INTERNATIONAL AIRCRAFT MATERIALS FIRE TEST WORKING GROUP MEETING

Hosted by Gulfstream Aerospace

March 4-5, 2014

TUESDAY, MARCH 4, 2014

Task Group Session on Revised Cargo Liner Test – T. Salter

Completion of 2013 NexGen sonic burner cargo liner round robin and final test results
Final settings for the NexGen sonic burner for use in the cargo liner test method
Background of 2012 and 2013 Cargo Liner Round Robins presented
Tim explained the slight modifications to sonic burner
Settings for flame retention head (FRH) were reviewed
Arrangement of ignition wires was reviewed
Schematic of set up inside the draft tube
2013 Round Robin: 7 labs participated including the FAA lab (materials used and sonic burner parts supplied were reviewed). Round Robin results were reviewed. Stator/Turbulator vs. FRH Results comparison. For the NexGen sonic burner in the future for cargo liner testing we will be using the Flame Retention Head, not the stator/turbulator. Question: Did you have the labs record the ambient temp and humidity? Salter: some labs did record this, but it was not required. Nixon: type of fuel factoring in? Salter: we've noticed a bit of a difference using diesel. We did require that labs report the type of fuel they were using. We are taking all these things into account. We will be making recommendations based on the information from the labs. Question: determination of burnthrough vs. a glow? Salter: as far as burnthrough when a flame actually penetrates through the material, that is burnthrough. We had hoped to produce a video to demonstrate the burnthrough. Question: are we done with this, Tim? Salter: Yes, the FRH will be used. I don't think there will be any more changes. Danker: will the FRH be the same for other tests? Salter: They will be used for the seat and cargo liner tests. The only difference is that one is vertical and one is horizontal. Busch: will there be a statement from the authority that the new sonic burner will be equivalent to the old burner? Hill: We will include it in the Handbook for cargo and seats. The Handbook we now have. Busch: Is it equivalent to the old one or not? Hill: The Handbook is equivalent to the Rule – there is an FAA Policy Letter that states this. Jensen: has comparison testing with Park burner been done against this test set up? Salter: we did testing with the Park when I first started working in FAA Fire Safety. We collected a lot of data and then installed the NexGen burner and ran the tests and collected a lot of data. We have quite a bit of data regarding the performance of our Park burner. Hill: If you are running the Park oil burner with cargo liners, the spread is larger. Your numbers may change a bit if you use the sonic burner. We are not saying you have to use the sonic burner. You can keep using the Park burner. Jensen: Do you have an actual comparison slide showing the comparison of the two burners? Salter: I do have that data and can put something together and send it to you if you want it. Busch: Do you have experience with the heat flux with the NexGen burner? Salter: We did not measure the heat flux with the NexGen burner, because I knew we were not going to use that with the NexGen burner. Hill; What you will see in a lot of these tests, is an effort to get away from measuring heat flux, because the heat flux measurement is so variable. Salter: we changed the thermocouples to 1/8" thermocouples. Slaton: on the retention head, do you have a part number? Salter: Yes, we have a part number. It is a readily available part, about $7. Slaton: Tolerance – have you done any testing to validate the tolerances you presented? Salter: Yes, I have a slide that was not presented for

the sake of time. Slaton: I think there is still some concern about the variation from lab to lab; some of those backside temps are still variable from lab to lab. We are going to have to do some oil burner/sonic burner comparisons for our own sake at lab level.

Test Plan for Proposed Cargo Liner Advisory Circular Material – T. Salter

The proposed guidance submitted by the Cargo Liner AC Task Group is currently under review by the FAA.
Items to be tested: Backside burning, fastener pitch, NexGen burner calibration, exhaust flow. Tim described the planned work for each of these items. Slaton: Calibration temps: maybe set some guidelines instead of hard requirements. Salter: we don't want to set any calibration temps so that people cannot achieve them. They will be used to determine if there is a problem with your burner as a check for your burner. Jensen: Is the TG meeting this afternoon going to discuss this test plan? Salter: Yes. Busch: Is there a thought to change the thermocouples being used? Salter: You mean the number of thermocouples being used? Busch: Yes Salter: Yes. This is something that we are going to be getting into immediately following the meeting. Question: Are you looking at the fanning affect of the flame or the oxygen getting to the flame? Salter: We are going to be looking at all aspects. We have not done any testing yet. We may do comparative testing from one of our chambers to the other.

Development of a New Flammability Test for Magnesium-Alloy Seat Structure – R. Ochs for T. Marker

An additional 115 tests have been conducted since the last Materials WG meeting (June 2013). Round Robin II Using EL43 Samples – results graph was presented. Statistical results for RR I & II were presented. Refinement of burner flame for increased repeatability: use of stator/turbulator (baseline), use of FRH, use of modified "Dutton" FRH (modified by M. Dutton – technician), and igniterless stator testing. Results of tests using all of these were presented. Planned activities and next steps were reviewed. Two reports have been published: previous report: www.fire.tc.faa.gov/pdf/ar11-13.pdf, and there is also a newer report.

Magnesium Usage in Aircraft Cabins – Certification – Bruce Gwynne

SAE AS8049 – Aircraft Seat Standard Paragraph 3.3.3 – came up for regular 5 year review in January 2010. AIR6160 issue Q1, 2014 – technical backup for AS8049 change. We were waiting for some of the FAA reports to be published. AIR6160 28 day ballot results 17 of 22 voting members responded, all approved. There were some informational and editing changes, but not technical changes. AS8049 Paragraph 3.3.3 reworded to allow magnesium alloys in aircraft seat construction. Bruce reviewed the Paragraph 3.3.3 re-wording. Exact Paragraph 3.3.3 is included in the slides of this presentation available on the FAA Fire Safety website. Jensen: What about lithium alloys and other metal alloys and composites? Hill: we have looked at lithium metal alloys for skins and other alloys. If someone proposed to use lithium metal alloys inside the aircraft, we would look at that. We will address composite structures. Tim is looking into how it can be certified: a number of concepts were presented. Damping thermocouples using stainless steel cubes: graph of temperature. Damping thermocouples using copper cylinders: graph of temperature. Thermocouple degradation: objective is to reduce temperature fluctuations, to minimize thermal shock and extend life (accuracy) of thermocouples. Possible solutions to thermocouple accuracy issue were reviewed. This is a discussion for the Task Group.

Development of In-Flight Flammability Test for Composite Structure – R. Ochs

Objective: design, construct, and evaluate a new flame propagation test method. Foam block tests were conducted. Microscale Cone Calorimeter (MCC) and Cone Calorimeter Study results were presented. Test Method Summary was reviewed. A draft test method procedure has been prepared to send to the participating labs. Pass/fail criteria was developed for each material.

Development of Flammability Tests for Ducting and Wiring – R. Ochs

Composite rig apparatus to test ducts and wiring. Rob reviewed how the test would apply to ducting materials and wiring. He conducted a wire insulation study on composite rig. Ducts: more duct materials would be appreciated. Wire: more materials would be appreciated. Glamoclija: We did an extensive study of aircraft wires using the radiant panel test, and it was presented in Singapore in 2012 – where are we with this database? Ochs: I do not know about the approved materials regarding AC 43-13. We want to reduce the amount of testing. We may do a standard gauge. Hill: There are reports that should be issued within the next 3-6 months on the lint and dust study of thermal acoustic insulation. These studies were funded by Transport Canada (TCCA). Glamoclija: I propose incorporating the TCCA study presented in Manchester in June 2013, into the Handbook or the new version of the Handbook. Hill: The one thing that we are missing here that we want to put forward; one of the things we got some kickback on was the complexity of sliding items into the radiant panel apparatus, so it was suggested that we use the composite test rig. We will be looking at the results from the radiant panel, and they will hopefully line up with the results we get for those materials on the composite rig. There may be ways of coming up with an approved list of wiring. There is a lot to be included. We are not throwing out what was done previously with the radiant panel. Nixon: I am assuming these three test units are similar. Ochs: Yes. Question: do you think this test is going to be adapted to thermoplastics as well? Ochs: we will have to look into it. We said it is going to be used for materials that are extensively used. Hill: You can always run the OSU on it. Buoniconti: you are going to run into issues with different gauges of plastics. Hill: you could modify it slightly with a little tray, like in the NBS chamber. Bresciano: it looks like we are trying to get one test to fit a lot of different materials. I want to make sure we are keeping this in mind – I'd rather have a separate test for wiring than a more complex test than we need. To me, it's more of a narrow band of materials. Slaton: we could talk about what other materials can be tested in this apparatus in the TG meeting. Glamoclija: You really need clear guidelines on how to proceed in the future. Jensen: On the composite structure test, I noticed the testing tends to be rather straightforward as far as the material, which doesn't really represent structure on aircraft. I worry that the testing we are doing is single layer. Have you looked at trying this test with more true to life constructions. Ochs: Not yet, because we don't have access to those actual constructions.

2013/2014 OSU Round Robin Update – Y. Agyei (Boeing)

This Round Robin: 26 participating labs (31 participating units) worldwide. Testing is per the Handbook. Test procedure provided to participating labs to follow (for more control). Project Background: 2012 FAA Round Robin: general round robin conducted every 2-3 years, 36 heat release units, collected machine parameters, units operated based on lab's normal practices. March 2013: analysis of results presented by Boeing (March 2013 Materials meeting). June 2013: Boeing proposed a more controlled round robin (set up, calibration, testing, analysis). Purpose: pinpoint major sources of variability.

Conducting Round Robin:
Phase 1: set units in similar condition
Phase 2: set up and testing
Raw data and analysis by Boeing
Phase 1: Pressure Measurements – most important part
Phase 2: Operating Parameters & Testing
Next Steps/Future Updates: there is still time to join this RR project. Phase 1 benefits: more unit leak awareness. Participants to complete Phase 2 by June 2014 – need results by end of May 2014, so Boeing can do analysis.

Radiant Panel Task Group – M. Burns

Tomorrow morning there will be Radiant Panel Task Group meeting. I am now covering the Radiant Panel test, since Pat Cahill has retired.

RTCA – R. Hill

Dick briefly described the work previously done by the Materials WG at the request of the RTCA. The RTCA group has asked if the Working Group would like to re-address the previous work. Sometime before the end of this meeting, we would like to get a show of interest in forming a Task Group to get back to address "can there be a test developed to test black boxes without testing all the individual components in the box".

Refinement of the Radiant Panel Test for Evacuation Slide Materials – R. Ochs (for D. Do)

Round Robin 3 Results: A Task Group meeting was held in December 2013 where these results were discussed. Rob also presented the results at this Materials meeting. Future Work: Comparison testing among labs will be performed using the new test method. Slaton: Is this heater the same one in the NBS? Has he thought about voltage control? Ochs: Dick Hill has thought about it and will pass the message along to Do when we get back to FAATC.

OSU & HR2 Updates – M. Burns

Wet Test Meter Calibration Facilities – Mike provided a list of facilities that calibrate wet test meters (see Presentation for the list and contact details).
OSU Negative Heat Release Rates: all negative values should be zero (0).
HR2: Upper Pilot Burner Alternatives: Upper Pilot Burner typically makes up approximately 30% of baseline mV Signal. FR off-gassing products can have a tremendous impact on pilot burner stability. Alternatives included: pilot burner relocation; hot surface ignition (HSI); hybrid (standard burner with HSI).
Upper Pilot Burner/HSI Summary:
Repositioned burner made no improvements
HSI:
Large power requirement needed to maintain equal heat output of current burner (2000 watt)
Trend: increased HSI Wattage = increase PHR/THR; decrease THP
Future Work: continue OSU Round Robin support; upper pilot burner alternatives (TG discussion); conduct testing using multiple HR2s – repeatability/reproducibility

Seat Cushion Oil Burner Round Robin Update – T. Salter

Tim gave background on this work. Flame Retention Head (FRH) produces a more complete flame overall. Test materials: all participating labs will be provided with the cushions needed for testing (3 different foam cushion types, 3 cushion sets of each cushion type will be provided). FAA Initial Test Results Using the FRH with the NexGen Burner were shown. Tim gave an update on the current RR – this RR is currently in progress – only 5 labs have returned results so far – all labs have been asked to return results prior to the June 2014 Materials meeting. Question: did you have covers on your test articles? Salter: Yes, the exact same material from the same batch of a material that was known to pass. Jeff Smith: have you been looking at the size of the test chambers? Salter: yes, we have been asking for labs to send us photos of their test chambers to determine if differences are caused by ventilation, size of chamber, airflow, heat radiating off of the chamber walls, etc.

Restraining Leather Cushions for the Seat Oil Burner Test – T. Salter

Typical fabric covered seat cushions burn away but do not deform when tested whereas leather cushions will tend to shrink and pull away from the burner flame. Photos of various methods of restraining leather cushions (photos taken from previous presentations). Different methods of restraint among test labs can lead to disparities in test results and be the difference between a specimen that passes and a specimen that fails the test. Three main things to consider: configuration, quantity of restraints, restraint materials (steel rod, hook and loop, safety wire, etc.). Standardized Restraint Configuration: Tim looked into this a year or so ago. Restraint Materials: various options looked into. Ethel Dawson (Accufleet) suggested using the clip-on SS rod – it can save time and money if it can be demonstrated to be an effective method of restraint (a photo was shown – see Powerpoint presentation). Interlab Study: a mini round robin is currently underway to test the effectiveness of the new configuration, as well as compare the performance of SS rod compared to 0.032” steel wire. The FAATC and Accufleet are conducting the mini round robin. The test specimens being used are fire-hardened foam cushions. Accufleet has completed testing of the leather cushions. The FAATC will begin the testing after the March 2014 Materials meeting. The final results and standardized restraint method will be presented at the June 2014 Materials meeting. Question: does the welding rod clip around the frame or just the cushion? Salter: Both, almost like a clothespin.

E-leather Task Group Formation – R. Hill

At the Triennial conference there was a bit of a mix up. FAATC had been approached by a group to find out if there was something that could be done to minimize the number of tests required for e-leather. FAATC suggested that industry get a group together and form a Task Group. If there is interest in industry to have a TG to produce data that would be used to request minimizing the certification testing. This would be an industry-lead TG, not lead by the FAA. This is certification testing. This would be for the seat covering e-leather.

Seat AC – R. Hill

Last year we got people’s interest peaked. We talked with people about this at the Triennial Conference last December. Agreement that now is the time to start working on this. We are looking to finalize what we need for the Seat AC. The TG will talk about what we need for this AC. The TG will meet this afternoon.

Approved Materials Task Group – S. Campbell

ICCAIA made a request that the FAA create an industry task group to formulate a process to develop an approved materials list. Scott reviewed the ideas brought up during the initial TG Session held during the week of the Triennial Conference in December 2013. Scott's presentation includes the concepts discussed during the initial session.

Status of Flame Retardants – S. Risotto (North American Flame Retardant Alliance –NAFRA)

Steve reviewed NAFRA purpose. DecaBDE – U.S.: new use restrictions announced in April 2012. This would apply to any use after December 31, 2013. The timing is uncertain for transportation applications. EPA Design for the Environment: DecaDBE alternatives assessment – released January 2014. Looks at 29 potential alternatives in 5 classes: halogenated, polymeric and brominated, phosphorus & nitrogen, polymeric P&N, inorganic (900 page document). Nixon: Where is the best place to follow the activity of the EPA's 29 possibilities and the BPE? Risotto: The EPA's DFE or send me an email, and I'll give you some details on where to follow it.

FAA Initiatives in Flame Retardant Replacements – R. Hill (for R. Lyon)

Advanced Fire Research F&CS-14-08-2

Is there a way of reducing the burden of showing compliance for say 500 parts/pieces in the aircraft when you have changed the fire retardant or in the case of FR on a film glued to a panel with a different FR in it and a resin with a different FR in it? Is there a way industry could work with Dr. Rich Lyon (FAA TC Fire Safety Advanced Materials Research Team) and the equipment he has in his lab to minimize the number of certification tests to be performed? Is there a way FAATC can use some of its expertise to work with industry to develop the criteria so the materials with FR changes do not need to be recertified.

Demostrate mg-scale test to measure effectiveness of halogen flame retardant replacements. Demonstrate similarity of cabin materials with substitute flame retardants.

Task Group Meetings I:

Magnesium Alloy – B. Gwynne
Composite In-Flight Flammability – R. Ochs
OSU – M. Burns
Seats: Round Robin/AC, etc. – R. Hill
Material List – S. Campbell

Task Group II:

Magnesium Alloy – B. Gwynne
HR2 – M. Burns
Wiring/Ducting – R. Ochs
Cargo Liner Advisory Material
Fire Retardants –

WEDNESDAY, MARCH 5, 2014

Task Group Meetings III:

Radiant Panel
Seats (if necessary)
Material List (if needed)
RTCA DO-160 Task Group
Any Task Groups needing additional time will meet.

Task Group Meetings IV:

Cargo Liner (if needed)
Heat Flux – M. Burns
Any Task Groups needing additional time will meet.

Task Group Reports

Magnesium Alloy – B. Gwynne

Where does heat release and OSU testing get involved with this? We need a little bit of clarification on this. Where else in the cabin can we use magnesium – (galleys, lavatories, but there has to be other areas)? These are things we can look at and talk about. If we did go into other areas, how would be test for them? Hill: As far as I know, there are no requirements for OSU testing other than large surface panels in the aircraft.

OSU – M. Burns

Yaw provided some data that the TG reviewed. He will email the data to TG members. We also discussed what a future measurement may include. We discussed including data acquisition frequency in the test plan. We talked about the hybrid burner and potential impacts to currently certified data.

HR2 – M. Burns

We are going to eliminate looking at hot surface ignition. There's a consensus that we all liked the hybrid burner with the rod in place – we need some more testing. One idea was to have a thermocouple attached to that rod. There was some discussion on the 80 percent rule.

Composites & Wiring/Ducting Task Groups– R. Ochs

Rob sent everyone an email with the Minutes from the TG meeting. This is a draft, so members can comment on it. We discussed afterflame a little bit. The afterflame is an issue for some labs. We discussed the effect of the radiant heat alone on the test sample. We discussed the need to clearly write the test procedure for those who have not been involved in this TG. We need to include steps in our procedure for checking the voltage regularly. We have noticed day-to-day and building-to-building fluctuations in power supply. We discussed what Rich mentioned during our group meeting at the Triennial conference in December 2013 – he will do some correlation work for us. He may have some results by the next WG meeting to share. Wires: we had a lot of good feedback on previous tests done by Pat and John Reinhardt.

Leather Seat Testing – T. Salter

Restraining leather seats – this is something that will be written into the AC and new rule. In the meantime, continue to use the method that is written up in the current Handbook. We will work with Accufleet to develop the method. We will also look into thickness, color, texture for similarity guidance and may speak to the leather manufacturers regarding quality control and process used to prepare leather.

Seat AC – T. Salter

The seat test is not going to change much in the AC. The test method will be a little bit different using the sonic burner instead of the Park burner. Small parts testing will be defined in the new rule. There will be two different definitions for cushions (headrests/footrests/etc.). There has been an increase in the use of leather in seats. Any AC material to be considered for inclusion in the AC should be sent to Tim Salter as soon as possible prior to the June 2014 meeting.

Cargo Liner – T. Salter

We are currently working on the AC for the cargo liner. The current AC does not have enough information on sandwich panels. The current AC is already in the regulatory process, so we will consider adding to current AC. Industry was asked to provide hardware they think is appropriate. We will be looking at backside burning, time of burn, and temps and if burning occurs on one side or the other. We may need to look into other types of materials used in cargo area. Sonic burner calibration was discussed – some work will be done on this. It was suggested that while we are doing our AC work, that we look into ambient temp and humidity and how they affect the burning of the sample itself. We will look into size of test chamber and airflow in test chamber and how they affect test results.

Fire Retardants – R. Hill

Focus: What can FAATC chemistry lab and advanced research group (Dr. Rich Lyon) do to assist in the work being done to minimize the testing required when the fire retardant is changed? Decision: Dan Slaton will be the focal on this, and other TG members will get their input to him on what this task should or could be. Dan will provide information from group to Dr. Lyon and coordinate with him. Slaton: I will gather any inputs on case studies (generic case studies, etc.), as a place to start as to how we would look at evaluating that material. Anyone who has any ideas can send them to me.

Radiant Panel – M. Burns

We talked about the measurement of heat flux at the three positions and what range that should be. We will work on this and provide it in the supplemental section. Randy Smith had quite a few comments on the AC which will be distributed to the TG for review. Mike Burns pulled items that were more supplemental out of the test method to put into a Supplement Section. There will also be an Appendix. There was a request within the group to add some tolerance criteria within the test method. The TG will work on this. We discussed if we should include a Schmidt bolder gauge – it was agreed that we should. Appendix Section: mention that we should add a manufacturer's part number for the superwool. Next year it looks like we will have a RR again –

we will try to go every 2 years for RRs. TG will look into paint coating and alternative paints. There is variability from burner to heat flux gauge – drawing needs to show this better.

RTCA DO-160 Task Group – R. Hill

The word has come back that the RTCA cannot start the revision for at least a year from now, and it usually takes up to three years once they start to get the revision completed. The TG consensus is to get this work done sooner rather than later to get it into the revision. We discussed level of interest. The participants will be sent a copy of the participants list. Electronic components that go into the boxes were discussed – some airframe manufacturers have developed methodology to minimize the number of tests. The need for a containment test for electronic components in the boxes was also discussed. Classifications of boxes may be considered. Group members will talk with their companies and see if they can provide data to minimize testing or contribute rationale. The Task Group was asked to review the work that has already been done – look at presentations from previous Triennial conferences (2007 & 2010 – circuit boards/panels presentations). FAATC will find this information and have it available for the next TG meeting. Campbell: Did you talk about boxes that may have vents but maybe there's a baffle plate in front of the vent? Hill: no, we didn't talk about the specific types of boxes. We used this as an organizational meeting. ACTION: Dick Hill will find out who the FAA's Designated Federal Official is assigned to this. There was some discussion of other ACs and other RTCA documents that cover other components or electronic boxes. We decided to hold off on looking at this material right away and focus on reviewing the RTCA DO-160 document to start.

Heat Flux – M. Burns

RR roughly laid out to prove out the repeatability/reproducibility within 2 percent – this is phase 1. We may include how these calibrations impact set points on certain equipment. Currently, the FAATC will be involved, Martin Spencer will be involved, and Boeing will see if they have a machine available to participate, and Mike will contact heat flux transducer manufacturers to see if they want to be involved.

Material List – S. Campbell

A small subgroup will develop a process, write a spec, and flush out a straw man that can be discussed at the June 2014 meeting. We will first look at monolithic materials. A few folks will look into if it will save time/money or both. We also looked into development of a list. We went through the UL process and how we would develop a process that would be acceptable to the FAA, what would our spec require for QA aspects are covered, and what happens if there is a failure on continued compliance.

Additional Discussion

Glamoclija: lint and dust information – will it be incorporated into an AC? Hill: The lint and dust report will be published as an FAA report. There have been a number of interim reports, and all this information will be incorporated into one FAA report. The report will be given to the FAA regulatory side – we cannot guarantee what they will do with it.

Maintenance Video

Dick showed the CAA/FAA produced airline maintenance personnel video to create awareness of fire consequences when proper procedures are not followed. If you would like a copy of this video, please contact April for a copy. It is used by the FAA for their DERs and electrical engineers in their EWIS training. Please contact April at april.ctr.horner@faa.gov if you would like a copy of this video.

Next Meeting:

The next meeting will be hosted by Lantal in Solothurn, Switzerland, June 25-26, 2014. Please be sure to go to **http://www.lantal.ch/faa** to request your hotel reservation and register for group activities. The hotel reservation deadline via this link is May 15, 2014.