INTERNATIONAL AIRCRAFT SYSTEMS FIRE PROTECTION WORKING GROUP MEETING MINUTES

Hosted by United Kingdom Civil Aviation Authority

June 13-14, 2002

THURSDAY, JUNE 13, 2002

B-747SP Flammability Data – B. Cavage

Review of test description and data collected to date. 747SP Center Wing Tank Temperature Data collected at various temperature conditions and with varying fuel loads was presented and explained. A copy of this presentation will be available on the FAA Fire Safety Branch website at www.fire.tc.faa.gov.

Full-Scale Inerting Efficiency Data – B. Cavage

Review and explanation of Vertical Mixing/Temperature Effects was given. 747SP Inerting Data with Different Vertical Mixing data was presented. Bill also provided a summary of the 747SP Inerting Efficiency data he presented. There was one deposit point for all of the 747 data. A copy of this presentation will be available on the FAA Fire Safety Branch website at www.fire.tc.faa.gov.

Modeling of Inert Gas Distribution in Commercial Transport Fuel Tanks – B. Cavage

An explanation of the Original Simple Inerting Model developed by Ivor Thomas (FAA) was given including a presentation of the Simple Inerting Model Results Compared with Ullage Washing Data. The Scale CWT Tests were described and the modifications/adjustments to the model were explained. The Scale Plywood CWT Model Data Comparison results were presented (the gas was generated with an NEA generator). The scale tank is a 24 percent length model. A copy of this presentation will be available on the FAA Fire Safety Branch website at www.fire.tc.faa.gov. A description of the Multiple-Bay Inerting Engineering Model based on the Original Inerting Model (developed by Ivor Thomas) was given as well as a diagram of the assumed flow pattern of this model. The Engineering Model Data Comparison results were presented. In summary, the scale tank testing produced good results when compared with the "good mixing" full-scale testing (cost effective modeling method); simple engineering modeling methods can produce fair results in a very cost effective way (additional work is needed to improve model for multiple deposits); and both methods predict VTE required (amount of NEA) very well, given a highly localized deposit. Bill has also written an AIAA report on this that will be posted to the FAA Fire Safety Branch website in the future.

Discussion on Fuel Tank Flammability – S. Summer

Jet A Fuel Vaporization Computer Model Validation (developed by Professor C. Polymeropolous)

The original model proved a good method of predicting the evolution of hydrocarbons. These results were presented by Professor C. Polymeropolous of Rutgers University at the October 2001 International Aircraft Fire and Cabin Safety Research Conference in Atlantic City. Steve described the physical considerations of the model. He also reviewed the major assumptions of the model. The program outputs were explained. A copy of this presentation will be available on the FAA Fire Safety Branch website at www.fire.tc.faa.gov. The experimental set-up was described (17 ft^3

vented tank placed inside an environmental chamber). Results of temperature comparison experimental tests vs. computed model results were presented. He also described the future testing he plans to do including varying pressure tests (flight profile) and future modeling improvements include capability of varying wall to wall temperature calculations, capability of varying tank pressure, and capability of varying fuel distribution. Does the model include water concentration of the fuel? The model can be adjusted to consider water concentration of the fuel.

Theoretical Flammability Limits as a Function of MIE, FP, and O_2 Content – S. Summer

Steve provided the background thinking on this topic. The Computed Flammability Limits as a Function of O_2 (a similar methodology as that in Report # DOT/FAA/AR-98/26). The results were presented. The Resultant Curves for a 20J Calculation were discussed. Flammability Limits as a Function of MIE, O_2 and FP were described. This model has not been validated yet, however, this is planned for the future.

Jet A Fuel Vapor Simulant – S. Summer

Our current method for ignition testing of Jet A fuel vapors is extremely time consuming (up to as long as 2 hours per test). Ivor Thomas is working on a formula for a mixture to simulate Jet A fuel for less time consuming tests. A subcommittee has been formed to evaluate the simulant mixture. Previous simulants and their results were presented. A 20-Liter combustion vessel will be built at the FAATC within approximately one to two months. This vessel will eventually be equipped for variable energy (0.5 mJ – 5 J) spark sources (in approximately two to three months). Steve presented and described a schematic of the proposed vessel. We may be able to use this vessel for the validation of the flammability limit curves as well.

In the near future, two reports recently written by Steve will be available on the FAA Fire Safety Branch website at www.fire.tc.faa.gov.

NASA OBIGGS/OBOGS Update – R. McKnight

NASA Glenn Research Center is constructing a small test chamber. Another project at NASA is the OBIGGS project. He described NASA's project for the creation of an OBIGGS system with high reliability and high performance. There is an RFP currently open for Phase I. In the Fire Detection area, there is a big program at NASA Glenn looking into false alarm rates and the development of gas detection systems. We have been working with Dave Blake at the FAATC on this project. NASA JPL are looking at gelling of fuels (for building fire protection) as a result of 9/11/01 the attacks.

October 2001 International Aircraft Fire and Cabin Safety Research Conference Proceedings CD – R. Hill

The CD of the conference proceedings will be mailed to all those who attended the October 2001 conference by the end of June 2002. It is also available on the FAA Fire Safety Branch website at www.fire.tc.faa.gov. If you did not attend the conference and would like a copy of the CD, please email your request for a conference proceedings CD to April Horner at April.CTR.Horner@faa.gov.

747SP Full-Scale Onboard Inert Gas Generating System Update – R. Hill

Dick reviewed the previously presented information that included the requirements of this system and provided additional updated material related to this project. A copy of this presentation is

available on the FAA Fire Safety Branch website at www.fire.tc.faa.gov. Dick presented a schematic of the FAATC 747SP OBGI Production System and described the system design and function. Dick reviewed the cost (production costs) and weight of the components of this system. This system is designed to fit into a pack bay of a 747. A schematic of this installation was presented. Dick presented photos of the current test system as installed in the FAATC 747SP.

New Approach to Inerting in Flight – R. Hill (prepared by Ivor Thomas, FAA CSTA Fuel System Design)

The new approach is to look at using the available bleed pressure and going to high flows of NEA and high O_2 content (10% above and during descent). Dick reviewed the concepts of this new approach. This presentation will be available on the FAATC Fire Safety Branch website at www.fire.tc.faa.gov. Ivor is currently working on Concept 1 of this approach. The FAATC will be conducting tests in its altitude chamber in the future.

Lithium Battery Fire Tests – H. Webster

Dick provided an update on the lithium battery test project conducted by Harry Webster at the FAATC. Full-scale tests with detection were conducted in the TC-10 test article cargo compartment. Dave Blake conducted single battery tests a few years ago using an alcohol fire source. The approach is to determine the maximum amount of lithium that can be safety controlled in a cargo compartment fire by the on board suppression system by increasing the number of batteries by increments until the fire is not controllable. The second approach is to investigate the effect of packaging. One of the products of the testing will be packaging requirements (if needed). Dick reviewed the results of the CR2 Battery Tests. Halon 1301 tests were recently conducted at the FAATC. Dick described the results/observations made during these tests. The halon suppression effect did not stop the burning of the batteries. The packaging may play an important role in how you protect against the spreading of a battery fire. Tests were also conducted with lithium-ion batteries (rechargeable laptop computer batteries). In conclusion, a relatively small fire source is sufficient to start a lithium battery fire, and the ignition of one battery may produce enough heat to ignite surrounding batteries. A copy of this presentation will be available on the FAATC Fire Safety Branch website at www.fire.tc.faa.gov.

Update on Hydrostatic Tests for Fire Extinguishers – H. Humfeldt

The draft letter prepared by this Task Group will be forwarded to Dick Hill for review and finalization for forwarding to the Environmental Protection Agency.

Cargo Compartment Work Update – J. Reinhardt

John described the Water Mist/N2 System set-up in the FAATC TC-10 cargo compartment test article used in this test series. John presented results of the Sub-Floor Fire Tests he recently conducted. A copy of this presentation will be available on the FAATC Fire Safety Branch website at www.fire.tc.faa.gov.

FRIDAY, JUNE 14, 2002

Engine Nacelle Update – R. Hill (as prepared by D. Ingerson, FAATC)

An outline of the hot surface ignition difficulties and response to hot surface ignition difficulties was provided including sources reviewed and contacted in research study on hot surface ignition difficulties. Three ignition source options were evaluated. The results of each of these trials were

reviewed. In conclusion, the continuous electrodes method produced the most consistent results. Some discussion on hot surface ignition took place. Dick will talk to Doug about having Task Group members meet at FAATC to discuss and work through the difficulties and witness some tests. A copy of this presentation is available on the FAATC Fire Safety Branch website at www.fire.tc.faa.gov.

International Environmental Update – J. O'Sullivan

In the United Kingdom, Treaty 37 will take effect in January 2003. Critical uses for Halon 1301 include command centers, radioactive matter, the English Channel tunnel, aviation, confined spaces, and occupied spaces. There is a lot of Halon coming into the U.K. for destruction.

FIREDETEX Update – K. Kallergis

New Fire/Smoke Detection and Fire Extinguishing Systems for Aircraft Applications – this project is funded by the European Commission. The program is currently in the hardware development and test phase. The program is the development of a system to use watermist initial fire knockdown with OBIGGS for long time fire extinguishment. Konstantin presented a schematic of the test apparatus. The MPS tests should begin in June or July 2002. The project is scheduled to end in spring 2003. Airbus intends to perform a follow-up project in 2003/2004. There should be results to present during the next Systems Working Group meeting. A copy of this presentation is available on the FAATC Fire Safety Branch website at www.fire.tc.faa.gov.

Systems Hidden Fire Protection Update – R. Hill

There is currently a large program underway at the FAATC to investigate the materials such as thermal acoustic insulation in inaccessible areas. The FAATC will begin a program to investigate the systems involved in fire suppression and extinguishment in inaccessible areas. The NTSB reviewed flight crew/cabin crew involvement in extinguishing fires in inaccessible areas in a number of aircraft fire incidents and determined the training/systems were not adequate. The NTSB made a number of recommendations in 2002 relating to fires in hidden areas (A-01-83 through A-01-86). Dick reviewed a number of recent aircraft fire incidents and presented photos of the damage caused by some of these fire incidents on various airlines. The Phases of this FAA program were reviewed and explained. The FAATC will be using its B-727 in this test program. This FAATC program should be underway by the date of the next meeting. A copy of this presentation will be available on the FAATC Fire Safety Branch website at www.fire.tc.faa.gov.

Working Group Member Presentations

Cargo Compartment Fire Verification System Development – K. Schmoetzer (Airbus)

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

New Hand-Held Extinguisher Halon Replacement Agent – A. Chattaway (Kidde)

The evaluation of bromotrifluorpropene as a Halon 1211 replacement conducted as part of the Advanced Agent Working Group (members of this group are the US North Slope Oil Producers, US DoD, NMERI, UK MoD, QinetiQ, and Kidde). A copy of this presentation will be available on the

FAATC Fire Safety Branch website at www.fire.tc.faa.gov. Kidde will run some hidden fire tests with this agent in the near future.

Ansul Cleanguard Agent Update – H. Hammel (DuPont)

New Extinguishing Agent Technology – J. Owens (3M)

Fluoroketone compound update.

Next Meeting

The next meeting will be held in New Jersey in fall 2002. The exact location and date will be posted to the FAATC Fire Safety Section website at www.fire.tc.faa.gov.