International Aircraft Materials Fire Test Working Group Meeting

Hosted by the United Kingdom Civil Aviation Authority (CAA), Gatwick, United Kingdom

June 28-29, 2005

TUESDAY, JUNE 28, 2005

Results and Discussion of Seat Round Robin – P. Cahill

Aircraft Seats Worldwide Round Robin Testing: testing complete in the United States. Three types of seats involved. Test results were displayed. Seven U.S. labs participated.

Laboratory Findings: 3 labs run their tests per FAR 25.853, Appendix 5, Part II
4 labs run their tests per the Aircraft Materials Fire Test Handbook
(plus, FAATC lab)

Fuels: JP8, Jet A, #2 Home Heating Oil, and Kerosene. Pat will look into sulfur content.

Nozzles: 80 degree cc (2 GPH); 80 degree AR (2.25. GPH); 80 degree PLP (2.25. GPH)

Static Disk and Tabs:
- 3 labs use neither
- 2 labs use tabs
- 2 labs use static disk
- 1 lab uses both

Thermocouples:

Type K are problematic.

Overall Observations of Lab Equipment, etc.: Labs were attempting to run tests correctly either by FAR or by Handbook. Dick noticed 3 things that stood out in reviewing the data:

1. 1 lab had recorded burnlength on the back of the seat cushion – their % weight loss was considerably higher.
2. The lab that was high had high burn lengths on bottom of seat cushion
3. The lab that was low had low burn lengths on top and bottom of seat cushion

Goal now is to have the other labs worldwide tests these materials.

Lightweight Seat Cushion Tests – T. Marker

Problem: The current test standard does not allow for lighter weight seats that are now available.

June 2002 Testing Proposed by FAATC: have labs send 18 sets of seat cushions. Lab scale test results were presented for 4 different lightweight seat cushion types. An analysis of laboratory tests on lightweight seats was presented and explained.

Full-scale Tests on Lightweight Seat Cushions

Test conducted in 707 test article
Video cameras inside and outside test article

Tim described the full-scale test parameters and showed a photo of the test configuration (various views). Photos showing typical cabin fire after 1 minute, 2 minutes, 3 minutes were shown. A post-test photo was shown. Charts of weight percentage loss were presented for each type. All test results of a very high percentage weight loss of seats near fire door. Additional overall analysis can be found in presentation given during meeting.
Lightweight A, C, and D. resulted in a more subtle flashover condition. Lightweight B resulted in a flashover condition sooner at approximately 3:30 (minutes). Tim reviewed the proposed/possible acceptance criteria for lightweight seat cushions and how results from this set of tests compared to these criteria (pass/fail). Seat cushions weighing 3 pounds or less would be considered lightweight. More full-scale tests planned? Not at this time.
Once acceptance criteria is finalized, the FAA certification group may put out a policy notice on lightweight seats. Tim plans to write an FAA Technical Report on this test program.

Discussion of Burnthrough Test Method for Aircraft Thermal Acoustic Insulation Blankets – T. Marker

Background on Round Robin VI: 9 labs participated
Preliminary Conclusions: Calibration results were not indicative of test results
Boeing burner was set up at FAATC lab. Boeing burner had a socket-style draft tube. FAATC burner has a flanged draft tube. Comparison of flanged and socket-style draft tubes. Adjustments made to Boeing burner to attempt to bring it closer to FAATC burner. Burner nozzles were compared. Tests were conducted with the FAATC nozzle installed in the Boeing burner and the FAA burner for comparison. Attempt to obtain nozzles like FAATC nozzle. Monarch indicated that the original FAA nozzle had M-80 on it. Accufleet proved that the orientation of the nozzle has some impact on results. Monarch developed a prototype copy of original FAATC nozzle. This proved to be unsuccessful based on heat flux comparison tests. The Monarch 6.5 GPH 80 degree PL nozzle was then evaluated. This information was sent to participating labs.

June 2005 Mini Round Robin with 6.5 GPH 80-Degree Nozzle for Comparison:

Participating Labs:
FAATC
Boeing
CEAT
Airbus
Accufleet

Summary:

Material weight consistent. 4 out of 5 labs capable of heat flux.

Planned:

Continue visiting labs and assisting in calibration of burner. Continue work on orientation of nozzle. Investigate correlation between premature failure and socket-style burner. A photo of the new FAATC test apparatus was displayed. Tim noted that Monarch recommends not taking the nozzle apart. Question: Did the FAATC test each of the nozzles before they were sent out? Tim: No, just the nozzle that was sent to Boeing. Question: Did anyone actually measure the amount of fuel going through the burner? Tim: Yes, we did. H.P. Busch: Heat flux mapping findings? We found 2 to 3 BTU differences. Tim; I sent out a standard for mapping, because each lab was doing the mapping differently. HP Busch: We are now able to move the hotspots. Tim: The concern is the same material performing the same in two different labs. T. Tompkins: The FAATC hotspots may be more uniform than those of the other labs. HP Busch: What is the timeframe to solve the problems? Dick: We will try to put together a couple back-up burners and work with Boeing and

Airbus. This will be done as soon as possible, but comparison results must be acceptable. HP Busch: How can we deal with the rule if the problem isn't solved in 6-8 weeks? Dick: FAATC will try to solve the burner issues as rapidly as possible. If you have regulatory concerns, talk to the regulatory group.

Radiant Heat Panel Discussion – P. Cahill

Foams: expand, extinguish pilot burner flame, exhibit intumescence, and redirect flame.

New tape configuration: Pat showed a diagram of new configuration; this was done because of polyimide film. Dick: some of the components such as in materials containing brominated materials (as presented at a previous Materials meeting) are being changed for environmental reasons. The new replacement components are affecting test results and reacting differently than the original components did. Pat presented photos of tests of various films and tapes.

Damping Systems

Showed diagrams of sample configuration and placement within chamber for testing.

Current Priority Testing:

Silicone impregnated fiberglass insulation –afterflame problem. Purpose: evaluate a 60-second pilot burner flame impingement versus 15- and 30-seconds. Initial testing has shown that the 60-secon flame exposure results in no afterflame time and no flame propagation.

Propane Pilot Burner Replaceable Nozzle Status Report – M. Spencer

Background: 17 nozzles and 20 total kits (entire assembly) supplied; revised configuration to eliminate O-ring.

Alternative Small-Scale Test for Unfaced Microlite AA© Blankets – M. Shumate

JM uses as an internal QC Test. Contact Monroe Shumate for more information.

"AC 25.856-1X Thermal Acoustic Insulation Flame Propagation Test Method Details"

J. Gardlin: Final AC was out as of June 24, 2005. The issued version is an expansion of the draft AC that was previously released. A copy of the final AC was available for group members at the meeting. Dick asked if there were any questions for clarification. No questions were asked.

Fire in Hidden Areas
Evaluation of the 12-Second Vertical Bunsen Burner Test – J. Reinhardt

Air conditioning duct material was tested: in-service since 1980s, passed this test. John showed video of Intermediate-Scale Aircraft Duct Test.

Tests evaluated for duct materials provided by Task Group members:

12-Second Bunsen Burner Test – all samples tested passed this test

Intermediate-Scale Fire Test

Radiant Panel test

Heat Release Rate Test for Cabin Materials

Smoke Test for Cabin Materials – all materials passed this test

John discussed the Material Fireworthiness Ranking he came up with after conducting this test evaluation against 12-second vertical Bunsen burner test.

New Test Proposal: Radiant Panel Test – use same equipment as used for insulation material with 1-minute radiant heat exposure time. Propane pilot burner impingement time = 10 seconds. Sample size: 9"x11.5". Afterflame time: 20 seconds. John reviewed the proposed acceptance criteria.

Dick: This is a proposal; this is the time for Task Group members to get involved and provide all the materials used in ducting to be tested and evaluated, etc.

Concern expressed regarding flexible materials used in ducting. John reiterated that samples from manufacturers are needed to be tested. FAATC needs samples of all materials used in ducting areas for the test program – now is your opportunity to provide these materials.

Some aircraft ducts contain 20 to 30 materials. The goal is to bring the ducting materials to be able to withstand the same fire threat scenario as the insulation materials – bring the standard for ducting equivalent to the standard for insulation materials. Ducting is the first part of the evaluation of tests for other materials in the hidden areas.

Hidden Fire – Electrical Wiring – R. Hill

Rob Ochs at the FAATC will now be continuing the development of a fire test for electrical wiring. Contact Rob via email at Robert.CTR.Ochs@faa.gov. Dan Slaton of Boeing suggested contacting the Task Group members for input to define test methods and for technical inputs on the Wiring Test Report, DOT/FAA/AR-TN04/32. Dick explained that the work Rob has completed to date will be presented at the October Working Group meeting. That will be the time for Task Group member input/comments/suggestions, but the Task Group members are welcome to contact Rob from this time forward to discuss the program with him. Dan Slaton stated that there had not been any formal request by the FAATC to industry for inputs on the report conclusions or for recommendations on test method proposals. Since the report indicates the FAA believes a new fire test on wiring is required and the FAATC is now working on a new test method, this is by definition "new rule making" and a formal ARAC committee is required.

Task Group Reports

Seat Task Group – R. Hill

1. Lightweight seat cushion testing: Q&A: leather is heavy, so a cushion covered in leather probably wouldn't be a lightweight seat cushion
2. Round Robin: Discussed worldwide round robin; FAA will discuss RR participation with EASA in the next few days; survey form to go with seat cushions; possibly requiring video taping of tests – what do other authorities think of this?
3. Tim's presentation on lightweight seats was discussed.

Radiant Panel Task Group – P. Cahill

1. Ventilation slits and location on multiplayer film foam and other exotic samples
   MTI/Polyfab will provide samples to be tested for data to find out if size of slit is a key factor; this work will be done within the next month

2. Nozzle and Aerator: standardized aerator in the near future
3. More samples for testing before October 2005 meeting
4. Calibration discussion
5. DERs

Burnthrough Task Group – T. Marker

1. Boeing distributed its CD of clocking tools to some labs
2. Manufacturers concerns – 5 issues. These issues were presented at the Task Group by Steve Morgan of Boeing with concurrence from Airbus and Bombardier. These items are critical for industry to proceed with developing and implementing the burnthrough requirements:
   a. Test equipment needs to be under configuration control defined by measurable and quality control parameters.
   b. The industry requires commercially available equipment.
   c. All world wide labs should be involved with round robin testing and results should be consistent across all labs.
   d. FAA needs to provide acceptance of all test equipment to initiate certification testing.
   e. A material that satisfies all product and certification requirements needs to be available. To date no materials have been found that meet all design requirements for burnthrough (NOTE: There is not concurrence between the FAA and industry on this item)
3. Advisory Circular: Include nozzle info; mark new nozzles that go to labs – such as a serial notation by FAATC; rotation of nozzle – continue testing at FAATC; torque specification on nozzle – should it be taken apart?
4. Mapping – renewed interest:
   Time –consuming; needs defined procedures – Steve Morgan will go to Redbrooks Labs to investigate their mapping procedure;
5. FAATC will obtain more 6.5 GPH nozzles and check them
6. Air velocity meter from Omega requires 9 month lead time
7. FAATC will calibrate labs' air velocity meters in its wind tunnel
8. Goal: FAATC will try to have 2 additional burners ready by end of July 2005

Ducting Task Group – J. Reinhardt

1. 20-second vertical Bunsen burner is not a good discriminator
2. Ducting systems: where does it start, end, what configuration should be tested?
3. Group will analyze data from John's 6/28/05 presentation and provide John with comments. Manufacturers suggested review of all available data before making a decision that a modified Radiant Panel test is required to replace the 12 second vertical test. Airbus & Boeing will provide some representative data for analysis such as 60 second vertical, smoke, OSU, etc…
4. Members will provide flexible materials, etc., to John for testing
5. John will put 6/28/05 presentation and data in an FTP site for Task Group members to access
6. August 1– comments/questions are due
7. 60-second vertical Bunsen burner testing will be conducted at FAATC

Dan Slaton of Boeing went on record to say that developing a new test method is by definition "new rule making" and this requires initiation of a formal ARAC committee. Historically the last two new fire test procedures that were initiated within the Fire Test Working Group (Radiant Panel and Burnthrough) have resulted in new rules.

Study on Aging and Contamination – K. Hesse (Airbus)

Contamination Task Group – D.Slaton (did not report out at Working Group since Task Group was after the main Working Group session)

A summary of the Task Group activities was reviewed:

1) Develop a list of possible OEM supplied "contaminants" (CIC, sealants/primers, etc…). Prioritize for flammability testing
2) Develop a list of possible Airline supplied "contaminants" (e.g cleaners, insecticides, etc…). Prioritize for flammability testing.
3) Define standard test configurations and procedures for evaluating the flammability properties of "contaminants."
4) Develop a comparison matrix of test methods for evaluating in-service flammability properties of insulation blankets.

The task group had open discussion on the presentation that Karsten Hesse (Airbus) presented on flammability properties of CIC and acetone on various insulation blankets. Boeing and Airbus will discuss all contamination testing results to date and recommend standard specimen configurations and test methods.

Ray Cherry presented a proposed approach which consists of a proposed protocol to assess the type and likelihood of contaminants against airplane type & zone/area to establish associated levels of risk, as a basis for developing/determining mitigation solutions.

The task group discussed plans to compare the various test methods for evaluating in-service flammability properties of insulation blankets. The task group will provide inputs on the positive and negative aspects of available test methods including bunsen burner, cotton swab, arc-n-spark, radiant panel, OSU & Smoke, and the large scale crown test.

Thermal Acoustic Insulation:

Process:

Material selection
Test method selection
Specimen definition
Focus of investigation: OEM – status of airplane
Design of Experiments
- Aging/contamination/ with Dimitrol (AV30)
- Contamination with acetone-based cleaning agent
- Contamination with organic phosphoric acid ester

Results of Bunsen burner and radiant panel tests of these materials were presented

AC Related Question from P. Short: Use of stitching or garment tags to prevent slippage. Dick: Use the same rationale for the radiant panel test of Thermal Acoustic insulation blankets with stitching or tags to prevent slippage as you would for small parts rationale for vertical Bunsen burner test.

Next Meeting

The next meeting will be hosted by Orcon Corporation and Delta Airlines on October 19-20, 2005, in Atlanta, Georgia.