INTERNATIONAL AIRCRAFT MATERIALS FIRE TEST WORKING GROUP MEETING

Hosted by Boeing Commercial Airplane Group, Renton, Washington, USA

March 3-4, 2010

WEDNESDAY, MARCH 3, 2010

RTCA Update – P. Cahill

Pat provided a brief background of the work done to draft a new Section 26 for inclusion in RTCA DO-160 document. Section 26 deals with flammability. The Task Group focused on testing specified in FAR 25.853, and works towards selecting the appropriate test method. Part of this includes determining what a small part is and does it fall under the small parts exclusion and determine configuration or parts of a product that may be exempt from testing. The Task Group was asked to test 2 units. Three tests from the Aircraft Materials Fire Test Handbook are applicable: Vertical, Horizontal and 60-Degree Bunsen burner tests are applicable. The RTCA policy is to not reference any document specifically. First review of Section 26 will be held at the RTCA Meeting scheduled for the week of March 17, 2010. Discussion as to whether the Task Group would be working with the RTCA over the next three years to test black boxes. Jim Peterson questioned how this will be implemented by the FAA – a new AC? Jeff Gardlin: yes.

Radiant Panel News – P. Cahill

Pat learned within the past three weeks that Watlow has discontinued producing the Radiant Panel used for Thermal/Acoustic insulation testing. Radiant panels will now be assembled and sold by Power Modules, Inc.
Contact info:
John Chapin
President
Power Modules Inc.
1210 Stanbridge Street
Norristown, PA 19401-5315
Phone: 610-292-8900
Fax: 610-292-8898
Email: jchapin@pmiheat.com
URL: http://wwwpmiheat.com

PMI will work with the FAA to ensure adherence to the tight specifications. Our first Radiant Panel from PMI will be arriving in the near future. Representatives from PMI will be onsite at the Tech Center the last week in March.
Are there published specifications for the Radiant Panel? Is there a way that a lab could test the panel they purchase to ensure that it meets the tight specifications. Pat: It is important to conduct the 3-position check. Pat will provide the specifications and drawings on the FAA Fire Safety website so a company can build/make their own Radiant Panel.

Vertical Bunsen Burner Note – P. Cahill

Vertical Bunsen Burner: The FAATC recently learned that a sample passed at one lab and did not pass at another lab. Possible differences: Gas (99% CP Methane vs. a different gas), diffusion flame vs. Premixed flame, Burner orifice size. If you run Bunsen Burner tests, please measure the diameter of the burner's orifice and email it to me (Patricia.Cahll@faa.gov). Martin Spencer suggested that the flame height may be a factor in the differences. Pat indicated that the FAATC has a flame height guide in its lab.

OSU/NBS Update – M. Burns

NBS Photometric System Round Robin – initial phase of Photometric System Round Robin has been completed. 20 labs (24 machines) participated in this Round Robin. Mike provided a list of the labs that participated. Slight delay in obtaining samples. New Task Group participant request: help develop OSU/NBS detailed checklist, format (advisory material)) may include: detailed drawings/dimensions, cold inspection checklist, hot inspection checklist, checkout and maintenance procedures, calibration, sample preparation, test procedures, training video, information will be available on FAA Fire Safety website in the Handbook section under the appropriate Chapter. Mike reviewed the Chapter 5 Handbook update: software analyzing calculator (calibration factor). He described this calculation tool. Chapter 6 Handbook Update: NISTIR 4917 (September 1992) New Heater and Flux Gage for the NBS Smoke box. NIST report has been posted in the Handbook Section of the FAA Fire Safety website. Most recent detailed drawing of the new tubular furnace that replaces the old wire-wound furnace was posted to the Handbook section of the FS website. Mike described the future OSU/NBS work.

FAATC Production of Test Method Training Videos – R. Hill

The FAATC will be updating these test method training videos. Tim suggested including the training video that pertains to a specific Handbook Chapter on the Fire Safety website with that Handbook Chapter. This is the purpose of the new Task Group that Mike will be forming today. It will mainly deal with OSU/NBS training videos but will also touch upon the other test methods.

Standardization of Flammability Tests Task Group – S. Campbell

The Flammability Standardization Task Group's mission is to validate and standardize acceptable methods of compliance with the flammability requirements. Scott presented the Task Group's project management plan. Scott reviewed the Task Group structure. The Task Group has organized the closely affiliated Draft Policy Reference Number. The breakdown was presented. This Task Group has a Sharepoint Site for online collaboration, file libraries, discussion forums, voting polls, industry team status, and total transparency. The site is hosted by C&D Zodiac. Task Item Status were provided by the Team Leaders.

Adhesives Update – R. Hill for Rich Lyon

Rich tested 27 adhesive samples received after the Florida Flammability Standardization Task Group meeting.

Classification of Small Parts – R. Ochs

Objective: determine when in the methodology a part should be considered small. Location of part: inaccessible area (in-flight fire threat) or in cabin (post-crash fire threat). What is the part constructed from? Material meets a flammability test – material is used in other means in the cabin –material does not meet a flammability test. Next steps: perform preliminary testing with small foam blocks at various vertical distances from each other to determine if they propagate flame from one small part to another. Rob explained the test set-up and showed video of the tests. We are working on a methodology/guidelines. Summary: determination of a small part requires more than just a size-based criteria. Please contact Rob Ochs to discuss this work/comment: Robert.Ochs@faa.gov.

Seat Heat Release Special Conditions MOC Update to Fire Test Working Group – D. Freeman

Dan explained the situation relating to this issue. Example: What is "traditional" and "exposed"? Seat design is unique and complex. Proposal: industry develop a common MOC proposal. This industry group

will meet afternoon of Thursday, March 4, and Friday, March 5, 2010. Goal: complete proposal and submit draft to regulators by March 31, 2010. And, Regulatory/industry session in mid-April 2010.

Update on Testing of Magnesium Alloy Components – T. Marker

Tim provided a background on the start of this testing program at the FAATC. The primary components are the cross tubes, spreaders, and legs are the seat components that lend themselves to magnesium use. A schematic of the test apparatus was presented. Photos of Baseline 1 configuration and test results. This test terminated at 3 minutes. Photos of Baseline 2 Test configuration and test results.

Mag-Alloy Full-Scale Testing: WE-43 (good-performing material) – Photo of WE-43 test configuration and test results. AZ-31 test configuration photos and test results photos. Summary of Full-Scale Testing and Next Steps- assembly of seats using WE-43 extrusions in back frame and baggage bar, comparison of all test results, study data, generate report. Lab test development? Tim discussed some items of consideration for test method development: thermal insult, test sample, and test parameters. All full-scale test results would help define an appropriate lab-scale test method or methods, which is the primary goal of the research. Peter Busch inquired about use of magnesium in areas other than seats. Tim explained that industry had the most interest in testing magnesium in seat structures first. Magnesium use in other aircraft structures will be looked into in the future. Dick suggested submitting an abstract to present at the Fire and Cabin Safety Conference in October.

SAE Aircraft Seat Committee: Magnesium Working Group – B. Gwynne

SAE International Aerospace Standard – AS8049 "performance standards for seats in civil rotorcraft, transport aircraft and general aviation" Paragraph 3.3.3: magnesium shall not be used. January 20, 2010: SAE- Magnesium Working Group Formed. White paper requested in form of Aerospace Information Report (AIR). The AIR to contain details of flammability testing and results, circulated to committee for comment and criticism. Questions for FAA: does TSO-C127 have to specify Paragraph 3.3.3? More expedient route to removing Magnesium prohibition. Is there a mechanism for changing TSO?

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

Objective: develop a lab-scale test to determine the propensity of non-traditional fuselage materials to propagate a flame or to sustain flaming combustion when subjected to a standardized hidden fire threat. Rob showed photos of the test frame. Materials in this test series: aerospace composites, non-aerospace composites. All panels were 1/8" thickness. Video of the aerospace composites and non-aerospace composites tested were shown. Test results were presented. Sample configuration: solid materials, laminates, and honeycomb sandwich panels. Does anyone have any of these materials for our test program? Intermediate scale testing has been performed for 2 different specimen-flame configurations. Composites Task Group meeting will take place afternoon of Tuesday, March 3, 2010. Contact Rob Ochs at Robert.Och@faa.gov with any comments/questions.

Composite Material Fire Fighting – J. Hode

External Fire Control Defined: extinguishment of the body of external fire: our question: will the composite skin continue to burn after the pool fire is extinguished, thereby requiring the fire service to need more extinguishing time.

Testing in Two Phases. Material Used: Air Force carbon fiber laminate composite. Test panels were weighed at 1 minute and 10 minutes. Longer exposures burn off more epoxy, and regularly caused release of fiber clusters due to severe damage to the exposed surface. Burner caused roughly circular hole in the center of the panel. Damage penetrated through first 4 plies. Jagged cut fiber ends from Test 15. Panel temperatures: exposures less than 10 minutes had maximum temps around 700 degrees F on average,

and occurred after burner removal. 10 minute exposures reached an average of 822 degrees F, normally prior to burner removal. Graphs of panel temps presented. Diagram of location of thermocouples initially and after being moved. Mechanical failures: test 4 panel photo shown, 7 tests suffered sudden mechanical failures, failures occurred in 30 seconds on average. Rear flashover: heavy smoke from the backside was sometimes ignited by the front side flame. This was clearly observed during the video review. Here, the ignition of backside off-gassing happened after the burner was turned off. Post-exposure flaming: some amount of flame continued after burner removal in every test. Post-exposure smoldering: during review of the video for the first 12 tests, areas of smoldering were observed. Color camera view after test 12 was tightened so that occurrences of smoldering could be seen more clearly. A fan was introduced into testing – a small floor fan was used to simulate airfield wind conditions. Re-ignition: noted in three tests, wind seemed to promote flaming and re-ignition in areas where the flow of oxygen is increased but protected from the wind. Other test configurations: measured temps in the vicinity of 1750^{o}F. As smoldering continued, plies could be seen to be dropping off. Moving forward: Phase II test plan currently being written. Agent application planned to be remotely controlled. Participation is welcome. Contact John Hode at John_Hode@sra.com.

NexGen Burner for Seat Cushion Fire Testing – R. Ochs

Background of reasoning for use of NexGen Burner for seat cushion fire testing. Specs of NexGen burner settings provided. Measured flame temperatures. Summary: the NexGen burner was able to achieve burner calibration according to the specs in Chapter 7 for seat cushion testing. Questions/comments contact Rob Ochs at Robert.Ochs@faa.gov or 609-485-4651.

Use of NexGen Burner for Firewall Tests – R. Hill

The oil burner is used for propulsion tests. Parts of oil burner are difficult to obtain. The FAA and EASA have decided to look into the use of the NexGen burner for propulsion tests. Dick listed the number of propulsion components that are tested using the oil burner. The FAA will coordinate with EASA on this work. A Task Group will be formed and will meet this afternoon to begin discussing this work.

Task Group Meetings – afternoon of March 3, 2010

THURSDAY, MARCH 4, 2010

Task Group Reports

Magnesium – T. Marker

NexGen for Powerplant – R. Hill

Engine Component fire test is part of the Systems WG. This will fall under the Systems work at the FAATC. We had some initial discussion including what the intent of the ISO committee is and some on the coordination between FAA Transport Directorate and EASA and where we are going with development and advisory material.

Composite Flammability Task Group – R. Ochs

Discussed panel configurations. Request for materials and design features information from industry. Contact Rob if you have any questions.

RTCA – P. Cahill

Pat will coordinate with Alan Thompson to ensure that those who attended the Task Group meeting receive a copy of the draft document.

Restraint of Leather Seat Cushions – J. Davis

Effect of Wires Baseline Tests of Fabric: 6 scenarios tested. Photos of test results. We are close to making a recommendation on "preferred method" based on consensus. This Task Group has set up a yahoo group. If you are interested in this topic, please join the group and vote.

OSU Checklist Task Group – M. Burns

11 members participated in the March 3, 2010, Task Group meeting. Mike ran through the checklist plan. The group's recommendation is that each section be as detailed as possible. A list of Task Group members will be available in the near future.

Standardization Task Group – S. Campbell

All needed data is outlined. Pom from C&D Zodiac has a sign up sheet for those that would like to be added to the Sharepoint. Plans are to have all of the proposals out by end of April 2010.

Summary of Ducting and Wiring Work – T. Marker for J. Reinhardt

Ducting Work: Tim provided the background of this research. The project objective and methodology were reviewed.
Tim ran through the Test Procedure. John has published the Test Method. It is available on the FAA Fire Safety website at www.fire.tc.faa.gov – Reports Section of website search by Author (John Reinhardt). Preliminary Conclusions from Round Robin – the average results of the labs matched the microscale calorimeter: 9 materials passed, 2 failed. ASTM E691- The practice describes the techniques for planning, conducting, analyzing, and treating results of an interlaboratory study.

Wiring Work: Objective, methodology, and product were reviewed as with the ducting work. Define Fire Threat: flaming foam block, 4 by 4 by 9 inch urethane foam block. A schematic of test configuration was presented. Description of Selected Test Method was reviewed with photos. The Execution Process was reviewed. 30-Degree Radiant Heat Panel Test Setup will be recommended as replacement to Chapter 4 of the Aircraft Materials Fire Test Handbook and CFR.
Additional Work: NFPA and ASTM recommended that testing should be done by bundling. In the past quarter, the FAATC decided to test wires in bundles. Photos of the test apparatus for bundled wires were shown. Results of the wire bundle tests were presented. Conclusions: wire bundling did not affect the results of the aviation-grade wires. Test Method: The preferred sample is the wire bundle. Jim Peterson: are these single tests or multiple tests with an average? Tim: I believe the wire bundle tests were single tests. Scott Campbell: Does it include the sleeve that goes over the bundle or just the wires? Tim: Just the wires. Dan Slaton: last meeting there was some discussion related to sleeving. Chris Bresciano: when the sleeve is adhered to the wire, then it is tested on the wire, and if the sleeve is loosely on the wire, it is tested separately. Dick Hill: The micorscale calorimeter does not correlate well with some of the data. Chris Bresciano: you may run into more wire breakages with the radiant panel the way it is set up now. Encourage participation from industry to use this machine and test and correlate the results. John Reinhardt has a Sharepoint on this group. Heiko Nuessel: Which radiant panel did he use? Pat Cahill: He used the electric radiant panel test apparatus. Dan Freeman: how does the test method relate to the threat? Will this test method be recommended for wires in inaccessible areas? Concerns about implementing a test method for a possible threat – raising the standard, adding cost of testing. Dan Slaton: The test scenario was for exposed wires.

Heat Flux Transducer Update – R. Hill/M. Burns

Dick provided a background and the problem with the heat flux transducers. Some time ago it was brought to our attention that there was a difference in the calibration between NIST and the transducers that came from manufacturers. The FAATC has been investigating this for the past year or so. Mike calibrated 20-30 transducers from various labs. FAATC sent 4 transducers to NIST to have them recalibrated. Mike will show the resulting data. Two transducers are Medtherm transducers and two are Vatell transducers. Mike described the results after receiving the 4 transducers back from NIST and had some problems with repeatability. Vatell Gages: both FAA and manufacturer calibration factors were about 5% lower than NIST. Medtherm Gages were about 2% higher. Mike explained all that he tried in the lab to get calibration correlation. He then ran a heat measurement study in the Radiant Heat Panel. He reviewed the results of the Radiant Panel heat measurement study. NIST and each of these companies use their own methodology. We have seen a difference in the readings when we put these gages into the various test apparatus we use (ie: an OSU has a little more convective heat than a radiant panel does), and this affects the gage. There are a couple options: a) specify the exact manufacturer or exact construction and exact way its calibrated, or, b) use a thermopile gage like a Schmidt-Boelter gauge. There is more of an affect from the convective heat on a guerdon gage than a thermopile gage. We have some Schmidt-Bolter gages on order, and we will continue the study with these. We found a number of additional problems that compound the problem when we began to investigate this situation. WG Member comment: RGF Corporation also manufactures a water cooled calorimeter. It is a thermopile device. Dick: to eliminate some of the problems: calibrate like transducer to like transducer. If you want to go further than that, then we have to go with standardizing a specific type of transducer. If you want to further than that, we should look at the Schmidt-Boelter that would take care of some of the convective heat issues. Dan Freeman: expressed concern with the implementation of a new step change in how the tests are run. Managing the implementation is going to be really important to industry. Dick: In the near future, we would like to start a Task Group to work on this once the Schmidt-Boelter gauge comparisons have been done at the FAATC. Hank Lutz: if you look into the calibrations that are done at Vatell, Medtherm, and NIST, they are all different. The NIST reports indicate a 7-10% difference in calibration depending on where transducer was calibrated. Dan Slaton suggested that the FAATC write up their proposals. Dick emphasized that each manufacturer should use a NIST calibrated transducer to calibrate their transducer and should calibrate a like transducer against a like transducer.

NexGen Burner Update – R. Ochs

Rob recently received a NexGen burner manufactured form the plans on the fire safety website (www.fire.tc.faa.gov). This is the first replica that the FAATC has seen. Photos of the components of this replica burner were presented. FAATC applied the new burner cone apparatus to their sonic burner system and conducted some comparison tests.

Flow Visualization Laboratory at FAATC – R. Ochs

Rob described the FAATC flow visualization lab, showed photos of the lab set-up, and reviewed the calibration objectives. Contact Rob Ochs if you have any questions or comments.

Flexible Ceramics – William Clarke

Copies of the Flexible Ceramics presentation were available to all attendees during the meeting.

Next Meeting

The next WG meeting will be held in Cologne, Germany, June 23-24, 2010.