International Aircraft Systems Fire Protection Working Group Meeting

November 5-6, 2003

Hosted by the Federal Aviation Administration Technical Center
At the Trump Taj Mahal Casino-Hotel, Atlantic City, New Jersey, USA

WEDNESDAY, NOVEMBER 5, 2003

User Preference Survey for Agents Used in Hand Held Extinguishers On Board Aircraft – H. Webster/R. Mazzone

Overview: This survey requested information from the user community on extinguishing agent properties that should be considered.

Survey Results: 112 total responses

A statistical analysis was performed on the collected data. Harry explained the method of analysis.

A copy of this presentation is available on the FAATC Fire Safety Branch website (www.fire.tc.faa.gov).

Aircraft Cargo Compartment Fire Detection Update – D. Blake

Jill Suo-Anttila and her colleagues at Sandia National Labs have prepared the two. Links to these reports will be available on the FAATC Fire Safety Branch website at www.fire.tc.faa.gov.

The report titles are:

Computational Fluid Dynamics Code for Smoke Transport During an Aircraft Cargo Compartment Fire: Transport Solver, Graphical User Interface, and Preliminary Baseline Validation

Comparison of Actual and Simulated Smoke for the Certification of Smoke Detectors in Aircraft Cargo Compartments

Dave described the planned future activities in this test program. A copy of his presentation is available at www.fire.tc.faa.gov.

Smoke Transport Model Update – J. Suo-Anttila

Goal: Develop a CFO-based simulation tool to predict smoke transport in cargo compartments.

Jill described the software design. She also provided an overview of the pre-processor. A status of the FAA Full-Scale Validation Experiments was provided. The 707 experiments have been completed. The DC-10 experiments are in progress at the FAATC. The future activities include: continuation of the validation of the smoke transport code and release of the code to a small user community in spring 2004. If you are interested in participating in this small user community, please contact Jill at Sandia. The final release of the code is scheduled for February 2005. If you would like additional information on this project, please contact Jill Suo-Anttila at Sandia (her contact information is available in the Attendee List for this meeting).

Fire Suppression System Scaling – J. Reinhardt

Objectives: To determine the critical parameters required to scale a water mist system combined with nitrogen, used as an aircraft cargo compartment fire suppression system that have met the MPS.

John described the scaling approach that included a literature search and characterization of the nitrogen system. The water collection test results were reviewed. The conclusions of this test program were reviewed.

A copy of this presentation is available at www.fire.tc.faa.gov.

Engine Nacelle Halon Replacement Project – D. Ingerson

Project Objectives:

Generate a procedure that can be used by anyone to demonstrate equivalence to Halon 1301 in the engine nacelle

Produce certification criteria for HFC-125 and CF3I

Doug plans to release a report upon completion of this work in summer 2004.

A copy of this presentation is available at www.fire.tc.faa.gov.

Fires in Hidden Areas – R. Hill

A number of recent aircraft fire incidents have led to NTSB Recommendations related to fires in hidden areas. Several of these fire incidents were described.
FAATC Coordinated Approach to Fire Protection:

Material Flammability
Accessibility
Detection
Suppression
Fire Fighting Procedures
Training and Equipment used by crew and flight attendants

Several photos of the candle lanterns mounted in the overhead hidden areas in the FAATC 747SP test aircraft were shown and explained. The results of these tests were presented.

Future Work:

Use of 5lb Halon 1211 extinguishers

Use of Halon 1301 to extinguish fire in overhead

Feasibility of larger bottle with a distribution system

Effectiveness of discharge ports in smaller narrowbody overhead

Effectiveness of thermal imaging device to locate hidden fires

Fires in other areas (cheek, behind sidewall, etc.)

Dick presented the results of some of the tests conducted with the thermal imaging device.

Boeing Position on Research on Fires in Hidden Areas – R. Mazzone

Concentrate the effort where the data shows the most effort should be concentrated: improving the arc fault circuit breakers, improving the materials used in hidden areas, and contamination of materials in hidden areas. These improvements should be data driven. Dan Lewinski commented that Boeing believes the activities in fire in hidden areas should have a centrally coordinated approach not be spread out with some of the activities coordinated through the Systems Working Group and some coordinated through the Materials Working Group.

Fire Protection in Hidden Areas (Airbus) – K. Schmoetzer

Airbus also believes that there should be a centrally coordinated effort for the activities related to research of fires in hidden areas.

Be sensitive to potential hazards
Envisage the areas
Design areas correspondingly
Optimize passive fire protection
Combine passive and active protection
Demonstrate that a fire hazard is not hidden

Locations of hidden areas on aircraft were reviewed.

A copy of this presentation is available at www.fire.tc.faa.gov.

International Environmental Update – T. Cortina

Tom provided the Kyoto Protocol Status (calls for a worldwide differentiated target of 5.2% reduction in GHGs between 2008-2012). 119 countries have ratified representing 44.2% of global GHGs emissions. Russia holds the key to reaching 55% of emissions required for entry into force. The U.S. will not become a party to Kyoto Protocol (at least under the current administration). EU emissions trading scheme was recently approved by the EU Parliament. Major industries included in the program, such as oil, steel, cement, glass, and paper will have a CO2 cap starting in 2005.

Momentum of HFC regulations in Europe seems to have slowed. Denmark, Austria, Switzerland enacted bans, Norway a tax, Germany has not proceeded with HFC controls. EC regulation on fluorinated gases does not limit use of HFCs for fire protection, only calls for reporting, recycling, and containment.

EC Halon Regulations: Critical Uses: provides for annual review of critical uses and for setting timeframes for eventual phaseout of critical uses. Bulk Halon – allows for export of “bulk Halon” for critical uses until 2009.

Montreal Protocol:

Halon Technical Options Committee (HTOC) met in December in Zurich. Discussion focused on applications where halons are still being used. HTOC concerned with lack of progress on halons in aviation. Draft decision proposed by EU at June OEWG meeting. Are the new jumbo/larger aircraft being designed based on the use of Halon in the extinguishing systems.

A copy of this presentation is available at www.fire.tc.faa.gov.

Limiting Oxygen Concentration (LOC) Work Update – S. Summer

Steve wrote a Tech Note on this topic: *Limiting Oxygen Concentrations Required to Inert Jet Fuel Vapors at Reduced Fuel Tank Pressures* (Report # DOT/FAA/AR-TN02/79). It is available at www.fire.tc.faa.gov.

Steve described the LOC test facilities at the FAATC. Steve described the test program. This test program has been completed, and the final report will be published and available on the FAATC Fire Safety Branch website (www.fire.tc.faa.gov) as soon as possible.

Jet A Vaporization in an Experimental Tank – Professor C.E. Polymeropoulos (Rutgers)

Professor Polymeropoulos acknowledged those who previously published work on this topic. The principal assumptions of this project were reviewed. He explained the conclusions derived through this experiment.

Jet-A Vaporization in an Experimental Tank (Part II)– R. Ochs

Robert provided an overview of the experiments conducted at the FAATC Fire Test Facilities. He explained the model inputs, model outputs, and described the experimental set-up. The fuel tank used measures 36"x36"x24", ¼" aluminum. The fuel tank is housed in an environmental chamber. The experimental procedure was described in detail.
A copy of this presentation is available at www.fire.tc.faa.gov.

NASA Glenn: Progress in Fire Protection Research – R. McKnight

Recent Accomplishments:

-Flight test planning JSC B-747 Shuttle Carrier Aircraft
-Valcor-Phase II: testing of small scale advanced high temp membrane

Security program planning:

-Flammability feedback control sensors, algorithms
-Participation in Air Force Large Aircraft Survivability Initiative (LASI)

Low False Alarm Fire Detection
- Testing at NIST
- Testing at Boeing
- Proposal for hidden fire detecting and locating technology

Elevated Flash-Point Fuels:
- Fuel modification concepts identified

Task Group Reports:

Engine Task Group – D. Ingerson

Handheld Task Group – R. Mazzone

A small Task Group meeting will be held on Wednesday (November 5) evening, since some members cannot attend on Thursday.

Fuel Tank Inerting Task Group will meet at the Visitor's Center at the FAATC to be escorted to Building 287 for the Task Group meeting.

Fires in Hidden Areas Task Group – R. Hill

This Task Group will not continue unless Working Group members indicate their interest to continue the group at this time, however, the FAA research on fires in hidden areas will be continued without Task Group involvement. Boeing is concerned with improvement of materials and research into ignition sources.

THURSDAY, NOVEMBER 6, 2003

Fuel Tank Inerting Joint Airbus/FAA, A320 Flight Tests – R. Hill

This presentation was prepared by Ali Tehrani of Airbus who was unable to attend this meeting. The FAATC nitrogen inerting equipment was used for these flight tests. The equipment was located in the cargo bay on an LD3 pallet. An outline of the OBIGGS equipment and interfaces was presented. A diagram of the center tank oxygen sensor location was displayed and described. A diagram of the location of the oxygen sample points was presented. A photo of the system as installed was shown.

Ground testing of the system included a period of 50 hours "mini-endurance" tests to gain confidence in the system operation. The flight test phase included a number of 9 flights, exploring system performance over a range of: tank fuel qualities, climb and descent rates, and different OBIGGS operational configurations. Dick reviewed the Airbus conclusions. The lessons learned were reviewed including: thermal characteristic of the ASM needs further investigation, a variable flow system may offer some advantages, and function of filter needs further investigation (the filter used in this series was oversized for this application).

A copy of this presentation is available at www.fire.tc.faa.gov.

FAA On-Board Inert Gas Generation (OBIGG) System Description – R. Morrison

Rob presented a photo of the system on the LD3 pallet as prepared for the A320 flight tests. Photos of the system as installed in the 747SP. A number of photos were used to display the design of the various sections of the system.

A copy of this presentation is available at www.fire.tc.faa.gov.

FAA Fuel Tank Inerting Tests Data – R. Hill

Dick presented and explained the fuel tank inerting test data. He described some of the observations made during the tests. This information is available at www.fire.tc.faa.gov.

A final report will be prepared in cooperation with Airbus. It will include the raw test data as an appendix.

FAA Concept OBIGG System Flight Testing on NASA 747SCA – B. Cavage

Bill outlined the testing goals and objectives. He described the system architecture as it will be installed on the NASA 747. The system will be installed in the empty pack bay (aft, right side fairing area) on the 747. The instrumentation and data acquisition system was described including locations of thermocouples, details of the onboard oxygen analysis system, and the flammability analysis system that will be installed. The CWT instrumentation location was discussed. The thermocouple map was displayed (it will discussed in more detail during the afternoon Task Group meeting). Steve Summer has developed the flammability analysis system to be used in this test program. The FAATC is now preparing to ship all the equipment for installation.

NASA/FAA Flight Test – Flammability Analysis System (FAS) – S. Summer

To date, real-time flammability (hydrocarbon) data in flight has yet to be obtained from fuel tanks (CWT or wing). Lab based instruments in use at the FAATC are based on a flame-ionization detection (FID) technique, and are unsuitable for in-flight use. Steve provided an overview of the FAS system. The FAS uses a non-dispersive infrared (NDIR) analyzer to measure fuel tank flammability in the form of total hydrocarbons (THC). This analyzer was custom built by Rosemount Analytical specifically for this application. Separated into two sections- electronics and sample stream. Sample stream section temperature controlled to 200 degrees F. Entire unit continuously purged. The sampling system is a rack-mounted sampling system. The details of this system design were provided. There are a number of safety features built into the FAS system. The FAS has been shown to accurately measure a sample of 2 & 4% propane from seas level to 35 kft with an accuracy of +/- 1%.

737 Tank Ground Tests – R. Hill

Dick gave a brief overview of the plans for the FAATC 737 Tank Ground Tests.

2004 International Aircraft Fire and Cabin Safety Research Conference – R. Hill

The conference will be held November 15-18, 2004, in Lisbon, Portugal. Additional information is available at www.fire.tc.faa.gov. The Call for Papers is also available at www.fire.tc.faa.gov.

Next Meeting

The next working group meeting will be held in Europe in June 2004.