

International Aircraft Materials Fire Test Working Group Meeting

February 26-27, 2002

Hosted by GBH International, San Francisco, California, USA

TUESDAY, FEBRUARY 26, 2002

Burnthrough Round Robin 5 Test Results for Proposed Insulation Burnthrough Test Standard – T. Marker

Objective: To identify problems with the test and equipment through systematic testing of identically prepared samples.

Tim reviewed the progress of this round robin program and explained the problems encountered such as method of calibration (timing), impact of altitude, burner configuration (angle of stator, distance between stators), and burner components (stators and fuel nozzle).

The goal is perfect correlation between all labs.

Six (6) materials were tested in this round robin. A copy of Tim's presentation will be posted to the Materials Group section of the Fire Safety Section website (www.fire.tc.faa.gov). Suggestion to explain/describe exactly what is considered burnthrough during testing.

Discussion on Testing of Printed Wiring Boards (PWB) – R. Hill/G. Sotolongo

Certification of Printed Wiring Boards – G. Sotolongo (Boeing)

The purpose of this presentation is to seek guidance and support to find alternative methods for PWB flammability certification. The plan for an "equivalent safety finding" was presented at the International Aircraft Fire and Cabin Safety Research Conference in October 2001, held in Atlantic City, New Jersey, USA.

One of the questions/concerns: How can similarity be applied without knowing the exact formula and combination of materials original test article and the similar article. What is the short term solution based upon materials similarity?

Some of the electronic components that must be test requirements are: electric wire, cathode ray tubes, liquid crystal displays, transformers, printed wiring boards. Currently, FAR 12-second vertical Bunsen burner test or an approved alternative test method is required for all the part numbers of these electronic components. The electronics are in constant redesign, thus, testing by part number is inefficient and extremely expensive. Most of the electronic redesign does not change the materials. Boeing proposes using a similarity matrix for certification of the PWB components.

The Task Group will address this subject in detail and work towards an international solution.

Radiant Heat Panel – P. Cahill

Pat discussed the Polyimide Tapes Aging Study conducted at the FAATC after the October 2001 Fire and Cabin Safety research conference. Pat reviewed test results and explained that three (3) configurations were evaluated. She also showed video of some of the tests conducted in the various configurations. Pat addressed a number of questions concerning the amount of tape used and the number of overlaps in the configurations used in these tests. Boeing conducted similar tests and got similar results.

Flame Propagation – Pat added the following definition of flame propagation to the rule. Definition: Flame propagation is the distance of the furthest propagation of visible flame towards the far end of the test specimen, measured from the midpoint of the ignition source flame. This measurement must be determined during the period between the initial application of the ignition source and the extinguishments of all flame on the test specimen. *The measurement is not a determination of burn length made after the test.*

Some discussion ensued after this definition was presented to the group. **ACTION:** It was decided that some further clarification would be added to this definition of flame propagation.

Round Robin III – This round robin will cover: tape configurations, duct insulation (suggestion to consider whole system in the round robin tests), foam, hook and loop, and other.

The FAATC has not conducted any recent hook and loop tests since the Fire and Cabin Safety Conference in October 2001.

CEAT Radiant Panel Test Results – A. Mansuet (CEAT)

Anne explained the results of tests conducted using the Insulation Standard Method to test electrical wire (1 mm and 3.2 mm diameter wires were tested). M. Hirschler asked if wire bundles were tested. One wire bundle was tested. Anne explained that one wire bundle test is not enough. This issue will be discussed in the Hidden Fire Task Group also.

OSU/Smoke Panel Round Robin Test Results – M. O’Bryant (Boeing)

Mike reviewed the results of the most recent round robin and provided the participating labs with the final report on this round robin.

WEDNESDAY, FEBRUARY 27, 2002

Renovation and Repair Presentation and Task Group Report – T. Marker

The *Heat Release and Flammability Testing of Surrogate Panels* report was published in December 2001 (this report will be posted to the “Reports” section of the Fire Safety Section website within the next month).

The Objective of this work is to determine if surrogate materials can be used as accurate HR and BL predictors for in-service materials being renovated. Tim reviewed the results of the recent series of round robin tests. He also reviewed the conclusions based on the results of these tests. He also explained the Proposed Methodology for Certifying Renovations/Alterations (65/65 interior). A copy of this presentation will be available on the Fire Safety Section website (www.fire.tc.faa.gov). Once this proposed methodology is approved by the FAA Regulatory Group, it will be included in the Aircraft Materials Fire Test Handbook.

Fire in Hidden Areas – R. Hill/P. Cahill

FedEx has donated a 727 aircraft to the FAA Fire Safety Section for use as a test article. This aircraft will be used for various tests conducted by the Fire Safety Section. The FAA has received additional recommendations from the NTSB to conduct tests on in-flight fires (cabin crew training and equipment used to extinguish in-flight fires). The test methods used for materials in hidden areas will be evaluated.

European Updated on Fire in Hidden Areas Work

Airbus has an internal action to identify materials in hidden areas such as cabling and ducting. These materials will be tested in the CEAT lab.

Hidden Fire Benefit Analysis – R. Cherry/K. Warren (RGW Cherry & Associates)

Ray explained the design and factors considered in this benefit analysis.

Alternate Cleaning Technologies Final Report Presentation – S. Hasselbrack (Boeing)

Phase 3 Summary: The study was done on fire-blocked foam and fire-hardened foams. The test materials will be subjected to 10 cleanings using three different cleaning technologies. Sally reviewed all the results of this phase of the test program.

Burnthrough Task Group Report – T. Marker

Burnthrough Task Group Meeting Minutes – (T. Marker)

The results of the fifth round robin were discussed in greater detail. In general, the data appeared to be slightly more scattered than during the previous round robin. It was not possible to calculate the standard deviations of the various results, since the complete set of data has not yet been received by the FAA Technical Center. Of the 9 labs participating, 7 submitted full results, and 1 lab submitted partial results. A more in-depth analysis will be performed once all of the data has been obtained.

It also appeared that certain materials produced better interlab correlation than others. While this would be difficult to prove without substantial testing, it seems more likely that slight differences in the participating labs' burners still exist, which is the cause of the scatter. Since all burner adjustments have now been set, it is possible that the amount of air entering the burner may be the cause of the scatter of data.

There are two aspects of the air velocity measurement to consider: 1) the method of taking the measurement (i.e., how and where the instrument is located/mounted), and 2) the accuracy of the instrument. A brief study was performed by Jim Davis, who determined that the Omega HH30 instrument can quickly fall out of calibration in certain environments. The study also determined that there is indeed a direction associated with the instrument, since the measured air velocity is different, depending on which way the instrument is facing. As a result, the task group participants agreed on the following items regarding air velocity measurement:

1) Send the air velocity meters back to Omega for recalibration if you have not done so since the last round robin. Omega will recalibrate the instrument, and send back an updated calibration sheet. Along with the updated calibration curve, the sheet will also show the previous calibration curve, so we can see how far out of tolerance we were during this round robin. Please make a copy of this info and mail to jdavis@accufleet.com. Jim will be analyzing the results to determine if a particular lab's instrument may have been far enough out of calibration to cause a problem with the test data.

2) Since the recalibration of the air velocity meter is not free, the group would like to explore a more reliable and cost effective means of measuring the air velocity. One possible interim solution would be to send the devices to the FAATC for recalibration, since they possess a wind tunnel specifically designed for recalibration of these devices. The FAATC has agreed to investigate the feasibility of using the wind tunnel for recalibration of the air velocity meters, and will make the equipment available if possible.

3) The air velocity study performed by Jim Davis and the FAATC also determined that the location of the instrument with respect to the burner intake can affect the instrument readings. For example, if an intake tube is used to duct air into the burner, the reading will be higher if the meter is mounted closer to the burner, rather than at the intake of the duct. So far, no specifics on the exact method of measuring the intake air velocity exist, only guidelines. Some of this difficulty lies in the fact that most of the labs participating in these round robins have slightly different intake airbox systems. For this reason, the FAATC has agreed to manufacture “standard” or identical intake airbox systems for all labs. The FAA-style airbox also doubles as a holder for the air velocity meter, so this standardization will likely reduce or possibly eliminate any fluctuations in test data resulting from the positioning of the instrument. Since the fabrication of these airboxes is not automated, it will take some time to complete.

4) In order to conclusively show that there is a relationship between the intake air velocity and the burnthrough time, a small series of tests will be run by several labs. The tests will incorporate one material only, which is known to fail consistently in the 2 to 4-minute range. The tests will be run at varying intake air velocities in the approximate range of 2000 to 2400 ft/min. These test results will be discussed at the next meeting.

5) Personnel from the CEAT laboratory presented data on the burner flame profile by mapping the temperature when viewed from the exit end. CEAT incorporated a special mesh system, along with photographic media that enabled a “picture” of the flame shape to be generated, including the hot spots (high temperature areas). The results indicated that there are actually 2 hot spots (in CEAT’s burner) separated by several inches rather than 1 centrally-located hot spot. As a result of this study, the task group raised the issue as to whether differing flame shapes can produce different test results. More importantly, the issue was raised as to whether the intake air velocity could be causing the different flame patterns. The consensus was that varying flame patterns could be a potential cause for the data scatter, so a more in-depth analysis of the flame pattern will be performed by all laboratories. Since most of the labs do not have sophisticated equipment like that used in CEAT’s flame mapping, the participants agreed to instead use the heat flux transducer to map the flame pattern. The FAATC will draft a test program/instructions that will be e-mailed to all laboratories.

6) Most of the discussion on data scatter and lab differences focused on burner air velocity and the steps needed to rectify the problem of measurement. However, other alternative methods of measurement were also discussed, such as the possibility of using a fixed-plate orifice system to control the amount of air entering the burner. Such a system is currently in use on the OSU rate of heat release apparatus. While this type of system would eliminate the need for mechanical measuring devices, it would require other controls. For example, the ability to manage the fan speed (motor revolutions) would become extremely important, since this would in turn dictate the amount of air entering through a fixed orifice. The FAATC has agreed to investigate the feasibility of such systems, but will not likely incorporate any until the results from the above mentioned studies can be analyzed.

Radiant Panel Task Group Report – P. Cahill

The group discussed their next round robin (RR 3). The next round robin will involve ducting and tape tests. The group also discussed the tape test configurations. The refractory materials used as ‘backer boards’ and how certain materials react with these boards during the tests.

Quality Assurance Task Group Report – C. Lewis

Production Quality Assurance Task Group Notes:

- Objective of activity: develop guidance on issues that need to be

considered in setting up a viable production QA system

- Agreement on final version of fault tree - now includes best practices / suggested safeguards, and has been 'verified' through application of example problems

- Report to be finalized and put forward for publication within next few months

- Considered this will complete this TG's activity at this time (although it is planned to keep fault tree 'alive' by adding to it as new issues arise)

Printed Wiring Boards- D. Johnson

The group is encouraging some additional input in order to go forward. The group is currently comprised of only 4 members, so additional input from aircraft manufacturers and electronics companies is crucial.

Working Group Member Presentations

Test Results Fire Resistant Coatings – M. Chapman (Akzo Nobel)

Next Meeting

The next meeting will be held at the Mercure – St. Georges in Toulouse, France, on June 11-12, 2002. Additional information on area hotels may be found on the Fire Safety Section website (www.fire.tc.faa.gov) on the “Materials Group”, “Upcoming Meetings” page.