INTERNATIONAL HALON REPLACEMENT WORKING GROUP MEETING

NOVEMBER 19-20, 1997

HARRAH'S CASINO-HOTEL, ATLANTIC CITY, NEW JERSEY

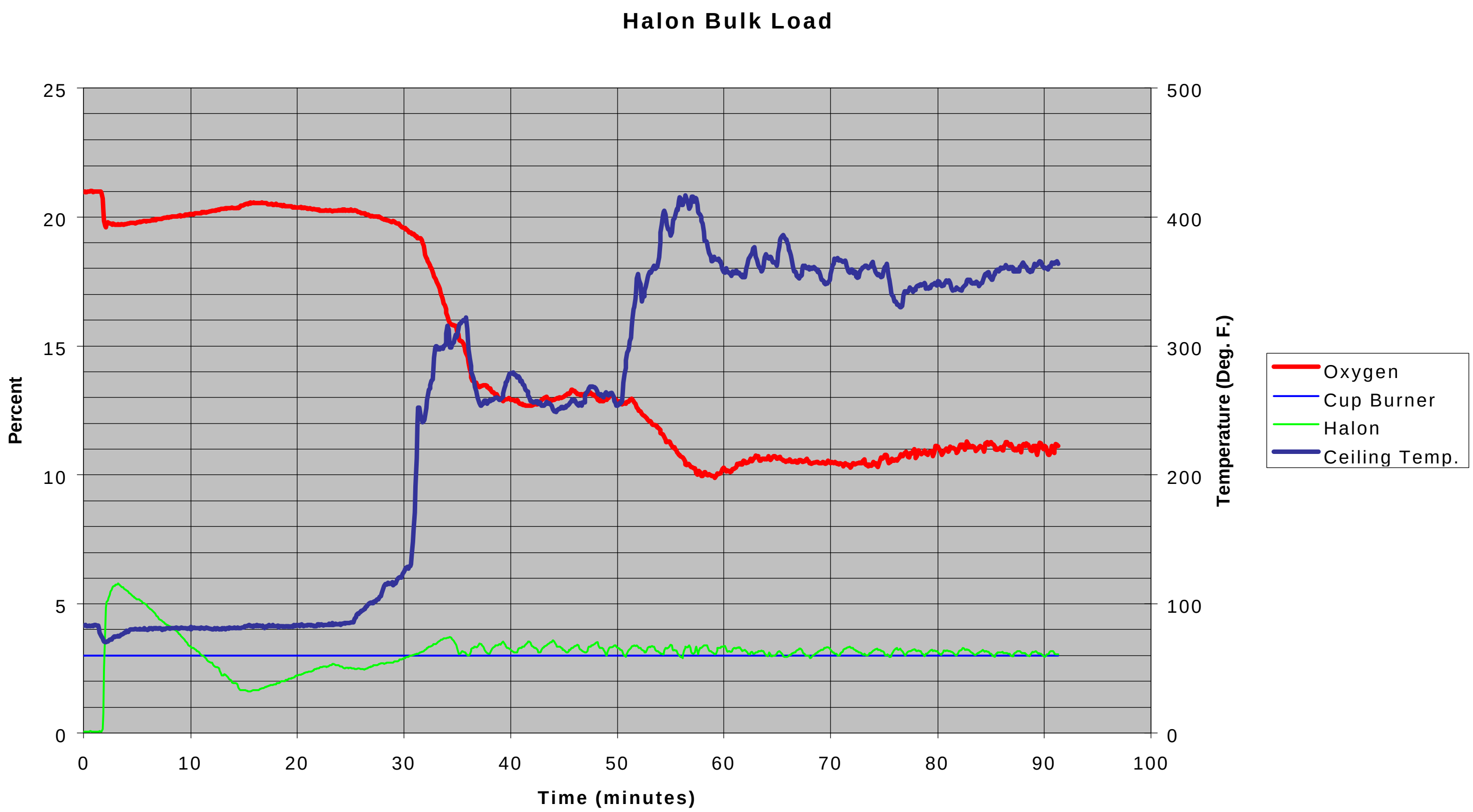
<u>WEDNESDAY, NOVEMBER 19, 1997</u>

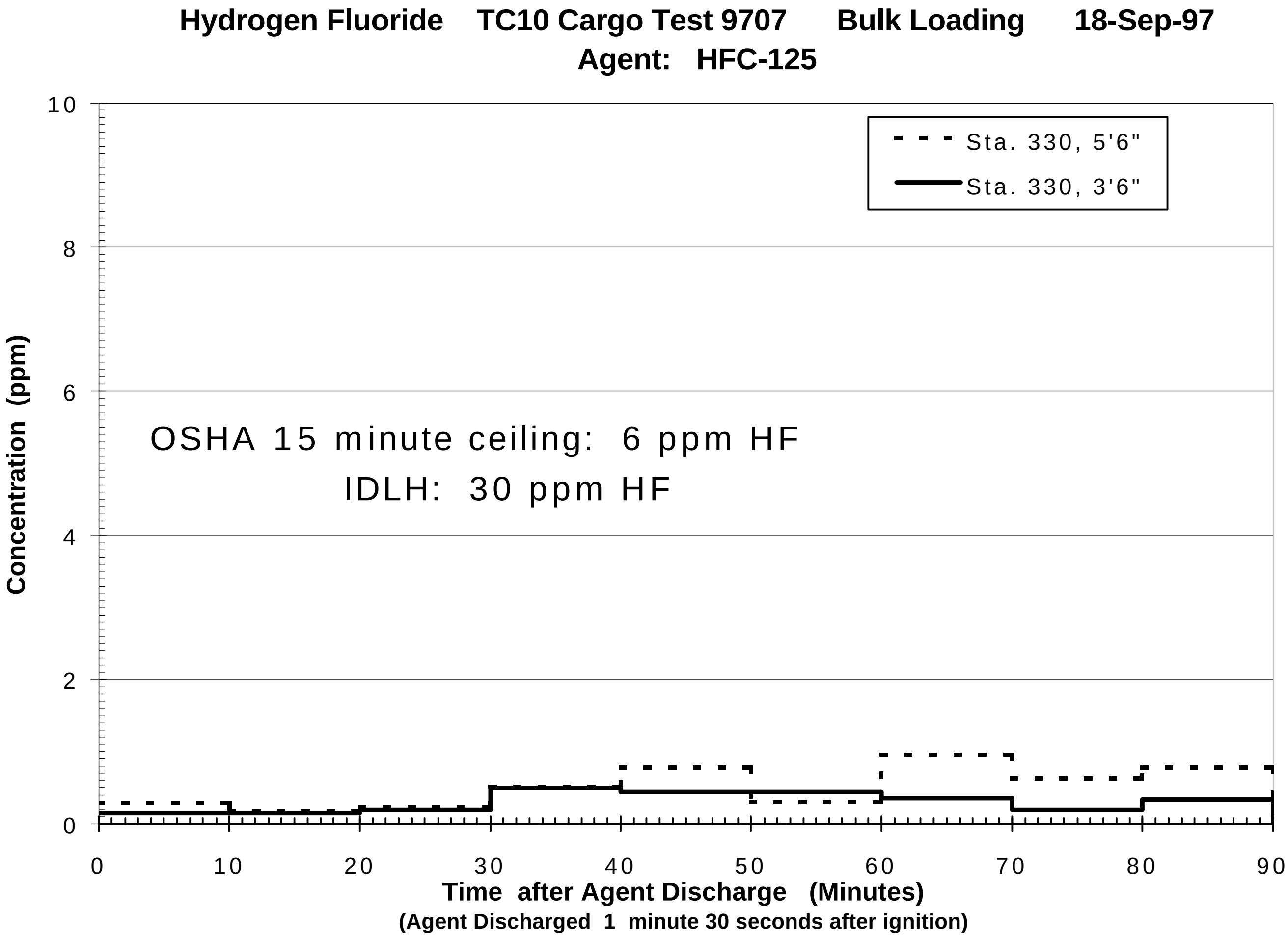
<u>Brief Update on Halon Replacement Work at FAATC</u> – R. Hill

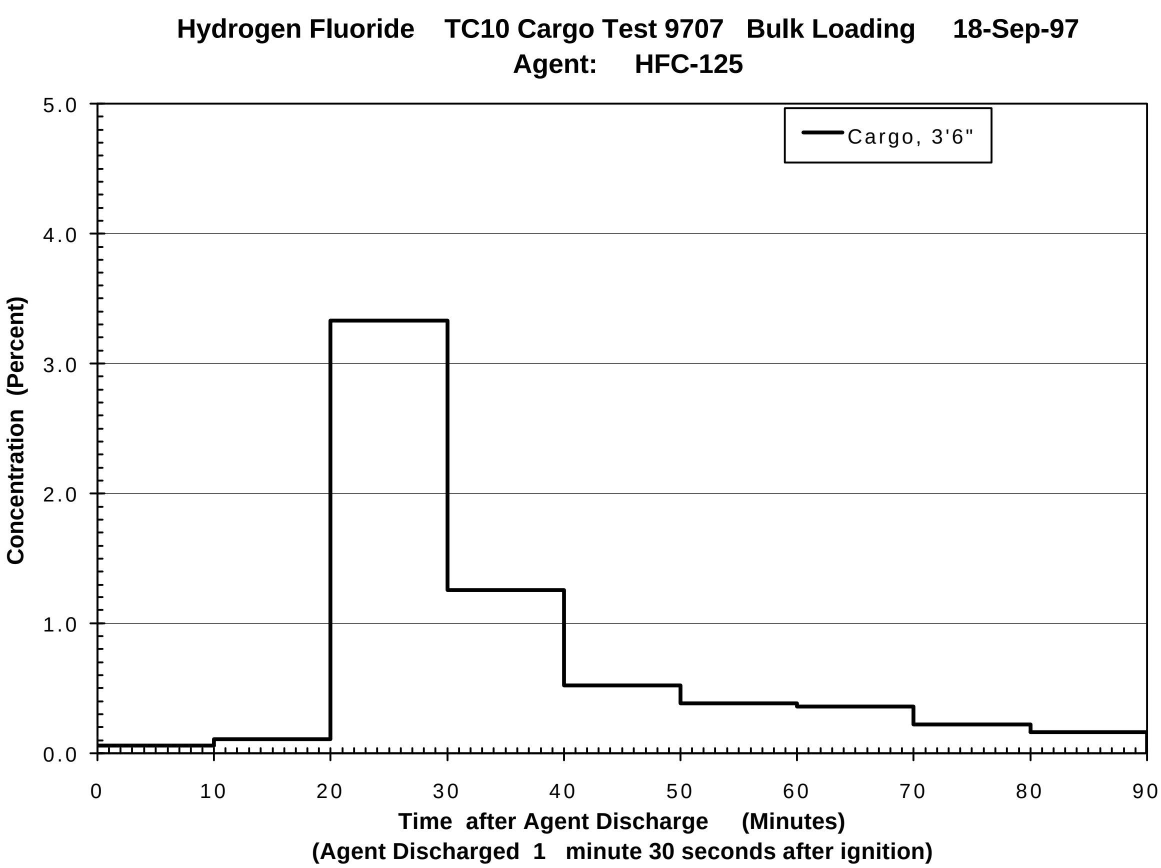
<u>Update on NPRM for Class 'D' to Class 'C' Cargo Compartment Conversion</u> – R. Hill

Does anyone have any plans to use an agent other than Halon 1301 in a Class 'D' to Class 'C' conversion? Unanimous: Every company represented at this meeting currently plans to use 1301 in their conversion. Is there talk of converting Class 'D' to Class 'C' in Europe? S. Hariram: We have received numerous requests from the airlines in Europe concerning conversion. H. Humfeldt: We at Lufthansa have been looking into the conversion. J. O'Sullivan: According to DG-11 in Europe, there won't be any restriction put on the use of Halon 1301 in Europe. There are approximately 3,000 aircraft with Class 'D' cargo compartments in the U.S.
B. Grosshandler: How will you (FAA) calculate the amount of agent used for a converted Class 'D' compartment? R. Hill: Right now we are planning to keep everything as if a Class 'C' tested? Response: To date, the aircraft has been selected at random. J. O'Sullivan: We made a commitment to the Montreal Protocol that as much as possible we would not use Halon 1301 for certification tests. R. Hill: John Reinhardt (FAATC) has been doing some tests on simulants and will present his data tomorrow.

Cargo Presentation and Discussion – FAATC Test Update – D. Blake




Hydrogen Fluoride TC10 Cargo Test 9707 Bulk Loading 18-Sep-97
Agent: HFC-125
Sta. 330, 5'6"
Sta. 330, 3'6"
OSHA 15 minute ceiling: 6 ppm HF
IDLH: 30 ppm HF
Concentration (ppm)
0
2
4
6
8
10
0
10
20
30
40
50
60
70
80
90
Time after Agent Discharge (Minutes)
(Agent Discharged 1 minute 30 seconds after ignition)


Hydrogen Fluoride TC10 Cargo Test 9707 Bulk Loading 18-Sep-97
Agent: HFC-125
Cargo, 3'6"
Concentration (Percent)
0.0
1.0
2.0
3.0
4.0
5.0
0
10
20
30
40
50
60
70
80
90
Time after Agent Discharge (Minutes)
(Agent Discharged 1 minute 30 seconds after ignition)

Presented results of FE-25 Bulk Load tests conducted at the FAATC. Showed videos of some of the tests conducted at the FAATC (FE-25 Bulk Load Tests).

FAATC Aerosol Can Tests – T. Marker

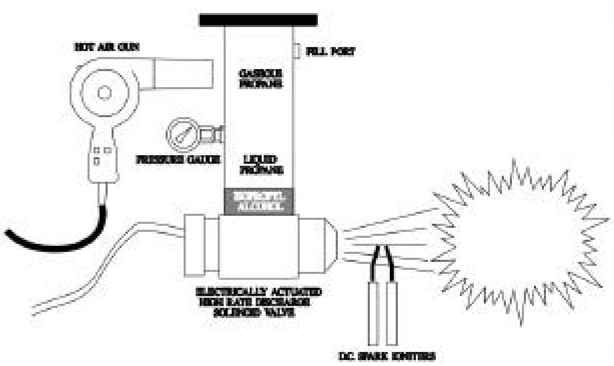
Discussed development of an exploding aerosol can test scenario at FAATC and previous aerosol can tests run by D. Blake at FAATC. Described tests conducted in the 727 compartment and the LD3 container at FAATC. Showed video of tests conducted.

FAATC Cargo Compartment Water Mist Test Work – T. Marker

Described the High Pressure Fog system recently installed in test article. Discussed use of water mist system in the exploding aerosol can tests in future FAATC tests.

Development of an Exploding Aerosol Can Test Scenario

According to current FAA guidelines pertaining to the shipment of hazardous materials, passengers are allowed to carry certain items in checked luggage for medicinal purposes. Research and Special Programs Administration (RSPA), the federal agency responsible for the regulation of hazardous materials transport, issued a brochure on this subject which states: "Personal Care Items containing hazardous materials (e.g. flammable perfume, aerosols) totaling no more than 75 ounces may be carried on board. Contents of each container may not exceed 16 fluid ounces." Over the past 10 years, ozone-depleting propellants have been phased out of aerosol products and replaced with hydrocarbon blends containing butane, propane, and isobutane. These aerosol cans can explode with violent force when subjected to a fire. For this reason, a scenario representing an exploding aerosol threat is being developed for inclusion into the Cargo Minimum Performance Standard (MPS), in addition to the existing test conditions (surface burn, bulk/loose luggage, and containerized luggage). Previous tests using actual aerosol cans have produced varying results. In some tests, the cans have produced mostly deflagration, while others will yield an explosion of considerable force. In order to develop a test condition that is both representative and reproducible, a simulator device will be used. The initial simulator consists of a 2-inch diameter pressure vessel, 8 inches in length. Affixed to the end of the pressure vessel is a high rate discharge (HRD) solenoid valve (figure 1). Hydrocarbon propellant and



SIMULATOR SCHEMATIC

ACTUAL SIMULATOR

FIGURE 1

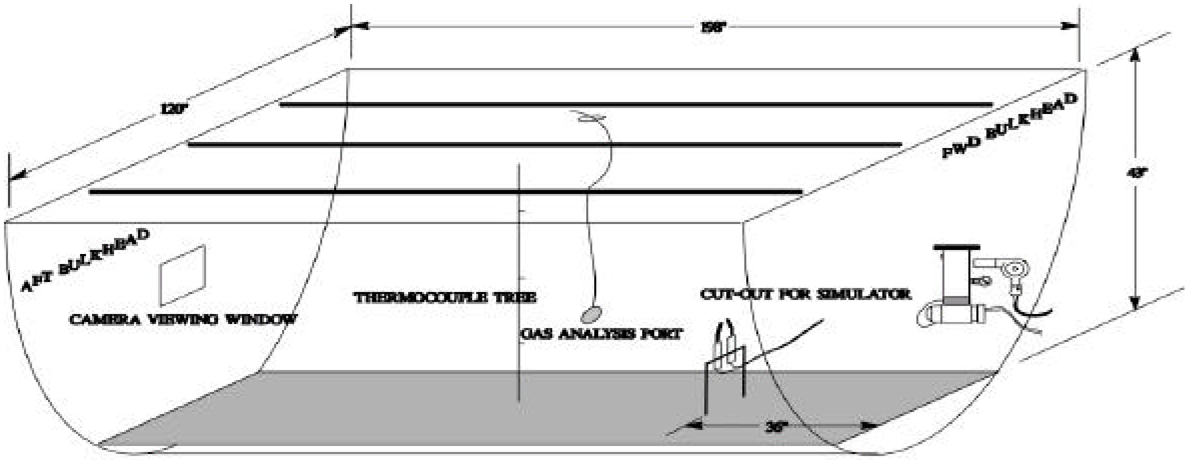


FIGURE 2

alcohol base-product can be loaded into the vessel, which is subsequently heated to approximately 200 psi and released over a set of spark ignitors. Tests using this arrangement were conducted in a 727 compartment, approximately 550 cubic feet in volume. The simulator activation caused considerable damage to the compartment, knocking out both front and rear bulkheads, as well as ripping up the cabin floor (figure 2). During a repeat test using halon 1301 at a concentration of 6.5%, no such incident occurred, illustrating the effectiveness of halon at mitigating this type of event. Further tests were conducted in LD-3 containers using actual aerosol cans and the simulator device. Similar results were achieved, including greater than anticipated results of Halon 1301 effectiveness. During a test series, the simulator was activated in the container inerted with 6% halon 1301; no explosion resulted. However, subsequent tests at 4%, 3%, 2%, and 1% concentrations produced identical results (no explosion). The simulator was then re-tested without the presence of 1301, and again the container was severely damaged. A pressure rise of 8 psi was measured during the event. In general, the simulator appears to yield a slightly more severe test condition than a typical hairspray can. A major reason for the consistent potency of the simulator lies in its ability to form a large, combustible vapor cloud, promoting complete combustion.

Subsequent tests will be conducted using an updated simulator with a more reliable solenoid discharge valve. In addition, the quantity of propellant will be reduced along with a proportional increase in the amount of base-product, in an effort to achieve a more representative condition. In order to facilitate the use of an accurate quantity of propellant/base product, the FAA has been in contact with several aerosol can industry consortiums, including Chemical Specialties Manufacturing Association (CSMA), The Cosmetic, Toiletry, and Fragrance Association (CTFA), and Factory Mutual Research Center, where considerable research on aerosol can fires has taken place. The consortia have provided the FAA with tabulated data from a survey conducted to determine the range of constituents used in today's aerosol products (see Table 1 below).

Product	Amount & type/class hydrocarbon	Amount & type/class other flammables	Classification by NFPA 30B	Europe
Antiperspirant	HFC 152a 15-25% hydrocarbonA-17 35-45%	cyclomethicone 25-27% Fragrance<1%	Level 2	isobutane 80% cyclomethicone 14% Level 3
Body Spray	Hydrocarbon blend 30 to 35%	Ethanol 50-60% Fragrance>1%	Level 3	Same as US
Deodorant	Propane/n-butane 14%	Ethanol 72% Fragrance<1%	Level 2	isobutane 20-45% ethanol 55-75%
Hairspray	HFC 152a hydrocarbon blend 35-45%	Ethanol 40-55% Fragrance<1%	Level 2	Many same as US DME/hydrocarbon blend 40-50%
Hairspray	Dymel A 10-35%	Ethanol 45-60% Fragrance<1%	Level 2	
Hairspray	n-butane/propane 10-25%	Ethanol 45-60% Fragrance<1%	Level 2	
Hairspray	HFC 152a 20%	Ethanol 80%	Level 2	N/A
Hair Mousse	Isobutane/Propane (/butane) 5-10%	Ethanol 4-5% Fragrance<1%	Level 1	Same as US
Shave Creams	Isobutane/(propane) 2-5%	Fragrance <1%	Level 1	Same as US
Shave Gels	Isopentane/Isobutane 3% Plus isobutane 4-6%	Fragrance <1%	Level 1	Hydrocarbon 9%

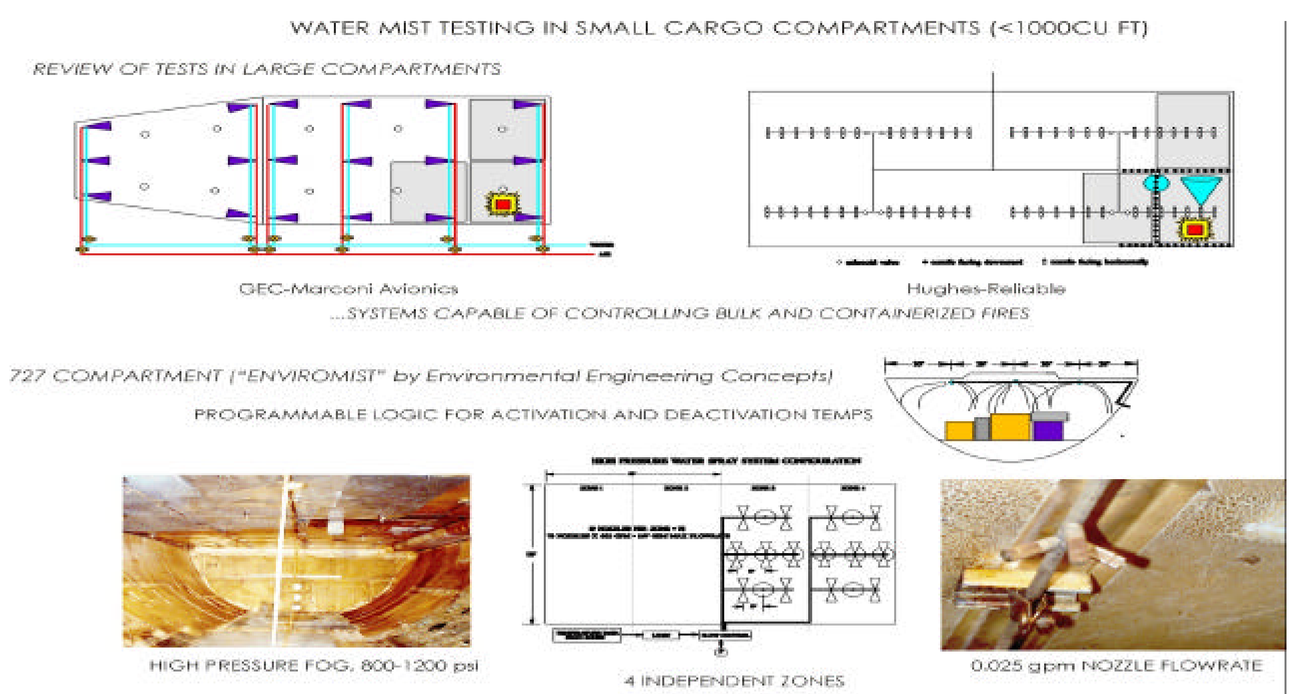


FIGURE 4

The concept of a water spray system for cargo compartment fire suppression has been tested previously at the FAA Technical Center. An air-injected low pressure water mist system and a high pressure fog-type system have both proven their effectiveness at suppressing a class A type of fire in a widebody compartment. The high-pressure system required 31 gallons of water to suppress a containerized fire for 90 minutes, and 25 gallons to suppress a bulk loaded fire for 90 minutes. A new, high-pressure system supplied by Environmental Engineering Concepts ("Enviromist") was installed in the 727 compartment for testing. The system utilizes a high-pressure fog, between 800-1200 psi, which is distributed via 4 thermally activated zones. The zone activation and deactivation temperatures can be pre-programmed in order to determine optimum settings. Two bulk loaded tests have been conducted so far, both with favorable results. During one test, the system suppressed the fire for 90 minutes, using approximately 12 gallons (figure 4).

The typical water mist system operates as an "on-demand" type of system in which thermocouples monitor the temperatures within the compartment. When a fire results and the temperatures exceed the pre-set activation value, the mist is activated. When the temperatures subside, the mist is deactivated. In doing so, the system can maintain control of the fire while at the same time not expend an excessive amount of water. The obvious weak link with this type of system is the possibility of an aerosol explosion event occurring while the mist is in the "off" mode. For this reason, the effectiveness of the current water mist system will be tested against 2 scenarios. During the first, the aerosol simulator will be activated while the water mist is in the "on" mode. During the second test condition, the compartment will be configured to simulate pre-existing damage that could have resulted from an aerosol event (either as the result of the mist being in the "off" mode, or simply the inability of the mist to mitigate such an event while in the "on" mode). This may include the removal of a portion of the sidewall and/or ceiling cargo liners, as well as a section of floor. A fire will then be initiated and allowed to develop prior to activating the automatic mist system. Temperatures, gas, and smoke levels will be measured in the cabin area to determine the effectiveness of the spray at containing the fire (figure 5).

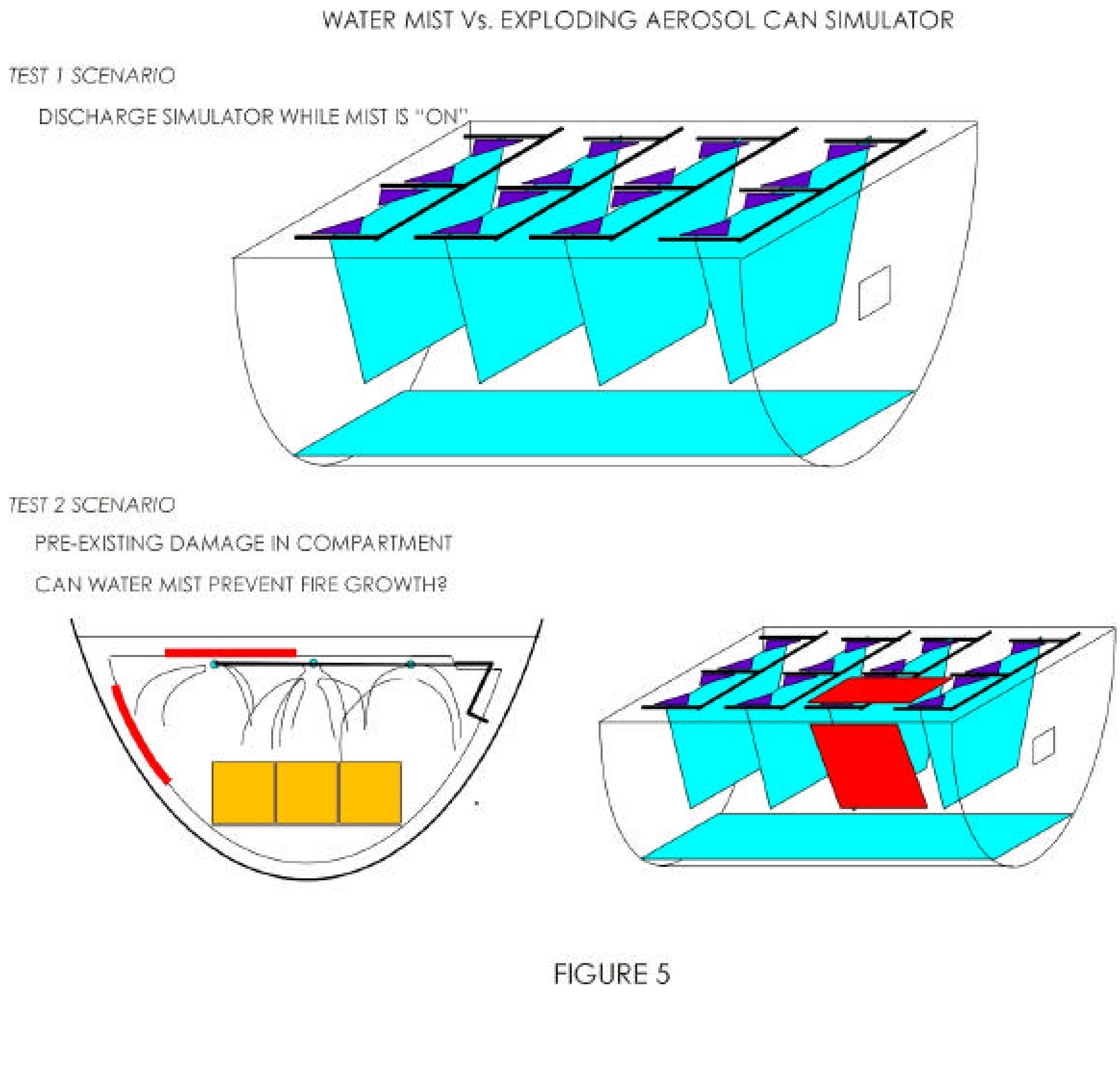


FIGURE 5

Halon Options Task Group Update – B. Grosshandler

Provided update on Task Group meeting held November 12, 1997, and status of forthcoming report.

FIREDASS Update – S. Chaer, P. Mangon

Provided update on FIREDASS work to date. Reviewed Tasks 1, 2, 3 and 4 of the FIREDASS program. DLR is in the process of building an A-340 cargo compartment for testing. There are a few reports available to the public that were published as deliverables to the European Community. The Internet address for access to the FIREDASS website is: //fseg.gre.ac.uk/firedass.

Cargo Compartment Minimum Performance Standard Update – D. Blake

The Task Group met all day November 18, 1997, to work out a final draft that will be made available on the FAATC Fire Safety Section Web Page on the Internet for comments or through April Horner if you do not have access to the Internet.

Update on Handheld Extinguisher Work at FAATC – H. Webster

We are at the point where we are ready to test new agents. He gave background on development of test. He reviewed results of some initial tests done at the FAATC.

CEAT Halon Replacement Testing Toxicity – A. Mansuet

Provided update on work on Analysis of Breakdown Products at CEAT. Described 8 Meter Cube Halon Test Chamber and test set-up. Presented results of tests conducted with Halon 1211. Presented results of test conducted with FM200 and FE36.

Air Force Update on Halon Replacement – Lt. Jim Tucker (Air Force Research Laboratory AFRL)

Presented an update on a few of the Air Force aviation related research projects. Explained the Engine Nacelle Design Equation and briefed group on other Air Force research projects.

FAATC Engine Nacelle Simulator Work – D. Ingerson

Gave brief status of engine nacelle simulator at FAATC. Discussed CF3I Evaluation. He wants an answer on whether to keep CF3I in the engine nacelle test work or not. R. Hill: I heard that one of the reasons the Navy has gone away from CF3I use is the possibility of accidental discharge being above the NOEL and LOEL levels. This issue should be discussed with the airlines. Would use of this agent be acceptable with the airlines?

THURSDAY, NOVEMBER 20, 1997

Montreal Protocol Update – J. O'Sullivan

FAATC Simulants Work Update – J. Reinhardt

Presented overview of this Task Group's objective and work done to date. This group has finalized the test plan and done some preliminary evaluation tests. R. Hill: This Task Group should take a look at the metering systems. We'd like to have a consensus from this group by the beginning of 1998 to have something in writing, and we'll coordinate with the FAA certification personnel.

Hydrostatic Test Task Group – R. Hill

No work has been done as of yet by this Task Group. R. Hill – Let's check into what the Navy is doing with Hydrostatic Testing and review their results when the tests are completed.

U.S. Navy Halon Lifecycle Hydrostatic Test Program – M. Tedeschi

The Navy has a draft test plan for the 50-year lifecycle Halon test that was described to this Working Group at the July 8-9, 1997, meeting if you would like to review the test plan let him know.

Minimum Performance Standards

Handheld Extinguisher Minimum Performance Standard – R. Hill

This MPS will be in on our web site on the Internet within the next couple of weeks.

Lavatory Extinguisher Minimum Performance Standard – R. Hill

Does anyone that has used this MPS have any comments?

Working Group Member Presentations

"Toxicology and Hazard Evaluation of Labile Bromine" – P. Haaland

FAATC Web Site Address: http://www.asp.tc.faa.gov/FAATC/AAR422/index.html

Final Discussion/Next Meeting/Closing – R. Hill

We are looking for a U.S. host for the next meeting (February/March 1998 timeframe). Please contact April Horner if you are interested in hosting the next meeting.