Next Meeting

The International Aircraft Fire and Cabin Safety Research Conference, October 29-November 1, 2007, will be held in place of the fall 2007 Materials WG meeting. If Task Groups would like to meet before, during or after the conference, contact April at april.ctr.horner@faa.gov, with approximate number of participants and length of time needed for the meeting, no later than August 15, 2007.

The spring 2008 Materials WG meeting will be hosted by Embraer in Sao Jose dos Campos, Brazil, on March 4-5, 2008. Please check VISA Requirements for entry into Brazil. Additional information on meeting location, etc., will be available on the Fire Safety website at www.fire.tc.faa.gov, at a later date.

Special Conditions – Seats with Non-Traditional, Large, Non-Metallic Parts (Notice No. 25-06-13-SC) – R. Hill

If a seat has more than 1.5 sq. ft of non-traditional, non-metallic panel material that has a non-traditional application any part over that quantity must meet smoke and heat release.

The lightweight seat cushion report has been completed and published. The final report is available on the Fire Safety website at www.fire.tc.faa.gov.