

# INTERNATIONAL AIRCRAFT MATERIALS FIRE TEST WORKING GROUP MEETING

March 6-7, 2007

Hosted by Schneller, Inc.

## TUESDAY, MARCH 6, 2007

### Development of a Sample Holder for Testing Calibration Materials – T. Marker

Tim presented views of the sample holder indicating the areas of concern during testing. He explained the design of the new sample holder and provided the results of tests conducted using the newly developed sample holder. The results of these tests were presented (tests with a Park burner and the new concept burner). A new sample holder will be shipped to Boeing for testing at their lab. This is not a replacement for the original frame. It is a tool for calibrating burners only.

### Sonic Burner Update – R. Ochs

Rob explained the Proof of the Concept of the sonic burner and described the operation and design of this new burner. The FAATC was able to prove this concept.

Phase II: Construction and calibration of multiple burners in order to show calibration and reproducibility of results from each of 10 next generation burners (NG 1-10).

NG-1 was shipped to the Boeing lab. Comparison of burnthrough results at Boeing lab and FAATC lab. All aspects of set up were compared (ie: power used, fuel flow rate, compressed air, etc.).

NG-3 was shipped to Airbus lab. Comparison of burnthrough results at Airbus lab and FAATC lab. All aspects of set up were compared same as at Boeing. Airbus burnthrough times were consistently longer than at the FAATC. Fuel temperature was not measured while the FAATC staff was at the Airbus lab. Does fuel pressure have more of an effect on burnthrough time than fuel flow rate? Some sooting was observed on the main thermocouple.

Fuel nozzles: To determine the flow properties of all the nozzles the FAATC had at the FAATC lab. FAATC received 10 hollow chrome and 10 solid chrome nozzles to test in its lab. The manufacturer has agreed to work with the FAATC to manufacture nozzles that can be used for the burnthrough tests.

January 2007: Boeing – FAATC burner comparison (2<sup>nd</sup> trial). Boeing chilled their fuel this time. The fuel flow rates did not exactly match at each lab. Is this discrepancy caused by the mechanical pump that Boeing is using?

The proper adjustment of the burners is very critical to the repeatability of tests. We need a method to determine if the burners are operating properly. We need a method to show the consistency or inconsistency of the burner or a material – to determine which is inconsistent. FAATC ordered more material to ensure a more even comparison.

FAATC determined that Boeing did not have an inline heat exchanger for their air. FAATC ran hot or cold water through its heat exchanger and measured the exit velocity.

Next Boeing burner comparison (NG-6). Boeing had its material shipment sent to the FAATC, and the FAATC sorted the materials and sent part the shipment to Boeing and kept some to test in its lab. This was an attempt to test the same materials on the same type of set up at each lab and compare results.

FAATC intends to work with the nozzle manufacturer to develop a nozzle to tighter specs. FAATC also wants to develop nozzle spray pattern specs.

What was fuel type decision? Jet A and JP-8 are both acceptable at this time.

Peter Busch: what is the aim of all of this investigation? To have burners available at the same level as the FAATC burner? Rob: The real goal is to have 10 burners at the same level as the Park oil burner – it sets the standard for all burners. Ethel: are you going to address the warpage? Tim: We may possibly include something in the A/C that addresses warpage.

#### NexGen Burnthrough Test Apparatus Laboratory Setup Guidelines – R. Ochs

System Schematic was displayed indicating some of the setup requirements including the following:

NexGen burner must be supported at a 30-degree angle.

Must be able to hook up fuel line and specified location.

Space size allowance for apparatus.

Compressed air supply/air temperature requirements.

Pressurized fuel system – Rob explained the diagram of the system.

Controls used at FAATC were covered.

Rob reviewed the Burner Setup Checklist including fuel temperature, fuel pressure, air temperature, and burner cone.

Contact Rob Ochs if your lab is interested in setting up the sonic burner. Labs must meet all these requirements in order to receive a sonic burner. These requirements will be available online at <http://www.fire.tc.faa.gov>.

#### Additional Burnthrough Discussion – T. Marker

Tim emphasized: any potential recipient lab of the sonic burner system must have their lab set up per the requirements Rob explained (also available on Fire Safety website).

Nozzle: old vs. new nozzles – additional language will be included in A/C to help differentiate the old style nozzle vs. new style nozzle (old style nozzle has slotted screw on the back of it).

#### Future Advisory Material 25.856(b) – J. Gardlin

The revision to this A/C will include:

Calibration and setup details: fuel nozzle discussion (model, orientation), heat flux calibration, fuel flow temperature

Methods of compliance: Areas covered by Paper on Fire Safety website, insulation that will not contribute..., equivalent safety approaches, procedure if a sample fails (assumption that material is good, additional testing to confirm that, similar to what was allowed for radiant panel).

NexGen burner: add a new Appendix to the A/C to describe the NexGen burner, major elements and test setup requirements covered including heat flux calibration, 'blueprints' not included, reference to website for design detail.

Timing: internal coordination within FAA is in process, possibly out for public comment summer 2007.

Jim Davis: Will the appendix on the NexGen burner be available by summer 2007, also?  
Jeff: Yes, I think we will be far enough along for that. Tim: It's not going to be perfect, but it should be 95% usable by the summer. I don't think if we make any minor changes that they will negate what you have so that you'll have to rebuild what you've got set up at that time.

Francisco Landroni: are you going to include the picture frame idea?

Jeff: No, not right now. It will not be part of the A/C. It is a tool to access the burner reproducibility. It might end up going into the *Aircraft Materials Fire Test Handbook* at a later time. Tim suggested maybe putting it on the Fire Safety website. This will be considered.

Jim Peterson: what to do if a test sample fails (either a bad sample or there was something amiss with the test equipment or test itself). Will this type of information be discussed in the A/C? Jeff: I don't plan to go into all that in the A/C.

Peter Busch: Will there be guidance for equivalent demonstration if better techniques arise later for equivalence demonstration? Jeff: It will be addressed if these come up, but it may not be in the A/C.

#### The Use of Magnesium in Aircraft Interiors – T. Marker

Tim reviewed the policy statement on magnesium use in aircraft cabins that is posted on the Fire Safety website (<http://www.fire.tc.faa.gov>).

Possible Locations of Magnesium Use in the aircraft cabin:

- Seat components
- Overhead ducts
- Galley components

Potential Threats:

- Electrical arc to a magnesium component
- Oxygen canister fire next to a magnesium component
- Intact components or shavings?
- Terroristic threats

Post-crash:

- External fuel fire impinging into cabin against magnesium components
- Safety of fire fighters

Development of test protocol based on these threats:

- Must have clearly defined threat
- Full-scale tests
- Lab-scale tests based on full-scale test results

In-flight test:

- Electrical arc
- Size, power of electrical arc
- Size, shape of test sample
- Pass-fail criteria?

Post-crash test:

- Oil burner apparatus, what heat flux?
- Oil burner apparatus with or without a seat cushion?
- Size, shape of test sample
- Duration of test, 2- or 5-minute test?
- Pass-fail criteria

Dick had asked Magnesium Task Group members in December 2006 to provide feedback on possible threats and possible test methods. Tim based this presentation on the input received from several of the Magnesium Task Group members since the December 2006 meeting.

There is a TSO on the use of magnesium in aircraft seats.

Becky Wulliman: Is there a serious consideration to use magnesium in aircraft cabins?  
Answer: Yes, it has the potential of a great deal monetary savings possibly up to 30%

savings. Jim Peterson: The steering wheels in Boeing aircraft have historically been magnesium. It has not yet reached the level of a defined, funded research program at Boeing. In the past, there have been some corrosion issues with magnesium. This would not lend it to galley or lavatory applications. It does have its attraction if you can get around its corrosion and flammability issues (money and weight savings issues are attractive). Tim: If there is that level of interest, show us that it is not going to compromise safety.

Bruce Gwynne: There have been a lot of advances in alloys in the magnesium area. Flammability is still an issue.

Tim: The use of magnesium in aircraft cabins is drawing enough interest that the FAA realizes that it has to act in some way. This is why we are discussing it now.

#### Update on Ducting Report – T. Marker

John Reinhardt indicated to Tim that the report is pending.

Dan Slaton: Has a next step been considered by the FAA regulatory side? Jeff: I see it being combined with other materials in inaccessible areas.

#### Task Group Meetings:

Burnthrough  
Magnesium  
OSU/NBS

### **WEDNESDAY, MARCH 7, 2007**

#### Task Group Reports

##### Magnesium Task Group – T. Marker

Magnesium use in airplane cabins only (inside the cabin). Define the realistic threats: postcrash threat, in-flight threat, and a terroristic threat. From these threats we would like to define a performance test – possibly using oil burner equipment for postcrash, electrical arc test for in-flight fires igniting magnesium. In the future, we may run a full-scale test but that would be after conducting the smaller scale tests. Right now this program and Task Group are very informal.

##### Burnthrough Task Group Report – R. Ochs

We discussed ways to improve the test method and concerns were voiced including the fuel nozzle situation (look into fuel nozzles from other applications), ways to adapt the fuel injectors, cone shape, warpage of the test frame issue, criteria for when test frame is too warped to continue testing with it,

### OSU/NBS Task Group – M. Burns

Discussion on improving the scatter in OSU/NBS data, procedures to initiate the OSU chamber prior to testing (possibly validating the light source), improving standard panels used in the round robins, and possibly using more than 3 samples in the round robins. Discussion on the affects of improper foil wrapping.

### Contamination Task Group – D. Slaton

We revisited the need to go back and look at the existing data on contaminants. We have been talking about the airline survey that was done a few years ago. Discussion of recommendations to be written up by Task Group as a general Task Group recommendation. John Harris at Boeing is working with UMass and NIST and he has got all the film manufacturers together and is coming up with an accelerated aging study with UMass and NIST, and this should provide some good information on the aging of the films.

Tim asked the Working Group if they saw a need for any additional Task Groups.

### Radiant Panel Work Update - T. Marker (for Pat Cahill)

There are 23 labs in the U.S. and Europe have radiant panel set up. The FAA has not been contacted by anyone recently indicating problems with their equipment or testing. If there are any, please contact the FAA. Repeatability check recently conducted produced the same results as the repeatability check done six months ago.

### Radiant Panel Round Robin 9

This Round Robin will consist of samples with tape. There will be 4 or 5 samples, and Pat is planning to begin shipping the samples in late April 2007. Peter Busch mentioned that the backer board specified in the final rule is now considered a hazardous material in Europe and Airbus cannot use this material any longer, so they have to use a substitute and is seeing some differences in the results because of this new material being used as backer board.

### Seat Round Robin – T. Marker (for Pat Cahill)

This is the worldwide Round Robin test program. A list of the labs/organizations samples were sent to worldwide was provided. Testing is complete in the U.S., and testing has started outside the U.S. with an estimated completion date of early May 2007. Results of tests to date were presented.

The full report on the U.S. testing should be completed in April 2007.

Dan Slaton: What equipment and procedure issues has Pat seen in the course of this Round Robin so far? Jim Peterson: The important thing is what the FAA is going to do with these results. Jeff: We are trying to identify problems with the test method and get

those fixed. We are trying to correct things that are wrong, but it still won't eliminate all the variability.

#### Seat Testing with the Sonic Burner – R. Ochs (Pat Cahill)

Set up the sonic burner in the same manner that the Park oil burner is set up for the seat test. Rob described what has been done so far including investigation into the airflow exit velocity, fuel flow, and FAATC will measure the temperature and heat flux in the near future.

#### OSU and NBS Round Robin Final Results – M. Burns

*OSU Round Robin* – 26 labs participated. Mike presented the results of the OSU Round Robin. Mike showed videos sent by participating labs showing differences in starting sequence that may have been the reason for a reduction of total heat by 12% and a delay in time to peak by 100% between these two tests.

*NBS Round Robin* – 27 labs participated. Some labs reported the smoke at 4 minutes and others reported every minute and gave the 4-minute value. Mike presented the results of the Round Robin. Mike showed a video from one of the participating labs that indicated two mistakes including no backing plate. He highlighted some other mistakes notices in photos sent in by participating labs. Pass/fail results were reviewed for each sample.

Mike is the new point of contact for the OSU and NBS testing at the FAATC. The FAA is currently evaluating how to proceed. This information will be posted to the Fire Safety website. Scott Campbell: We may want to conduct another Round Robin to confirm because there was some question if all the materials were made at the same time, etc. We may want to conduct another Round Robin now that Mike has observed some potential problems with how some of the labs conducted the tests from the photos/videos sent in by the participating labs. If we tighten up the process based on what Mike has discovered, it might be good to run another Round Robin. How about a training video on how to set up the equipment based on some of the things observed in the videos sent in by the participating labs similar to what Pat Cahill did for the other equipment?

#### Recent Burnthrough Tests – J. Davis (Accufleet)/C. Garvey (Unifrax)

A copy of Jim's presentation is available on the Fire Safety website ([www.fire.tc.faa.gov](http://www.fire.tc.faa.gov)).

Test works well enough to develop and certify materials.

Chad Garvey – (Unifrax)

Chad showed a graph of the output of a prototype, graphs of test results, and described the results.

New OSU Compliant Polycarbonate Developed – R. Buoniconti (GE Plastics)

A copy of Ralph's presentation is available on the Fire Safety website.

Next Meeting:

The next meeting will be hosted by Jehier-Hutchinson in Paris, France, on June 26-27, 2007. If you plan to attend, please be sure to register and make your hotel reservations by the deadlines. They are early for this one.

There will not be a fall 2007 Working Group meeting, however, some Task Groups may be meeting in Atlantic City, New Jersey, during the week of the Fifth Triennial International Aircraft Fire and Cabin Safety Research Conference (October 29-November 1, 2007).