



U.S. Department
of Transportation

**Federal Aviation
Administration**

Technical Center

Atlantic City Int'l Airport
New Jersey 08405

April 28, 1995

Dear International Halon Replacement Working Group Member:

Enclosed please find a copy of the Minutes/Information Package from the April 19-20, 1995, meeting held in Rome, Italy.

I believe that our recent meeting was a successful one. By now everyone should have received a copy of Task Group #6's report entitled: "Chemical Options to Halons for Aircraft Use", report number DOT/FAA/CT-95/9. This report was distributed to all Working Group members.

The next meeting will be hosted by the University of New Mexico on July 18-19, 1995. Those who did not attend the April meeting will find an information package for the July meeting enclosed in this package.

Please contact April Horner if you have any questions or need further information. Her telephone number is 609-485-4471, and her fax number is 609-646-5229.

I look forward to seeing you in July.

Sincerely yours,

Richard G. Hill
Program Manager

Enclosures

APRIL 19-20, 1995 MEETING ATTENDEES

<u>First</u>	<u>Last</u>	<u>Company</u>	<u>Country</u>	<u>Phone</u>	<u>Fax</u>
Dale	Atkinson	Consultant		703-451-3011	703-451-4278
David	Ball	Kidde-Gravner Ltd.	England	44 753 683 245	44 753 683 032
Ulrich	Bamer	LBA	Germany	49 531 235 5372	49 531 235 5254
Jelle	Benedictus	KLM Engineering Dept.	The Netherlands	31 20 64 906 31	31 20 64 881 62
Mike	Bennett	U.S. Air Force		513-255-6302	513-255-2237
John	Blackburn	Avro International Aerospace	England	061 439 5050 x3696	061 767 3180
Dave	Blake	FAA Technical Center		609-485-4525	609-485-4810
Luciano	Borghetti	Safety Hi-Tech NAFGT	Italy	39 6 87 1344 21	39 6 871 344 26
Alan	Brinson	Tyco Europe	France	83 1 44 43 95 99	33 1 47 20 96 40
Gregg	Caggianelli	U.S. Air Force		513-255-6179	513-255-2237
Dave	Catchpole	BP Exploration		907-564-5038	907-564-5020
Adam	Chattaway	Kidde International	United Kingdom	44 1753 683245	44 1753 683810
Paul	DeSipio	Naval Air Warfare Center		215-441-1326	215-956-4103
Doug	Dierdorf	Pacific Scientific		505-291-1109	505-291-1141 or 505-298-
Mike	DiProse	Pacific Scientific Ltd.	England	44 628 810252	44 628 810124
Bernd	Dunker	Deutsche Aerospace Airbus	Germany	040 7437 5309	040 7437 4742
Vittorio	Fiorini	RAI	Italy		39 06 678 1318
Kevin	Frid	GEC Marconi Avionics	England	UK 01634-84400	UK 01634-816721
Regis	Gautreau	STPD/CIN/EMC	France	33 1 4552 4335	33 1 4552 5960
Bob	Glaser	Walter Kidde Aerospace		919-237-7004	919-237-4717
Frank	Govaerts	3M Belgium	Belgium	32 3 250 7862	32 3 250 7847
Thomas	Grabow	Daimler Benz Aerospace Airbus		49 421 538 4033	49 421 538 4639
Alankar	Gupta	Boeing Commercial Airplane Company	Germany	206-237-7515	206-237-5444
Sham	Hariram	McDonnell Douglas Corp.		310-593-4305	310-593-7104
Richard	Hill	FAA Technical Center			
	April Homer	FAA Technical Center		44 1 81 562 3944	44 1 81 562 2026
Frank	Hughes	British Airways	Germany	49 40 5070 2406	49 40 5070 2385
Hans	Humfeldt	Deutsche Lufthansa RG		49 5055 596 0	49 5055 596 17
Konstantin	Kallergis	German Aerospace Research Establishment	Germany	612-631-0629	612-636-1977
Dale	Kent	3M		513-429-9509	513-429-9795
Mathias	Kolleck	Booz-Allen & Hamilton		908-323-1184	903-323-1989
Bill	Leach	Naval Air Warfare Center		33 1 30 84 66 51	33 1 39 56 13 64
Eric	Lejars	Cerberus Guinard	France	33 1 30 84 66 34	33 1 39 56 13 64
Philippe	Mangon	Cerberus Guinard	France	634 816 915	634 816 721
Bill	McCutcheon	GEC Marconi Avionics Ltd.	England	206-234-3650	206-234-8539
Harry	Mehta	The Boeing Company		33 619 371 65	33 619 38 874
Jean	Paillet	Aerospatiale	France	020 6052069	020 6052895
Kryn	Pellen	Fokker Aircraft B.V.	Holland	33 61 58 74 10	33 61 58 74 78
Jean-Francois	Petit	CEAT Toulouse	France	202-267-9274	202-267-5340
John	Petrakis	FAA Aircraft Certification			
Marco	Potschkat	Airbus Industrie	France	61933759	61934908
Nick	Povey	U.K. Civil Aviation Authority	England	44 1 293 573 347	44 1 293 573 554 or 981

<u>First</u>	<u>Last</u>	<u>Company</u>	<u>Country</u>	<u>Phone</u>	<u>Fax</u>
Bud	Roduta	United Airlines - SFOCE		415-634-4857	415-634-4986
Terry	Simpson	Walter Kidde Aerospace		919-237-7004	919-237-4717
Felix	Stossel	Swissair Engineering	Switzerland	41 1 812 6930	41 1 812 9098
Robert	Tapscott	NMERI/CGET		505-272-7252	505-272-7203
Gordon	Taylor	ICI Explosives	Scotland	44 1 294 487 792	44 1 294 487 370

INTERNATIONAL HALON REPLACEMENT WORKING GROUP MEETING MINUTES

Held at the Claridge Hotel, Rome, Italy

April 19-20, 1995

WEDNESDAY, APRIL 19, 1995

REVIEW OF NOVEMBER 1994 MEETING MINUTES: one edit: Page 1 in CARGO WATER MIST SYSTEMS WORK Section: 4th sentence should read: *Per A. Gupta: Should LD3 container with cardboard be one of the design fires that any agent should tested with?*

TASK GROUP REVIEW - R. HILL (FAA TECHNICAL CENTER)

R. HILL: Gave explanation of Task Groups. Stressed importance of working group member participation in Task Groups.

TASK GROUP LEADER PRESENTATIONS

ENGINE REPORT STATUS - M. KOLLECK (BOOZ-ALLEN-HAMILTON): Gave status report on Engine Report. A draft of the report has been prepared. The Air Force has a copy of the draft. The report is a summary of the database that was created. Reviewed samples of database information. It should be available on the SURVIAC Bulletin Board in 3-6 months. Member question (N. Povey): who will be able to access the bulletin board and how is it accessed? Matt will check into this for next meeting. A copy of his presentation is enclosed.

CURRENT ALTERNATIVE AGENTS FINAL REPORT (TASK GROUP #6) - B. TAPSCOTT (NMERI): Gave summary of report topics. There was some discussion about report information and purpose of this task group was discussed. R. Hill explained that this report is to be used to start developing the test methods that can be used for an agent. (We are doing this for certification of airplanes). B. Tapscott suggested: have a committee of aircraft manufacturers incorporate concerns of working group members and decide what types of agents they would use (be most likely to test for use). It must be done by those who are going to use the agents (aircraft manufacturers--membership in this committee must be restricted).

HALON RESTRICTIONS UPDATE - FRANK HUGHES (BRITISH AIRWAYS): gave updated information on restrictions on Halon on a global basis. The list is included in this package (this list is not comprehensive). If you have any additional information, please supply it to John O'Sullivan at British Airways. In Germany, use of Halon is banned. German registered aircraft must apply for an exemption in order to use Halon. In Switzerland, an exemption may be requested for use of Halon on aircraft. There was some group discussion on this topic.

SMALL SCALE SCREENING FOR CARGO AGENTS UPDATE - DAVE BLAKE (FAA TECHNICAL CENTER): Outlined 3 Action Items established at this task group's meeting at November 1994 meeting. B. Grosshandler accepted Action Item #1, he was unable to attend this meeting. D. Blake-Action Item #2, fire load: we plan to use the same fire load--

cardboard boxes stuffed with shredded newspapers. Doug Dierdorf presented his work on Action Item #3--his presentation is included in this package. Doug raised three questions (as listed on the last page of his presentation). A. Gupta: should we use halon as a standard or go back to the standard of fire suppression?

POTTY BOTTLES FINAL PRESENTATION - BOB GLASER (WALTER KIDDE): gave summary and final recommendations on potty bottles. A copy of his presentation is included in this package.

HANDHELD EXTINGUISHER STANDARD UPDATE - NICK POVEY (U.K. CIVIL AVIATION AUTHORITY): Reviewed objective of this Task Group.

ENGINE NACELLE STANDARD - MIKE BENNETT (WPAFB): Presented some points that have come up since the November 1994 meeting.

SUBGROUP LEADER PRESENTATIONS

CARGO - DAVE BLAKE (FAA TECHNICAL CENTER): gave summary of recent water mist work done by T. Marker at FAA Technical Center. F. Stossel: when outside temperature is -30 or -40°F, then there will be ice build-up. What do you use to pressurize the water?

D. Blake: that's what we are looking for, if there are insurmountable problems, then we will not go another further with water mist tests. We use compressed air for pressurization. We want input from everyone on whether this is a viable system. R. Hill: if you are not willing to make the design changes as a manufacturer, then it is not worth us doing more work in this area. We need your thoughts on this. F. Stossel: if we use water spray, it will damage the cargo (such as expensive electronic items); if we use a gaseous agent, it won't damage the cargo. R. Hill: we will have to form a task group on this, so that we have something in writing about whether or not to consider water. We need the end-users to let us know if they would use a water mist system. We'll form a task group of airframe manufacturers and airlines to find out if they will use a water mist system. N. Povey: the new agents will require better detection systems because of environmental concerns and expense. M. BENNETT: have you looked at a system for water mist similar to a snow blower system? B. Roduta: have you got a detailed report on your presentation that I can take it back to our systems engineer to review and get that person's input? D. Blake: no, these tests were just completed last month, but data will be provided in the minutes. R. Hill: if we decide to have a task group on this, we will provide that task group with all the data we have available. A copy of this presentation is included in this package.

OTHER CARGO WORK - DAVE BLAKE: showed photos of test apparatus for tests of gaseous agents. We are using this to measure agent concentration for full-scale tests.

ENGINES - R. HILL (FAA TECHNICAL CENTER): we are beginning work once again on our engine simulator.

HANDHELD - KONSTANTIN KALLERGIS (DLR): gave overview of work that has been done at DLR to date. A copy of his presentation is included in this package.

HANDHELD - TOXICOLOGY TESTING - JEAN-FRANCOIS PETIT (CEAT): this test method uses a modified NBS Chamber. The NBS Chamber is chosen because it is widely used. Reviewed chamber set-up and plans for test method to date. N. Povey: what is the status of this work as far as your organization is concerned? J. Petit: we will begin modification

of the smoke chamber in the near future. N. Povey: we need to address your proposal and test method you have outlined.

HANDHELD - HIDDEN FIRE TEST METHOD - ADAM CHATTAWAY (KIDDE INTERNATIONAL): gave background on importance of handheld hidden fires and extinguishing methods. Gave explanation of 3 test variants. Explained Test Methodology. Reviewed Results and Conclusions of the 3 variants. Explained Redefinition of Test after observation by FAA and TCA representatives. Explained reconfiguration of test article after discussion with FAA and TCA representatives. Reviewed results of tests conducted after test article was reconfigured. Reviewed conclusions on tests using reconfigured test article. A. Gupta: questioned test configuration. A. Chattaway: reviewed conclusions of all variants. His presentation is included in this package.

R. Hill: A lot of people have taken the 1992 Delta L1011 accident and used it to design to. I do not like to see that. Hidden fires are an important issue. The agent we use must be equivalent to Halon 1211. There is a lot more work in defining what we want.

DISCUSSION ON MINIMUM PERFORMANCE STANDARD FOR HANDHELD EXTINGUISHERS - BOB GLASER (WALTER KIDDE): gave summary of standard. A copy of his presentation is included in this package. B. Tapscott: under AGENT SELECTION CRITERIA what do "B" and "C" have to do with performance? S. Hariram: are you going to make any reference to the A/C that directed everyone to use Halon 1211 or equivalent? B. Glaser: yes, I did.

PRESENTATION AND DISCUSSION OF REVISED CARGO COMPARTMENT HALON REPLACEMENT AGENT/SYSTEM MINIMUM PERFORMANCE STANDARD - R. HILL:
Comments Received Were as Follows:

1. Commentors reworded (A) and (B) with a variety of wordings. The intent of those two paragraphs is to: 1) limit the need for special approval and testing in the area of agent toxicity and acceptability and 2) make sure it is an environmentally acceptable agent. This section is not meant to be a system approval. I suggest we form a small Task Group to come up with wording for all the minimum performance standards.

2. Commentors questioned the types of fires likely to occur. After taking into account past accidents, incidents, the type of material normally carried in cargo compartments, and Task Group #4's report; the types of fires considered likely to occur are:

- 1) a surface burning Class A or B material
- 2) a deep seated Class A material
- 3) the involvement of an aerosol can containing butane or propane

It is also considered likely that any of those fires could be at any location within the compartment.

Most commentors agree with 1 but take exception to 2 and 3. The rationale is that the surface burning fires can come from aircraft equipment and be defined, however, the fires developing within cargo can be from any number of sources. However, because the vast majority of materials in cargo compartments are Class A, most if not all fires starting in the cargo from whatever (chemicals, oxygen system, explosives, etc.) will quickly become Class A deep seated fires. Given the number of aerosol cans being carried in cargo compartments, it is considered likely that if a fire develops in the cargo, an aerosol can will become involved.

We agree with commentators that state the need to define various terms used. An example is worst case scenarios, which is meant to define configuration and/or location of fire not types which have been defined under likely fires. A system should be capable of controlling a likely fire no matter how the compartment is loaded or the location of the fire.

The matrix of tests outlined may not be needed in all cases, depending on what is known about the agent/system. It is meant to determine the effect of compartment volume, location of fire, configuration of cargo, etc., on the agent/system effectiveness. These are one-time tests to determine acceptable agent/system design criteria.

In-flight test requirements do not necessarily mean in-flight tests must be conducted, however, in some cases, some analysis may suffice. Example: the discharge of an agent needing an initial concentration of 10% by volume in an empty compartment may blow out the panels in a compartment that is full. Compartment pressures could be calculated and an analysis made without an in-flight test. The same would hold true for the neat agent toxicity in the cabin. The extent of analysis or testing would depend on the agent/system.

The final major comment dealt with using Halon 1301 as the baseline to compare replacements to. One commentator stated that the other task groups on engines, potty bottles, and handheld extinguishers are not using the present halon systems as baseline. However, they in fact are. The use of Halon 1301 and 1211 has defined the present level of protection. In some cases the envelope of protection with those agents is not well defined. The development of independent standards may in some cases lead to standards that even the present system could not meet. If this is acceptable to the group, independent standards should be developed. We want to find replacements that give us at least the same level of safety as Halon 1301. Comparison of a new agent with what we get with 1301 is the easiest way, because results from 1301 are already accepted. A. Gupta: if the gunpowder and gasoline had exploded would it have been considered a likely fire. Do we design for sabotage? R. Hill: at the present time, we are not going to look at things that are not normally carried by passengers. That would be a rule change that would affect more than what we are doing here. You as the manufacturer can design your tests for more than what is currently tested for. A. Gupta: we have a problem determining what exactly is adequate protection. I have a problem defining adequate protection. R. Hill: if we define adequate protection with one definition, there will be total chaos. You have to compare like tests. A. Gupta: the terms should be defined. Member question: will you issue an A/C on the means of compliance? R. Hill: our Minimum performance standards will cover that. They are based on what level of protection we now have with 1301. Member comment: in your minimum performance standards there is no reference to the FAR. R. Hill: these minimum performance standards are not regulatory documents.

DISCUSSION OF MINIMUM PERFORMANCE STANDARD FOR ENGINES - M. BENNETT

(WPAFB): Reviewed revised standard. Reviewed health and safety concerns in engine area. B. Leach: question based on Navy's tests for totally extinguishing the fire. R. Hill: we are testing for the same results that we get with Halon. Halon does not have to meet the relight. A. Gupta: your definition of adequate protection does not agree with the FAR's definition. M. Bennett: we have concentrated mainly on fire suppression issues. M. Bennett: we are looking for suggestions on things such as powders. We should address these. P. DeSipio (NAWC): I don't agree with the size in 2.1.1. M. Bennett: These are commercial engines, not military engines. For military engines, I agree with you. I will get information on size from the airframe manufacturers. P. DeSipio: what about changing the fire location? M. Bennett: it does have a measurable difference in amount of agent required. P. DeSipio: what about forward and aft locations? We have a top, aft fire and a lower, forward fire. M. Bennett: that is something for us to consider. D. Dierdorf: in a test fixture like this, can you calibrate this test fixture in a certification spec Halon distribution?

M. Bennett: when you get to the large scale, you almost have to assume a distribution system. H. Mehta: this is a research device. D. Dierdorf's suggestion is very useful. Reviewed information added on APU Engine Simulator recently added. F. Stossel: why do you make tests with hydraulic fluid near the APU? M. Bennett: are there APU's with hydraulic fluid in the vicinity. Group consensus: no. M. Bennett: I will check with the project engineer for the reasoning. A. Gupta: you did not refer to Halon as a baseline. M. Bennett: 6% per half second is the Halon requirement. You cannot do that with an alternative agent. P. DeSipio: your minimum performance standard is based on the criteria for Halon 1301, weren't they? M. Bennett: yes. H. Mehta: that was an introductory statement to alleviate confusion. R. Hill: you have to remember that probable fires Mike was discussing were based on what a Halon system presently acceptable will put out. D. Dierdorf: you only have about 4 sets of areas and airflows that you use in your facility, have you used halonizers to measure how close or far away you are from 6% per half second with the alternative agents? M. Bennett: no, we worked with agent quantities.

TASK GROUPS

Engine Database Study - M. Kollect to update group on access to the SURVIAC Bulletin Board.

Current Alternative Agents Final Report - closed. Some suggestions to look at agents that are not commercially available at this time.

1. Agents not commercially available- future agents/systems research - group definition requested. Bob Tapscott will poll current members of group anyone else interested, contact him.

We (FAATC) looking into putting IHRWG information onto the INTERNET. This may save Task Group leaders some faxing.

2. **New Task Group:** Airframe Manufacturers and Airlines only to determine which agents/systems they would use such as water spray systems or powders. Give reasons for and against (ie: weight, expense, etc.). What systems are acceptable and why and not acceptable and why and what you would consider under certain conditions and what those conditions are. S. Hariram (McDonnell Douglas), Airbus will participate, B. Roduta (United). R. Hill: I will request that ATA and AIA try to get some additional airlines involved. This should be an industry group. FAA or other authorities should not chair this group. We (the authorities will provide whatever information we can. A. Gupta-I believe it is a little premature because we do not have information on lifecycle costs. R. Hill: we are looking for a direction to go with R&D work. The authorities are going to be doing research to come up with criteria and spend money doing it. We need your input as the end users. This is your opportunity to give us feedback on what direction we should go. We are asking you to tell us some of the things you need to know. K. Slack: that information is also useful to manufacturers of these systems.

additional participants: H. Humfeldt Lufthansa, F. Stossel Swissair, J. Blackburn Avro Int'l. R. Hill: I will ask ATA or AIA to chair this Task Group.

N. Povey: Ask the group for a suggestion on how to make the system more reliable R. Hill: We have asked the group to do that.

R. Hill: We would like some recommendations within a reasonable amount of time, the group will have to work it out. Let us know at the next meeting when we can expect some recommendations. The longer it takes, the longer it will be before we can begin R&D.

A. Gupta will chair handheld, cargo, and potty bottle and H. Mehta will chair engines sections. R. Hill: We will ask ATA and AIA and IATA to provide an overall coordinator.

Halon Restrictions Update - no new tasks. continue to provide updates

Small Scale Screening for Cargo Agents - ongoing. Group should decide where they want to go with this.

Potty Bottles - B. Glaser has been asked to put together a final report using the minimum performance standard and test method in appendix on how it was developed. FAA will publish this report.

Handheld Extinguisher Standard - N. Povey --ongoing. no further assignments

Engine Nacelle Standard - M. Bennett - ongoing. give Mike Bennett your input.

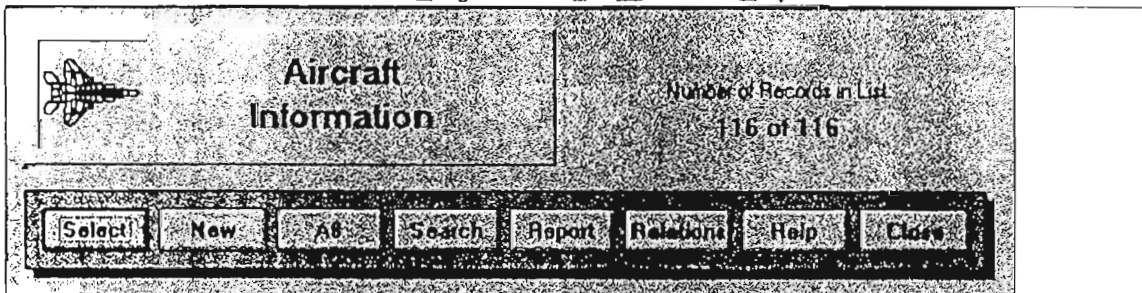
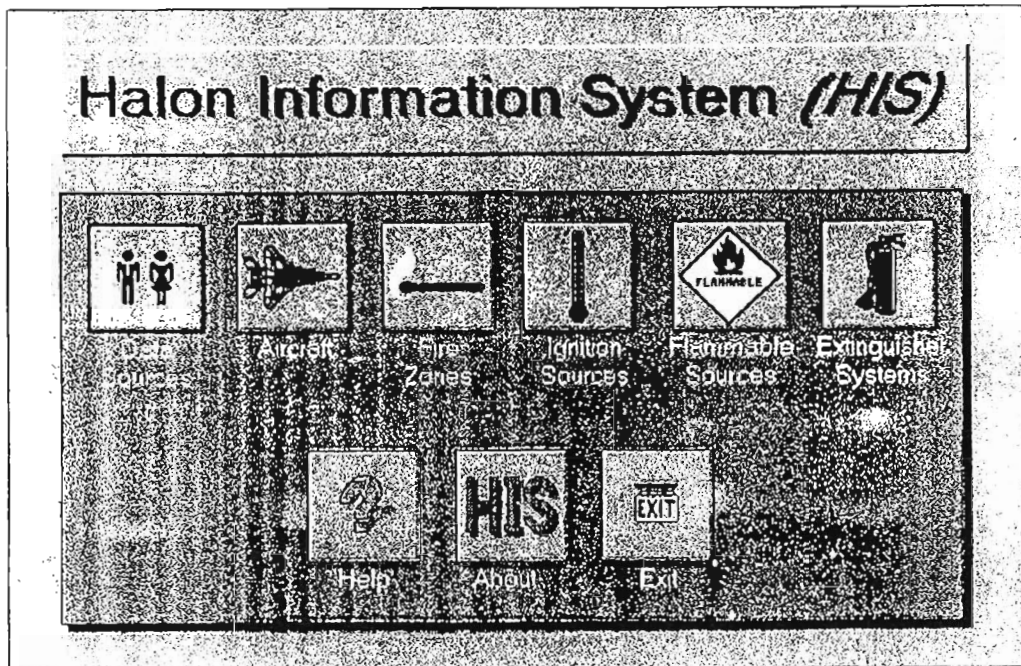
TASK GROUP A: Wording on environmental and toxicity standards for all of our minimum performance standards for general usage around the world. B. Glaser: we should have a statement in there about environmental issues to give guidance, etc., so people do not go off in too many different directions. R. Hill: someone has to tell us what the words should be so that it is clear globally. B. Tapscott: I think we are mixing up two different things here. We do need to address what is allowed. B. Tapscott, David Catchpole, B. Glaser will participate in this group. A. Gupta: for every statement there should be a reason. TOXICITY ENVIRONMENTAL TASK GROUP: D. Catchpole - Chairman.

WORKING GROUP MEMBER PRESENTATIONS

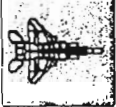
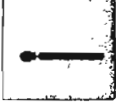
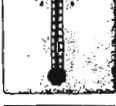
Kathy Slack - Reliable Automatic Sprinkler Company: if you would like a copy of her presentation, contact April Horner at 609-485-4471, or by fax at 609-646-5229.

Paul DeSipio - NAWC (Warminster, PA) - questions may be addressed to him. His telephone and fax numbers can be found on the meeting attendees sheet.

Bill Leach - NAWC (Lakehurst, NJ) - a copy of his presentation is included in this package.



Aircraft List							
Sour_id	Airc_id	Service	Aircraft	Mod_series	Block_num	Category	Eng_model
1	1 AF	F-111				bomber	
2	1 AF	F-111				bomber	
2	2 AF	F-16	B/D			fighter	
2	3 AF	F-16	A/C			fighter	
2	4 AF	F-15	A/B/C/D/E			fighter	
2	5 AF	F-15	A/B/C/D/E			fighter	
2	6 AF	F-15	A/B/C/D/E			fighter	
2	7 AF	C-5	A			transport	
2	8 ARMY	C-20	H			transport	
2	9 AF	T-1	A			training	
2	10 AF	CV-22				helicopter	
2	11 AF	B-2	A			bomber	
2	12 AF	F-22				fighter	

Press	This happens	Press	This happens
	A list of sources supplying data used in this database is displayed. From this list, information such as name, address, and phone number can be accessed.		A list of extinguisher systems that are used for each fire zone is displayed, including agent type, container and trigger specifications, and yearly discharge estimates.
	A list of aircraft is displayed that includes information identifying the aircraft, its function, and halon usage and service cycle statistics.		
	A list of fire zones that have been identified for each aircraft is displayed. Specifications on the zones' dimensions, ventilation, temperature, pressure, etc. are provided.		This help screen is displayed.
	A list of ignition sources that have been identified for each fire zone is displayed, including data on ignition source type, operating and overheat temperatures, cooling times, etc.		A window containing information about the current release of this system is provided.
	A list of flammable sources that have been identified for each fire zone is displayed, including data on material specifications, operating pressure and temperature, flash point, etc.		The system is terminated.



Data Source Record



Data Source Information

Data Source ID: 17

Source

BELL HELICOPTER

Name

Prefix First M. Last Suffix

Mr. Bob Wooster

Address

Organization: Bell Helicopter Textron

Street Address Line 1: P.O. BOX 482

Street Address Line 2:

City or Base: Fort Worth

State or Province: TX

Zip Code: 76101

Telephone Number: (817) 280-3801

Notes

↑

↓

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Save

Delete

Reset

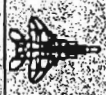
Help

Close

Microsoft FoxPro

File Edit View Window Program Run Window Help

Data Source Record



Aircraft Information

Data Source ID: 2
Aircraft ID: 6

Service	AF	Number in Service	0
Aircraft	F-15	Zone Count	1
Model Series	A/B/C/D/E	Total Hahn	0.0000
Block Number		Usage per Year	0.0000
Category	fighter		
Design Threat			

Engine

Model Count

Service Cycle

Repair Refill Maintenance

Aircraft Picture Extinguisher Profile Notes

Microsoft FoxPro

File Edit View Window Program Run Window Help

Fire Zone



Fire Zone Information

Data Source ID: 3
Aircraft ID: 1
Fire Zone ID: 1

Fire Zone Type	THROTTLE IS SHUT OFF		☒ Ventilated
Additional procedures			
Surface Temperature	0.0000		
Dimensions	Length	200.0000	Width 36.0000
	Height	36.0000	Units inches
Volume	Total	0.0000	Free 50.4000
Airflow	Minimum	0.0000	Maximum 28387.0000
Oper. Temp.	Minimum	50.00	Maximum 400.00
Pressure	Minimum	0.0000	Maximum 0.0000
Drawing	JTCG/AS-74-T-002 FIGURE 6		
Count	Extinguisher	1	Flammable 1 Ignition 2

Zone Picture Notes

Microsoft FoxPro

File Edit **Record** Program Run Window Help

Data Source Record



Ignition Source Information

Data Source ID 12
 Aircraft ID 1
 Fire Zone ID 3
 Ignition Source ID 1

Type
 Normal Operating Temperature
 Minimum Temperature at Overheat
 Cooling Time
 Location





 Save
 Delete
 Report
 Help
 Close

Notes

Microsoft FoxPro

File Edit **Record** Program Run Window Help

Flammable Source Record



Flammable Source Information

Data Source ID 7
 Aircraft ID 1
 Fire Zone ID 5
 Flammable Source ID 1

Type
 Line Designator
 Flammable Material Specification





 Save
 Delete
 Report
 Help
 Close

Fluid
 Maximum Operating Pressure
 Maximum Operating Temperature
 Flash Point
 Drain Time

Notes

Microsoft FoxPro

File Edit View Record Program Run Window Help

Extinguisher



Extinguisher Information

Data Source ID: 7
 Aircraft ID:
 Fire Zone ID:
 Extinguisher ID:

Container	Capacity	15.0000	Volume	756.0000
	Fill %	50	Pressure	635.0000
	Growth	0	Location	inside
	Material	stainless steel	Width	0.0000
Storage	Length	0.0000	Maximum	0.00
	Height	0.0000	Mode	0.0001
Oper. Temp.	Minimum	0.00	Agent Type	halon 1202
	Temp.	0.00	Disch. Rate	0.0000
Est. Yrly Disch.	Suppression	0.0001	Total Weight	30.00
Trigger	Servicing	5.0000	Panel ID	
Detector Type	Thermistor Device			
Disper. method	nozzle			
Response Time		0.0001		
Seal Material	Copper Diaphragm			
Manufacturer	Walter Kidde			
Ver. Method	By Manufacturer			

Exterior Picture
 Interior Picture
 Parts Picture
 Notes

Save
 Delete
 Report
 Help
 Close

Microsoft FoxPro

File Edit View Record Program Run Window Help

Aircraft

Number of Records in List:



Search

Criteria:
 AIRCRAFT: London: 15

Select
 Add
 Replace
 Delete
 Or
 Clear
 Switch
 Help
 Close

Sour_id	Field	Operator	Value
1	AIRCRAFT	Contain	F-16
2	11 AF		B-2
2	12 AF		F-22
2			A
2			bomber

Microsoft FoxPro

File Edit Database Record Program Run Window Help

Aircraft Information

Number of Records in List: 4 of 116

Select New All

Select the desired related data..

- ☐ Data Sources
- ☐ Aircraft
- ☒ Fire Zones
- ☐ Ignition Sources
- ☐ Flammable Sources
- ☐ Extinguisher Systems

OK Cancel

Sour_id	Airc_id	Service	Aircraft	Mod_series	Block_num	Category	Engr_model
2	2	AF	F-16	B/D		fighter	
2	3	AF	F-16	A/C		fighter	
4	1	AF	F-16	C/D		fighter	
32	15		F-16	N		other military usage	

Microsoft FoxPro

File Edit Database Record Program Run Window Help

Aircraft Information

Number of Records in List: 4 of 116

Select New All Search Report Relations Help Close

Aircraft List

Sour_id	Airc_id	Service	Aircraft	Mod_series	Block_num	Category	Engr_model
2	2	AF	F-16	B/D		fighter	
2	3	AF	F-16	A/C		fighter	
4	1	AF	F-16	C/D		fighter	
32	15		F-16	N		other military usage	

HIS

AIRCRAFT RECORDS



Data Source ID: 1	Aircraft ID: 1
Service: AF	In Service: 0
Aircraft: F-111	Zone Count: 1
Model Series:	Total Halon: 0
Block number:	Usage per Yr: 0
Category: bomber	
Design Threat:	
Engine	
model	
count 0	
Service Cycle	
Repair 0	Maintenance 0
Refill 0	
Data Source ID: 2	Aircraft ID: 1
Service: AF	In Service: 39
Aircraft: F-111	Zone Count: 1
Model Series:	Total Halon: 24
Block number:	Usage per Yr: 0
Category: bomber	
Design Threat:	
Engine	
model	
count 0	
Service Cycle	
Repair 0	Maintenance 0
Refill 0	
Data Source ID: 3	Aircraft ID: 1
Service: AF	In Service: 0
Aircraft: F-111	Zone Count: 2
Model Series:	Total Halon: 24
Block number:	Usage per Yr: 0
Category: fighter	
Design Threat:	
Engine	
model	
count 0	
Service Cycle	
Repair 0	Maintenance 0
Refill 0	

Hand Held Extinguishers - 19-20 April 1995

Slides presented by:- Nick Povey

Hand Held Extinguishers

- Nick Povey
- Research Project Manager
 - Civil Aviation Authority, Safety Regulation Group, Aviation House, Gatwick, West Sussex, RH6 0YR, U.K.
- JAA Focus for halon issues
- Telephone 44 (0)1293 573347
- Facsimile 44 (0)1293 573554
- E-Mail 100550.3221@Compuserve.com

International Forum on Extinguishers Working Group 19-20 April 1995

Position - November 1994

- The Aviation Authorities want no loss of safety with the introduction of new agents - all sectors of the industry agreed
- A single document technical specification was desired
- The need for aviation specific fire tests was identified - in particular a hidden fire test
- A hand held extinguisher sub-group was formed
- Some urgency was identified - a one year timescale suggested

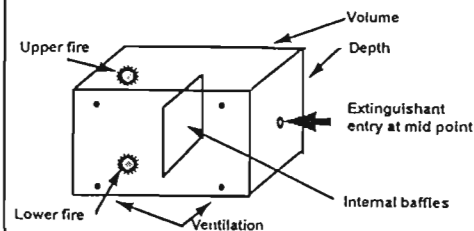
International Forum on Extinguishers Working Group 19-20 April 1995

Actions

- Sub group formed - 19 members
- Data collection - Specifications, Test Methods, Incidents
- Task group to address the specification
- Research
 - CAA to contract a hidden fire simulation test
- Other European research initiatives to be explored

International Forum on Extinguishers Working Group 19-20 April 1995

Suggested Hidden Fire Test Apparatus - Circa November 1994



International Forum on Extinguishers Working Group 19-20 April 1995

Incident and Accident Data

- Searching of Boeing database confirms that there is a very low probability of a significant on-board fire
- Many minor fires apparently easily tackled - ovens, cigarettes and electrical lighting predominate
- 18 recorded by Boeing in five years and ten months in which it is known that a hand held extinguisher was used

International Forum on Extinguishers Working Group 19-20 April 1995

FAA AC20-42C

- Minimum 5B:C rating
- 10 foot range
- "Halon 1211 extinguishers of less than 9 pounds capacity are not always equipped with a discharge hose. However for access to underseat, overhead, and other difficult to reach locations, consideration should be given to using extinguishers equipped with a discharge hose of a minimum length of 12 inches. An extinguisher with a discharge hose is more likely to result in the extinguisher being properly held in an upright position"

International Forum on Extinguishers Working Group 19-20 April 1995

Hand Held Extinguishers - Subjects Today

- European Research
 - DLR, Konstantin Kallergis
 - CEAT, Jean F Petit
 - CAA, Adam Chataway Kidde International
- Specification
 - Presentation of work to date by Bob Glaser followed by group discussion to include;
- Future Activities
 - Specification
 - Agent Testing

International Forum on Extinguishers Working Group 19-20 April 1995

Testing of New Agents

- The CAA commissioned facility will be available for the testing of new agents
- An 'at cost' figure for this work has been agreed with the contractor (Kidde)
- CAA will not be paying
- It is hoped that results can be published in a CAA Research Paper

International Forum on Extinguishers Working Group 19-20 April 1995

Intermediate Scale Screening Test

for

Carigo Compartment Fire Extinguishing Agents

Doug Dierdorf

Rome, Italy

April 19, 1995

Screening Test

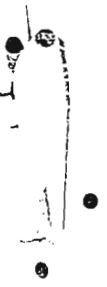
- Common Test for all Agents
 - Gaseous Halon Replacements
 - Non-Gaseous Halon Alternatives
- Low Cost
 - Minimal Agent Requirements
 - Low Test Cycle Down Time

Fixture Design Factors

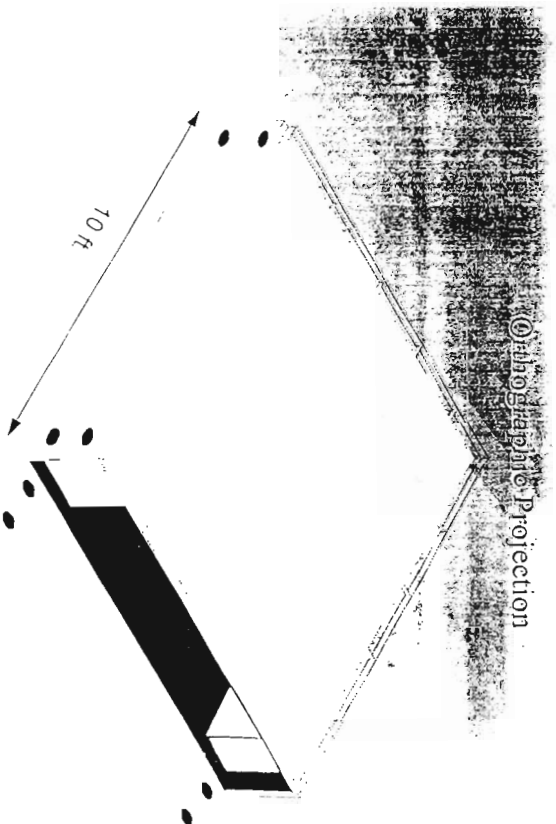
- Fire location remote from agent distribution
- Fire well developed, not oxygen depleted
- Fire scenario must be readily reproduced
- Minimize cleanup and maintenance

Impulses

- Fire size small compared to chamber volume

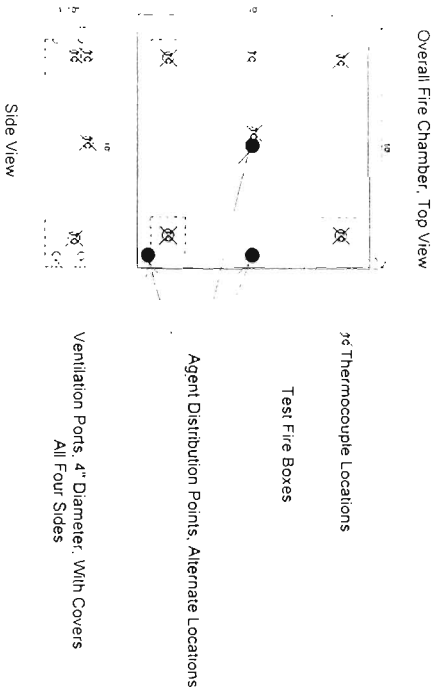


Geometric Projection



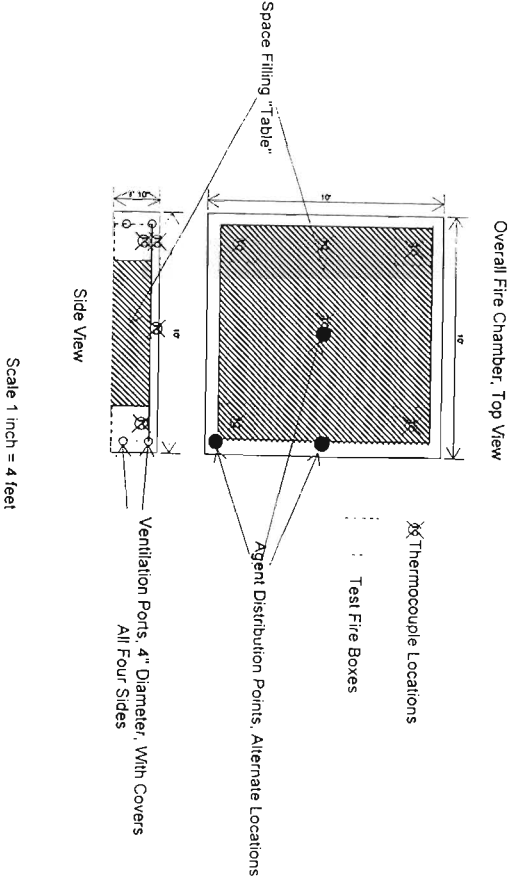
Intermediate Scale Cargo Compartment Test Chamber

For Testing the Distribution Properties of Halon Replacement Agents



Intermediate Scale Cargo Compartment Test Chamber

For Testing the Distribution Properties of Halon Replacement Agents
(Alternate View -- Dead Space Filler)



Fuel Requirement

- 2,250 ft³ per firebox, 9 ft³ total
- What fuel?
 - Previous Proposal
 - 5 lb/ft³
 - Subject to Halon challenge

Constituent	Weight %
Shredded paper	10
Urethane foam	4
Polystyrene packing material	16
Cardboard	40
Fabrics (Old Clothes)	30



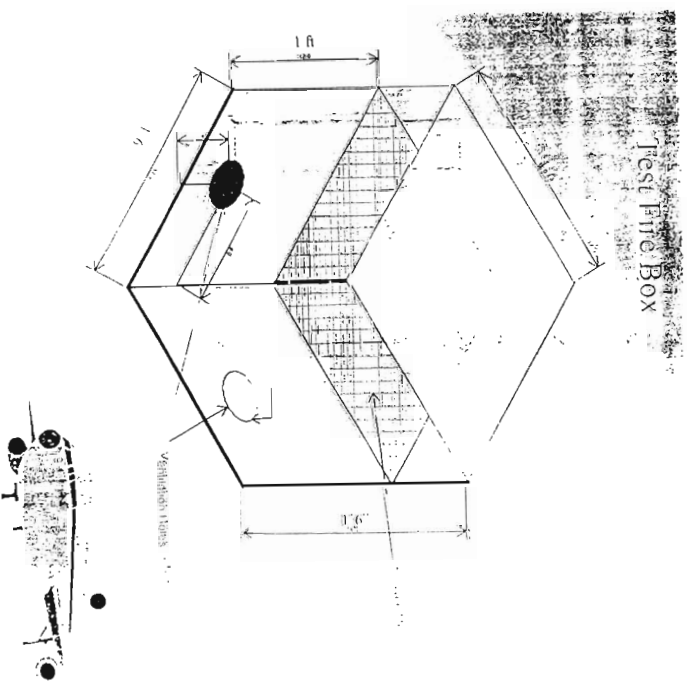
What Next?

- Is a screening test valuable to the working group?
- Who should run the test?
 - FAA-TC
 - NMJERI or other independent lab
 - Individual Companies
- Who will pay for the testing?
 - FAA
 - Users/Airframers/Agent suppliers



Experimental Features

- Nominal volume 183.3 ft³
- Nominal Halon 1301 requirement (5% @ 70 °F) 3.75 lb
- Requires experimental validation to
 - Adjust leakage rates
 - Establish suppression time scale



Halon Replacement Research

Handheld Extinguisher Tests

- Object:
 - Aircraft Carpet, 2m x 2m
 - Soaked with 4 l Benzine
 - Preburn Time: 30 s
- Measuring Parameters:
 - Extinguishing Time
 - Extinguishing Mass
 - Gas Analysis: O₂, CO
 - Toxicity: HBr, HCN, HCl, HF
 - Temperatures



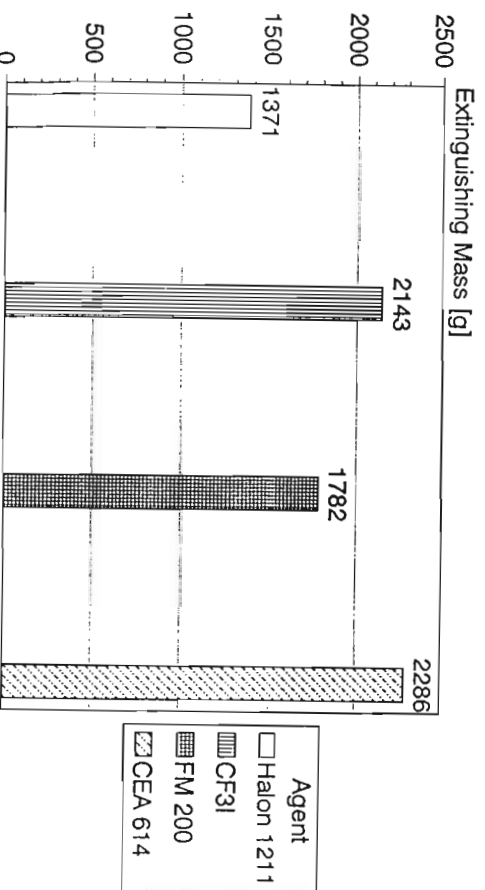
Halon Replacement Research

Handheld Extinguisher Tests

- Tested Agents:
 - Halon 13001 (CF₃I)
 - FM 200 (C₃F₇H)
 - CEA 614 (C₆F₁₄)
- in Comparison with Halon 1211 (CF₂ClBr)

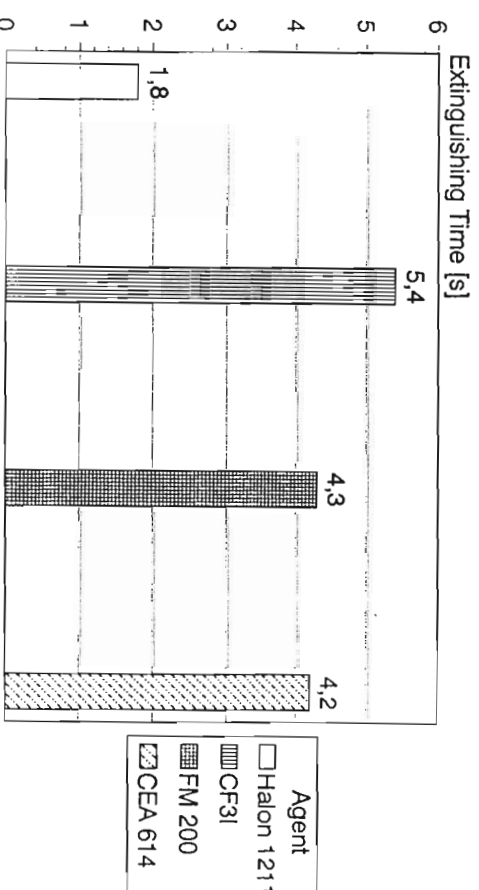
Handheld Extinguisher Tests

Extinguishing Mass



Handheld Extinguisher Tests

Extinguishing Time



Handheld Extinguisher Tests

Toxicity

	Halon 1211	CF3I	FM 200	CEA 614
F [ppm]	*	53	10	60
Cl [ppm]	*	*	*	*
Br [ppm]	*	*	*	*
CN [ppm]	*	*	*	*

* : Under value of pure carpet fire



Handheld Extinguisher Tests

CO and O2

	Halon 1211	CF3I	FM 200	CEA 614
CO max. [ppm]	3100	7400	3300	2800
O2 min. [Vol. %]	12,3	9,7	11,35	12,8



The Development of a Hidden Fire Simulation Test for the Evaluation of Halon Replacement Agents in Aircraft Hand Extinguishers

CAA Contract No

8D/S/00003

Adam Chattaway

April 1995

Background

1. March 1992 - Delta Airlines L1011 suffered a hidden fire in the cheek area which was successfully extinguished using a number of Halon 1211 hand extinguishers
2. Following Montreal Protocol & subsequent amendments, Halon production ceased 1.1.94.
3. There is a need to quantify how effective Halon is for the suppression of hidden fires before any replacements are tested

Contents

1. Introduction
 - Background
 - Scope of Test Work
2. Initial Experiments ("Variant 1")
 - Results
3. Further Experiments ("Variant 2")
 - Results & Preliminary Conclusions
4. Redefinition of Test ("Variant 3")
 - Results & Conclusions
 - Alternative Fire Type

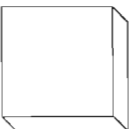
Initial Scope of Test Work

To devise a test method that evaluates the ability of Halon 1211 to extinguish hidden fires:

1. Build test article representative of a cheek area
2. Develop experimental methodology to achieve borderline extinction (4/6 successful suppressions) using a fixed amount of Halon 1211
3. Evaluate Class A fires

Test Variables 1

- Test chamber: 2m high, 2m long & 0.5m wide heated to $20 \pm 1^\circ\text{C}$

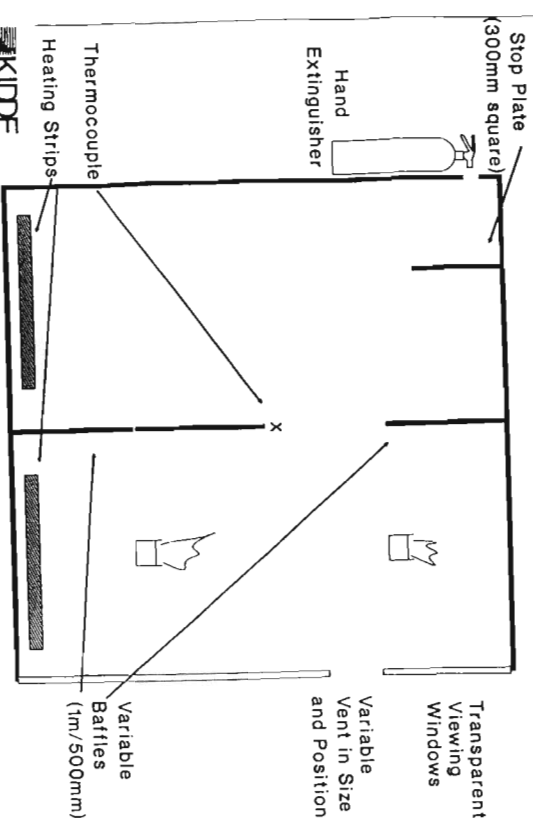


- Position/size of centre baffle plate: Start at 50% blockage, vary as required
- Position/size/number of fires: Start with 2 as shown below

Test Variables 2

- Use n-heptane for majority of tests
Class A fire to be shredded paper
- Extinguisher: 2.5 lb (1.1kg) Halon 1211
Pressurised with N_2 to 100 psi, equilibrated at $25 \pm 1^\circ\text{C}$ for 10 minutes
- Extinction time < 60 s, otherwise classed as a failure

Test Article - Variant 1



Test Methodology

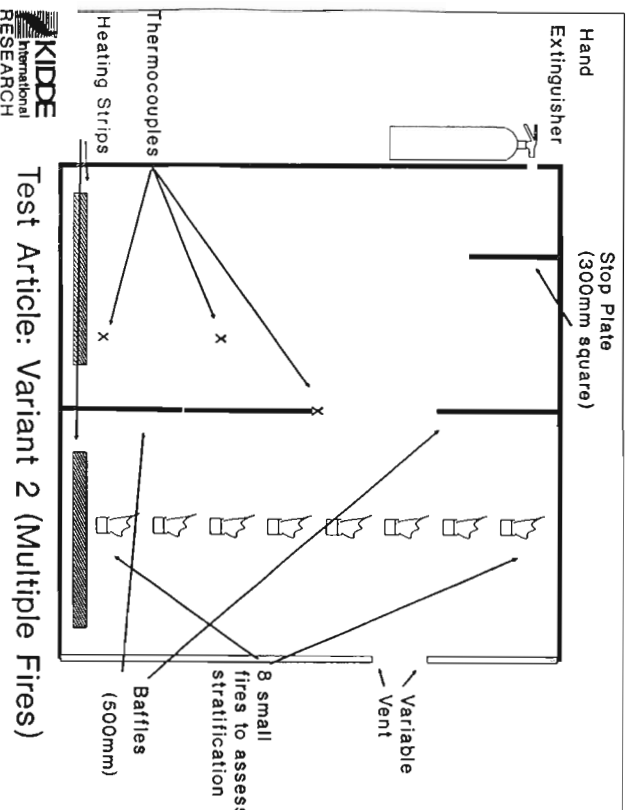
- Fixed amount of agent (2.5 lb) & fixed volume of test article (2 m^3) ----> final Halon 1211 concentration of 8 volume% (2x cup-burner)
- All fires should be easily extinguished
- Vary ventilation & level of obstruction to achieve borderline suppression
- Initial CAA guideline:
4 suppressions from 6 tests

Results - Variant 1

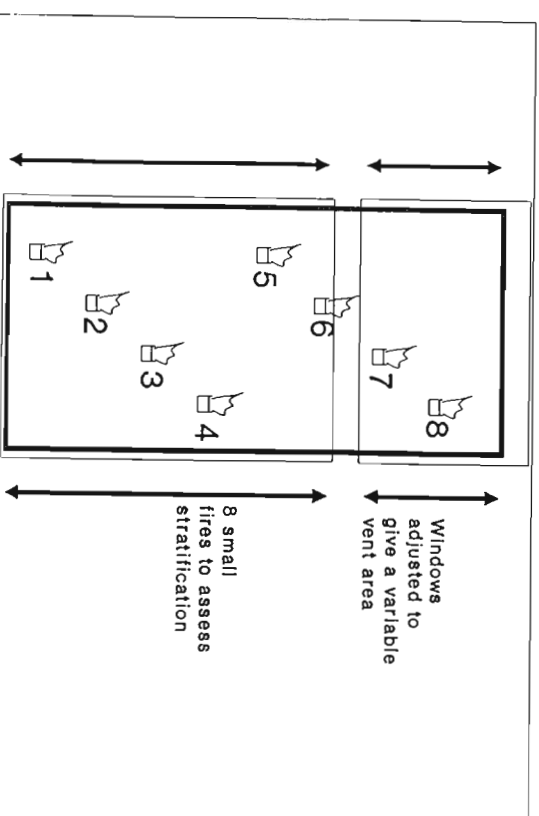
- Both baffles 500mm (50% obscuration) and vents up to 250 x 500mm: both fires extinguished reliably 10-15 s
- Lower baffle increased to 1m (75% obs) and vent reduced to 200 x 500 mm gave 1/5 extinctions for upper fire
- Problems over the location of the vents
- 1st Progress Meeting with CAA led to the following conclusions:

Conclusions - Variant 1

1. Ventilation can be increased to the point where suppression of the upper fire becomes uncertain. *ie what was originally wanted*
BUT:
Position of vent is just as important as size:
High --> Halon will extinguish top fire first
Low --> Halon will escape from chamber first
2. Use of 2 fires gives limited information, therefore an alternative strategy of multiple fires was employed: *Variant 2*



Test Article: Variant 2 (Multiple Fires)



Variant 2:
Multiple Fire Configuration (End View)

Results - Variant 2

(1) 75% Obstruction, vent 2/3 way up chamber

Vent size/mm	# of Fires Extinguished
200	6 out of 8
100	7 out of 8
0	7 out of 8

(2) 75% Obstruction, vent at bottom of chamber

Vent size/mm	# of Fires Extinguished
100	8 out of 8 (i)

(Agent entrainment
into convection plume?)

Redefinition of Test

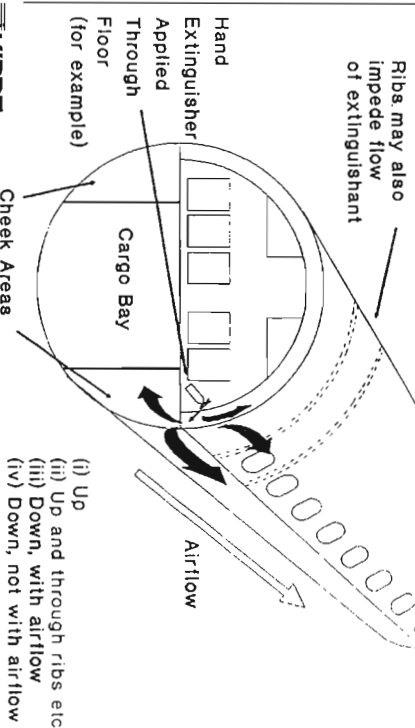
- 2/3 through test programme, a second progress meeting was held with CAA; FAA & Air Transport Canada in attendance
- Other aspects of test were introduced:
 - Ability of Halon to "climb" above point of entry (in an enclosed area)
 - Ability of Halon to extinguish fires both on its natural flow path and off it
 - Simulation of the "infinite" aspect of the aircraft cheek area
 - Radical reconfiguration of test article

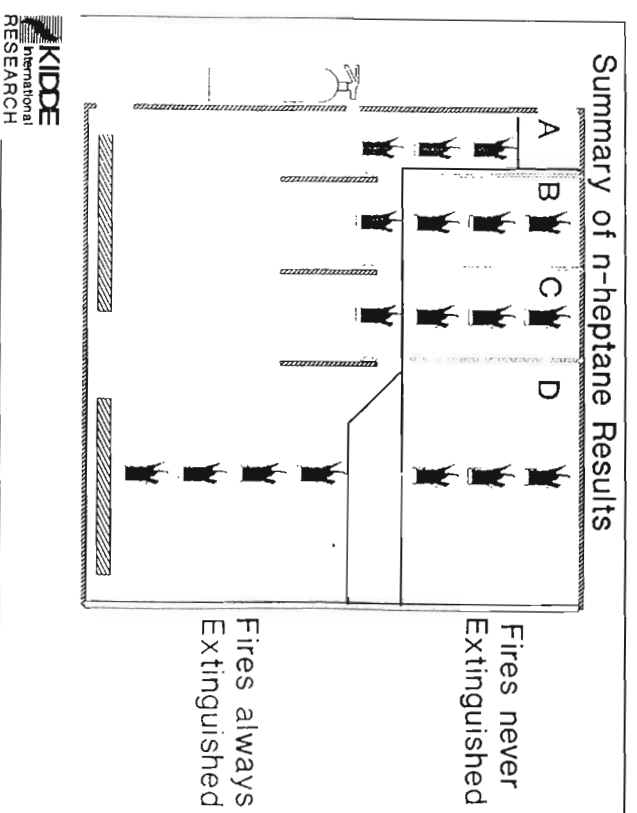
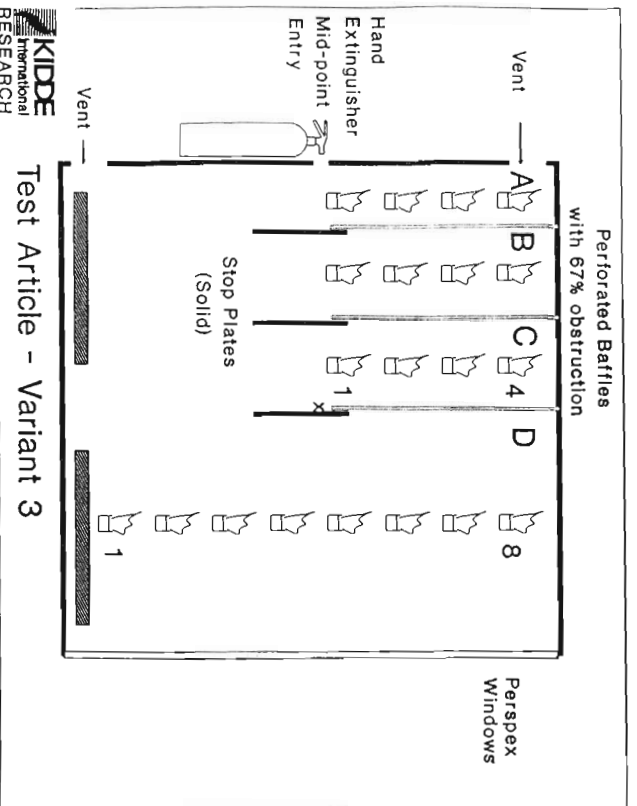
(Variant 3)

Conclusions - Variant 2

1. 8 small fires show that with no ventilation stratification occurs although the chamber and the agent are heated to 20/25 °C
2. Not really surprising: *Halon 1211 is not a total flooding agent!*
3. Have we fulfilled our objective of establishing just how good a suppressant Halon 1211 is for this application? Instead of 4 out of 6 suppressions from separate tests, we can vary ventilation to achieve 6, 7 or 8 suppressions every time.

Hidden Fires Aboard Aircraft





Conclusions - Variant 3

n-heptane fires

- In a confined space Halon 1211 can "climb" up to 1m but extinction of fire A4 is uncertain
- Fires B2-B4 & C2-C4 never extinguished: 33% hole area in the baffles is not enough
- Lower fires D1-D4 always extinguished but upper fires D6-D8 never go out:

Stratification

- Have we fulfilled objective? Now 9/20 - 11/20 fires are extinguished - original spec 4/6

Class A Fires

Fire Details

- 8 small fires (8 cm diameter) in mesh baskets placed in Zone D only due to poor visibility
- 8 g (1/4 oz) shredded paper, lit using 1mL n-heptane.
- 1 minute preburn (n-heptane consumed in 30-40 s)
- Fire size/fuel loading adjusted to give same heat output as the 8 n-heptane fires

Class A Fires Results & Conclusions

- Test Article Variant 3 used
- Fires 1-6 extinguished; 7 & 8 still alight after one minute (c.f. n-heptane fires where only bottom, 4 or 5 fires extinguished)
- Flaming combustion extinguished, but most fires continued to smoulder i.e. true class A
- On removing viewing panel no restrikes occurred, presumably due to small fire size
- Valid test in that different results were obtained compared with n-heptane



Conclusions

- Variant 1 shows
 1. Ventilation-controlled suppression can be achieved
 2. Two fires give very limited information
- Variant 2 shows stratification to be a problem for cheek area fire suppression
- Variant 3 shows
 1. Halon can "climb" 1 m in a confined space
 2. Diffusion through perforated baffles does not readily occur
 3. Suppression can occur off the flow path
 4. Class A fires can be controlled but not necessarily extinguished



Summary & Future Work

- With Variant 3 we have achieved our objective of developing a test procedure to define the performance of Halon 1211 against a number of hidden fire scenarios
- Phase I of the contract has now finished
- Phase II will be the evaluation of replacement agents, supplied by manufacturers
- Phase III is the publication of a Formal Report



IHRWG

ROME, APRIL 95
R. E. GLASER

INTERNATIONAL HALON REPLACEMENT WORKING GROUP

TASK GROUP #7
"POTTY BOTTLES"

SUMMARY & FINAL RECOMMENDATIONS

REPORTED ON APRIL 19, 1995
CLARIDGE HOTEL,
ROME, ITALY

BY
R. E. GLASER

IHRWG

ROME, APRIL 95
R. E. GLASER

SUBGROUP ACTIVITIES REPORT

- MEETING HELD AT WALTER KIDDE AEROSPACE WILSON, NORTH CAROLINA
JUNE 27 & 28, 1994
- ATTENDED BY:
 - ◆ WKA (6)
 - ◆ FAA
 - ◆ BOEING
 - ◆ USAF
 - ◆ AIRBUS (2)
 - ◆ GLCC
 - DOUG INGERSON
 - GREG GRIMSTAD
 - CAPT. BOB TETLA
 - THEO KLEMS, THOMAS GRABOW
 - DR. MARK ROBIN
- CONDUCTED A SERIES OF 12 FIRE TESTS
 - ◆ AGENTS
 - HALON 1301
 - FM-200

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TASK GROUP CHARTER:

PREPARE RECOMMENDATIONS FOR TESTING ALTERNATIVE AGENTS, FOR USE IN LAVATORY FIRE EXTINGUISHERS, TO DEMONSTRATE EQUIVALENT PERFORMANCE.

- PREPARED A DRAFT TEST PROCEDURE FOR CERTIFYING ALTERNATIVE AGENTS
- JULY 26, 1994 TASK GROUP # 7 RESULTS PRESENTED AT SEATTLE MEETING
 - ◆ OPEN ISSUE MINIMUM OPERATING TEMPERATURE
 - TO BE DETERMINED
 - ◆ NEW ISSUES RAISED THRU GROUP DISCUSSIONS
 - FUEL MOISTURE CONTENT
 - IMPACT OF WET STRENGTH TREATMENT ON PAPER TOWEL (FUEL LOAD)

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- OCTOBER, 1994 FAA PREPARED A PROPOSED DRAFT MINIMUM PERFORMANCE STANDARD
 - ◆ BASED ON TASK FORCE #7 RECOMMENDATIONS
 - ◆ THE FUEL MOISTURE CONTENT WAS ESTABLISHED BY CONDITIONING @ 50% RH FOR 24 HOURS @ 70±5°F
 - ◆ MINIMUM OPERATING TEMPERATURE WAS SET AT 5°F (REF. RTCA DO 160C). THIS WOULD PRECLUDED THE USE OF MANY OF THE 0 ODP AGENTS IN CERTAIN NON-SUPERPRESSURIZED DESIGNS.

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- FINAL TASK GROUP #7 RECOMMENDATIONS
 - ◆ MINIMUM OPERATING TEMPERATURE SHOULD BE SET AT JUST ABOVE THE F.P. OF WATER/ 33°F/0.5°C.
 - LAVATORIES UNLIKELY TO BE OCCUPIED IF UNUSABLE.
 - AIRCRAFT ARE HEATED PRIOR TO PASSENGER LOADING.
 - ◆ RECOMMENDATION HAS BEEN COORDINATED WITH BOEING & FAA
 - ◆ NO ACTUAL TEMPERATURE DATA AVAILABLE FROM BOEING OR AIRBUS COLD SOAK TESTS.
 - ◆ AIRCRAFT MFG. MAY SPECIFY LOWER TEMPERATURE IF REQUIRED.

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- NOVEMBER 15, 1994 - ATLANTIC CITY, NEW JERSEY TASK GROUP # 7 REPORTED
 - ◆ EFFECT OF WET STRENGTH ADDITIVE ON FUEL IS DEEMED TO BE MINIMAL. NO CHANGE TO PROPOSED MPS.
 - ◆ ISSUE OF MINIMUM OPERATING TEMPERATURE DISCUSSED BUT STILL UNRESOLVED.
 - ◆ THE TASK GROUP WAS CHARGED WITH ACTION TO RECOMMEND THE MINIMUM OPERATING TEMPERATURE.
 - BOEING & AIRBUS HAD COLD SOAK AIRPLANE TESTS PLANNED FOR WINTER MONTHS IN RUSSIA.

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- OTHER ISSUES
 - ◆ FYI - FAA-TC IS SETTING UP A LAVATORY WASTE RECEPTACLE TEST FACILITY WHICH SHOULD BE OPERATIONAL LATE 2Q95 (CONTACT DICK HILL OR DUNG DO)
 - ◆ MANY THANKS TO ALL CONTRIBUTING MEMBERS OF TASK GROUP #7

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Rome, April 95
R. E. Glaser

PROPOSED DRAFT MINIMUM PERFORMANCE CRITERIA
FOR REPLACEMENT
HAND HELD PORTABLE FOR
AIRCRAFT CABIN FIRE PROTECTION

PURPOSE

TO ESTABLISH MINIMUM PERFORMANCE REQUIREMENTS FOR
AN ENVIRONMENTALLY ACCEPTABLE REPLACEMENT FOR THE
CURRENT HALON 1211 HAND HELD FIRE EXTINGUISHERS

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AGENT SELECTION CRITERIA

- A. THE AGENT MUST BE SUITABLE FOR FIRE SUPPRESSION
NEEDS TYPICALLY ENCOUNTERED IN TRANSPORT TYPE
AIRCRAFT CABINS, LAVATORIES AND FLIGHT DECKS.
- B. THE AGENT USED SHOULD HAVE 0 ODP
- C. THE AGENT SHOULD HAVE THE LOWEST PRACTICAL GWP
AND BE ACCEPTABLE TO LOCAL ENVIRONMENTAL
AUTHORITIES. THE ATMOSPHERIC LIFETIME OF THE AGENT
SHOULD BE AS LOW AS POSSIBLE.
- D. THE AGENTS TOXICITY MUST BE ACCEPTABLE FOR USE IN
THE CONFINES OF AN AIRCRAFT PASSENGER
COMPARTMENT.

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PERFORMANCE CRITERIA

GENERAL:

THE EXTINGUISHER MUST BE APPROVED BY A RECOGNIZED
FIRE TESTING LABORATORY WHICH IS ACCEPTABLE TO THE
REGULATORY AUTHORITIES.

- UL
- FM
- BSI
- OTHERS - TBD

MINIMUM RATING:

EACH EXTINGUISHER EMPLOYED MUST MEET THE MINIMUM
RATINGS.

- UL - 5 BC
- BSI - TBD
- OTHERS - TBD

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HIDDEN FIRE DEMONSTRATION:

THE EXTINGUISHER MUST SUCCESSFULLY PASS THE
AIRCRAFT HIDDEN/REMOTE FIRE CHALLENGE TEST, TO THE
SATISFACTION OF THE REGULATORY AUTHORITIES.

ARSON/HIJACKING THREAT PROTECTION DEMONSTRATION:

THE EXTINGUISHER MUST SUCCESSFULLY PASS AN
AIRCRAFT ARSON/HIJACKING THREAT FIRE CHALLENGE
TEST, TO THE SATISFACTION OF THE REGULATORY
AUTHORITIES.

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COMPATIBILITY WITH AIRCRAFT OPERATING ENVIRONMENT

IN ADDITION TO APPROVALS BY FIRE TESTING LABORATORIES, EACH EXTINGUISHER UTILIZED ON THE AIRCRAFT MUST SATISFACTORILY DEMONSTRATE COMPATIBILITY WITH ANTICIPATED AIRCRAFT OPERATIONAL ENVIRONMENTS.

- RTCA/DO - 160C (APPROPRIATE SECTIONS)
 - ◆ SECTIONS 4.0 - TEMPERATURE & ALTITUDE
 - ◆ SECTIONS 5.0 - TEMPERATURE VARIATION
 - ◆ SECTIONS 7.0 - OPERATIONAL SHOCKS & CRASH SAFETY
 - ◆ SECTIONS 8.0 - VIBRATION

IHRWG AIRCRAFT
HAND HELD EXTINGUISHERS
AIRCRAFT SPECIFIC
VS
COMMERCIAL STANDARD

BACKGROUND:

- ORIGINAL CHARTER WAS TO ADOPT COMMERCIAL PRACTICES FOR AN AIRCRAFT SPECIFIC DESIGN, AVOIDING THE NEED TO OBTAIN EXPENSIVE TESTING AGENCY APPROVALS.
- ONLY PRIOR PRECEDENCE IS TSO-C19b WATER TYPE
 - ◆ NO FIRE TEST CRITERIA SPECIFIED
- ALL OTHER PORTABLES HAVE BEEN UL, FM OR BSI LISTED
 - ◆ CO₂
 - ◆ HALON 1211
 - ◆ DRY CHEMICAL

- HOWEVER, DESIGN STANDARDS ARE SIGNIFICANTLY DIFFERENT

PARAMETER	UL	BS	REMARK
OPERATING PRESSURE (PSI)	100	174	TYPICAL CHARGING PRESSURE @ 20°C
TEST PRESSURE (PSI)	300	235	BS NO LEAKAGE @ 1.35 X O.P.
MINIMUM BURST (PSI)	600	725	BS 50 BAR MIN UL 6 X O.P.

- CONCLUSION: SPECIFICATIONS ARE BOTH GOOD BUT NOT EASILY INTERCHANGEABLE

- FIRE TESTS AMONG THE TESTING LABS APPEAR TO BE SIMILAR

EXAMPLE:

BS 54 23
◆ CYLINDRICAL PAN
◆ HEPTANE FUEL
13 B = 0.41M²/10L FUEL
VS.

UL 711
◆ SQUARE PAN
◆ HEPTANE FUEL
2 B = 0.45M²/23.5L FUEL
∴ BS 13B ≈ UL 2B

- USE OF EXISTING COMMERCIAL STANDARDS OFFERS BENEFITS
 - ◆ EXISTING STANDARDS (UL, FM, BSI) INSURE CONTROL AND MONITORING OF THE DESIGN AND MANUFACTURE OF THE PRODUCT.
 - SYSTEM IS IN PLACE AND WORKING.
 - ◆ ECONOMIC BENEFITS ARE EXPECTED IF SUITABLE COMMERCIAL EQUIPMENT CAN BE UTILIZED.
- OTHER ISSUES
 - ◆ CLASS A RATING OR CAPABILITY DEMONSTRATION
 - DOES ARSON/SKYJACKING THREAT PROTECTION OR HIDDEN FIRE DEMONSTRATION SATISFY CLASS A?

HALON RESTRICTIONS UPDATE

(J. O'SULLIVAN - BRITISH AIRWAYS)

PRESENTED BY FRANK HUGHES

AUSTRALIA

Hazardous waste (regulation of exports and imports) Act 1989

Same as in the Basel Convention

Environment Protection Act 1970. Industrial waste management policy (come into effect November 1, 1990)

Are regarded as "Priority wastes", inter alia:

-> Ozone depleting substances

AUSTRIA

Hazardous waste regulation ordinance, January 31st, 1991, Fed. Law Gazette Nr. 49/1991:

Are regarded to be "hazardous wastes", inter alia:

-> 20 Product containing CFC's such as refrigerators, freezing systems, air-conditioning systems (Nr. 55205 of öNORM S2100)

(-> 55209 *Perchloro ethylene*)

BELGIUM

Under OECD and EEC regulation.

CANADA

Canadian Environmental Protection Act. Export and import of hazardous wastes regulations P.C. 1992/2284 12 November, 1992

Are regarded "hazardous wastes", inter alia:

-> 50. Wastes that contain or consist of chlorofluorocarbons and come within class 2 or 6.1 of TDGR CR1050

-> 51. Halons that come within class 2 of TDGR and are wastes CR1051

CZECH REPUBLIC

Provisions of the Federal committee for environment of August 1, 1991:

Are regarded to be "hazardous wastes", inter alia:

-> 55205 Fluorochlorohydrocarbons, cooling and propelling media, solvents

(-> 55209 *Waste perchloroethylene (tetrachloroethylene)*)

DENMARK

Statutory Order from the Ministry of the Environment Nr. 804 of December 15, 1989, on oil and chemical waste

listed as "chemical waste", inter alia:

(-> *Organic solvents with organically bound halogen, not containing inflammable solvents, e.g. methylene chloride, trichloroethylene, trichloroethane, and perchloroethylene. Card 2.11)*

(-> *Organic solvents with organically halogen mixed with inflammable solvents, e.g. perchloroethylene and butanol. Card 2.12)*

ESTONIA

Classifier of hazardous waste

Constituents of wastes which render them hazardous:

(-> C40 *Halogenated solvents (halogens: Cl, Br, F, I)*)

solvents: (...) *Carbonetrachloride, trichloroethanes (...)*

Ordinance designating materials to be controlled by the council decision C(92) 39 /FINAL. Law Nr. 108 of 1992:

Are regarded to be "hazardous wastes", inter alia:

-> AC150 Chlorofluorocarbons

-> AC160 Halons

Law for the control of export, import and others of specified hazardous wastes and other wastes
Same as Basel Convention

JORDAN

same as Basel Convention

KOREA (REPUBLIC OF)

nothing mentioned on CFCs

MALAYSIA

Scheduled wastes from non specific sources, P.U. (A) 139

Are regarded to be "hazardous wastes", inter alia:

(-> *Spent organic solvents containing halogen or sulphur, including methylene chloride, 1,1,1, trichloroethane, perchloroethylene, and dimethyl sulphide.*)

PHILIPPINES

Rules and regulations of republic act 6969

nothing mentioned about CFCs

SAUDI ARABIA

The environmental protection standards for waste EPS-W 1991

Same as Basel Convention

SINGAPORE

The environmental public health (toxic industrial waste) regulations 1988, S.L. 30 of 1988:

Are regarded as "toxic industrial wastes", inter alia:

(-> *"Spent halogenated organic solvents, e.g. trichloroethylene, 111-trichloroethane, perchloroethylene, methylene chloride, tetra-chloromethane and 112-trichloro-122-trifluoroethane"*)

SRI LANKA

nothing mentioned on CFCs

LATIN AMERICA

ARGENTINA

Decree Nr. 181 of the National Executive, Annex I

-> waste that contains chlorofluorocarbons

(-> waste which contains perchloroethylene)

(-> waste which contains carbon tetrachloride)

-> "Envases de aerosol llenos con propelentes a base de clorofluorocarbonados"

BRAZIL

FINLAND

Council of State decision (508/91) relating to the prohibition on the use of CFCs in certain products.

According to this decision the use of CFCs has been banned as of May 1, 1991 in the production of

- aerosols
- packaging materials
- flexible foam
- sealing foam
- XPS

The import of similar products containing of or made with CFCs has also been banned

same as the Basel Convention

FRANCE

Amendment Nr. 90-267, March 23, 1990

(-> *wastes from the production, the preparation and the use of organic solvents*)

GERMANY

Catalogue of wastes requiring special attention. Annex C of the Second Ordinance on the Law on Wastes, April 10, 1990

Are regarded as "wastes requiring special attention", inter alia:

-> 552 05 Chlorofluorocarbons, cooling and propelling media, solvents

GREECE

no translation. Under EEC and OECD

HUNGARY

Annex 1 to the Order Nr. 56/1981/XI.18/ of the Council of Ministers on the control of the production of hazardous waste and the activities related to its neutralization.

Are regarded as "hazardous waste", inter alia:

(-> *Perchloro-ethylene waste, waste containing perchloro-ethylene (Class of hazard I/IIII)*)

(-> *Carbon tetrachloride waste, waste containing carbon tetrachloride (Class of hazard I/IIII)*)

IRELAND

The Council Directive on regulation on toxic and dangerous waste (78/319/EEC)/1 is basis for the control of hazardous waste. The list of substance (Annex 1 in the directive) is used to define hazardous or toxic waste

LIECHTENSTEIN

Movement of hazardous waste ordinance (ODS) Nr. 814.014, November 12, 1986:

-> 1213 Chlorofluorocarbons (e.g. freons)

LUXEMBURG

Rules on hazardous wastes, Aug. 1, 1988

Are regarded as "hazardous wastes", inter alia:

-> 8 Brome (element) . Concentration: 5,000

(-> *halogenated solvents. concentration 5.000*)

NORWAY

same as basel cc tion

THE NETHERLANDS

Regulation on import, export, and transit of hazardous waste:

Are regarded as "hazardous wastes", inter alia:

(-> organic bromine compounds)

POLAND

UNEP Industry and Environment Special Issue 1983

nothing mentioned about CFCs

PORTUGAL

Under OECD and EEC regulation

ROMANIA

nothing mentioned about CFCs

SLOVAK REPUBLIC

Nothing more than the Basel Convention listed in the Catalogue of waste in regard with CFCs

SPAIN

same as EEC Catalogue of toxic and hazardous wastes.

SWEDEN

Under OECD legislation

SWITZERLAND

Movement of hazardous waste ordinance (ODS) Nr. 814.014, November 12, 1986:

Are regarded to be "a special waste, which exhibits or can exhibit hazardous properties", inter alia:

-> 1213 Chlorofluorocarbons (e.g. freons)

-> 1214 Halogenated hydrocarbons with brome (e.g. halons)

ASIA

BANGLADESH

nothing mentioned on CFCs

CHINA

nothing mentioned on CFCs

INDIA

Hazardous Wastes Rules, 1989

nothing on CFCs

Central Motor Vehicles Rules, 1989

Are listed as "hazardous and toxic chemicals":

(-> *Carbon tetrachloride, (Toxic)*)

JAPAN

Materials stipulated in item 1(a) of section 1 of article 2 of the law for the control of export, import, and others of specified hazardous wastes and other wastes

(-> *Wastes containing 0.1 % or more by weight of any of the following h... generated organic*

Nothing mentioned on CFCs

EL SALVADOR

Regional agreement on the transboundary movement of hazardous wastes
Nothing mentioned on CFCs (but on "halogenated organic solvents")

MEXICO

Are regarded to be "hazardous wastes", inter alia:

- (- > "colas de la destilacion de la produccion de retractoruro de carbono")
- (- > "fondos pesados o productos residuales de la etapa de destilacion en la produccion de retractoruro de carbono.")
- (- > "fondos o residuos pesados de las torres de la produccion combinada de trichloroetileno y perchloroetileno")
- (- > "colas de la destilacion de la produccion de retractoruro de carbono")

PANAMA

Same as Basel Convention

PERU

Nothing mentioned on CFCs

AFRICA

MAURITIUS

Nothing mentioned on CFCs

NIGERIA

Nothing mentioned on CFCs

SEYCHELLES

Nothing mentioned on CFCs



United States
Environmental
Protection Agency
Stratospheric Protection Division
Office of Air and Radiation April 1993
Stratospheric Protection Rev. 8
QUESTIONS AND ANSWERS ON HALONS
AND THEIR SUBSTITUTES

Ozone Protection Hotline toll-free (800) 246-1996 • Ozone Protection Hotline direct dial (202) 775-6677

This fact sheet provides an overview of regulations governing the production and use of halon and the development of substitute agents for fire suppression and explosion protection.

A. HALONS AND THE PHASEOUT OF OZONE
DEPLETING SUBSTANCES

1. Q: When was the production of halons banned?
A: Under the Clean Air Act, the U.S. has banned the production and import of halons 1211, 1301, and 2402 beginning January 1, 1994 in compliance with the Montreal Protocol On Substances That Deplete The Ozone Layer.
2. Q: Must I now dismantle my halon fire protection system?
A: No. It is legal to continue to use your existing halon system. It is even legal to purchase recycled halon to recharge your system.
3. Q: I have heard that not all halon production will cease after 1994. Is this true?
A: The Montreal Protocol does allow production exemptions for what are called "essential uses." Production allowed under the essential use exemption is likely to be very small, however. This issue is discussed below.
4. Q: Are there any laws on emissions of halons?
A: Currently there are no laws prohibiting halon emissions. However, EPA, the National Fire Protection Association (NFPA), the National Association of Fire Equipment Distributors (NAFED), the Fire Suppression Systems Association (FSSA), and the Fire Equipment Manufacturers Association (FEMA) all discourage discharge testing of halon. Proper conservation of halon includes improving leak detection, preventing accidental discharge, and avoiding frosting and training.
5. Q: Will there be enough recycled halon available for my use?
A: The U.S. owns 40 percent of the world's supply of halon 1301. Fire protection contractors and EPA believe that there will be enough of the chemical to service existing critical needs for several years. EPA is

B. HALON RECYCLING AND RANKING

2. Q: Where can I purchase recycled halon?
A: Recycled halon can be purchased from many halon and fire protection equipment distributors or directly from owners who are discontinuing their halon systems. In addition, the Halon Recycling Corporation (HRC) may be able to provide information on such sellers.
3. Q: What is the HRC?
A: The HRC is a non-profit information clearinghouse established to assist sellers wishing to dispose of halon 1301 in a responsible manner, and to help buyers with critical uses locate supplies of halon 1301 for recharging their existing systems.
4. Q: Who set up the HRC?
A: The HRC was established by members of the fire protection community and by the Halon Alternatives Research Corporation (HARC), an industry consortium that promotes the research, development, and promotion of alternatives to halons for fire protection.
5. Q: What do you mean by the term "critical use"?
A: The term "critical use" is used by HRC to identify priority uses of recycled halon. A use is considered "critical" when a need exists "to minimize damage due to fires, explosions, or other extinguishing agents, which would otherwise result in serious impairment of an essential service to society or pose an unacceptable threat to life, the environment, or national security even though all other appropriate fire protection measures have been taken."
6. Q: Who determines that my use is critical?
A: The HRC has established two ways to make this determination. To be "registered," a buyer must sign a self-evaluation form. To be "certified," a buyer must submit an application that will be reviewed by an independent review committee. The committee certifies that the user has a legitimate need to continue using halon,

taking into account technological, economic, and legal considerations.

7. Q: Why do these distinctions matter?
A: The HRC wishes to facilitate the trade of recycled halon. However, some sellers may want to ensure that their halon is sold only to users with the most critical value to society. The "certified" rating, which is granted by HRC's independent review committee, will provide this assurance.
8. Q: When are the terms of the contract if I want to buy or sell halons through the HRC?
A: The terms of all transactions are completely between the buyer and the seller. HRC merely acts as a clearinghouse by putting buyers and sellers together. However, EPA has prepared a "Sample Agreement for the Sale of Halon 1301" which may be helpful to those writing such agreements. This document is available on either hard copy or electronic dictate by contacting the Stratospheric Ozone Information Hotline or HRC.
9. Q: How can I contact the HRC?
A: You can phone the HRC at (800) 258-1283 or (703) 841-0626, or fax (703) 243-2874.
10. Q: Are there standards for recycled halon?
A: The military specification for halon 1211 has been revised to allow the use of recycled halon. Also, ASIM has developed E3 24-93, an emergency specification for halon 1301 for both commercial and military use.
11. Q: Is recycling equipment available?
A: Yes. Several manufacturers have developed recycling equipment for both halon 1301 and halon 1211 that recover almost 100% of the halon and reclaim it to meet specifications. Contact HRC for the list of vendors.
12. Q: Can I import halon?
A: It is legal under the Montreal Protocol and the U.S. Clean Air Act to import recycled halon, that is, halon that has been recovered from a fire suppression system. However, current U.S. tax code imposes a tax on imported ozone-depleting substances. In addition, all bulk imports must be reported to EPA. Unused or newly produced halon may not be traded across international borders. Contact the IRS for more information concerning the tax.

C. HALON DISPOSAL

1. Q: I am removing halon from my systems. How can I dispose of it?
A: Your halon is valuable to society and has a market value. You can make it available to critical users through the HRC. You can sell or give it to the Department of Defense (DoD) halon bank, or you can return it to your halon distributor for resale.
2. Q: Will the HRC come to take my halon?
A: No. The HRC is not a physical "bank," but is an information clearinghouse that will help you locate a buyer for your halon.
3. Q: What if I can't find anyone to buy my halon because I have too little for it to be of interest or because I have halon 1211 or halon 2402?
A: HRC and EPA can help you locate a regional organization that will take your halon as a service.
4. Q: Tell me more about the DoD bank.
A: The Defense Logistics Agency (DLA) is coordinating the DoD bank for the U.S. military in order to maintain a reserve of ozone-depleting substance (ODSE) for supporting Mission Critical Requirements. DLA has a policy to rely on information and recovery whenever possible. DLA is willing to purchase recycled ODSE from the public, particularly halon 1301. CFC-11, CFC-12, and CFC-114.
5. Q: How can I contact someone at the DoD Bank?
A: Phone DLA at (804) 279-4526.
6. Q: What are the criteria for essential use?
A: The Montreal Protocol requires that (1) the use is necessary for human health and safety or is critical for the functioning of society, and (2) there are no technically and economically feasible alternatives that are acceptable from the standpoint of the environment and health. Once an end use has been defined as essential, two further

D. THE MONTREAL PROTOCOL AND REQUIREMENTS FOR ESSENTIAL USE

1. Q: Is the term "critical use" the same as the term "essential use"?
A: No. The term "critical use" is being used by HRC as a broad screen to help channel stocks of halons to users with applications requiring halons at least for the near term. The term "essential use" has a specific meaning under the terms of the Montreal Protocol. Under the Montreal Protocol, it is possible for a national government to represent a particular use as essential to society and obtain permission to continue manufacturing new halon for that use.
2. Q: What are the criteria for essential use?
A: The Montreal Protocol requires that (1) the use is necessary for human health and safety or is critical for the functioning of society, and (2) there are no technically and economically feasible alternatives that are acceptable from the standpoint of the environment and health. Once an end use has been defined as essential, two further

criteria must be met in order to allow production. The applicant must show that: 1) all economically feasible steps have been taken to minimize emissions from the "essential use," and 2) sufficient supplies are not available from existing stocks of banded or recycled halon.

Q: How can I obtain halon under the "essential use" designation?
A: You must submit a detailed application to EPA describing the use, why you consider it essential to society, why no alternatives are feasible, and what you have done to locate stocks of banded or recycled halon. If EPA accepts your application, EPA will nominate your use to the Parties to the Protocol. EPA believes, however, that it will be very difficult to obtain this designation.

Q: What happens then?
A: EPA, working with the State Department, must submit the nomination to the United Nations Environment Programme (UNEP) six months before the Parties to the Protocol meet. UNEP's Halon Technical Options Committee (HTOC) will first determine whether there is sufficient recycled halon available to meet the need. Only then will the HTOC evaluate the technical merits of the nomination. The recommendation is then passed on to the Technology and Economics Panel, which in turn will make a recommendation to the Working Group of the Parties. Once a decision has been made by the Parties, EPA must review the decision to ensure that it complies with the Clean Air Act.

Q: Does this apply to Halon 1301 as well as to Halon 1211?
A: While the Clean Air Act requires the phase-out of Halons 1211, 1301, and 2402, only Halon 1301 is likely to be considered for an essential use nomination. There is an oversupply of Halon 1211 in the U.S. and it is unlikely that new production will be necessary. Halon 2402 is rarely used.

Q: I don't know if there are any suitable alternatives yet, and I don't know if there will be enough recycled halon for my needs. But I believe my use is essential to society. What should I do?
A: Nominations for essential uses can be made annually for consideration by the Parties to the Montreal Protocol. EPA recommends that you research alternatives thoroughly, search for recycled halon from both your internal stores of halon in non-essential systems and from other sources, and implement new risk management and

conservation schemes to minimize halon emissions. If you still believe you need an essential use exemption, EPA would like to work with you as you develop your application in order to fully represent U.S. interests before the Parties.

Q: Are applications made on an industry-wide basis?
A: No. Exemptions will only be granted to individual users. Therefore, each company within an industry must submit a separate application.

Q: Can I apply for an essential use exemption this year?
A: EPA typically issues a Federal Register notice in the fall calling for nominations to be considered at the meeting of the Parties in the summer or fall of the following year. Call EPA for the current schedule.

Q: Is there anything else I should know?
A: New production is still subject to the U.S. tax on newly produced halone (\$53.50 per pound for Halon 1301 in 1995), and it may be very costly to manufacture halon in small quantities. After the year 2000, there may be no company in the world still producing halon. Further, after 1999, the Clean Air Act severely restricts uses for which halon may be produced.

E. SNAP STATUS AND REVIEW PROCESS

Q: What does SNAP stand for?
A: EPA's Significant New Alternatives Policy program. The Agency set up the SNAP program under Section 612 of Title VI of the Clean Air Act Amendments (CAA) of 1990.

Q: What is EPA doing under the SNAP program?
A: Under SNAP, EPA is evaluating substitute chemicals and alternative technologies that companies want to use in place of the ozone-depleting substances, to ensure that they won't cause greater damage to human health and the environment than the ozone depleters that are being replaced. Based on this evaluation, EPA maintains a list of acceptable substitutes and a list of unacceptable substitutes.

Q: When were the SNAP lists published in the Federal Register?
A: 58 FR 13043, March 18, 1994 (Rule) 59 FR 44240 August 26, 1994 (Notice) 60 FR 43108 Sept. 76, 1994 (proposed Rule) 60 FR 3318 January 13, 1995 (Notice)
A summary of substitutes is detailed in Exhibit 1.

Q: What is the difference between a "Notice," a "Proposed Rule," and a "Final Rule?"

A: A "Notice" contains no regulatory controls and thus does not need to go through the notice and comment rulemaking process. It contains technical corrections to the original rule as well as listings of new agents which are "Acceptable" without restrictions. It enters into force upon publication in the Federal Register.

A "Proposed Rule" contains proposed lists of agents deemed "Acceptable" but which are subject to use restrictions or which are "Unacceptable." There is a 45-day public comment period beginning with the date of publication in the Federal Register.

After the public has an opportunity to comment on EPA's proposed rules, a "Final Rule" is published enforcing the provisions into law.

Q: Will there be other agents available in the future?
A: Yes. Manufacturers are continuing to develop new agents and technologies which EPA will review and which will be included on future SNAP lists. These updated lists will be published periodically in the Federal Register. Exhibit 1 lists agents which are listed as pending because the evaluation of the product has not yet been completed.

Q: How does EPA decide whether a substitute is acceptable or unacceptable?
A: EPA's decision on the acceptability of new substitutes proposed by manufacturers is based primarily on the potential human health and environmental risks posed by the substitutes as compared to (in the case of halons) the halon being replaced, as well as to other substitute fire-control agents. The screening of new substitutes is done separately for each specific application, such as for a total flood agent or for use as a streaming agent. A listing of "acceptable" does not imply that the agent is necessarily effective for a particular fire hazard or site, and users are advised to consult with a fire protection professional for selection of appropriate agents.

Q: What are the most significant criteria for evaluating a halon substitute?
A: The key factor in assessing the safety of a halocarbon fire agent is cardiotoxicity. The results of a standard protocol to determine an agent's cardiotoxicity level is compared to the amount of agent required to extinguish a fire. We call this comparing the design concentration to the No Observed

Adverse Effect Level (NOAEL) and the Lowest Observed Adverse Effect Level (LOAEL).

Q: Are there any restrictions on the use of these agents?
A: Halocarbon substitutes being used as total flooding agents have conditions which must be observed. These conditions include:

- Where egress from an area cannot be accomplished within one minute, the employer shall not use the agent in concentrations exceeding the cardiotoxic "No Observed Adverse Effect Level" (NOAEL).
- Where egress takes longer than 30 seconds but less than one minute, the employer shall not use the agent in a concentration greater than its cardiotoxic "Lowest Observable Adverse Effect Level" (LOAEL).
- Agent concentrations greater than the LOAEL are only permitted in areas not normally occupied by employees provided that any employee in the area can escape within 30 seconds. The employer shall assure that no unprotected employees enter the area during agent discharge.

In addition, systems using agents which are safe in high concentrations must be designed to ensure a minimum of 16% oxygen.

Please see the SNAP rule for complete details of the use conditions for each agent.

Q: I heard that HCFCs are not acceptable halon substitutes.

A: Under section 610 of the CAA, Congress requires EPA to ban HCFCs in all pressurized dispensers. Portable extinguishers fall under the definition of a pressurized dispenser, but total flooding systems and fixed streaming systems do not. However, EPA will allow the sale and distribution of HCFCs in portable extinguishers to commercial users and owners of marine vessels and aircraft, for uses where the HCFC is the most suitable agent for fire safety. The Final Rulemaking for the section 610 "nonessential products ban" for class II substances was published December 30, 1993. For more specific guidance, contact the Stratospheric Ozone Information Hotline or the "Nonessential Products Ban" program coordinator at (202) 233-9729.

Q: What are the limitations on using a PFC (either C₂F₆, C₃F₈ or C₄F₁₀)?
A: PFCs may only be used where no other agent is technically feasible due to performance or safety requirements. The user must conduct an evaluation of the other alternatives and must determine that they

either will not perform properly or that they will pose a risk to human health. In addition, PFC use must meet the conditions discussed in question E.6 above.

11. Q: Do I have to obtain EPA approval to use a PFC?
- A: No approval is required from EPA. However, the user must maintain documentation of the evaluation.

12. Q: What is the SNAP status of alternative technologies such as inert gases, water mist, and powdered aerosols?
- A: Non-halocarbon systems are considered "alternative technologies" and are subject to EPA SNAP review.

13. Q: What are the SNAP conditions on the use of inert gases, which work by lowering the oxygen level?
- A: Inert gas systems work by lowering the oxygen in a room to a level that will not sustain combustion, while remaining high enough to sustain human life.

Three inert gases are being listed by SNAP. IG-541 is an inert gas blend which lowers the oxygen level and raises the CO₂ level. SNAP requires that the oxygen level must not fall below 10% and the CO₂ level must not exceed 5%. IG-01 and IG-55, which do not raise the CO₂ level, will be listed in a Final Rule in the near future. The design concentration of each of these agents must result in an oxygen level of at least 10%.

14. Q: Are there conditions on using water mist or water fog systems?
- A: EPA is proposing to list water mist systems that do not contain any additives as acceptable without use restrictions. However, any system with an additive must be reviewed by EPA on a case-by-case basis.

15. Q: Can I use a powdered aerosol in a total flood system in an occupied area?
- A: Powdered aerosol in total flooding systems have not undergone a medical panel peer review for physiological effects, and thus they have only been listed as acceptable in normally unoccupied areas.

16. Q: What alternatives are suitable for my particular end use?
- A: EPA maintains a list of acceptable substitutes, but it is up to manufacturers and users to assess their suitability for particular uses.

17. Q: How can I contact the vendors of these substitutes?
- A: Exhibit 2 & 3 include lists of manufacturers and vendors of inert misting systems.

18. Q: How can I obtain copies of the SNAP rule?
- A: The SNAP rule can be ordered for a nominal fee from the Government Printing Office, (202) 783-3238. You must provide them with the date of publication of the rule you want (see question E.3).

19. Q: Is the Rule available electronically?
- A: Yes, the rule can be downloaded from the EPA OADR's bulletin board service (Office of Air Quality Planning and Standards, Technology Transfer Network). The BBS modem number is (919) 541-5742, with modem settings of N, 8, 1, Full Duplex, using a terminal type of VT100, VT102 or ANSI. For assistance in accessing this service, call (919) 541-5384 during normal business hours, EST.

Internet users can use telnet to access this service interactively. However, as there is no FTP service, the Kermit protocol is required to download a file. The internet telnet address is: lubbbs.rtpnc.epa.gov

20. Q: What other government regulations or industry standards concerning halons should I be aware of?
- A: The National Fire Protection Association (NFPA) has issued NFPA 2001 to address alternative total flooding agents and further work is underway to address water mist and other alternative systems. In addition, manufacturers of systems containing the new alternative agents typically obtain Underwriters Laboratories (UL) or Factory Mutual (FM) certification.

21. Q: Where can I obtain additional information about the SNAP program and likely alternatives for halons?
- A: Please contact:

EPA's Stratospheric Ozone Information Hotline
(800) 296-1896
(202) 775-6677

or
Karen Matcha
Halon Program Manager
Stratospheric Ozone Division
U.S. EPA 6205J
Washington, DC 20460
(202) 233-9133
FAX (202) 233-9577
Internet: Matcha.Karen@epamail.epa.gov

F. IMPORTANT PHONE NUMBERS

1. Q: Please repeat all the phone numbers again. What other phone numbers could be helpful?

- A:
- EPA Stratospheric Ozone Hotline
(800) 296-1896 or (202) 775-6677
 - EPA Halon Program Manager
(202) 733-3193
 - EPA Import and Production Regulation
(202) 233-9185
 - EPA Nonsensical Products Ban Program Coordinator
(202) 233-9729
 - Halon Alternatives Research Corporation (HARC)
(703) 841-0626
 - Hison Recycling Corporation
(800) 258-1283 or (703) 841-0626
 - DIAL/DOD Bank
(804) 278-46260
 - Internal Revenue Service (IRS)
(202) 622-213
 - National Fire Protection Association (NFPA)
(800) 344-3555
 - National Association of Fire Equipment Distributors (NAFED)
(312) 644-6610
 - Fire Suppression Systems Association (FSSA)
(410) 931-8100
 - Fire Equipment Manufacturers Association (FEMA)
(216) 241-7333
 - Underwriters Laboratories (UL)
(700) 272-8800
 - Factory Mutual (FM)
(617) 255-4772

**Exhibit 2:
FIRE AND EXPLOSION PROTECTION
AGENT MANUFACTURERS**

3M
John Schuster
(612) 736-8055
FAX (612) 736-7542
3M Center Building, 223-65-04
St. Paul, MN 55144-1000
Ct. # (654-6141) C.F. # (654-4510)

Allied Defense Industries, Inc.
Larry Brown
(703) 724-9626
FAX (703) 440-0591
1487 Chain Bridge Road, Suite 304
McLean, VA 22101
Powdered Aerosol A (SFE Powdered Aerosol)

American Pacific Corporation
Haleton, Inc.
Fred Gibson, III
(702) 735-2200
FAX (702) 794-4463
3770 Howard Hughes Parkway, Suite 300
Las Vegas, NV 89109
HCCP Blend A (Haleton II); HFC Blend A (Haleton II)

Ansil Fire Protection
David Paton
(708) 305-5700
FAX (708) 305-3380
1540 Roosevelt Drive, Suite 107
Naperville, IL 60563-8537
70 East, Kennedy/Robert Gas Blend (longway)

DuPont Fluoroproducts
Daniel Moore
(302) 992-2177
FAX (302) 992-2836
Beeley Mill Place 1a 2100
P.O. Box 80012
Wilmington, DE 19880-0013
HFC-23 (FE-13); HFC-125 (FE-25); HFC-134a;
HFC-126 (FE-26); HFC-123 (FE-23)
HCCP-126 (FE-26); HCCP-123 (FE-23)

BioGenetics Engineering
Dr. Mehlen C. Amiran
(414) 758-2468
FAX (414) 571-2422
610 W. Rawson Avenue
Oak Creek, WI 53154
Surfactant Blend A (Concise 502, Free Gonal)

Ginge-Kerr as
Ola Barnsholt
111, Stenholm
UK-2650 Hydrovair
Dremitt
70 62 (A-gas-62)

Great Lakes Chemical
Doug Register
(317) 487-6382
FAX (317) 463-2849
P.O. Box 2200
West Lafayette, IN 47906
HCC-2220 (PM-200); HFC-2281 (PM-100)

Minimax GmbH
Mr. Wolfgang Koch
(49) 4531 803-443
FAX (49) 4531 803-500
Industrieweg 10/11
23840 Bad Oldesloe, Germany
R-01 (Algeol)

North American Fire Quantan
Elio Guglielmi
(604) 664-7374
FAX (604) 684-7415
Suite 304
700 West Pender St.
Vancouver, B.C. Canada V6C 1G8
HCCP Blend A (NAF S-8); HCCP Blend C (NAF P-8); HCCP
Blend D (R-02)

Olin Aerospace Co.
Gary Holland
(206) 885-8000
FAX (206) 602-2744
11441 Willows Rd., N.E.
Redmond, Washington 98073-8709
Inert Gas/Powdered Aerosol Blend

Pacific Scientific
Steve Newhouse
(415) 359-9317
FAX (415) 359-7013
HTL/Kentech Division
1800 Highland Avenue
Chico, California 95010
CFJ (Thiodex)

Pomusa, Inc.
Henry E. Stewart
(215) 647-2267
1178 Wilentz Drive
Malvern, Pennsylvania 19355
Powdered Aerosol B (PQA Powdered Aerosol Formulation)

Securix Technologies, Inc.
Victor Demetrio
(514) 623-1000
FAX (514) 633-8385
549 Melville
Dorval (Quebec) Canada H9P 2V2
Water Mist A (FireScope 2000 Fine Water Spray System);
IC-2C (A-gas-62)

Yates Fire Protection
H. James Yeter
(804) 627-6999
FAX (804) 827-8897
P.O. Box 8206
Hempden, VA 23070
Water Mist B (Unifog Water Mist)

**Exhibit 2: (continued)
FIRE AND EXPLOSION PROTECTION
SYSTEM HARDWARE MANUFACTURERS**

Vendor	Contact	Address	Telephone No.	Fax No.	Approvals
Great Lakes Corporation					
Fike Fire Suppression Systems	Jeff Moore	704 South 10th St. P.O. Box 610 Blue Springs, MO 64013	816-229-3405	816-229-4615	UL listing and FM approval of engineered and pre-engineered systems are imminent
Figgie Fire Suppression Systems	Steve Dinutrovich	1000 Governors Highway University Park, IL 60466	708-534-1000	705-534-1011	UL listing and FM approval of engineered and pre-engineered systems are imminent
Kidde-Fenwal, Inc.	Stan Slanski	400 Main St. Ashland, MA 01721	508-881-2000 ext. 2273	508-881-8920	UL listing and FM approval of engineered and pre-engineered systems are imminent
Cerberus Pyrotechnics	Mike Prouse	8 Ridgedale Avenue Cedar Knolls, NJ 08927	201-267-4300	201-397-7047	negotiating with another equipment manufacturer. That equipment is currently undergoing testing by FM.
3M					
Fike Protection Systems	Jeffrey Moon	704 S. 10th St. P.O. Box 610 Blue Springs, MO 64013	816-229-3405	816-229-4615	UL listing and FM approval of pre-engineered systems
Modular Protection Corporation	Richard Niemann	5916 Dearborn Street Mission, KS. 66202	913-384-2566	913-384-3641	Negotiating with another equipment manufacturer. That equipment is currently undergoing testing by UL and FM
Pera All	Dor Applegate	39A Myrtle St. Cranford, NJ 07016	908-276-0211	908-276-8074	UL listing and FM approval of pre-engineered and engineered systems are pending

EXHIBIT 1:
FIRE AND EXPLOSION PROTECTION AGENTS
STATUS OF SUBSTITUTES
SUBMITTED UNDER EPA'S SNAP PROGRAM

ACCEPTABLE TOTAL FLOODING AGENTS *
(Feasible for Use in Occupied Areas)

Agent	Comments
C ₂ F ₆ (PFEC-410 or CEA-410)	Allowed where no other agent is technically feasible. NOAEL 40%
C ₂ F ₄ (PFEC-218 or CEA-318)	Allowed where no other agent is technically feasible. NOAEL 30% (final listing forthcoming)
HCEC Blend A (NAF S-III)	NOAEL 10%; LOAEL 10%
HFC-23 (FE 13)	NOAEL 30%
HFC-227ea (FM 200)	NOAEL 9.0%; LOAEL 10.5%
IG-01 (Argon)	Minimum oxygen 10%. Proposed Acceptable. (forthcoming)
IG-55 (Argonite)	Minimum oxygen 10%. Proposed Acceptable. (forthcoming)
IG-541 (Inergen)	Minimum oxygen 10%, Maximum CO ₂ 5%
Water Mist with No Additives	Acceptable. (forthcoming)
Carbon Dioxide	Must meet NFPA 12 and OSHA 1910.162(b)5 requirements.
Water Sprinklers	

ACCEPTABLE TOTAL FLOODING AGENTS *
(Feasible for Use in Unoccupied Areas Only)

Agent	Comments
CK-1	NOAEL 0.2%; LOAEL 0.4% (final listing forthcoming)
HBFC-22B1 (FM 100)	Class 1 substances will be phased out by 1990. NOAEL 0.3%; LOAEL 1.0%
HFC-22	NOAEL 2.5%; LOAEL 5.0%
HCEC-124	NOAEL 1.0%; LOAEL 2.5%
HFC-125	NOAEL 7.5%; LOAEL 10.0%
ITC-134a	NOAEL 4.0%; LOAEL 8.0%
Gelled Halocarbon/Dry Chem. Suspension (PCA)	(final listing forthcoming)
Inert Gas/Powdered Aerosol Blend (FS 0140)	(final listing forthcoming)
Powdered Aerosol A (SF ₆)	

EXHIBIT 1: (continued)
FIRE AND EXPLOSION PROTECTION AGENTS
STATUS OF SUBSTITUTES
SUBMITTED UNDER EPA'S SNAP PROGRAM

MISCELLANEOUS ACCEPTABLE TOTAL FLOOD LISTINGS

Agent	Comments
Sulfur Hexafluoride (SF ₆)	(final listing forthcoming) Discharge test agent for low halon system, allowed for military uses and civilian aircraft uses only.

ACCEPTABLE STREAMING AGENTS

Agent	Comments
C ₂ F ₆ (PFEC-014 or CEA-014)	Allowed where no other agent is technically feasible.
HBFC-22B1 (FM-100)	Non-residential uses only. Will be phased out by 1996.
HCEC Blend B (Halonon 1)	Non-residential uses only.
HCEC Blend C (NAF P-III)	Non-residential uses only.
HCEC Blend D (Blue III)	Non-residential uses only.
HCEC-123	Non-residential uses only.
HCEC-124 (FE-241)	Non-residential uses only.
Gelled Halocarbon/Dry Chemical Suspension (formerly Powdered Aerosol B)	Allowable in the residential use market.
Water Mist with No Additives	Acceptable. (forthcoming)
Carbon Dioxide	
Dry Chemical	
Water	
Foam	

PENDING

Agent	Comments
[HFC Blend] A	Total flooding agent for unoccupied areas
Water Mist Systems with Additives	Streaming & total flooding applications. Must be individually submitted to EPA and reviewed on a case-by-case basis.

Vendor	Contact	Address	Telephone No.	Fax No.	Approvals
DuPont Fluoroproducts					
Convenience Marine Products, Inc.	Keith Weldy	P.O. Box 152 Grand Rapids, MI 49501-0152	616-454-8337	616-454-8256	UL listing and FM approval of pre-engineered systems
Kidde-Fenwal, Inc.	Stan Shaski	400 Main St. Ashland, MA 01721	508-381-2000 ext. 2273	508-881-8920	UL listing of modular spherical pre-engineered system; UL listing and FM approval of pre-engineered cylinders pending; software for engineered systems undergoing approval process by UL and FM (the hardware does not change in the engineered cylinder systems)
Fenwal Safety Systems, Inc.	Dan Guarice	700 Nickerson Rd. Marlborough, MA 01752	508-481-5800	508-485-3115	
Ansul					
Ansul Fire Protection System	David Pelton	1240 Iroquois Drive Suite 102 Naperville, IL 60563-8537	708-305-5700	708-305-3360	UL listing and FM approval for engineered systems
North American Fire Guardian Technology Incorporated					
S.E.S. Cease Fire	Ken Easey	Unit #5, 80 Citreza Court Markham, Ontario, Canada	416-415-0400	not available	UL (Canada) listing for pre-engineered and engineered balanced systems
Flag Fire Equipment	Dean Doster	Hwy #2 & Patillo Road Tecumseh, Ontario Canada N8N 2L9	519-727-6722	519-727-3177	UL (Canada) listing for pre-engineered system

Fenwal Systems produces explosion suppression systems only, which are currently undergoing FM testing. Explosion suppression systems are neither tested nor approved by UL.

Exhibit 3:

STREAMING AGENT FIRE PROTECTION
HAND PORTABLE/WHEELED HARDWARE MANUFACTURERS

American Pacific Corporation					
Ansul Fire Protection	Jim Engman	1 Stanton St. Marinette, WI 54143	715-735-7411	715-732-3479	no equipment has been submitted for UL or FM testing
Amerex Corporation	Fred Goodright	Box 81, Tusculum Alabama 35173-0081	205-655-3271	205-655-3279	no equipment has been submitted for UL or FM testing
Buckeye Fire Equipment Co.	Neil Hoogmoed	110 Kings Rd. Kings Mt., NC 28086	704-739-7415	704-739-7418	no equipment has been submitted for UL or FM testing
Pem All Fire Extinguisher Corp.	Tom Moskatuk	39 Myrtle St. Cranford, NJ 07016	908-276-0211	908-276-8074	no equipment has been submitted for UL or FM testing
BioGenesis (Surfactant Blend A)					
BioCenter, Inc. (FireStrike)	Scott Kelling	610 West Rawson Ave Oak Creek, WI 53154	414-768-7100	414-571-2472	
North American Environmental Oil & Chemical Cleaning Supply Company (ColdFire 302)	Juergen Gissler	270 Route 46 Rockaway, NJ 07866	201-627-0722		

FAA International Halon Replacement Symposium

19 - 20 April 1995

Presented by: Bill Leach
Naval Air Warfare Center
Lakehurst, NJ

◆ Naval Requirement, from MIL-E-22285:

Concentration of agent - Actuation of the extinguishing system shall produce a concentration of agent at least **6 percent by volume** in air (22% by weight) in all parts of the affected zone. This concentration shall persist in each part of the zone for at least **0.5 seconds** at normal cruising condition.

NAVY HALON ALTERNATIVES

- INERT GAS GENERATORS
- FINE WATER MIST
- ENHANCED CONTAINMENT/MATERIALS
- AIR/FLW MODIFICATION
- METAL FIRES INTERACTION

NAVY USE MINIMIZATION

- INADVERTENT FIRING REDUCTION
- FALSE ALARMS REDUCTION
- HYDROSTATIC TESTING TERMINATION
- HALON SIMULANT IDENTIFICATION

NAVY USE MANAGEMENT

- RESERVE MANAGEMENT
- RECYCLING/RECLAMATION

NAVY ALTERNATIVES PLANNING STUDIES

- NAVY SAFETY CENTER ANALYSIS
- HALON EFFECTIVENESS STUDIES
- ALTERNATIVES INCORPORATION TRADE OFF STUDIES

AIR FORCE EFFORTS

- PROPELLANT GAS GENERATORS

ARMY EFFORTS

- TANK ENGINE BAY TESTING
- CREW COMPARTMENT EXPLOSION SUPPRESSION
- ATTITUDE EMISSIONS STUDY (USN/USAF)
- JTG ULLAGE PROTECTION

FAA EFFORTS

- HALON SIMULANTS
- ENGINE NACELLE TEST FACILITY

JOINT EFFORTS

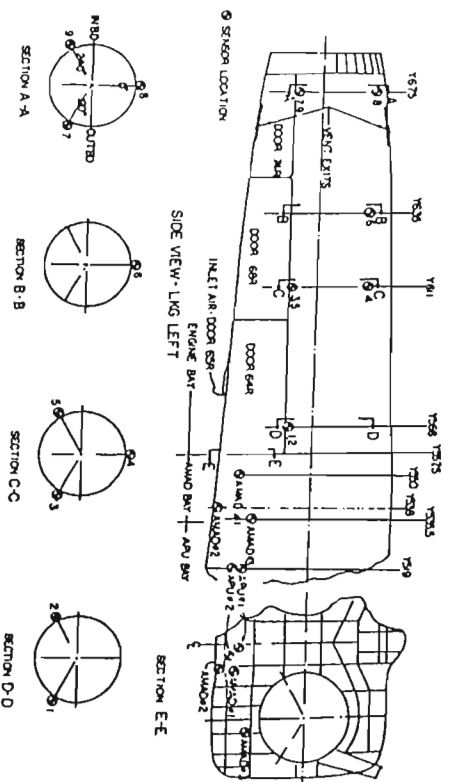
- ENGINE/ANGEL FIRE/BA TESTING (USDA/AF/USAF/AF/AF)
- 100 P0874 BIES (USN/USA)
- 100 P0874 BIES (USN/USA)
- 100 P0874 BIES (USN/USA)

ACCEPTED TEST
PROCEDURE

- ◆ Normal Cruise Condition
- ◆ System Activation
 - *NO FIRE* during qualification testing
- ◆ Agent Concentration Measurement
 - Sniffer tubes
 - Gas analyzer
- ◆ Agent Concentration vs. Time Curves

NEED FOR SIMULANT

- ◆ Regulation against Purposeful Emission
- ◆ Continued Qualification Testing of Halon-Based Systems
 - Modified fire zone
- ◆ General System Discharge Testing
- ◆ Historical Use of Test Agent



RELATED EFFORTS

- ◆ Room Flood Application
 - Naval Sea Systems Command
 - British Ministry of Defense
- ◆ Aircraft Application
 - Boeing 777
 - ★ APU and Engine Testing

COMPARISON OF REQ'TS (NAVY/FAA)

- ◆ Identical Suppression System Requirements
 - Agent Concentration
 - Agent Duration
 - Temperature Extremes
- ◆ No Low Temperature Testing
 - Minimal Application

PROGRAM OBJECTIVES

- ◆ Definition: Simulant vs. Replacement
 - ***NO FIRE*** during qualification testing
- ◆ Physical Characteristics of Simulant
 - Fluid Flow Properties
 - Three Dimensional Dispersion Qualities
- ◆ Calibration Curves
- ◆ Parameter Equations
 - Correlation to Halon

PHASE I

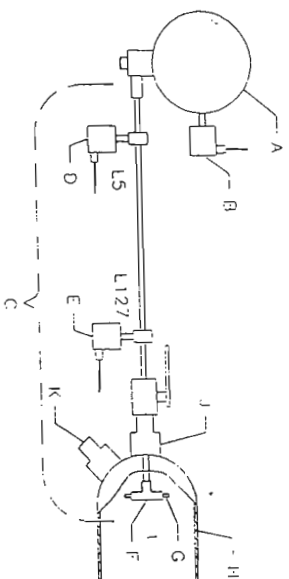
- ◆ Analytical Investigation
 - Currently available chemicals
 - Gas Analyzer applicability
- ◆ Selection of Test Chemicals
 - SF6 Sulfur Hexafluoride
 - HFC-125 Pentafluoroethane
 - HCFC-22 Chlorodifluoromethane

CHEMICAL COMPARISON

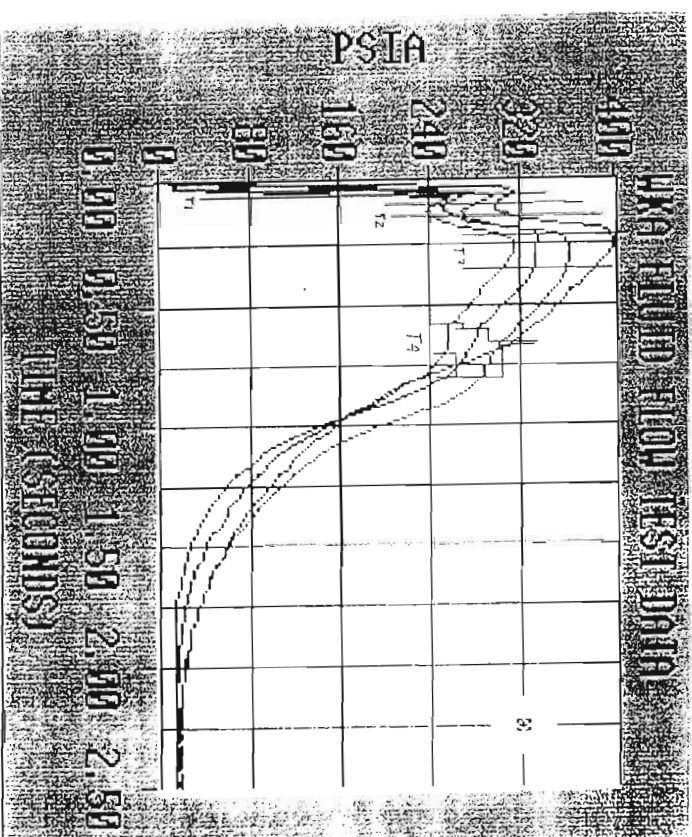
- | | |
|-------------------------------|------------------------|
| ◆ Boiling Point | ◆ Melting Point |
| ◆ Critical Temperature | ◆ Heat of Vaporization |
| ◆ Molecular Weight | ◆ Heat Capacity |
| ◆ Critical Pressure | ◆ Vapor Pressure |
| ◆ Liquid Density | ◆ Jakob Number |
| ◆ Liquid Viscosity | ◆ Vapor Viscosity |
| ◆ Liquid Volume | ◆ Thermal Conductivity |
| ◆ Solubility w/N ₂ | |

PHASE II

- ◆ Fluid Flow Analyses
 - Discharge Characteristics
 - Flow through plumbing
 - Dispersion Patterns
- ◆ Chemical Ranking
 - HFC-125
 - SF6
 - HCFC-22
- ◆ Static Awareness



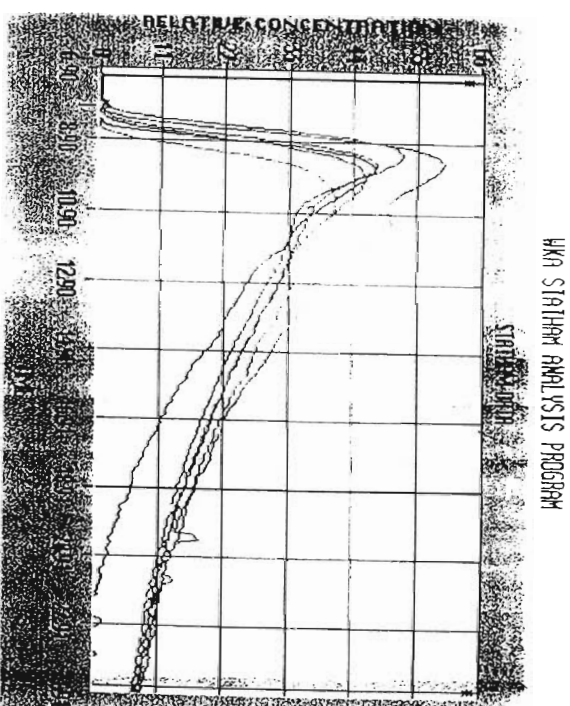
224 CUBIC INCH CONTAINER IN FLUID FLOW TEST CONFIGURATION



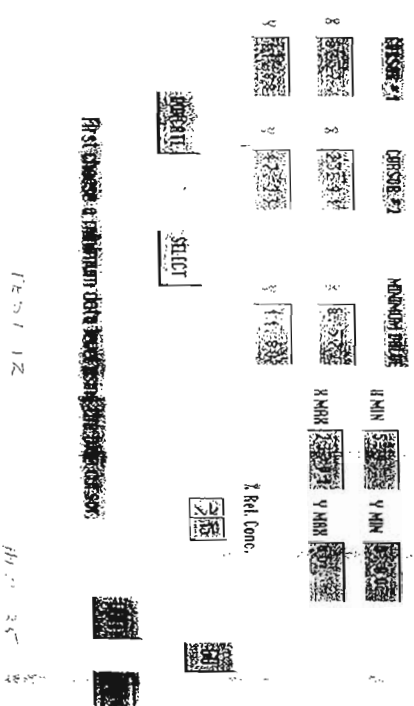
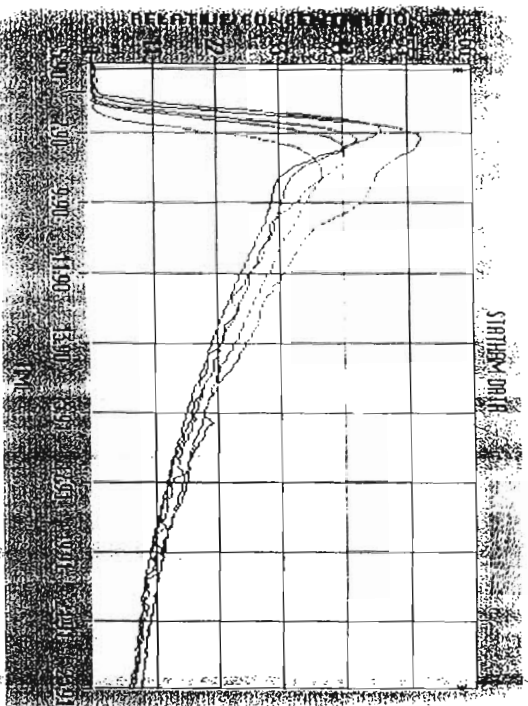
PHASE III

- ◆ Small Scale Discharge Testing
 - Wind Tunnel
 - Variable Airflow
 - Clutter Packages
 - Concentration Measurement
- ◆ HFC-125 Clearly Defined “WINNER”
 - Slightly lower peak concentrations
 - Slightly shorter duration times

- ◆ Full Scale Discharge Testing
 - F/A-18D
 - 12 Discharges
 - Airflow
 - Concentration Measurement
- ◆ No Unexpected Results
- ◆ Verified Use Parameters

 γ Rel. Conc.

WKA STATHAM ANALYSIS PROGRAM



PROGRAM RESULTS

- ◆ HFC-125 is an Exceptional Halon Simulant
 - Unexpected Answer
- ◆ Very High Repeatability
- ◆ Equivalent Liquid Fraction
 - 77% of Halon Fill
- ◆ Volumetric Concentration Comparison
 - Statham vs. Halonizer
- ◆ Local Phenomena

REMAINING EFFORTS

- ◆ Prepare Simulant Use Documentation
- ◆ Guidance to Commerce (FAA acceptance?)
- ◆ Local Phenomena
 - Enhanced qualification awareness
 - Revise qualification procedures?
- ◆ Re-think Other Simulant Applications?

FIRST CUSTOMER

- ◆ F/A-18E/F
 - Simulant “blessed” end of Jan
 - Simulant used beginning of Feb
- ◆ ***SUCCESS!***
- ◆ Large (Positive) Program Impact
 - Huge cost savings
 - Program schedule maintained

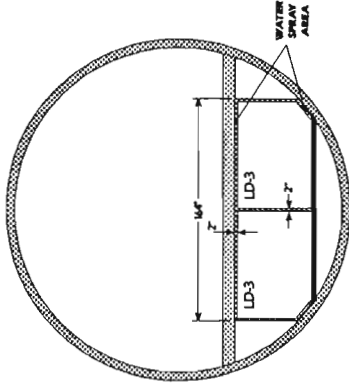
SIMULANT APPLICATION

- ◆ Naval Need
 - Next Customer: AH-1W
- ◆ Worldwide Need
 - U.S. DoD
 - U.S. Industry
 - International Industry

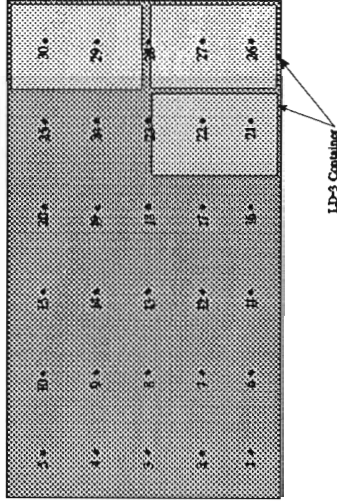
ACKNOWLEDGMENTS

- ◆ Naval Air Systems Command
 - James Homan
- ◆ National Institute of Standards and Technology
 - Carole Womeldorf
- ◆ Kidde Technologies, Inc.
 - Mark Mitchell
- ◆ Boeing Aircraft Company
 - Ken Kaufmann

TC-10 FUSELAGE CROSS SECTION



THERMOCOUPLE LAYOUT



TEST PROGRESSION

TEST 1: MECHANICAL FAILURE, ABORT TEST AFTER 20 MINUTES

TEST 2: 11 GPM IN FIRE ZONE, 16 GPM IN NON-FIRE ZONE
 200 F ACTIVATION, SPRAY DURATION 20 SECONDS
 64 GALLONS USED, 90 MINUTES

INSTALL LOWER FLOWRATE NOZZLES

TEST 3: 16 GPM IN FIRE ZONE, 16 GPM IN NON-FIRE ZONES
 200 F ACTIVATION, SPRAY DURATION 20 SECONDS
 341 GALLONS USED, 90 MINUTES

LOWER ACTIVATION DURATION TO 10 SECONDS IN FIRE ZONES

TEST 4: 16 GPM IN FIRE ZONE, 16 GPM IN NON-FIRE ZONES
 200 F ACTIVATION, SPRAY DURATION 10 SECONDS
 315 GALLONS USED, 90 MINUTES

REMOVE FIRST 3RD NOZZLE IN FIRE ZONE

CHANGE ACTIVATION DURATION TO 20 SECONDS IN FIRE ZONES

TEST 5: 10 GPM IN FIRE ZONE, 16 GPM IN NON-FIRE ZONES
 200 F ACTIVATION, SPRAY DURATION 20 SECONDS
 43 GALLONS USED, 90 MINUTES

CHANGE ACTIVATION LOGIC 12 SECONDS ON, 20 SECONDS OFF

TEST 6: 10 GPM IN FIRE ZONE, 16 GPM IN NON-FIRE ZONES
 200 F ACTIVATION, SPRAY DURATION 15 SEC ON, 10 SEC OFF
 30 GALLONS USED, 90 MINUTES

LOWER ACTIVATION TEMP TO 150 F, AUTO SCAN EVERY 10 SECONDS

TEST 7: 10 GPM IN FIRE ZONE, 16 GPM IN NON-FIRE ZONES
 150 F ACTIVATION, 10 SECOND DURATION, 10-SCAN
 344 GALLONS USED, 90 MINUTES

INCREASE ACTIVATION TEMPERATURE

TEST 8: 10 GPM IN FIRE ZONE, 16 GPM IN NON-FIRE ZONES
 250 F ACTIVATION, 10 SECOND DURATION, RE-SCAN
 36 GALLONS USED, 90 MINUTES

BULK LOADED CARGO NOZZLE ARRANGEMENT

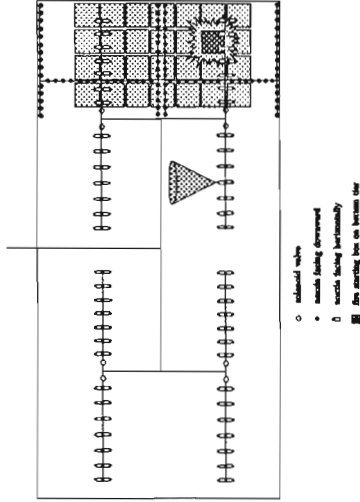


figure 3

ORIGINAL NOZZLE ARRANGEMENT

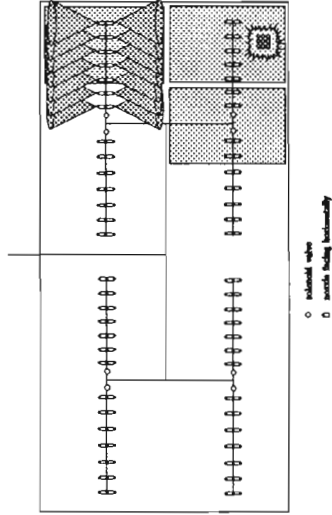


figure 1

UPDATED NOZZLE ARRANGEMENT

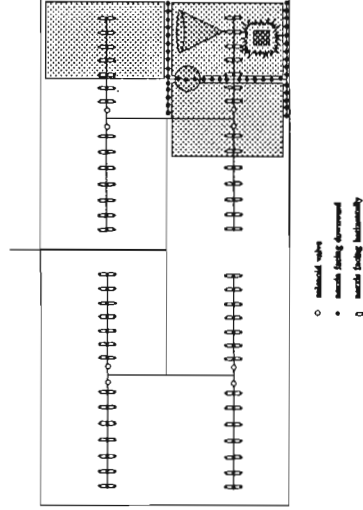


figure 2

Incidents of Cargo Fires or Potential Fires.*

Totals by Ignition Source/Material Involved

Electrical (A/C systems)	8
Mailbags (Internal)	4
Hazardous material (as freight)	9
Hazardous material (checked by PAX)	11
Oxygen generators	3
Contact with light bulbs/heat source	11
Luggage (unknown ignition)	1
Cargo (unknown ignition)	2
Bomb/Incendiary	4
Unknown	5
Total Events	58

Totals by Compartment

Class B	2
Class C	9
Class D	30
Class E	5
ULD	1
Sort Facility	2
Unknown	9

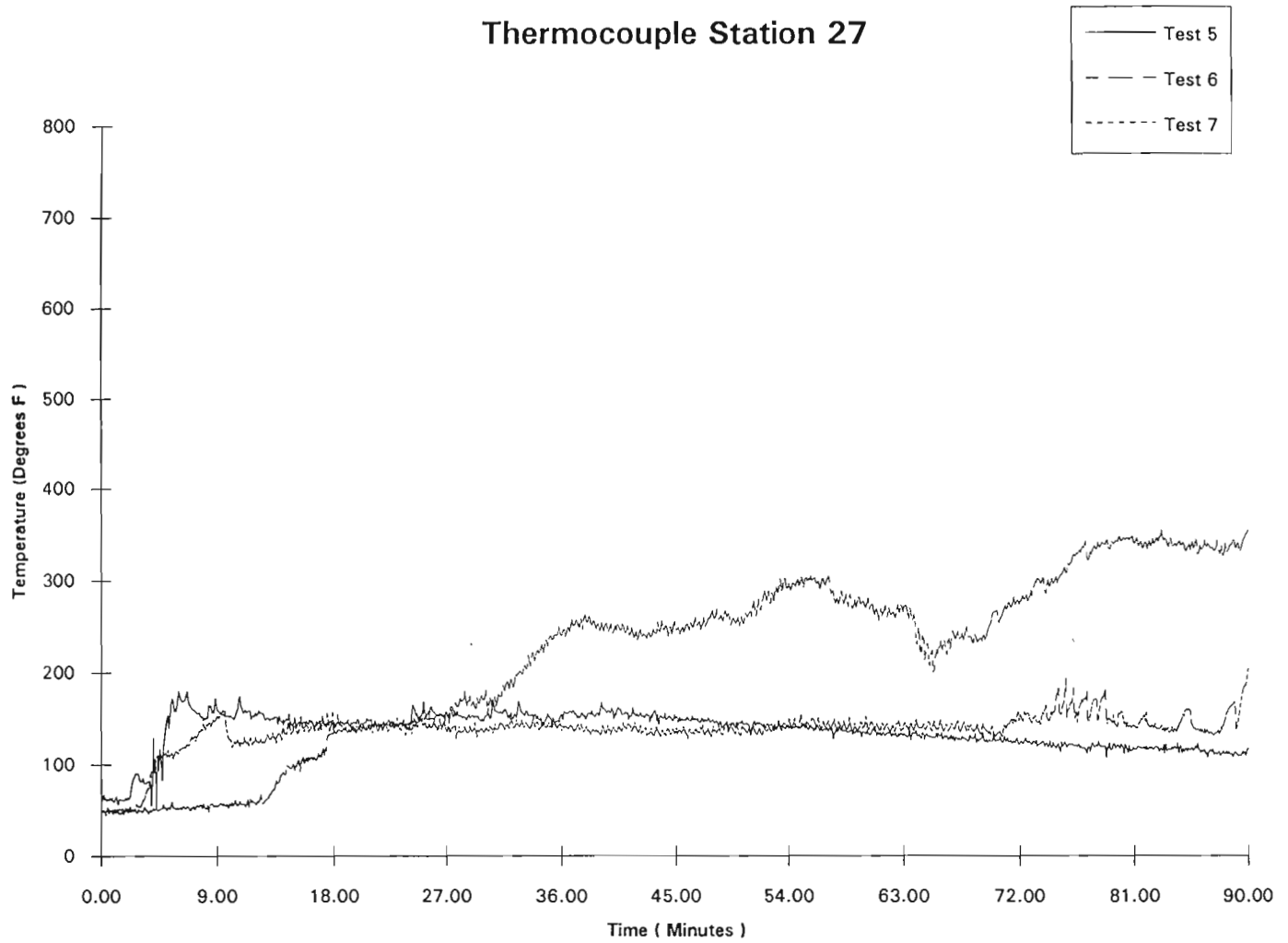
* These incidents are compiled from FAA Service Difficulty Reports, FAA Accident/Incident Reports, FAA Hazardous Material Program Offices, and NTSB Accident Reports.

Incidents of Spills, Leaks, and Discovery of Hazardous Materials in Aircraft Cargo Compartments. 1/1/90 to 10/21/94.*

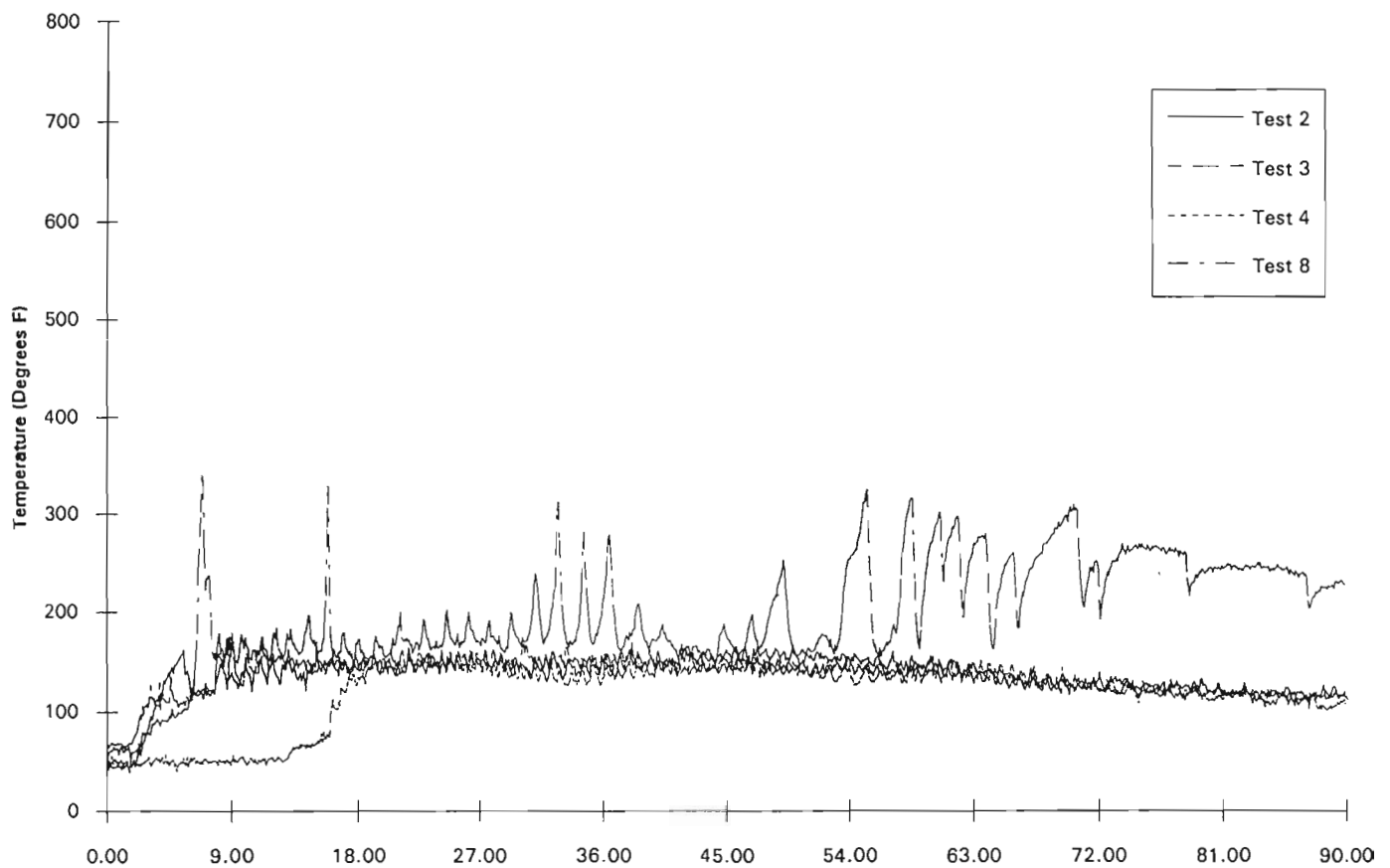
Explosives (fireworks, ammunition)	4
Flammable Solids (matches, metals)	4
Flammable Liquids	46
Compressed Flammable Gas	2
Corrosive Liquids	49
Multiple Haz Mats	1
Total Events	106

* These incidents are compiled from the Department of Transportation, Research and Special Projects Administration, Hazardous Materials Information Service.

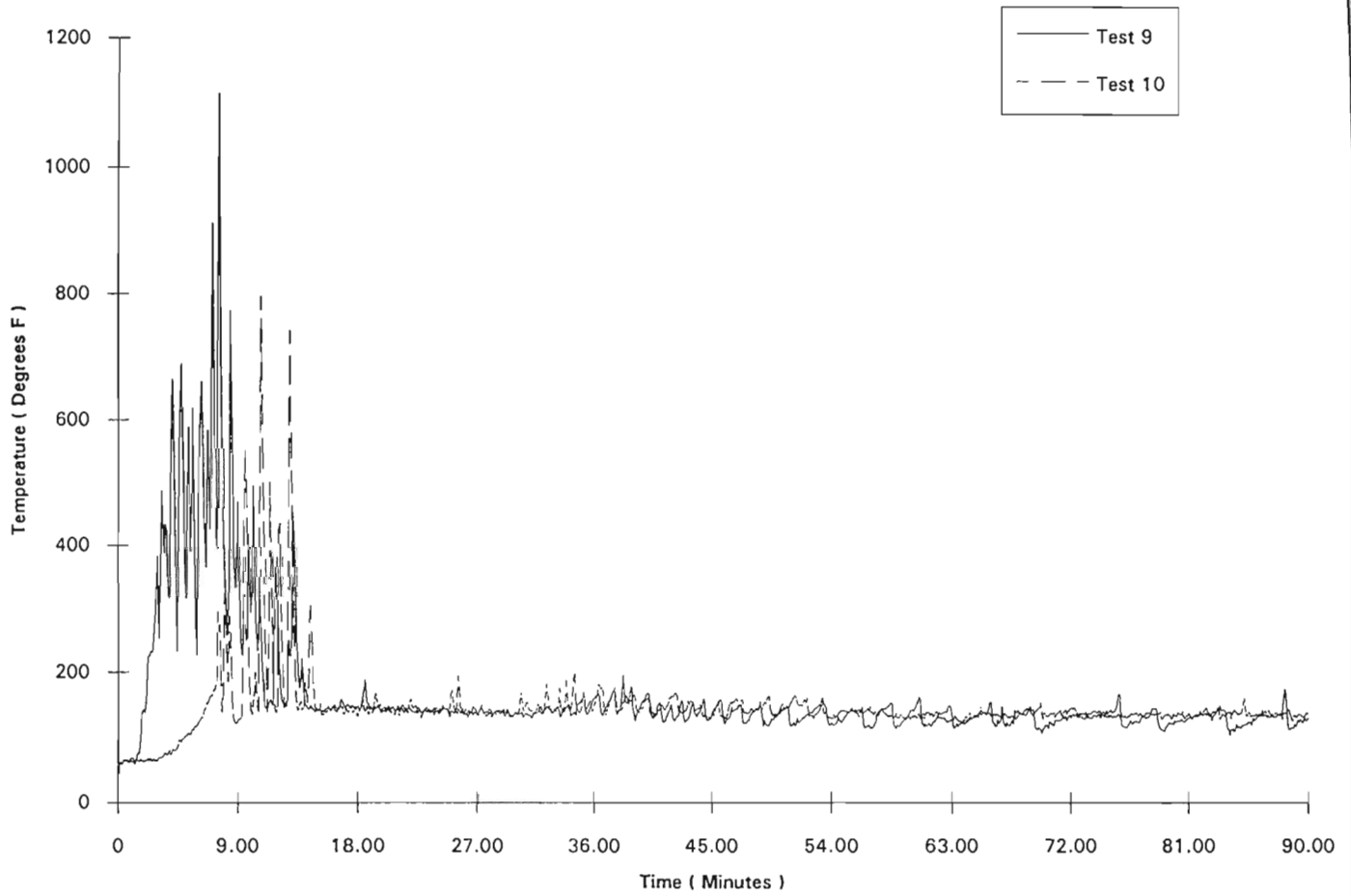
Thermocouple Station 27



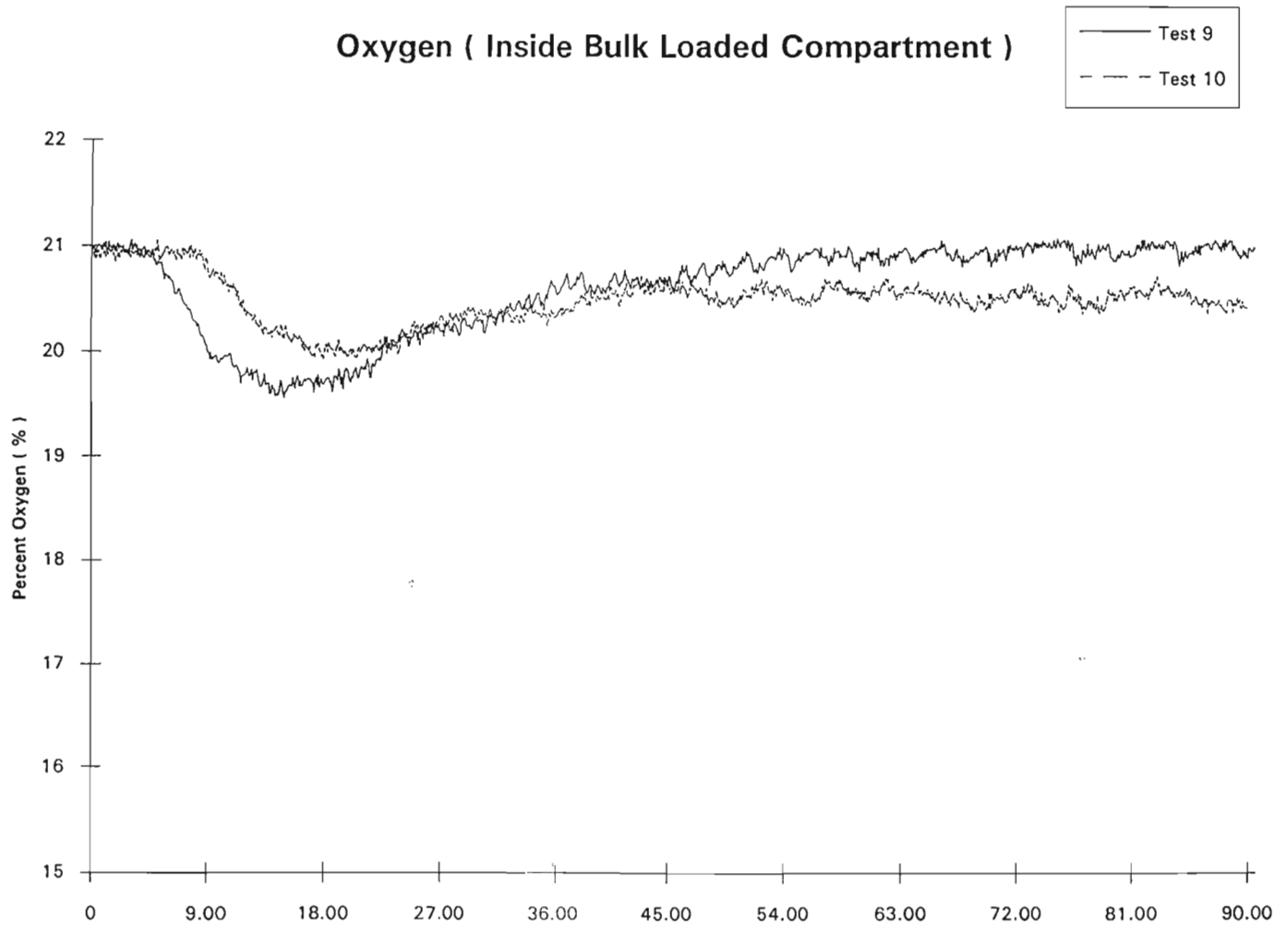
Thermocouple Station 27



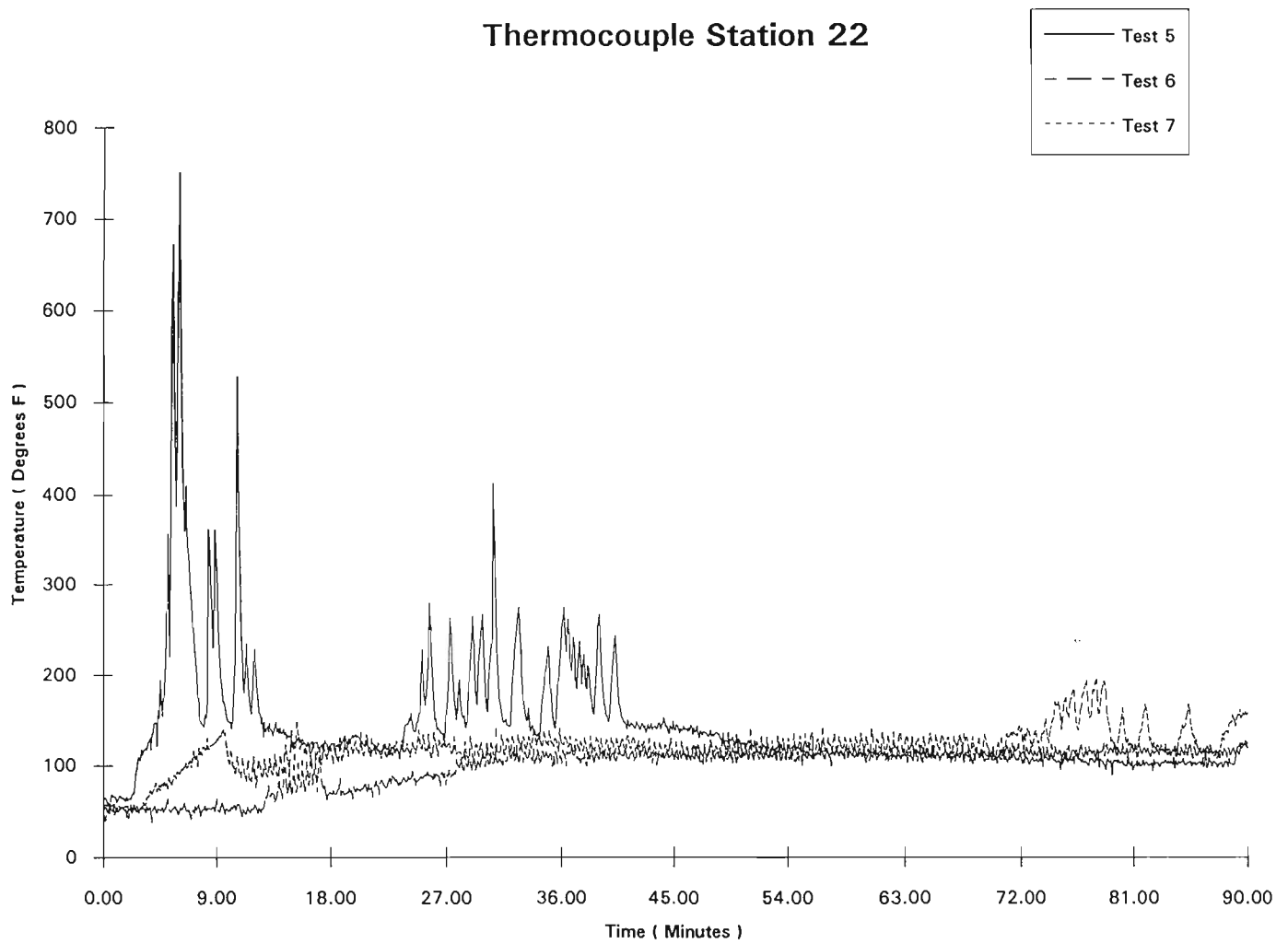
Thermocouple Station 27 (Bulk Loaded)



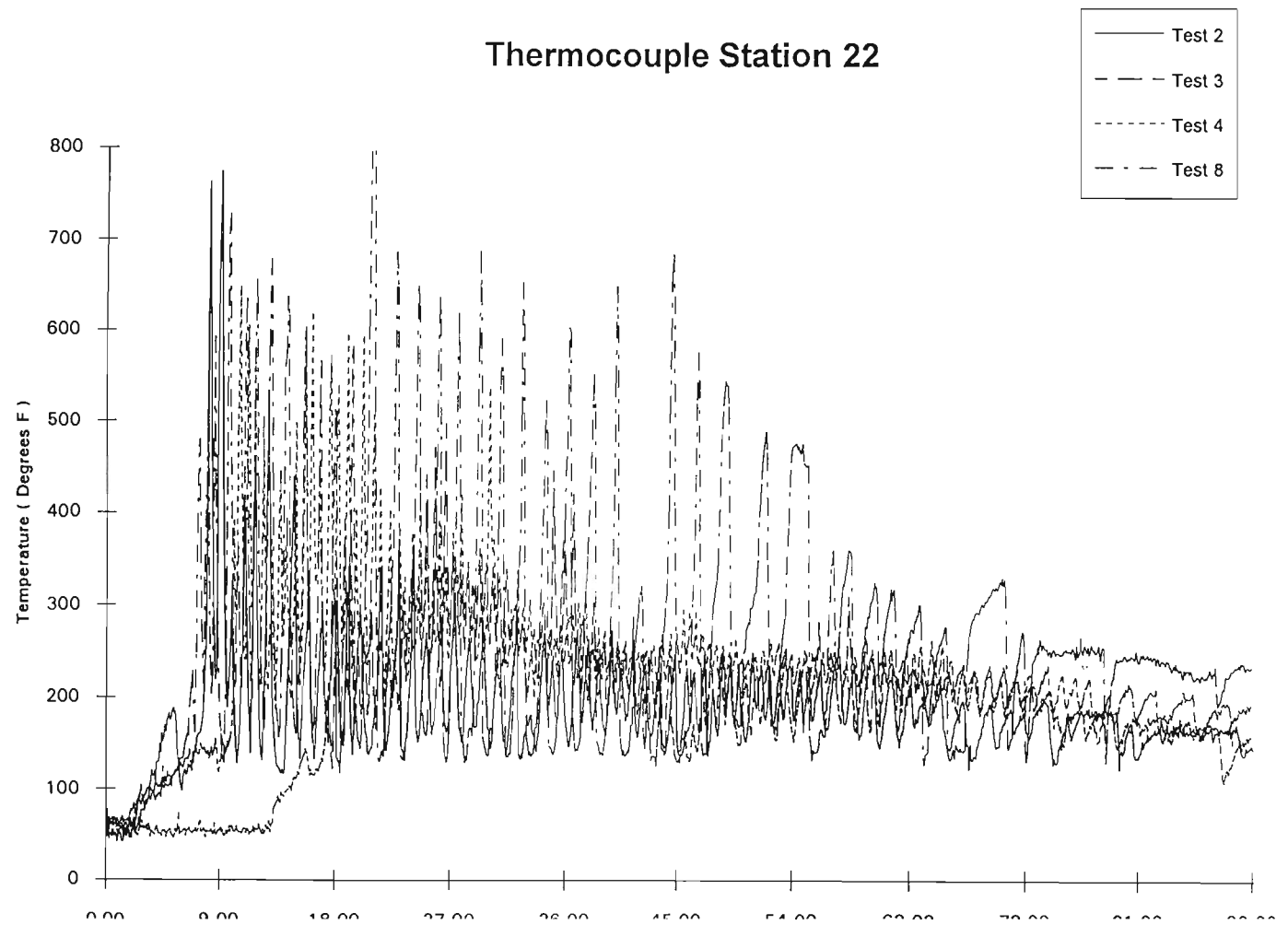
Oxygen (Inside Bulk Loaded Compartment)

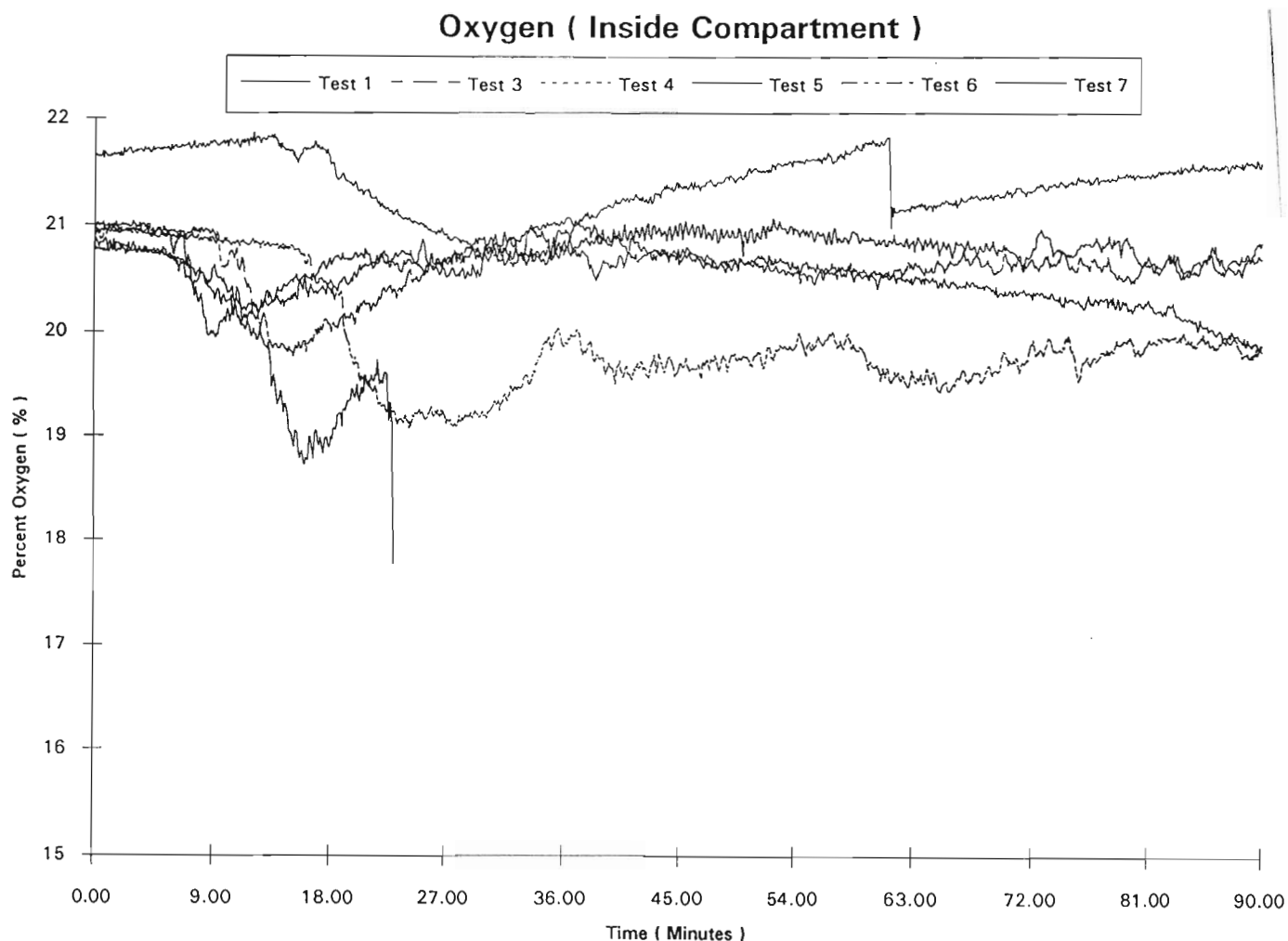


Thermocouple Station 22



Thermocouple Station 22





TEST RESULTS

HIGH PRESSURE SINGLE FLUID NOZZLE

TEST 1: 250 F ACTIVATION, 10 SECOND SCAN, 60 MINUTE DURATION
CEILING TEMPS REACHED 1000 F, 40 GALLONS USED

ACTION ➡ *INCREASE ZONE SIZE, INCREASE FLOWRATE*

TEST 2: 250 F ACTIVATION, 10 SECOND SCAN, 90 MINUTE DURATION
CEILING TEMPS LOWERED, 44 GALLONS USED

ACTION ➡ *DECREASE ACTIVATION TEMP, INCREASE FLOWRATE*

TEST 3: 200 F ACTIVATION, 10 SECOND SCAN, 90 MINUTE DURATION
CEILING TEMPS EXCEEDED 1000 F, 85 GALLONS USED

ACTION ➡ *DECREASE SCAN RATE, INCREASE FLOWRATE*

TEST 4: 250 F ACTIVATION, 5 SECOND SCAN RATE, 90 MINUTE DURATION
400 F - 500 F CEILING TEMPS, 65 GALLONS USED

AGENDA

INTERNATIONAL HALON REPLACEMENT WORKING GROUP MEETING

Wednesday and Thursday, April 19-20, 1995

Claridge Hotel, Rome, Italy

WEDNESDAY, APRIL 19, 1995

- 8:00-9:00 Individual Task Group Meetings
9:00-9:15 Welcome/Opening
9:15-9:30 Introduction/Background/General Information - R. Hill (FAA Technical Center)
9:30-9:45 Review of Minutes of November Meeting
9:45-10:00 Task Group Review - R. Hill (FAA Technical Center)
10:00-11:30 Task Group Leader Presentations
- 10:00-10:10 Engines Report Status - M. Kolleck
10:10-10:20 Current Alternative Agents Final Report - B. Tapscott
10:20-10:40 Break
10:40-10:50 Halon Restrictions Update - J. O'Sullivan
10:50-11:00 Small Scale Screening for Cargo Agents Update - D. Blake
11:00-11:10 Potty Bottles Final Presentation - B. Glaser
11:10-11:20 Handheld Extinguisher Standard Update - N. Povey
11:20-11:30 Engine Nacelle Standard - M. Bennett
- 11:30-11:45 Task Group Assignments
11:45-1:30 Lunch
1:30-2:30 Subgroup Leader Presentations
- 1:30-1:50 Cargo - Dave Blake (FAA Technical Center)
1:50-2:00 Engines - R. Hill (FAA Technical Center)
2:00-2:15 Handheld Overview- Nick Povey (U.K. Civil Aviation Authority)
2:15-2:45 Handheld - Konstantin Kallergis (DLR)
2:45-3:00 Break
3:00-3:30 Handheld-Toxicology Testing - Jean-Francois Petit (CEAT)
3:30-4:00 Handheld-Hidden Fire Test Method - Adam Chataway (Kidde Int'l)
- 4:00-5:00 Discussion on Minimum Performance Standard for Handheld Extinguishers - B. Glaser (Walter Kidde)

THURSDAY, APRIL 20, 1995

- 9:00-10:00 Presentation and Discussion of Revised Cargo Compartment Halon Replacement Agent/System Proposed Minimum Performance Standard
10:00-10:15 Break
10:15-11:15 Discussion of Minimum Performance Standard for Engines
11:15-1:00 Lunch
1:00-2:00 Working Group Member Presentations
1. Kathy Slack-Reliable Automatic Sprinkler Company
 2. Paul Disipio-NAWC (Warminster) - Watermist
 3. Bill Leach-NAWC (Lakehurst) - Halon Simulant
- 2:00-3:00 Summary/Closing/Next Meeting

Held at the Claridge Hotel, Rome, Italy
April 19-20, 1995

NAME	ORGANIZATION/ AFFILIATION	ADDRESS	PHONE/FAX
John J. Petrakis	FAA	800 Independence Washington, DC	PHONE: 202-267-9274 FAX: 202-267-5340
Robert E GLASER	Walter Kidde Aerospace	4200 Airport Dr Wilson, N.C. 27896	PHONE: 237-7000- 319) FAX: 237-4717
Dave Blake	FAA TC	Atlantic City Airport NJ. 08405	PHONE: 609-985-4528 FAX: 609- 985-4812
	CAA	Hyderabad, India	PHONE: 44 1213 573597 FAX: 44 1213 573594
Terry Sipe	Walter Kidde Aerospace	4200 Airport Dr Wilson, N.C. 27896	PHONE: 237-7000 FAX: 237-4717
	Lyons International Aerospace	Woburn Aerospace 2000 Woburn Rd Woburn, MA 01801	PHONE: 617-235-1100 FAX: 617-235-1100
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SHAM HARIRAM	MCDONNELL DOUGLAS DOUGLAS AIRCRAFT	3855 LAKEWOOD LONG BEACH MC 800-23, CA. 90846	PHONE: (310) 593-4305 FAX: (310) 593-7104
	BRITISH AIRWAYS	32111th Avenue PO Box 13 MATHURON, INDIA	PHONE: 91 11 562 3200 FAX: 91 11 562 2326
DAVID CATCHPOLE	BP EXPLORATION (ALASKA)	P.O. Box 196612 ANCHORAGE ALASKA 99519-6612 U. S. A.	PHONE: 907-564-5038 FAX: 907-564-5020
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LIST OF ATTENDEES
INTERNATIONAL HALON REPLACEMENT WORKING
GROUP MEETING

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NAME	ORGANIZATION/ AFFILIATION	ADDRESS	PHONE/FAX
BILL LEACH	NAVY - LAKEHURST	CODE 4352A LAKEHURST, NJ 08733-5100	PHONE: (908) 323-1184 FAX: -1184
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Dale Kent	3M	223-65-04 St. Paul, MN 55144 USA	PHONE: 612- 733-4931 FAX: 612-636 1927
GOLBERTS FRANK	3M	CHANDLER HAT 11 2430 40th AVE St. Paul	PHONE: +1 612/345 2866 FAX: +1 612/345 2866
MIKE DIPROSE	PACIFIC SCIENTIFIC LTD.	SEVEN CENTRE 8 BOSTON DRIVE BOURNE END BUKS SL8 5YS UK	PHONE: +44 1753 628 81025 Z FAX: +44 1628 810124
DOUG DIERDORF	PACIFIC SCIENTIFIC HTC/ION TECH	3114 JUAN TABO NE ALBUQUERQUE, NM 87111	PHONE: 505 291 1149 FAX: 505 291 1141
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LUIGIANO CORRADI	SAFETY-HI-TECH NAFAT	VIA GINO CERV 14 00137 ROMA ITALY	PHONE: 06-58713442 FAX: 06-58713442
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NAME	ORGANIZATION/ AFFILIATION	ADDRESS	PHONE/FAX
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Philippe MANGON			PHONE: FAX:
GORDEN TAYLER	ICI EXPLOSIVES	ACHARD SITE STEVENAGE MIDSEX SUSSEX K120 ENGL	PHONE: 441 274 487 712 FAX: 441 274 487 372
Jean-François PETIT	CEAT	23, avenue Henri Guillaumet 31050 TOULOUSE	PHONE: (33) 61 51 41 10 FAX: (33) 61 51 41 78
ALAN BRINSON	TYCO EUROPE	30 AVENUE MARCEAU 75008 PARIS FRANCE	PHONE: 33.1.47.2 FAX: 33.1.47.2
Robert E. (Bob) Tapslett	NMERC	UNIV. OF NEW MEXICO Albuquerque, NM 87131-1370 USA	PHONE: 505-272-7252 FAX: 505-272-7203

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NAME	ORGANIZATION/ AFFILIATION	ADDRESS	PHONE/FAX
Vittorio Floriani	RAI	Via del Tritone 169 Rome ITALY	PHONE: 6783696 FAX: 6786368
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Kevin FRID	GEC MARCONI AVIONICS	AIRPORT WORKS ROCHESTER, KENT ENGLAND ME1 2XX	PHONE: (44) 1634 84440 EXT 415 FAX: (44) 1634 816121
BILL M COTCHEON	GEC MARCONI AVIONICS	AIRPORT WORKS ROCHESTER, KENT ENGLAND ME1 2XX	PHONE: (44) 1634 816121 FAX: (44) 1634 81674
Hans Hampel	Lufthansa Technik AG	P.O. Box 1000 D-22313 Hamburg	PHONE: 44-40-5040-40 FAX: 44-40-5040-35
Ray P. Hony (Ellen)	Fokk		PHONE: FAX:

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