

INTERNATIONAL AIRCRAFT SYSTEMS FIRE PROTECTION WORKING GROUP MEETING

MARCH 12-13, 2002

Hosted by Boeing Commercial Airplane Group, Wyndham-Sea-Tac Hotel, Seattle, Washington, USA

TUESDAY, MARCH 12, 2002

Fuel Tank Inerting (FAATC Fire Safety Section B-747 SP and Plywood Model) – R. Hill

Dick gave an update on the work Bill Cavage has been doing on Ground-Based Inerting (GBI) and fuel tank modeling at the FAATC. He also described some of the results of the tests Bill has run to date. Graphs of the test data showing Average Oxygen Concentration were presented (a copy of this presentation will be available on the FAATC Fire Safety Section website www.fire.tc.faa.gov under “Systems Group”). Future work includes the Ancillary Equipment Development and the OBGi Deposit System (using Scale Plywood Tank). A flammability survey of the B-747 SP is also underway. Data will be collected in both summer (heat) and winter (cool). Wing tank flammability may be studied in summer 2002. A graph of the B-747 SP Flammability Data showing Temperature measurements on cool days against warm days was reviewed.

On Board Gas Generating System Discussion– R. Hill

The FAATC on board gas generating system design, requirements (including volume, time to inert, time line, overall objective, starting O₂ concentration, and inerted O₂ concentration), and set-up was described/reviewed. The system flow requirements were also described. A diagram of the FAA 747 SP OBGi Production System was presented and explained. A copy of this presentation will be available on the FAATC Fire Safety Section website at www.fire.tc.faa.gov under “Systems Group”. An outline of the System Components and Production Costs was also presented. Dick provided some of the specs on several of the systems components as well. Dick fielded a number of questions related to the system design and functions. Testing of this system is tentatively set to begin in May 2002.

NASA OBIGGS/OBOGS Update – C. Chang

Clarence updated the group on 1) NASA OBIGGS/OBOGS project status; 2) Requirement and resource update; 3) Boeing contract as airframe integration advisor; and 4) NASA in-house work update.

The OBIGGS/OBOGS RFP is scheduled for release in mid-March 2002. The closing date on this RFP will be April 15, 2002. The selection of Phase I proposals (up to 6) will be approximately May 15, 2002. Clarence reviewed the Performance Requirements and Assumptions (of this project). The NEA Inerting Flow Requirements were also reviewed (including inerting at gate, descent inerting, cruise fuel-volume make-up, and cargo compartment inerting). (Boeing) OBIGGS/OBOGS reports are available at this website: www.grc.nasa.gov?WWW/avsp/reports_fire_prevention.htm. The Airframe Integration Support Issues (Boeing) were reviewed.

The NASA In-house N₂-CO₂ (Combustion Exhaust) Inerting Issues were described (Science Issues, Engineering Issues, and System Issues). Clarence also provided the status of the Fire-Safe Fuels Research conducted in the NASA fuels facility that opened in January 2002. NASA welcomes suggestions related to its in-house work.

Fuel Tank Ignition Experiments at Reduced Oxygen Concentrations – S. Summer

Steve reviewed the objectives of these tests. A diagram of the test set-up in the pressure vessel apparatus was presented and described. A description of this test program was provided and results of the tests conducted were reviewed. A description of the Ignition Pressure Test Program was also provided. The results of the Pressure tests conducted with and without Pressure Relief were presented. LEL tests were conducted at 0 and 38,000 feet altitude. These test results were also presented. The future plans in this

program include conducting ignition pressure tests without pressure relief at lower altitudes and conducting a thorough investigation of the LEL dependence on O₂ concentration and altitude. A paper detailing the LOC tests will be composed and published shortly.

Jet A Vaporization Computer Model – S. Summer

This model was written in Fortran Code by Professor C. Polymeropoulos (Rutgers University). Dave Adkins of Boeing converted the program code into an Excel Spreadsheet for use in the FAATC test program. Steve reviewed the major assumptions of this model including the assumed Jet A composition. A copy of this presentation will be available on the FAATC Fire Safety Section website at www.fire.tc.faa.gov under “Systems Group”. The Program Outputs of this model were explained. Steve described the future work in this program as well.

Handheld Extinguisher Project Update – R. Hill

The final report is in review. A copy of this presentation will be available on the FAATC Fire Safety Section website. The extinguisher labeling details are outlined in this presentation. How will this be handled equivalently in Europe? How will the JAA handle this, since UL is an approved test facility/program in the United States?

Lavatory Extinguisher Project Update – R. Mazzone (Boeing)

Boeing is proceeding to certify the agents that have passed the Lavatory MPS. The certification should go through in the near future.

Airbus: The paperwork has been processed, and Airbus is close to production.

Update on Standardization of Hydrostatic Test Intervals for Fire Extinguishers – H. Humfeldt

A copy of this presentation will be available on the FAATC Fire Safety Section website. The goal for all users is to perform hydrostatic tests for fire extinguishers every fourteen years instead of every five years to cut down on the amount of halon released into the atmosphere. Hans Humfeldt is currently the only remaining member of this Task Group since its establishment in 1997. Hans presented a chart indicating the quantity of Halon in the commercial aircraft fleet as of 1997, based on input from Boeing, Airbus, and McDonnell Douglas. There was 508 tons of Halon in the commercial aircraft fleet at that time (according to data collected from Boeing, Airbus, and McDonnell Douglas). Presently, the DOT requires in general an interval of 5 years. The fire extinguisher manufacturers (Kidde and Pacific Scientific) recommend 14-year intervals. The DOT E 10990 has allowed an interval of 14 years, but only to ATA members. The European airlines have made 4 requests to the DOT under the AEA (Association of European Airlines). To date, all requests have been refused. Hans outlined the four requests made by the AEA members and the responses (or lack of responses) from the DOT. What should we do now? Dick suggested that Hans draft a letter to the U.S. EPA and the European environmental organization (EPA equivalent organization) explaining the group’s concern over the release of Halon into the atmosphere through hydrostatic tests and providing the data that has been collected by this Task Group to ask for EPA and European environmental organization input/support, etc. Dan Moore suggested looking into how hydrostatic testing is handled in the marine industry (are there exemptions and if so, what are they?). Hans is looking for other participants to join this Task Group to assist with its work and drafting the letter Dick suggested. Please contact him directly if you will participate in this Task Group.

Engine Nacelle Project and MPS Update – R. Hill

The progress/current status included information on the fuel system, the fire extinguisher, and the hot plate. Further work on the halonizer has been completed. A copy of this presentation (prepared by Doug Ingerson) will be available on the FAATC Fire Safety Section website. Questions may be directed to Doug Ingerson.

Dick reviewed the HFC-125 Agent Distribution Profile on recent data (February 2002). The future test activity plans were reviewed. Gas analysis test are currently being conducted through mid-March 2002. The fire characterizations should be completed in March 2002 as well.

The Effects of Altitude and Low Humidity on the Performance of a Water Mist System – J. Reinhardt

The presentation outlines the objective, technical approach, test set-up, evaluation tests, and test results/findings. John described the test chamber and test set-up. The tests were conducted in the FAATC Fire Safety Section's altitude chamber. John outlined and explained the details of the test and the test conditions. The test findings were presented. It was found that there was no statistically significant water loss. Further details of the technical approach, test set-up, tests, and the findings are included in the copy of the presentation available on the FAATC Fire Safety Section website at www.fire.tc.faa.gov under "Systems Group".

Lithium Battery Test Program – R. Hill

Aircraft cargo fire in April 1999 at LAX caused by lithium batteries similar to those used in cameras. The fire when a pallet of these batteries was dropped onto a ramp at LAX. There was no external ignition source. Is there a need for regulation on the transport of these batteries? Dick described the development of the lithium battery test. Dave Blake described the preliminary tests he conducted on one lithium battery and the reaction with halon. Harry Webster is now the engineer working on this project. The approach is to determine the maximum amount of lithium that can be safely controlled in a cargo compartment fire by the on-board suppression system. Dick outlined the test series. He also reviewed the preliminary test results. It is costly to test large quantities of these batteries. In the CR2 battery tests conducted to date, the packaging delayed the ignition of the batteries by 30-60 seconds, however, it did not prevent the ignition of the batteries. Future tests include full-scale cargo tests if possible using the FAATC Fire Safety Section DC-10 cargo compartment test article and the effects of Halon 1301 against lithium battery fires in cargo compartments. For more specifics on this test programs, please contact Harry Webster.

Systems Hidden Fire Protection Update – R. Hill

The FAATC Fire Safety Section has begun a hidden fire test program in response to NTSB recommendations related to recent in-flight fires in hidden areas. Dick described the recent in-flight fires that prompted the related NTSB recommendations. Several concerns/questions have arisen related to these NTSB recommendations as well as the Canadian TSB recommendations related to the Swissair 111 accident a couple years ago. These concerns include: flight attendant training for fighting in-flight hidden fires, the effect of a small fire on the air conditioning systems, and fighting fires in electronics bays. The FAA will investigate all of these areas over the next few years. We (FAATC Fire Safety Section) will be using our 747 and 727 test aircraft for test work in these areas. Tim Marker will be the engineer initially responsible for this project.

Discussion on Cabin Air Quality – R. Hill

A couple of recent studies have concluded that the FAA is not doing enough research on short-term or long-term exposure effects of cabin air quality on crew and passengers. The FAA Civil Aeromedical Institute (CAMI) in Oklahoma will take the lead on this research since it is human-related. Some of the test work may also be done using the FAATC Fire Safety Section's 747 and 727 test aircraft. The aviation authorities are also looking into other health issues related to the aircraft cabin such as DVT (deep vein thrombosis) for example.

WEDNESDAY, MARCH 13, 2002

Cargo Compartment Fire Detection Update - D. Blake

Dave described the DC-10 Below Floor Center Cargo Compartment test design including number of and location of smoke meters and thermocouple set-up and presented graphs of smoke meter readings for each smoke meter location (forward, mid, and aft). Dave also described the modifications made prior to the next set of tests and the set-up and results of this series of tests. A copy of this presentation will be available on the FAATC Fire Safety Section website at www.fire.tc.faa.gov under "Systems Group". The next series of tests studied Signatures of Various Fire Sources in DC-10 Lower Cargo Compartment. Dave reviewed graphs of some of the results of this series of tests as well. A brief description of the future cargo smoke detection work outline was provided. The future work listed includes: conduct baseline CFD model validation tests in 707 with flaming resin, no ventilation and conduct tests with NASA/industry developed miniature CO/CO₂ sensors, and conduct tests with cloud chamber particle counting technology.

Modeling Smoke Transport in Aircraft Cargo Compartments – J. Suo-Anttila

This modeling work is being done at Sandia National Laboratories in conjunction with the FAATC Fire Safety Section. Jill described the types of scenarios the model would be capable of assessing: buoyant plume, attached flow, diffuse source, and containerized source. She described some of the code features of the model. Jill reviewed a few demonstration calculations for the group. An outline of the possible future activities was presented and discussed. Documentation and release of code to a small user community is planned at a later time.

Design for Security – Cockpit Smoke Penetration – D. Blake

This recent work is based on an ICAO agreement. The FAA was asked to look at cockpit smoke penetration and ventilation rates necessary to keep smoke generated from an incendiary device (for example) out of the cabin. The first test was conducted in the FAATC Fire Safety Section 727 freighter. Dave described the factors that changed ventilation patterns in the tests conducted. He also reviewed the test scenarios and the results of the tests conducted to date at the FAATC. The same basic set of tests was conducted in the FAATC Fire Safety Section 747 passenger aircraft. All of the various ventilation settings for this aircraft were used in this series of tests.

Task Group Reports

Cargo MPS Task Group Report – J. Reinhardt

The majority of the group believes the Weibull method is the way to go.

Fuel Tank Task Group Report – R. Hill

The group discussed the current and potential future work in this area.

Hydrostatic Test Task Group – H. Humfeldt

The task group has decided on how to proceed.

Next Meeting

The next meeting will be held June 13-14, 2002, at the Civil Aviation Authority (CAA) facility in downtown London, United Kingdom. Additional details on the meeting location may be found under "Systems Group" under 'Upcoming Meetings'.