INTERNATIONAL AIRCRAFT MATERIALS FIRE TEST WORKING GROUP MEETING

June 23-24, 2010

Hosted by EASA, Cologne, Germany

Wednesday, June 23, 2010

Radiant Panel News – R. Hill

Reminder: Watlow has discontinued making separate heater panels for the radiant panel. The radiant panels are being assembled and sold by Power Modules, Inc. Go to: http://www.pmiheat.com. Pat Cahill has tested the PMI assembly with success.

RTCA Update – R. Hill (for Pat Cahill)

The FAA has reviewed the draft that supports the changes made to Category C flammability section. It has been submitted to RTCA organization for its final review. Once revision G is finalized, the group will continue working on alternate test methods for H.

The "Trends in Accidents and Fatalities in Large Transport Aircraft" Report, DOT/FAA/AR-10/16, is now available on the FAA Fire Safety website.

OSU and NBS Update – R. Hill (for Mike Burns)

NBS Photometric System Round Robin: The goal was to look at the scatter the photometric system/software may have on fleet test data. There are 20 labs participating in this round robin only looking at photometric cell. Phase 2 is underway.

OSU Questionnaire: each lab has received questionnaire. July 15 is the deadline for completed questionnaires to Mike Burns. This work will assist the OSU Checklist Task Group.

OSU Checklist Task Group Update: a new effort was introduce OSU/NBS training tools that will be available on the FAA Fire Safety website. An FAA Sharepoint site is being set up.

Peter Busch: how can we do an OSU round robin if there is the question on the heat flux calorimeters? Dick: there are two things going to happen: 1) in the interim we have come to the conclusion that the heat flux gages have an inherent scatter and they vary depending on what piece of equipment you use it in, so short term, the best we can do is to request that the manufacturers use a standardized calibration traceability (with the guardon gage). 2) long term we are looking at how to make things more repeatable and more reproducible.

Heat Flux Calibration Study – R. Hill

Comparison of variation in paint systems on the gages: Vatell and Medtherm NIST calibrated gage (of the same range) in Radiant Panel Tester. A description of this test may be found in the presentation included with the minutes of this meeting on the FAA Fire Safety website (www.fire.tc.faa.gov). Dick provided the background on the heat flux transducer issues. Comparison data shown for Vatell/Medtherm comparison for (paint in center portion only vs. full painted face).
Schmidt-Boelter Gages: Dick described the Schmidt-Boelter gages apparatus and how it works. FAATC has purchased Schmidt-Boelter gages from Vatell and Medtherm and have sent them to NIST to have them recalibrated.

NIST Single Point vs. Full Range Calibration: calibrated at 10 points, Mike looked at the difference between the calibration slope and what the heat flux would be in various pieces of equipment.
Peter Busch: in the meantime, will the FAA prepare a recommendation letter for the interim? Dick: We can put something on the FAATC Fire Safety website for the interim. Any other heat flux questions? Dan Slaton: aerospace standard – is there a timeline on this? Dick: we would like to have something very soon. We can discuss this in more detail in the Task Group. Are there other methods to consider for calibrating a piece of equipment (like the OSU) similar to the sonic burner effort? Dick: we tried doing something similar to that with the OSU many years ago without success. We looked at several different types of ways of calibrating at that time. Unless you redesign the whole OSU apparatus, it will be very difficult.
If you take a Vatell gage that is calibrated by NIST, with all the different parameters within a piece of equipment, it may be off by as much as 10-12%.
We are working towards a future standard that is much more repeatable and reproducible.

Flammability Standardization Task Group Presentation – S. Campbell/M. Jensen

Updates presented by Task Group Leaders:

Martin Spencer updated group on 'face'. Dan Slaton updated group on bonded inserts. Hector Alcorta updated group on item 44. Bruce Gwynne updated group on metals/coated metals. Patrick Zimmerman/Klaus (from Sell) updated group on joints (all types). Cheryl Hurst updated group on bonded details part 1. Lisa Gras updated group on bonded details part 2. Mike Jensen updated group on color of thermoplastics – proposal sent to FAA, waiting on response. Ingo Weichert updated group on color of paint – proposal sent to FAA. Michael Miler updated group on decorative laminate items. Mary Pacher updated group on thickness ranges - submitted proposal to FAA, received comments, and have addressed the FAA comments. Ava Ronnquist updated group on items 20, 21, and 22.
Pom (C&D Zodiac) provided a few tips on the group's Sharepoint site.

Classification of Small Parts – R. Ochs

Investigation into when small parts should be tested. Objective: develop a methodology to determine when a small part does not need to be tested. Consider where part is located: inaccessible area (in-flight fire threat) or in cabin (post-crash fire threat). What is part constructed from? FAATC performed preliminary testing with small foam blocks at various vertical distances from each other. Rob showed photos of some of the small foam block test that have been conducted at FAATC. Summary: Determination of what a small part is requires more than just a size-based criteria.

Update on Flammability Testing of Magnesium Alloy Components – R. Hill (for Tim Marker)

Proposed Mag-Alloy Testing at FAATC: various phases of testing to determine if the use of mag-alloy poses additional hazard during entire 10-minute event. Peter Busch: was any type of coating used on the mag-alloy? Dick: No, it was just the mag-alloy. No coatings, intumescents, paint, etc., were used. A diagram of the full-scale test apparatus, camera locations, and a water mist diagram were shown. Photos of test results were shown. A photo of the seat construction was shown. A diagram of the additional thermocouples on seat leg frames was shown. A photo of the test set-up was shown. The results of the baseline tests conducted were summarized. Mag-alloy materials tested WE-43 and AZ-31. Results of two tests conducted since March 2010 Materials meeting were presented. Next Steps: comparison of test results, study data, and generate report. Possible development of a representative laboratory test. For consideration: What is the best type of test for mag-alloy seat components?

Jim Davis: there seems to be some parallels with looking at composites for seat structure, is the test going to be developed for all seat structural components or for these mag-alloys? Dick: I don't know that you could have the same requirement with the same pass fail for both, but ideally I think that is what you would want to do. This is what the Task Group will have to look into. Peter Busch: have you tested carbon structure parts with flammability? Dick: no, we have not.

NexGen Burner for Seat Cushion Fire Testing – R. Ochs

NexGen burner has been found to be equivalent to the Park Oil burner for burnthrough testing. This burner can be built in-house or purchased. Set up a NexGen burner with equivalent air velocity, fuel flow rate, and measured flame temperature. A graph of measured flame temperatures was presented. NexGen Flame Temperature measurements variations by burner configuration: straight configuration vs. 90-degree angle. 90-degree elbow summary: overall flame temperature decreased approximately 100 degrees but the exit velocity stayed the same. 2010 Series – we procured the same fire hard foam used in the 2007 Seat Test Round Robin. Leather seat cushions were donated by a Materials Working Group member for testing as well. 2010 Series Results – Repeatability graph was shown. A graph of the 2007 Round Robin vs. 2010 Comparison - % Weight Loss chart was shown. Summary: the NexGen burner was able to achieve burner calibration according to the specifications. Next Steps: configure an identical NexGen burner and perform calibration and comparative seat tests. Mike Jensen: did you do any burn length comparisons on the cushions? Rob: Yes, I just didn't include the data in this presentation.

Development of the Next Generation Fire Test Burner for Powerplant Fire Testing Applications – R. Ochs

Current status: all the specified burners are no longer available. The propane burner can be used, but propane flames are fundamentally different from the jet fuel flames. FAATC will be developing a powerplant test using the NexGen burner.
Thermocouple effects: tests were performed to determine the effect of the thermocouple on the measured flame temperature. A graph showing thermocouple effects old 1/16" compared to new 1/16" was shown.

Composite Material Fire Fighting – J. Hode (SRA International)

Do composite skinned aircraft require more fire fighting agent? John reviewed the tests that have been conducted to date. Phase I Findings: all tests showed some post-exposure flaming. Insulated areas were always several hundred degrees Fahrenheit higher than the panel temperature. Oxidation of fibers was noted. Phase II Testing: lateral flame spread testing, thermal decomposition testing. If anyone has any ideas/thoughts, please contact John Hode at 609-601-6800.

Development of a Lab-Scale Flame Propagation Test Method for Composite Fuselage Materials – R. Ochs

Develop a lab-scale test to determine the propensity of a non-traditional fuselage material to propagate flame or to sustain flaming combustion.

Aerospace composites were used in these tests. Non-aerospace materials were also used. All samples were 1/8" thickness. Rob showed a graph of the intermediate scale test results. A graph of the results of the 60 Second Vertical Bunsen burner test on these same materials was shown. Radiant Panel Test results were also shown. Summary: material construction is a big factor in fire performance. Upcoming Work: continue radiant panel tests, gather sandwich panel materials for testing.

Task Group Meetings:

Magnesium
Standardization
Composite Fuselage Work

THURSDSAY, JUNE 24, 2010

Task Group Reports:

Magnesium Alloy Task Group – (R. Hill): discussed the outcome of full-scale tests and where the lab tests should be going. The lab test should represent a material test and not a component test. The group has information on a good alloy and a marginal alloy. TG is considering using the oil burner for the lab-scale tests. Suppliers will send samples, need to determine pass/fail, dimensions of sample, etc. These will be discussed. FAATC will begin running some lab-scale tests to generate data to be reviewed and analyzed.

Heat Flux Task Group – (R. Hill) -discussed problems, possibility of developing a new standard (factor tolerances into a new standard), and questions were brought up regarding use of old transducers, etc.

Composite Task Group (R. Ochs) –discussed flame propagation tests, and fire fighting work for post-crash fires, varying sample thicknesses were discussed, the test parameters were discussed and varying the radiant panel test parameters was discussed, what is really the threat of a small flickering flame (how much of a threat is this?), performing more fundamental tests like microscale calorimeter was discussed.

Standardization Task Group (M. Jensen) – thanked participants, invited new participants, encouraged participants to vote via the Sharepoint group.

NexGen Fire Test Burner Update – R. Ochs

Recap of presentation given at March 2010 Materials WG meeting. The Marlin Engineering burner was built according to the specifications with only minor discrepancies. CNC machined precision stators do not fit rolled tubing. FAATC bought a Flexible Cylinder Hone from McMaster Carr to smooth out inside of draft tube.

FAA Flow Visualization Laboratory: set up to measure the flow coming out of small jet nozzle at this time. Calibration Objectives: velocity measurement of a turbulent jet, compare results.

Flammability Requirements Improvement – J. Gardlin (FAA Transport Airplane Directorate)

Current Flammability Requirements: apply to all materials except small parts that would not contribute to the propagation of a fire, certain locations in the airplane.

Appendix F has grown and evolved over 40-plus years. Each successive revision has focused more specifically on a particular safety issue. Many materials/parts are subject to multiple requirements (because different usage).
Appendix F has 7 parts. Only part I establishes requirements based on type of material (opposite to usage). All requirements permit ‘other required equivalent method’. Current approach, whether by usage or materials, is to list applicable parts explicitly.

Main Factors in Establishing Flammability Requirements: Nature of threat (post-crash or inflight), potential contribution of the item, relative ability to mitigate the fire.

Several Motivators for new rulemaking:
-enhanced safety
-standardization
-simplification

Existing Test Methods and their applicability: Jeff reviewed the current test methods how they relate to accessible or inaccessible fire threats.

Jeff presented a visual representation of current state.

Current state has:
-lots of overlap
-lots of test methods
-challenges to determine applicable requirements

results in different interpretations, etc.

Simplified Structure Might Be:

Appendix F, Part I: in-flight fire protection requirements
Appendix F, Part II: Post-crash fire protection requirements

There would be an associate change to the regulatory language.

Status:
-FAA is seriously considering rulemaking
-very likely would be addressed through some sort of industry group – ARC or ARAC
-Tasking could appear quite soon
-FAA would provide a proposal for feedback, rather than request a proposal starting from scratch

Question regarding possibly developing new test methods as part of this effort. Jeff explained that current test methods would be reviewed for applicability, some of the more recently developed test methods that have already been worked through may be up for consideration as required tests as part of this effort.

<u>Update Handbook Chapters</u> – R. Hill

Creation of 11 New Task Groups to support this FAA effort in combination with the current Task Group on Heat Flux:

Seat Oil Burner for Cushioning
Seat Structure
Cargo Liner
OSU
Bunsen Burner
Radiant Panel for Insulation
Insulation Burnthrough
Radiant Panel for Ducting
Radiant Panel for Wire
Radiant Panel for Fuselage Skin
Evacuation Slide

Seat Oil Burner for Cushioning TG Tasks:

-incorporate sonic burner
-update advisory material
-incorporate lightweight seat criteria
-testing of other padded areas (footrests, headrests, ottomans)
-large surface areas on seats (either small part or not!)
-incorporate testing of inflatable bladders
-incorporate testing of non-traditional materials used in place of foam
Seats – Flammability of Structure:

Develop new Handbook Chapter to include test using sonic burner.
If seat structure is other than aluminum: test for composite structure, test for magnesium-alloy structure.

Cargo Liner – Flammability:

-Incorporate sonic burner
-Update advisory material
-Include testing criteria for seams, joints, fastening systems, light fixtures
-Include testing criteria for cargo liner patches, repair

OSU:

-update handbook Chapter
-incorporate Handbook OSU Minimum checklist
-Fix heat flux method

Bunsen Burner Test (or similar):
-update Handbook Chapter
-update advisory material
-incoroporate the latest upgrades
-include testing criteria for carpeting

Radiant Panel Test for Insulation:

Burnthrough Test for Insulation:
-Write Handbook Chapter for this test method incorporating sonic burner
-update advisory material

RP for Ducting Materials:

-write handbook chapter for this test method

RP for Wiring:
-write Handbook Chapter for this test method

RP Heat Test for Evacuation Slide Materials:
-update Handbook Chapter for this test method

Task Group Chairmen (FAA Fire Safety engineering staff):

Seat Oil B for Cushioning – Pat Cahill
Seat Structure – Tim Marker
Cargo Liner – Tim Marker
OSU – Mike Burns

Bunsen Burner – Dung Do
Radiant Panel for Insulation – Pat Cahill
Insulation Burnthrough – Rob Ochs
Radiant Panel for Ducting – John Reinhardt
Radiant Panel for Wire – John Reinhardt
Radiant Panel for Fuselage Skin – Rob Ochs
Evacuation Slide – Dung Do

First meeting of these Task Groups will be the week of October 25, 2010, during the conference week.

Task Groups:
-one representative per company per group (only one official company rep per TG)
-limit to two Task Groups per person (one person can only participate in 2 TGs)
-timeframe target – 2 years

This will require a significant amount of work for Task Group chairmen and TG members. This work will require everyone involved to put their best effort into accomplishing the tasks of the Task Groups.

Dan Slaton: will FAA provide some more details before the meetings the week of October 25?
Dick: we have already assigned these TG Chairmen. You have their contact information, you can contact them directly for details. If you do not see any information on the Fire Safety website on a specific Task Group, contact that Task Group Chairman. If you have questions or suggestions for a specific Task Group, contact the Chairmen of that Task Group directly.

Thomas Ohnimus mentioned that EASA will be hosting a TSO workshop in Cologne, Germany, at the end of this year. This information will be linked to the FAA Fire Safety website.

<u>October 25-28, 2010</u>

Sixth Triennial International Aircraft Fire and Cabin Safety Research Conference. Please see FAA Fire Safety website for registration, hotel information, details, and schedule.

The conference will replace the fall 2010 Materials Working Group meeting.

Close of Meeting