

INTERNATIONAL AIRCRAFT MATERIALS FIRE TEST WORKING GROUP MEETING

JUNE 22-23, 2011

Hosted by Airbus, Bremen, Germany

WEDNESDAY, JUNE 22, 2011

FAA Coordination with ARAC – R. Hill

The FAA has tasked an Aviation Rulemaking Advisory Committee (ARAC) with members from the FAA, other authorities, and industry to look at 25.853 and other associated materials flammability requirements rules to simplify where possible and review all that has been added on over the years and coordinate and simplify these standards. The Task Groups of this Working Group have been asked to review the current test methods (some have been modified per the Handbook), consider any problems with current test methods that can be modified, ensure the test methods are more repeatable and reproducible, and compile simplified versions of the test methods and submit them to the ARAC.

The ARAC is established to advise the FAA on how to maintain the same level of safety or improve it this includes looking at the special conditions such as those on seats and tests for the newer composite fuselage aircraft. The ARAC was asked to consider all issues related the 25.853 required materials tests and the perceived threats they represent, do they represent all possible threats. Other issues such as testing of rogue samples will be reviewed by the ARAC. The ARAC will submit its recommendations to the FAA. The ARAC can also recommend new requirements (i.e.: inaccessible areas).

Cargo Liner Oil Burner Test – T. Marker (FAATC)

Review of possible New Appendix F Structure presented at a previous Materials Working Group meeting. Proposed use of new sonic burner to replace Park oil burner. Tim reviewed the proposed revised cargo liner test method coordinated through the Cargo Liner Task Group. These revisions have been uploaded to the Task Group KSN site for review and comment by Task Group members. Summary: generated calibration temperature results with FAATC Park burner apparatus, results will be used to calibrate sonic burner apparatus, additional calibration trials using 1/8 inch thermocouples will be conducted. Generated test results with FAATC Park burner apparatus. Baseline results of Park burner tests were presented for materials tested. Tim reviewed the planned activities including conducting tests using NexGen burner with materials previously tested with Park burner and development of advisory material for cargo design features and possible ARAC recommendation. Conduct Round Robin.

Magnesium Alloy Testing – T. Marker

Summary of Program on Magnesium Alloy Flammability: Full-Scale Testing of Mag-Alloy Seats to determine postcrash fire threats: baseline tests, WE-43 and AZ-31 tests, and two all-mag tests. Full-scale seat set-up: 3 rows, single aisle. Development of a lab-scale test for mag-alloy seat structure: test results of cone-shaped test samples. Review of possible Appendix F outline for mag-alloy seat structure tests. Review of possible methodology for

testing flammability of magnesium alloy. We are looking to simplify this test method. Considering a cone shaped test sample for lab-scale test. Testing has revealed 2 key elements: ease of ignition, duration of burning once ignited (will materials self-extinguish?). Results of preliminary test results (8 test samples) were presented. Truncated cone: problems encountered during preliminary tests: 1. Upper portion of cone sometimes falls off, away from bulk of sample; 2. Thinner cone could decrease the likelihood of upper portion falling away. Review of other possible sample cone shapes. We did some experimentation with exposure. Planned activities for summer 2011: continue testing of various magnesium alloys and how do they react compared to WE-43 and AZ-31, continue fine-tuning of test parameters (sample size, distance, exposure time), continue to update sonic burner with set-up parameters obtained from seat burner tests. M. Agnlin: what about mag-alloys painted with a decorative finish? What about ignition requirements? T. Marker: this test is representative of a postcrash fire threat, so the mag-alloy material seat structure will have to be tested as it will be installed in the aircraft. P. Busch: at the end of your test campaign will there be advisory material on material ranking? T. Marker: We would prepare a report, and FAA regulatory will take it into consideration. Approximate time frame is 9 months or so from now.

Burnthrough and NexGen Burner Update – R. Ochs (FAATC)

Review of background of NexGen burner development. Review of design of NexGen burner. Review of results of JP-8 vs. Jet-A comparison. These two fuels can be considered equivalent for burnthrough testing purposes. R. Hill: the flashpoint was in the range of flashpoints of Jet-A fuel. This was the Jet-A fuel that we had available at the FAA Technical Center. The specifications for these particular types of fuel are very broad. This was a comparison of the two fuels that we had available to us at the time of the comparison tests.

New sonic chokes: from Flow Systems, Inc. Results: sonic chokes from different manufacturers with the same throat diameter at the same inlet pressure produce similar burnthrough results. Backside of heat flux: investigating the effect of securing the samples to the test rig. Spray Nozzles: discussed with a spray industry expert/representative: industry standard on flow rate is about +/- 10%, typical nozzles are produced by the thousands, to get a specifically produced nozzle would be very costly. Review of results from previous spray nozzle study. The results of the Everloy nozzles were presented. What's next?: CNC stator and turbulator: 3D CAD drawings of the stator have been made at FAATC and by Marlin Engineering, CNC parts have been made from both drawings, CAD files will be on FAA Fire Safety website. Task Group Update: a draft test method was uploaded to the Task Group KSN site.

Development of a Flame Propagation Test Method for Structural Composite Materials in Inaccessible Areas – R. Ochs (FAATC)

Objective: develop a standardized lab-scale test to determine the flame propagation resistance of structural composite materials. Intermediate Scale Test Rig: plans for this rig are on the KSN site and are also available as part of this presentation that will be available on the FAA Fire Safety website. Baseline test results were presented. Radiant Panel Test Series #1: R&D panel at FAATC Bldg. 217, radiant panel set to 1.5 BTU²s at "zero position". The results were presented. Test Series #2: different configuration. A

short video of each of these test configurations was shown. A draft Technical Note was submitted to our FAA sponsor, and it has been through the editing process. Radiant panel test series #3 and #4: at the request of the Task Group, other configurations were investigated. Video of radiant panel moved to 15 degrees. Video of Radiant Panel at 30 degrees and sample at 10 degrees. Neither of these configurations propagated in the right direction. We will be conducting a Round Robin in the near future. A. Carlo: since this type of materials and others like them don't change very often, why don't we just run a foam block test? R. Hill: what foam block test? I haven't seen anyone standardize a foam block test. It is much easier to standardize the radiant panel test than a foam block. No one has used the exact same pass/fail with a foam block test. We have learned over the years from some of the other test methods regarding repeatability and reproducibility.

Heat Flux Calibration Task Group – M. Spencer (for M. Burns)

Draft – Aviation Heat Flux Calibration

New section added to Introduction

Minor definitions changes

Calorimeter specification to include Schmidt-Boelter Type Gauges (thermopile)

Better defined coating parameters

Calibration interim remained unchanged

Added a Section on Laboratory Environmental Conditions surrounding the calibration apparatus

Added a requirement to measure impedance of heat flux gauges before and after calibration

Redefined the requirement/analysis section to include successive calibration factor criteria

Added a required reporting parameter section

The reorganized structure of the document was presented. Original transition target date has been delayed. Vatell has shipped a HFG to NIST (01/11) and is awaiting its return. The Working Group will be notified once more information is available. What's Next? Addition of Supplemental Section? Paint application recommendations, mounting and aligning HFG's, radiant heat source. Continue to look at Schmidt-Boelter type gauges. Install gauges into OSU & NBS. There will be a Task Group meeting this afternoon.

HRR² Development – M. Spencer (for M. Burns)

Review of the work done and being done by each Sub-Task Group was given. HRR2 Prototype development plan timeline: the goal of this plan is to eliminate or reduce a major portion of variables that may have an impact on data produced in the Heat Release Rate test apparatus. The Task Group is focused on how to update the heat release tester (HRR2) with the latest technologies as well as standardizing and improving the test method itself.

Aircraft Wiring – P. Cahill (FAATC)

Round Robin: Results of the first Round Robin were given out to the participants that attended the last meeting in Savannah. We did not discuss the data because only a few participants attended the Savannah meeting. Pat reviewed the samples tested in the Round Robin. The Round Robin results were presented. The use of sleeves and shrink tubing came up during the Task Group meeting discussion in Savannah. The results of the two sleeves and shrink tubing materials were presented. The 2nd Round Robin is being planned. Tech Center work: we are currently evaluating larger AWG wires in the ½ inch bundle to see if we get the same data as a 20 AWG bundle (burn length and after flame). If successful, we will save wire and time in bundle preparation.

Aircraft Ducting – P. Cahill (FAATC)

Pat showed photographs of ducting materials that have been tested in the radiant panel. The majority of these samples passed. More cooperation is needed from the Task Group members: Round Robins, individual labs. M. Jensen: have you tested any of the silicone reinforced ducts? P. Cahill: No. M. Jensen: Boeing uses quite a bit of it. P. Cahill: I will get some of it to test. P. Busch: was there discussion within the FAA regarding the proposal I made at the last meeting? R. Hill: We discussed it. The problem is that most of the materials need the radiant heat to represent the larger fire to see how they will perform. Pat stressed that Task Group member participation is crucial.

Slide Evacuation Test Method – P. Cahill (for D. Do)

The Round Robin is currently underway. The data from the Round Robin will be presented during the fall 2011 meeting. Do is currently conducting a furnace study. The furnace study conducted tested three coils run with three different slide materials. The results of this study were presented. FAATC is recommending that each test be evaluated individually instead of an average of three samples. A. Carlo: I think going away from an average is going in the wrong direction. P. Cahill: the folks in the Task Group agree with this. There is one slide manufacturer not participating in the Round Robin. J. Peterson: not using the average is very dangerous. P. Cahill: I will pass this on to Do. I will let him know that the overall sentiment from the Working Group as a whole is the average is better.

RTCA Update – P. Cahill (FAATC)

AC21-16F identifies RTCA Doc No 160F. Focus on current industry accepted method, FAR Part 25 (Fire Test Handbook).

DO-160 Revision G: There are no recent updates. The document is still under review and awaiting approval.

They are looking at testing the whole box. J. Peterson: who is the approval authority for this Revision? P. Cahill: I do not know. R. Hill: RTCA is similar to an SAE committee. J. Peterson: do you have a copy of the draft Revision G that you can share? P. Cahill: yes, I will send it to you when I get back to the office.

Bunsen Burner Test – R. Hill (FAATC)

Two tasks: 1) Airbus was going to look at a better way of determining burn length of some materials (Airbus posted information on translucent materials on the Bunsen Burner Task Group KSN site). 2) Pat Cahill will look into a better definition of flame height.

Seat Cushion Test Method Update – R. Hill/R. Ochs (for T. Salter)

2.0 gph NexGen Burner Set-Up: investigation of stator positioning, axial location, configuration (muffler and 90 degree elbow – the burner was fitted with a 90 degree elbow at the rear of the draft tube to reduce the space needed to run the device. This seemed to have an impact on the operation of the burner, and resulted in reduced TC temperatures, and erratic results. The muffler on the burner was repositioned in between the elbow and the draft tube. The muffler acts to smooth out the flow which was being disrupted by the 90 degree elbow).

Muffler and Elbow Configuration: move the muffler per sketch on Page 5 of this presentation. Fuel Nozzle Adjustment: flame temperature profile can further be refined by clocking fuel nozzle. A non-uniform spray pattern can require nozzle adjustment to achieve a more uniform temperature profile. This setting would not necessarily be the same for each burner since each fuel nozzle may have slight variations in fuel spray pattern. Testing has shown even small changes (~5 degrees) can have an effect on the flame temperature profile. Fuel Nozzle Flow Test Rig: fuel is pressurized to 100 psi, and fuel is collected for one minute then stopped. Fuel Nozzle Flow Rate Delevan vs. Monarch Nozzle. The Everloy nozzles will be tested next. The results of the Delevan Nozzle Flow Rate tests were presented. Graphs of the Monarch and Delevan Nozzle Clocking Tests were presented. Summary: Monarch nozzles are not uniform around the spray cone periphery.

Ceramic Fiberboard Seat Cushion: to reduce costs, FAATC has developed a ceramic fiberboard seat test with embedded thermocouples.

Summary: back end of burner (muffler, sonic choke, etc) configuration has an impact on test results for the seat cushion test. New fuel nozzles have been obtained and flow checked - results are more consistent than original.

H. Nuessel: What is the time line? We previously discussed starting a Round Robin in the 2nd half of the year. R. Hill: we want to make sure we get the burner set the way it should be before we initiate a Round Robin. We have the quantity of materials needed to run a Round Robin.

M. Spencer: are we 6 months away from using the NexGen burner for certification tests?

R. Hill: You have to convince the authority that you are just replacing the Park oil burner with the sonic burner. P. Busch: will there be a test method (a standard material) available to compare the burners without testing the seat cushions? R. Hill: It's a good idea, but it's something that will have to be investigated later on once all the details are worked out with the test.

General Radiant Panel Information: Airbus has posted a General Radiant Panel Test Method on the KSN website. FAATC has also written a General Test Method which will be posted to the KSN site sometime in the next month or so. Thermal Acoustical Insulation: During the Savannah meeting there was a question about using smaller sample sizes. FAATC decided tape/film samples would be the most critical based on their experience. During the last two months, we have tested hundreds of 12-inch and 15-inch tape/film samples. This testing has shown that the 15-inch sample is acceptable and the 12-inch sample is too small. The results of these tests were presented. D. Slaton: can you

describe again what the data was trying to do? P. Cahill: There is other data to show that the 15-inch samples are acceptable and 12-inch samples are too small. The data I am showing here is only the peek data. Round Robin: We will be sending samples out to five independent labs next week. Samples consist of metalized PEEK film and metalized PEEK tape. A broader Round Robin that will include all labs is scheduled for later this summer.

Task Group Meetings:

- Session 1: Cargo Liner
Burnthrough Test
Ducting
Bunsen Burner Test
Radiant Panel for Insulation (if time permits)
- Session 2: Magnesium Seat Frame Flammability Test
Composite In-Flight Flammability Test
OSU Test
Wiring Flammability
Seat Cushion Oil Burner Test

THURSDAY, JUNE 23, 2011

Cargo Liner Task Group – T. Marker

One discussion point was clamped vs. non-clamped samples on sample holder. If it is not clamped, you may be allowing some slippage when there is shrinkage and pull of the material. We may run a few tests to see if there is a difference. We plan to define the difference between shrinking materials and non-shrinking materials. We will begin development of guidance material that can be used for advisory material. We will start a list of items for this material on our Task Group KSN site (bracketing of material, etc.). Use of sonic burner – use OF a smoother 90-degree elbow was discussed in order to lower the unit down. Ethel Dawson will run some trials on three types of Delevan nozzles. The burner cones – what are we allowing (different thicknesses and different materials) – a specification for all the tests using the oil burner will have to be established.

Magnesium-Alloy Task Group – T. Marker

Continue with testing at FAATC. Magnesium Elektron will supply 10-inch cones for the lab-scale test at the FAATC. These will represent all the alloys in between the AZ-31 and the WE-43. We will run some limited testing on aluminum cones and will look into what the influence of anodizing or painting causes (if any) on the magnesium components. Tim will be working on an FAA summary report to be finished in spring 2012.

Burnthrough Task Group – R. Ochs

Burner cone discussion – Airbus has found good steel that resists warping better than others previously used – we will look into using this one as the specification. Discussion of

heat flux on the backside of the test specimen. The external lab influences were discussed – humidity, etc. These will have to be considered when there is further discussion on general specifications are discussed.

Composites Task Group – R. Ochs

Some Task Group members offered to send materials for testing. Testing with foam block simulant was discussed. We are going to do a comparison of panel thickness.

Ducting Task Group – P. Cahill

Everyone would like a definition of a duct – are we talking about air ducts? Some of the materials tested by John Reinhardt were older materials, and some newer materials were not tested and should be tested. Some members of the task group felt that the correlation between the intermediate scale tests and the radiant panel was not good. We discussed whether the entire duct should be tested. Foam block – the task group feels that more foam block testing should be done.

Wiring Task Group – P. Cahill

The latest draft 5.7 will be uploaded to the KSN Site. We discussed standardizing on a wire gage size. We discussed the half inch bundles – use lots of wire and time consuming to make. Someone asked about using a single wire vs. a bundle as far as burn length and after flame. The arc tracking test uses a 7-wire bundle. Can we investigate a 7-wire bundle so all of the testing uses the same number of wires? Pat will look into this.

Thermal Acoustical Insulation – P. Cahill

The group would like the AC (25.856-1) to be updated and areas such as the Rule of Seven to be rewritten. We also discussed having a Round Robin, since it has been over two years since our last. Group decided to stay with the standard size samples instead of making them smaller. We also discussed the 3-position check before running tests.

Bunsen Burner Task Group – R. Hill

The group is discussing burn length determination in the Handbook. The group will meet again at 2:00 PM today to try to finalize an agreement on the wording that should be used. The other item of major interest – an idea was passed along that the ARAC should take into consideration if they are going to keep two tests or go with one modified test (12-second and 60-second).

Seat Cushion Task Group – R. Hill

Ethel Dawson will look at airflow in the test chamber on and around the seat area and determine whether it is necessary to have a few more measurements or whether it is necessary to restrict airflow around the seat. There was some discussion on small cushioning – Gary Palmer is chairing a sub group on footrests and headrests, etc., through this Task Group. A questionnaire was developed but did not get good response. They will redo this survey and send it out again. Dick suggested that Task Group members collect

materials that have passed and failed the oil burner and either run OSU tests on these materials or send them to the FAATC and to run OSU tests on them. The other subgroup that was formed will look into the AC material (there are problems that it is dated material – things have changed/evolved) – take the AC and determine where there are inadequacies and problems, and provide a list of these and their suggestions. Some of the Seat Cushion Task Group members will meet this afternoon at 2:00 PM.

Heat Flux Task Group – M. Spencer

We agreed the Vatell method should be investigated in more detail. We also discussed the labs that will be engaged in this calibration method and how often they should be checked and how tight the calibration should be in these labs.

OSU Task Group – M. Spencer

We discussed airflow and the effect of baffles, etc. We want to try and figure out how to even out the airflow in the chamber. We talked about standardization of the calibration times. We talked about the use of a radiant panel in place of the glow bars. Further investigation and discussion with Mike Burns is needed on this.

Generic Language for Common Test Apparatus in New Appendix – R. Ochs/P. Cahill

Rob discussed how the FAA envisions the Handbook replacement being set up by Common Test Apparatus – all tests using the same apparatus will be included in the Chapter for that test apparatus (i.e.: NexGen burner, radiant panel, etc.). He showed the outline for the NexGen Chapter of this proposed document. G. Danker: Do you anticipate a template for the Chapters? FAA: Yes, it will be coordinated.

Large Surface Areas on Seats Acceptable Method of Compliance – J. Gardlin/E. Canari

25.853 does not require non-metallic materials installed on seats to comply with Heat Release/Smoke Emission requirements – then background was provided on this.

Two Main Compliance Questions: When to implement the special conditions and how to determine whether something is covered by the special conditions. An industry group was formed to work on this seat issue. FAA, ANAC, EASA, TCCA tried to maintain awareness of this group's work throughout its process. Jeff and Enzo provided information on the authorities' harmonization efforts related to this topic. Enzo explained EASA's outline on the special conditions, Jeff provided additional explanation from the FAA.

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

Presentation Agenda:

Items not going forward
Part 1 items with little or no changes
Part 1 items with significant changes
Part 2 items

A copy of their presentation will be available on the FAA Fire Safety website with the other presentations from this meeting.

Next Meeting

The next meeting will be held October 19-20, 2011, in the Atlantic City, New Jersey, area.