INTERNATIONAL HALON REPLACEMENT WORKING GROUP

A Message From The Coordinator's Office

April 15, 1996

Dear International Halon Replacement Working Group Member:

Enclosed is a copy of the Minutes/Information Package from the March 26-27, 1996, meeting held in Hamburg, Germany.

Please note that the Handheld Extinguisher Minimum Performance Standard will be sent to all Working Group members with the Meeting Details Package for the next meeting under separate cover.

The next meeting is scheduled for July 16-17,1996. The meeting will be held at the Federal Aviation Administration (FAA) Technical Center. Hotel information will be included in the Meeting Details Package.

In order to provide more advance notice of upcoming meetings, we are currently in the process of planning meetings through the end of 1997. Please let us know if your organization is interested in hosting a future meeting.

We hope to see you at the July meeting.

Sincerely yours,

April Horner

Enclosures

Sponsored by:
Federal Aviation
Administration
Technical Center

INTERNATIONAL HALON REPLACEMENT WORKING GROUP MEETING

MARCH 26-27, 1996

Hosted by Lufthansa Technik and Airbus Industries
at the Radisson SAS Hotel, Hamburg, Germany

Tuesday, March 26, 1996

Introduction and Background on Working Group - R. Hill

Review of Minutes of November 17, 1995 - R. Hill

No Comments

Schedule for Halon Replacement Program - R. Hill

Cargo Compartments:

Bulk and containerized testing of three agents (HFC-125), FM200, and CF3I) to be completed by the end of the summer of 1996

A. Gupta: Does FAA plan to complete the tests on Water Mist? R. Hill: At the present moment we've put that aside to look at gaseous agents. If your Task Group recommends water mist as the first choice, then the FAATC will stop testing gaseous agents and start testing water mist. We have limited manpower and resources. Your group's first choice was gaseous agents, therefore, that is what we are testing. N. Povey: Tomorrow I will be discussing the EC Cargo Water Mist Program which may answer some of your questions

Engines Nacelles:

- FAATC is developing an Engine Nacelle Simulator which we plan to have up and running by the end of the summer of 1996

- It will take approximately one year to do validation testing

- By October 1997 validation testing should be complete and the Minimum Performance Standard finalized

Handheld Extinguishers:

- Test developed for handheld extinguishers by the CAA and Kidde Graviner in the United Kingdom

- We are building the test apparatus at the FAATC and it should be competed by April 1, 1996

- We (FAATC) are putting together a test program to look at agent toxicity in the cabin. The Minimum Performance Standard will be finalized after this testing is completed.

Lavatory Receptacle Extinguishers:

- Task Group worked on a Standardized Test
- A Task Group Report is in Final Review and will be published as an FAA Report

- The Potty Bottle Minimum Performance Standard will be published as an FAA Report through this Working Group.

A. Gupta: Will the Potty Bottle Minimum Performance Standard be published as an A/C? J. Petrakis: Yes it will. That is what we stated when we started this Task Group.

A. Gupta: Will you publish this schedule? R. Hill: What we have just discussed will be in the Minutes. John Petrakis will put something together similar to a milestone chart.

PLEASE NOTE:

ALL TASK GROUPS WRITING REPORTS TO BE PUBLISHED AS FAATC REPORTS THROUGH THIS WORKING GROUP SHOULD GIVE US THEIR REPORTS ON DISK IN EITHER MSWORD OR WORDPERFECT FORMAT.

Subgroup Leader Reviews/Presentations -

Potty Bottles - R. Hill

Showed photo of test apparatus and set-up. Presented data collected from a number of tests run at the FAATC using the Kidde Graviner Minimum Performance Standard using Halon 1301, FM200, HFC-125, and water.

R. Hill: Data presented differed from results obtained by Walter Kidde Therefore, we will send our engineer who has been running these tests down to Walter Kidde to work with the Walter Kidde personnel who helped develop the Minimum Performance Standard.

M. Potschkat: CF3I will be tested in this apparatus? R. Hill: If someone wants it tested. R. Gautreau: I would like a copy of a technical report outlining all of this data and test specifications, is that possible? R. Hill: When the testing is completed, a report will be published.

B. Glaser: There may be a difference in the paper used or how the fire is started between the way we set up the test and the way the test was run at the FAATC. R. Hill: Our engineer working on this project will compare his test set up and procedure with that of the Walter Kidde test set-up in order to determine if there are any differences.

The graphs presented indicated that the fires were consistently extinguished.

H. Mehta: We might end up with a similar situation in the engine nacelle or cargo compartment tests where there are many more parameters. R. Hill: Yes, we are aware of that.

M. Kolleck: Does consistently mean 100% of the time? R. Hill: I don't know.

Cargo Compartments - D. Blake

Presented data collected from full scale cargo compartment bulk load fire tests done at FAATC with Halon 1301, FE 25, and FM 200. Presented summary of agent suppression and extinguishing concentrations.

Showed photo of small scale test apparatus which he discussed at November 1995 meeting. Described small scale test design and set up.

We are trying to compare the baseline of Halon to the other agents.

A. Gupta: Where do we stand with water mist? D. Blake: Your Task Group's first choice was to test gaseous agents. R. Hill: If your Task Group comes back to us after what you've heard at this meeting that you would like us to test with water mist instead of the gaseous agents, then we will stop testing the halocarbons and start testing with water mist. We (at FAATC) cannot run tests on both gaseous and water mist systems at the same time.

Engine Nacelle - D. Ingerson

Nacelle Simulator at FAATC - Gave update on development of nacelle simulator at FAATC. He will pick up on this project in early April 1996. I will attempt to set up what is currently accepted for certification.

Halonizer Concentration Work done at Wright Paterson AFB - Gave update on progression of work since November 1995 meeting. Gave brief explanation of background on test selection for halonizer work at WPAFB. Presented some of the data used in halonizer work at WPAFB. Tests were run with Halon 1301, CF3I, and HFC 125.

H. Mehta: I suggest running the concentration tests and the fire extinguishment tests on the same day.

Handheld Extinguishers - N. Povey

CAA Report 9513 (completed work on the development of a hidden fire test).

CEAT Work - R. Gautreau

Presented new test chamber designed at CEAT (the previous test chamber has been redesigned). He described this new test chamber's design. He explained the planned test program. The test chamber is cleaned after each test prior to the next test.

DLR Work - K. Kallergis

Gave update on status of report he discussed at November 1995. The report should be available by the July 1996 meeting. We have not ran any halon tests since the November 1995 meeting, but will have data to present at the July 1996 meeting. Showed design of hidden fire test for handheld extinguishers.

Handheld Extinguisher Minimum Performance Standard - N. Povey

Reviewed the Draft of the "Minimum Performance Criteria for Replacement -Handheld Portable Extinguishers for Aircraft Cabin Fire Protection". A copy of this draft will be sent out to all working group members with the Meeting Details Package under separate cover.

Discussion on Handheld Extinguisher Minimum Performance Standard. Member Question: Can we ask you to make sure you come up with a reproducible fire? R. Hill: We plan to do that first. A. Gupta: What is the next step on the Minimum Performance Standard? N. Povey: It will be presented to and reviewed by the International Cabin Safety Study team.

Discussion on Cargo Compartment Minimum Performance Standard - R. Hill

R. Hill gave update on this standard. There has not been any work on this standard in the last 2 or 3 meetings. We are considering simplifying this standard based on what we have learned in our testing. Our fire load is the most closely representative of some of the items carried in a cargo compartment. H. Mehta: As long as you are going to evaluate several agents, it might be good to record and select data at one time to be reviewed at a later time. S. Hariram: We are asking you to provide us with the data (toxicity readings from cabin area) so that we can determine if the agent has a high toxicity. A. Gupta: As far as toxicity, there are two things that must be looked at: one is the FAA (regulatory authority's) requirement and the other is each manufacturer's requirement. S. Hariram: We (the manufacturers) need to find out what the toxicity levels are. J. O'Sullivan: As an end user I'd like to see some type of performance standard. A. Gupta: What would the Minimum Performance Standard include? R. Hill: It would include some information on the concentration of gases, ...A. Gupta: What about an area coverage such as water mist or liquid halocarbon? R. Hill: As I stated earlier, we are testing gaseous agents, because your Task Group selected gaseous agents as its first choice with water mist as its second choice. If your Task Group wants us to test water mist or something other than gaseous agents, you must let us know and understand that we cannot test gaseous agents and water mist at the same time.

Wednesday, March 27, 1996

Discussion on Cargo Compartment Minimum Performance Standards (continued)

Summary: There is concern over toxicity in accidental discharge and when an agent is decomposing in the cargo compartment.

Discussion on Engine Minimum Performance Standard - R. Hill

H. Mehta: We have not made any changes to the Engine Minimum Performance Standard. R. Hill: How did you handle the neat toxicity? H. Mehta: For either the engine nacelle or cargo compartment you (R. Hill, J. Petrakis, B. McCracken) are going to allow any agent that is approved for an unoccupied area. This was discussed at the July 1994 meeting in Seattle, Washington. H. Mehta: Up until now we have emphasized the gaseous agent in the engine nacelle. R. Hill: At the present time, the gaseous agents are the top priority over other alternative technologies. H. Mehta: That is correct. R. Hill: We are looking at gaseous agents first, because that is what we have been requested to do.

Comments on Published Reports/Status of Reports to be Published - R. Hill

Chemical Options to Halon for Aircraft Use was published February 1995 (B. Tapscott's Task Group)

Potty Bottle Minimum Performance Standard and Report in process (B. Glaser)

Lavatory Trash Receptacle Report (G. Grimstad) is on its way to the printer

Cargo Compartment Preference Report (A. Gupta) is in final review process

H. Mehta: We owe you an Engine Agent Preference Report

Task Group Leader Presentations/Updates

Advanced Alternative Agents - B. Tetla

Reviewed changes that have been incorporated into updated report that is in draft format at this time. A copy of his presentation is included in this package. S. Hariram: When will the updated report be available? B. Tetla: It has been circulated for comments within the Task Group. After Bob Tapscott receives all the comments and incorporates them, he will forward it to April for FAA review and publication.

Halon Restrictions Update - J. O'Sullivan

Reviewed background on Montreal Protocol and gave update. A. Gupta: Is there one organization or office that can be contacted to find out regulations or halon restrictions within certain countries? D. Catchpole: There is the UNEP office is Paris which publishes information quarterly about various ozone depleting substances, but as far as an office that has knowledge on the regulations in all countries, there is nothing established, because it is dealt with on a global level not on an individual country basis. F. Stossel: There is an association called the Airline Engineering Association that most airlines in the world participate in that keeps airlines updated in this area. A copy of his presentation is included in this package.

Cargo Detection False Alarm Survey - J. O'Sullivan

Presented survey form that Task Group has come up with. It will be distributed through the FAATC within the next month. A copy of the survey is included in this package.

September 11-12, 1996 conference in London, United Kingdom on Halon alternative agents. Contact John O'Sullivan for further details on this conference. There will be major international participation and a number of manufacturers will demonstrate their alternative agents at that conference.

Agent Concentration - D. Dierdorf

A copy of his presentation is included in this package.

Engine Work at Wright Paterson AFB - J. Tucker

Gave update on work since 1992. Final reports on near-term work will be available to the public at a later date. A copy of his presentation is included in this package.

Database Update - M. Kolleck

The 'Halon Information System' is now on-line. Gave instructions on accessing the database through the SURVIAC bulletin board.

<u>Working Group Member Presentations</u>

'EC Cargo Water Mist Program' - N. Povey

Gave background and explanation of program and its participants. A copy of his presentation is included in this package.

<u>Engine Fire Simulation Test</u> - R. Gautreau

Presented photos and described the French Engine Fire Simulation Test Facility.

<u>Presentations by Agent/Systems Manufacturers</u>

DuPont - P. Bleasby

North American Fire Guardian - G. Whitworth

Pacific Scientific - D. Dierdorf

Additional Discussion - R. Hill

Does anyone have any questions on anything we have seen or heard in the past two days?

Next Meeting - R. Hill

The next meeting will be held at the Federal Aviation Administration (FAA) Technical Center on July 16-17, 1996. Further details will be sent to all Working Group members in a separate mailing.

LIST OF ATTENDEES

INTERNATIONAL HALON REPLACEMENT WORKING GROUP MEETING

March 26-27, 1996

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IHRWG Meeting Presentation Notes, Hamburg, Germany, 16 March 1996
Halon Replacement, Engine Nacelle
FAA Technical Center, Fire Safety Section, AAR-422, Presented by Douglas Ingerson

FAA Technical Center Nacelle Simulator Status:

1. Core Heating system is in place.
    a) Must work with it to develop understanding of capabilities.
    b) Actual surface temperature profile yet to be seen.
2. Fuel for fire scenarios on order:
    a) Skydrol LD4
    b) Mobil Jet Oil II
    c) Jet-A
3. Currently working on the following systems:
    a) Inlet air flow conditioning.
    b) Inlet air flow measurement.
    c) Fuel delivery and fire scenario systems.
    d) Agent conditioning and delivery system.
4. Anticipated scenario will:
    a) be built around Halon 1301 level of safety.
    b) not have below ambient temperature nacelle air flow potential. Will only be able to run at elevated air flow temperatures.
5. Timeline:
    a) Functional engine representation, mid to late summer, 1996.
    b) Halon 1301 baseline and eventual alternate agent testing, fall 1996.

Wright-Patterson Air Force Base (WPAFB) Results from Halonyzer Concentration Work:

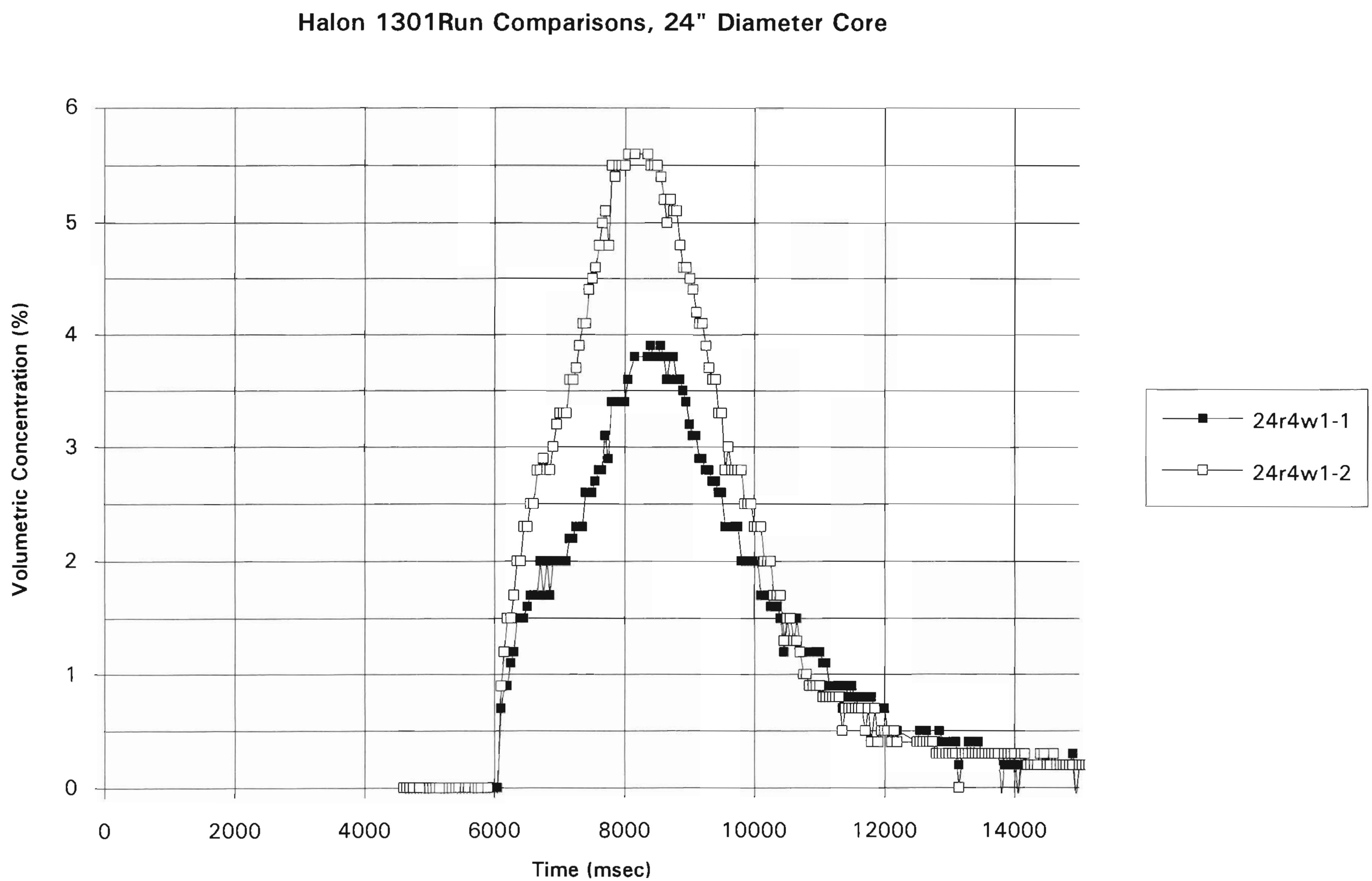
1. General Halonyzer performance comments:
    a) Halonyzer operator was in contact with manufacturer (Pacific Scientific/HTL) throughout sequence.
    b) Performance was acceptable over the entire test sequence. Some sensor degradation was noted.
    c) Test results infrequently suggested other than expected behavior (i.e. anomalous behavior, see accompanying Halon 1301 plot).
2. Approximately 200 hundred tests performed.
3. FAA Halonyzer operator requested testing for certain scenarios.
    a) Data from four years work at WPAFB, OH was briefly reviewed. Test scenarios selected for the 36" and 24" diameter cores.
    b) Agents examined included were Halon 1301, HFC-125, and CF_3I.
    c) Agent weights based on single-point weights, bracketed weights, and factor-of-safety weights. All weights suppressed fire in the United States Air Force (USAF) Aircraft Engine Nacelle (AEN) simulator located at WPAFB, OH. See USAF presentation notes, 17 March, for clarification on bracketing procedures.
4. See attached view graphs for test scenarios and concentration profiles.

36" (0.91 m) ∅ CORE
Bottom fire location
2" (5.08 cm) Clutter
Short compartment configuration
Agent Distribution: short, dump on the side

AGENT and AMOUNT	FUEL	AGENT TEMP	FUEL TEMP	HOT SURFACE TEMP	AIR TEMP	INTERNAL AIR FLOW	NUMBER OF CONCENTRATION RUNS
2 lbm HFC-125 0.9 kg	Skydrol LD4	160°F 71°C	200 °F 93°C	175 °F 79°C	275 °F 135°C	0.9 lbm/s 0.4 kg/s	4
5 lbm HFC-125 2.3 kg	JP-8	-55°F -48°C	100°F 38°C	850°F 454°C	-35°F -37°C	2.7 lbm/s 1.2 kg/s	4
3.35 lbm HFC-125 1.52 kg	JP-8	-40°F -40°C	325°F 163°C	500°F 260°C	-20°F -29°C	2.7 lbm/s 1.2 kg/s	1
5.03 lbm HFC-125 2.40 kg	JP-8	-40°F -40°C	325°F 163°C	500°F 260°C	-20°F -29°C	2.7 lbm/s 1.2 kg/s	1
6.60 lbm Halon 1301 2.99 kg	JP-8	-40°F -40°C	325°F 163°C	500°F 260°C	-20°F -29°C	2.7 lbm/s 1.2 kg/s	4

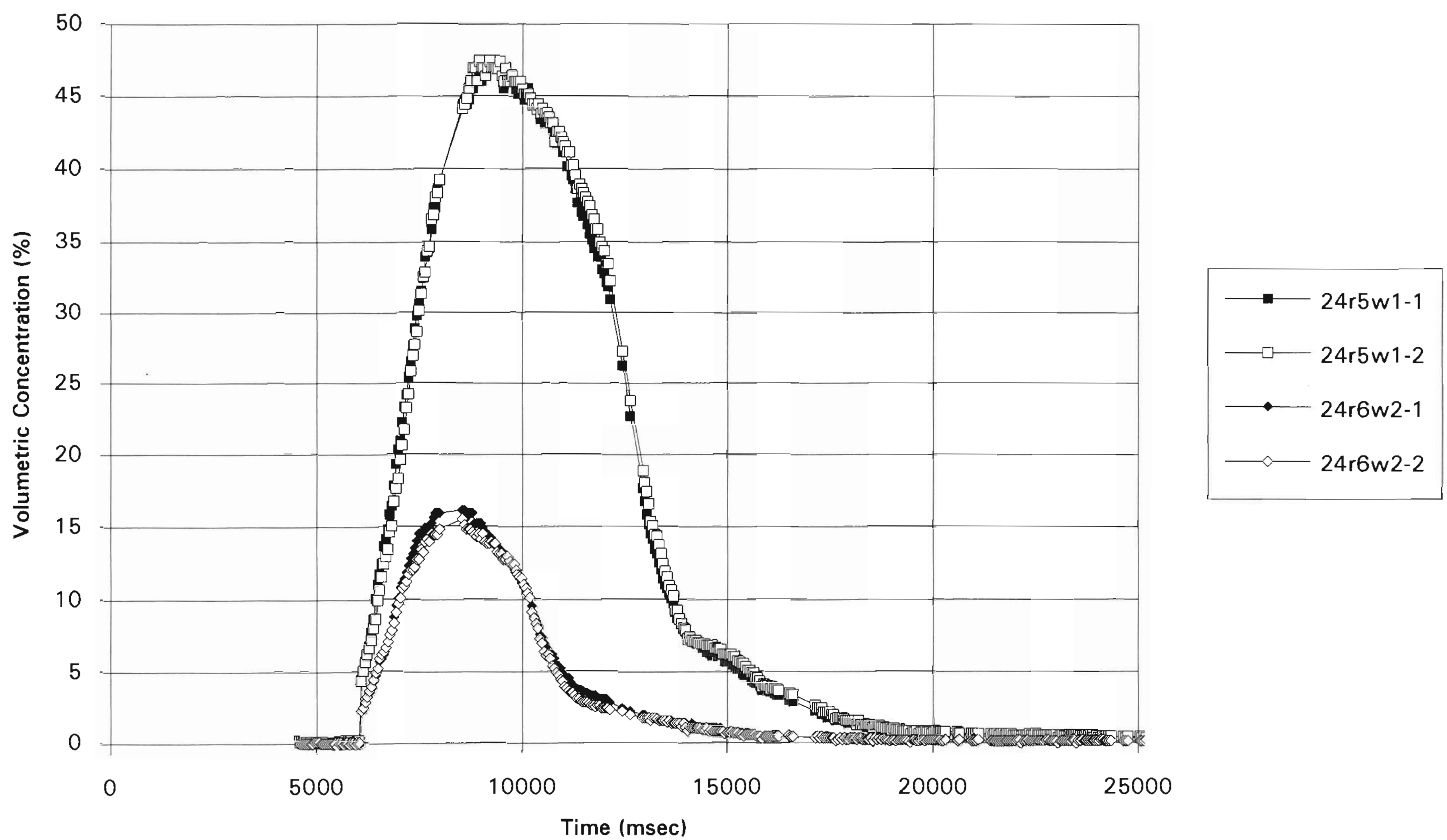
24" (0.61 m) ∅ CORE
2" (5.08 cm) Clutter
Short compartment configuration
Agent Distribution: short, CF_3I dumped on the side, all other agents were dumped on the side and top

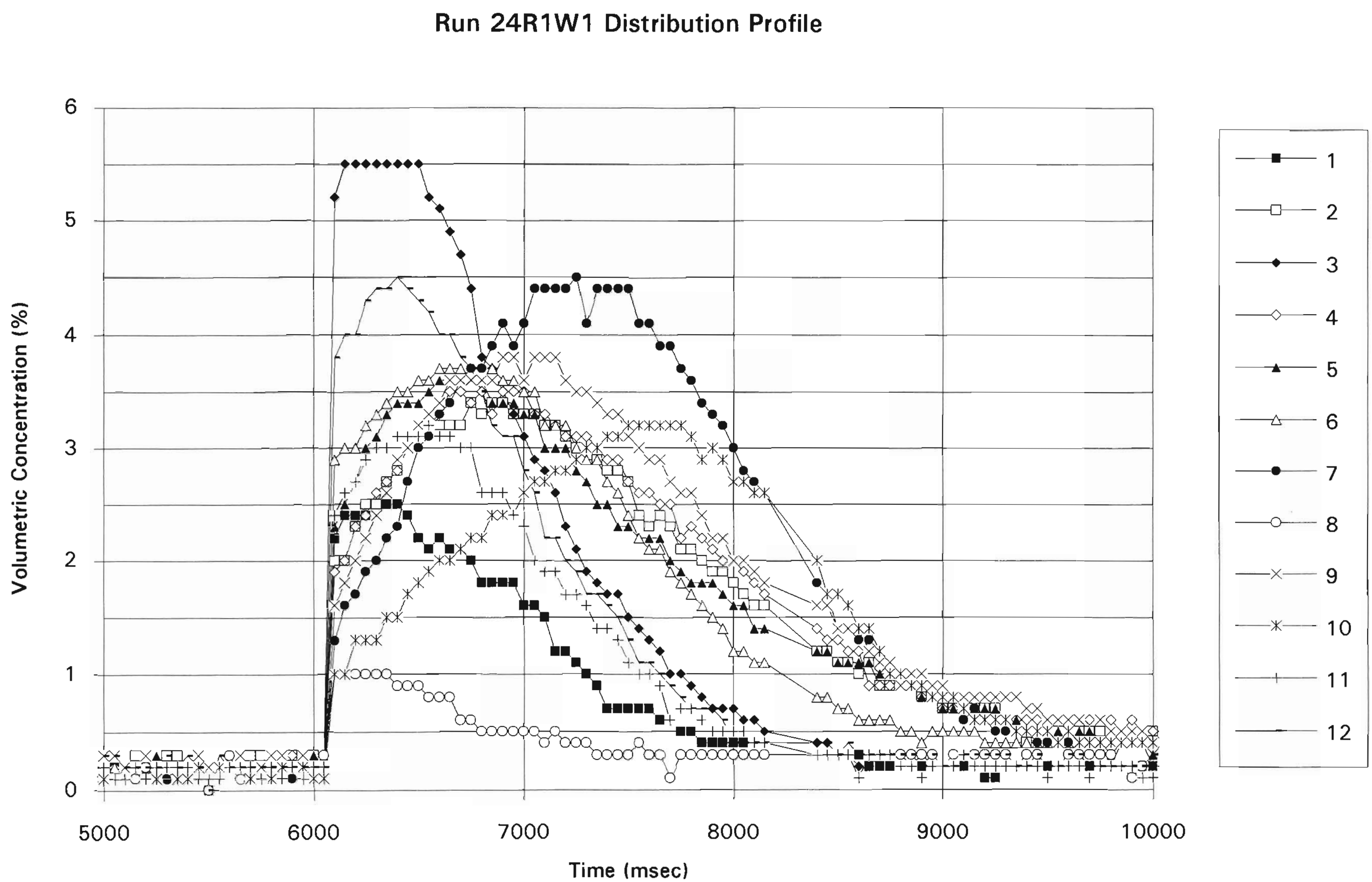
FUEL	AGENT and AMOUNT	AGENT TEMP	FUEL TEMP, FIRE LOCATION	HOT SURFACE TEMP	AIR TEMP	INTERNAL AIR FLOW	NUMBER OF CONCENTRATION RUNS, TEST ID
JP-8	1.375 lbm CF_3I 0.624 kg	160°F 71°C	325°F, TOP 163°C	1300°F 704°C	275°F 135°C	2.7 lbm/s 1.2 kg/s	1 24R1W1
JP-8	1.125 lbm CF_3I 0.510 kg	-55°F -48°C	325°F, BTM 163°C	175°F 79°C	100°F 38°C	2.7 lbm/s 1.2 kg/s	1 24R2W2
JP-8	0.940 lbm CF_3I 0.426 kg	-55°F -48°C	100°F, BTM 38°C	1300°F 704°C	275°F 135°C	0.9 lbm/s 0.4 kg/s	1 24R3W3
JP-8	1.33 lbm Halon 1301 0.60 kg	140°F 60°C	100°F, TOP 38°C	175°F 79°C	125°F 52°C	1.57 lbm/s 0.71 lbm/s	2 24R4W1-1, -2
JP-8	17.92 lbm HFC-125 8.13 kg	140°F 60°C	100°F, TOP 38°C	1300°F 704°C	125°F 52°C	1.57 lbm/s 0.71 lbm/s	2 24R5W1-1, -2
JP-8	4.48 lbm HFC-125 2.03 kg	140°F 60°C	100°F, TOP 38°C	175°F 79°C	125°F 52°C	1.57 lbm/s 0.71 lbm/s	2 24R6W2-1, -2

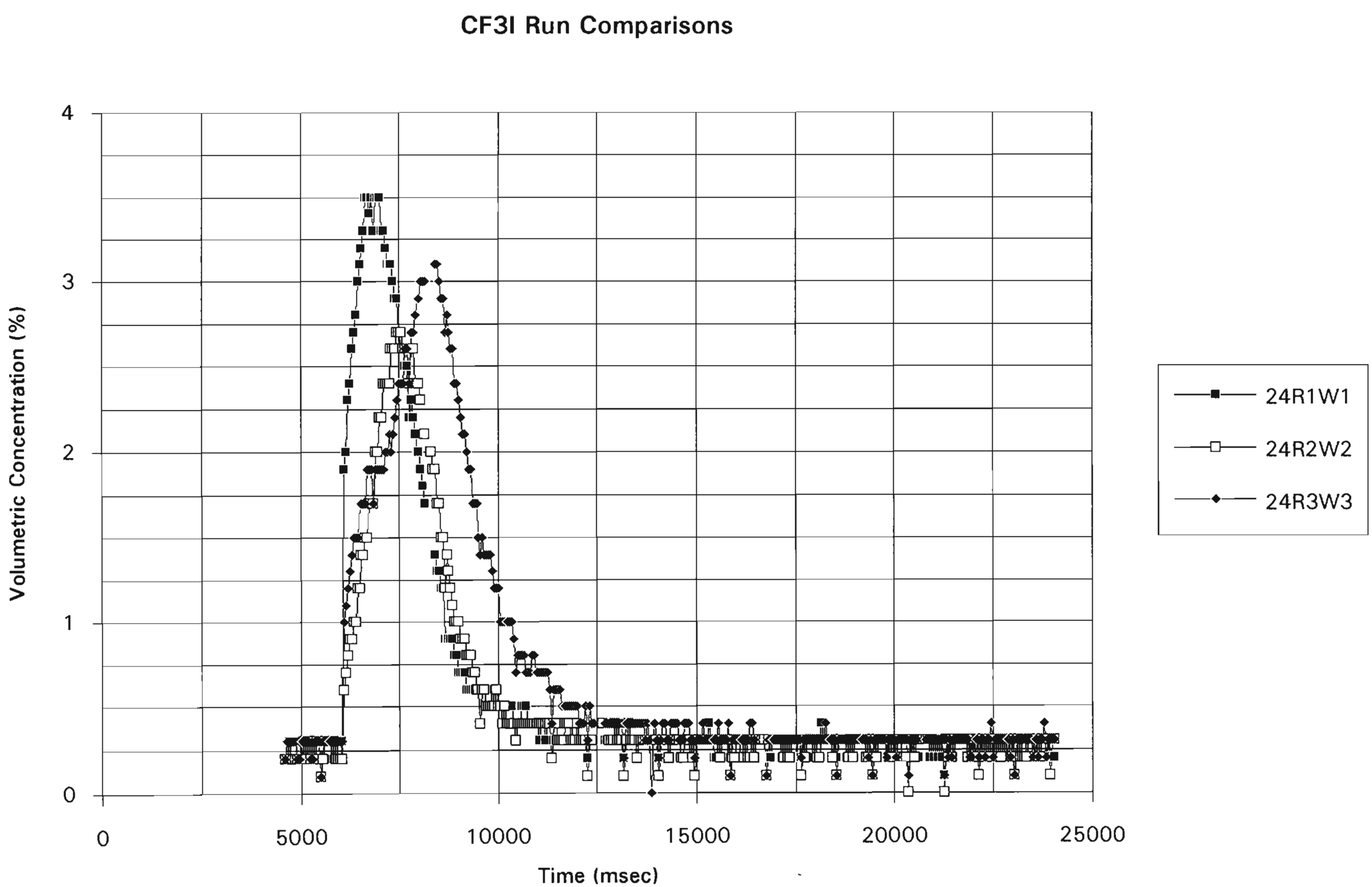


Halon 1301Run Comparisons, 24" Diameter Core
Volumetric Concentration (%)
0
1
2
3
4
5
6
0
2000
4000
6000
8000
10000
12000
14000
Time (msec)
24r4w1-1
24r4w1-2

HFC-125 Run Comparisons, 24" Diameter Core



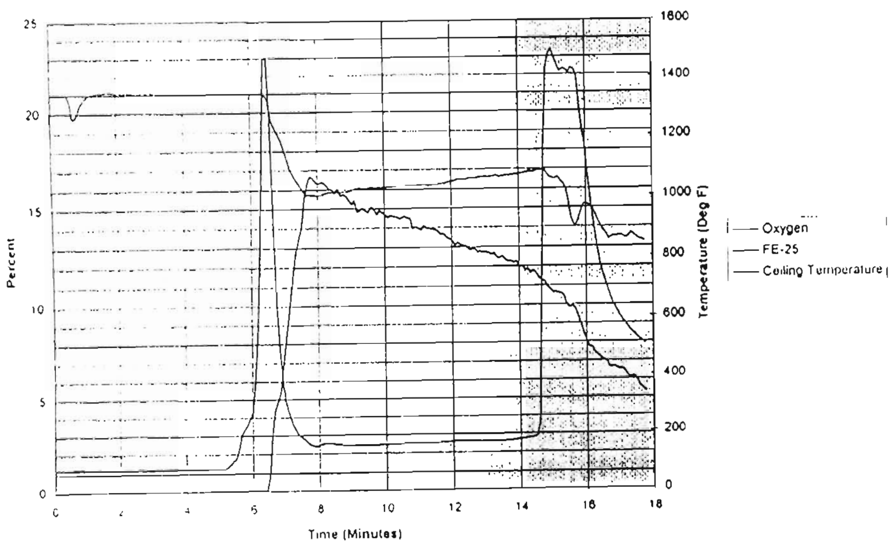

Run 24R1W1 Distribution Profile
Volumetric Concentration (%)
0
1
2
3
4
5
6
Time (msec)
5000
6000
7000
8000
9000
10000
1
2
3
4
5
6
7
8
9
10
11
12



CF3I Run Comparisons
Volumetric Concentration (%)
4
3
2
1
0
0
5000
10000
15000
20000
25000
Time (msec)
24R1W1
24R2W2
24R3W3

Chart1

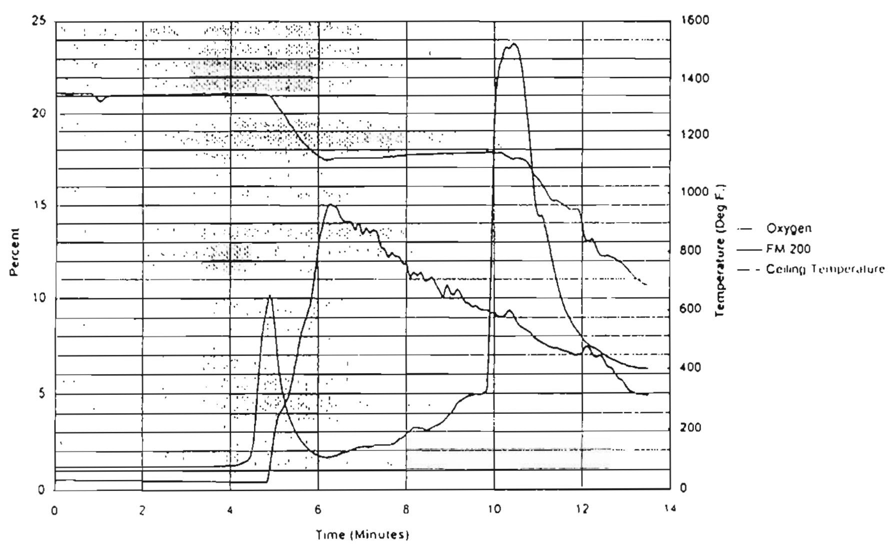
FE 25, BULK FIRE LOAD



Page 1

Chart2

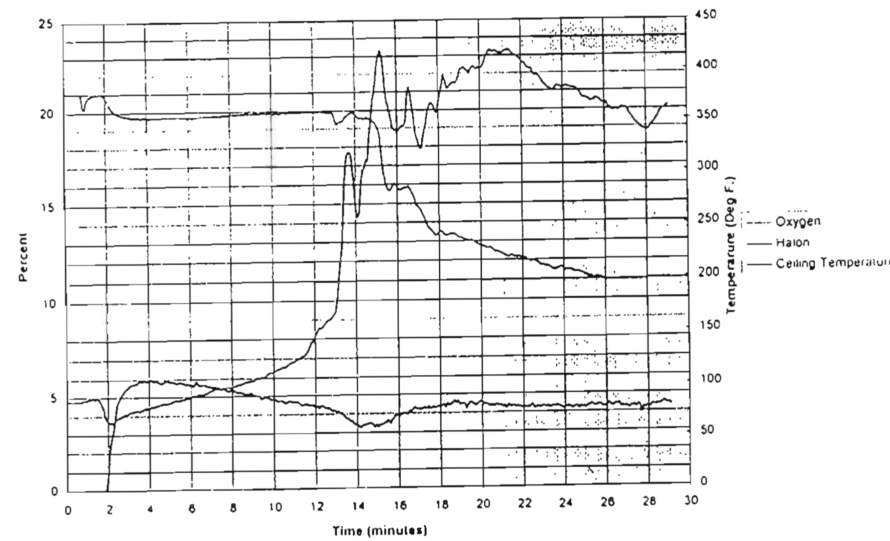
FM 200, BULK FIRE LOAD



Page 1

Chart1

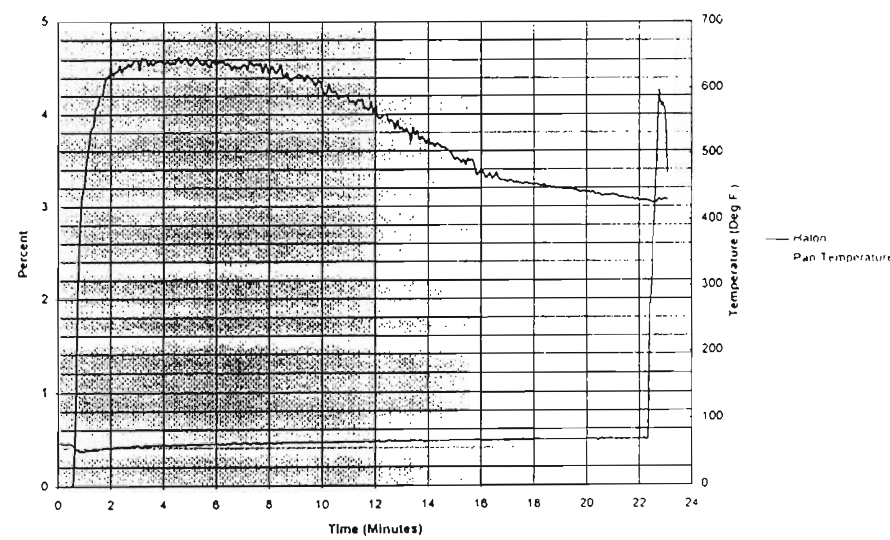
HALON 1301, BULK FIRE LOAD



Page 1

Chart2

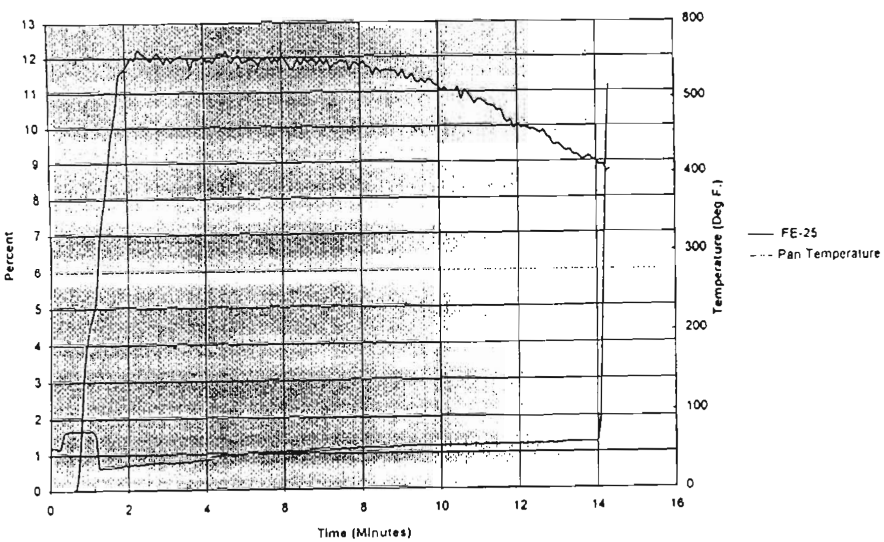
Halon 1301, Surface Burning Fire



Page 1

Chart1

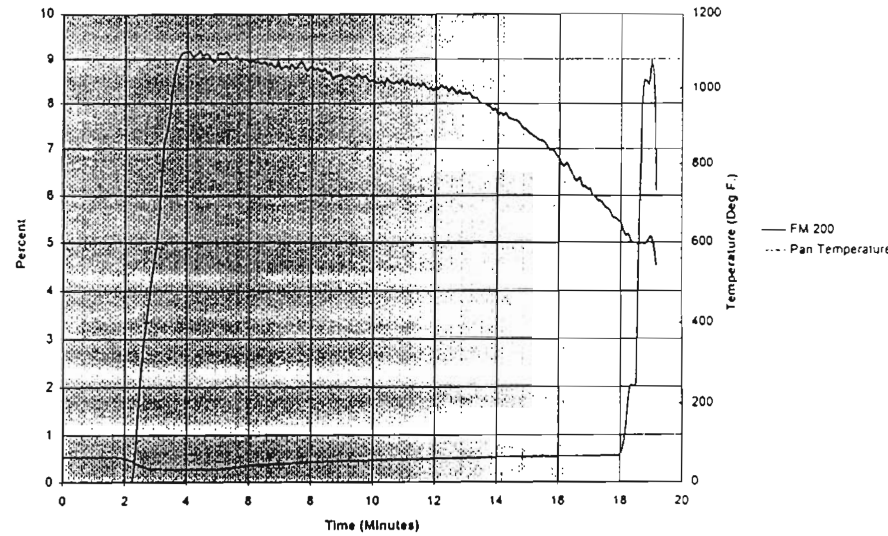
FE-25, SURFACE BURNING FIRE



Page 1

Chart1

FM 200, SURFACE BURNING FIRE

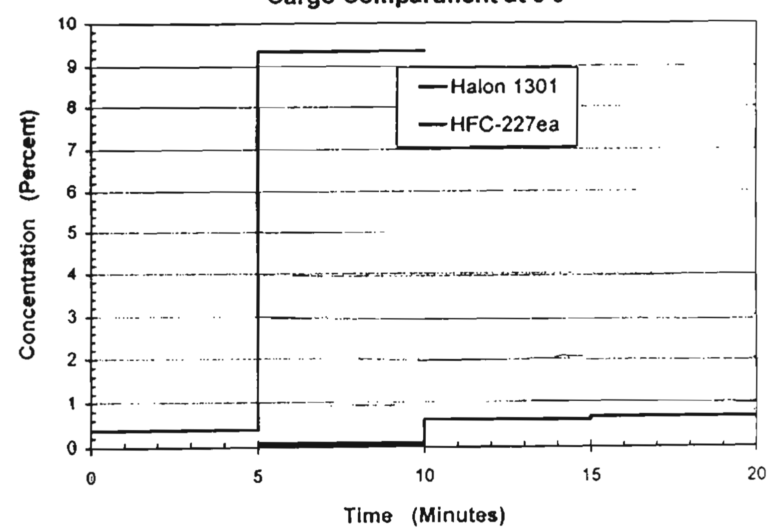


Page 1

AGENT SUPPRESSION AND EXTINGUISHING CONCENTRATIONS

AGENT	CUP BURNER	CLASS A FIRE	RATIO	CLASS B FIRE	RATIO
1301	3.1	4.1	1.3	3.0	1.0
FM 200	6.6	9.3	1.4	5.2	0.8
FE 25	8.8	11.3	1.3	8.9	1.0

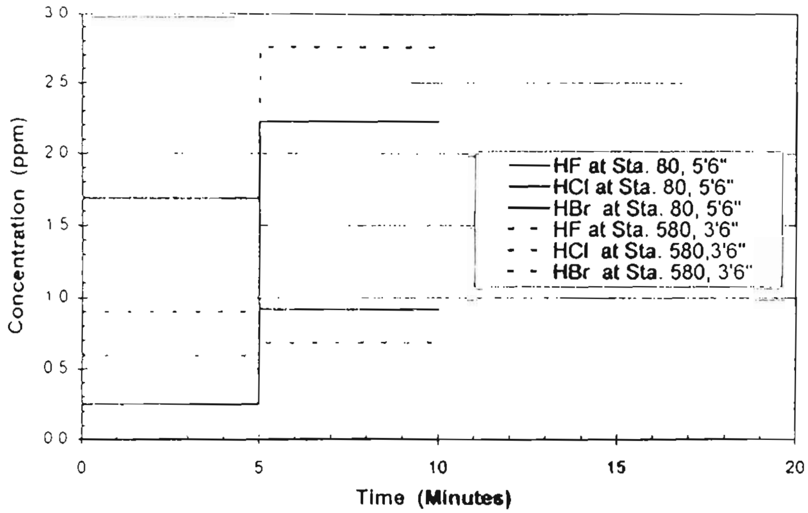
Hydrogen Fluoride TC10 Cargo Test
Cargo Compartment at 3'6"



Ion Chromatography Method 1

a:\cargo\results\HFMAR96.XLS

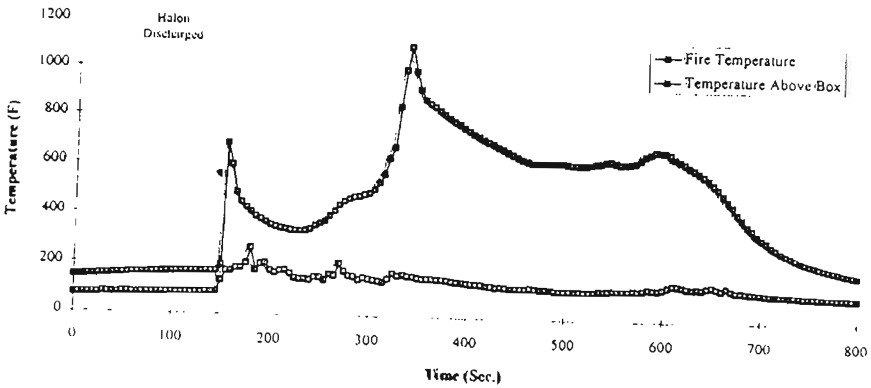
Acid Gases From HFC-227ea Discharge Cabin



Ion Chromatography Method 1

a:\cargo\results\HFMAR96.XLS

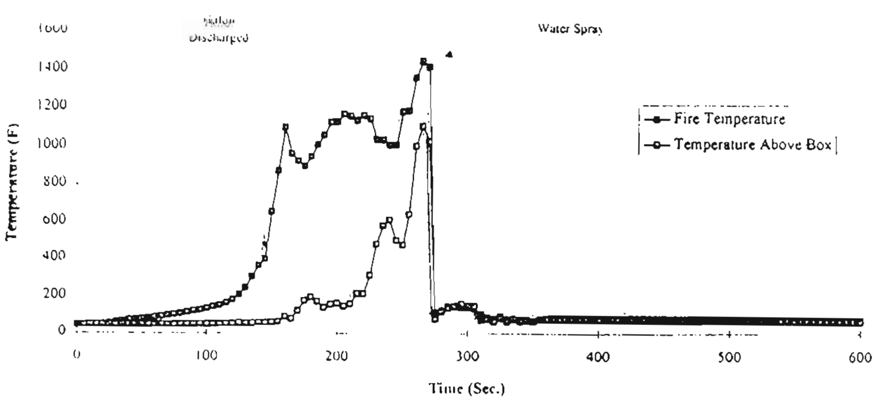
4.49% Halon 1301



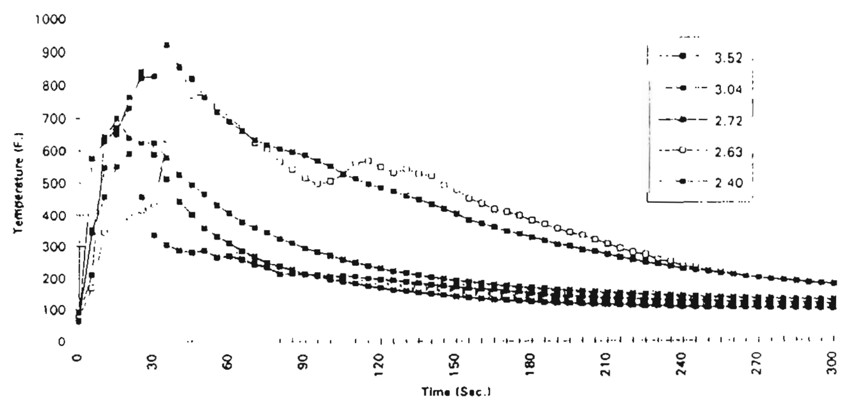
DSF377.XLC

H1301.XLC

3.77% Halon 1301



Halon 1301 Extinguishment



Halon Options for Aircraft Use

Robert A. Tetla
International Halon Replacement Working Group

Commercial Total Flood Agents

Agent	Extinguish Conc,%	Wt. Vol Equiv	Storage Vol Equiv
Halon 1301	2.9	1.0	1.0
HCFC-124[1]	6.7	2.12	2.39
HCFC Blend A[1]	9.9	2.13	2.73
HFC-23[1]	12.6	2.04	2.62
HFC-125[1]	9.41	2.61	3.38
HFC-227ea[1]	6.3	2.48	2.75
HFC-236fa	5.6	1.97	2.22
FC-218[1]	6.11	2.66	3.03
FC-3-1-0[1]	5.49	3.03	3.06
FIC-13I1[1]	3.02	1.37	1.01

1 SNAP Approved some restrictions may apply

Commercial Total Flood Agents

Agent	ODP	GWP	Atm Life, yrs	NOAEL %	LOAEL %
Halon 1301	12-16	5600	65	5	7.5
HCFC-124[1]	0.022	480	6	1	2.5
HCFC Blend A[1]					
HFC-23[1]	0.0	12100	250	30	50
HFC-125[1]	0.0	3200	36	7.5	10
HFC-227ea[1]	0.0	3300	41	9	10.5
HFC-236fa	0.0	8000	250	10	15
FC-218[1]	0.0	6100	3200	30	40
FC-3-1-0[1]	0.0	5500	2600	40	>40
FIC-13I1[1]	0.0001	<5	<1 day	0.2	0.4

1 SNAP Approved some restrictions may apply

Commercial Total Flood Agents

Agent	Trade Name	Design Conc. (min), %	Fill Density (max), lb/ft	Storage Pressure at 70F, psi
Halon 1301		5	70	360
HCFC-124	FE-241	8.5	71	195
HCFC Blend A	NAF-S-III	11 9	56.2	360
HFC-23	FE-13	16	54	608.9
HFC-125	FE-25	10.9	58	166.4
HFC-227ea	FM-200	7	72	360
HFC-236fa	FE-36	6 4	78	18.4
FC-218	CEA-308	8.8	80	360
FC-3-1-0	CEA-410	6	80	360
FIC-13I1	Triodide Iodoguard	3 6	104.7	360

Commercial Streaming Agents

Agent	Trade Name	ODP	GWP	Atm.Lifetime yrs	NOAEL %	LOAEL %
Halon 1211		3		15	0.5	1.0
HCFC-123[1]	FE-232	0.02	93	1.4	1.0	2.0
HCFC-124[1]	FE-241	0.02	480	6	1.0	2.5
HCFC Blend B[1]	Halotron I					
HCFC Blend C[1]	NAF-P-III					
HCFC Blend D[1]	Blitz					
HFC-227ea[2]	FM-200	0.0	3300	41	9.0	10.5
HFC-236fa[2]	FE-36	0.0	8000	250	10	15
FC-5-1-14[1]	CEA-614	0.0	6800	3200	40	>40
FIC-13I1[1]	Triodide Iodoguard	0.0001	<5	< 1 day	0.2	0.4

1. SNAP Approved some restrictions may apply
2. Should be in next SNAP approval, some restrictions may apply

Proposed NFPA 2001 Changes

- Inert gases
  - NOAEL/LOAEL values inappropriate
  - No Effect Level (NEL)/Low effects Level (LEL)
    - Based on physiological effects in hypoxic atmospheres
- Inert gas agents (IG-01, IG-541, IG-55)
  - NEL 43% (12% O_2 concentration)
  - LEL 52% (10% O_2 concentration)

Proposed NFPA 2001 Changes

- Inert gases
  - Up to LEL
    - Class B hazards in normally occupied areas with a predischarge alarm and time delay
  - Up to NEL
    - In absence of time delay
- Difference between NFPA and EPA
  - Egress times not mandated in NFPA

International Aviation Halon Alternatives
Working Group Meeting

Hamburg

March 26 and 27, 1996

John J O'Sullivan
Fire Protection Manager
British Airways

United Nations Environment Programme

Seventh Meeting Of The Parties To
The Montreal Protocol On Substances
That Deplete The Ozone Layer

Vienna - Austria

December 5 - 7, 1995

History

1. New Agents
2. EEC Regulation on HCFCs
3. Nairobi Open Ended Working Group Meeting - February 1995
4. Introductory of C.R.P. No.2
5. Proposed By: Italy
   Supported by: Germany, Holland, Denmark, Sweden
6. EEC Regulation - Importation Ban
7. Vienna - Decision VII/12
   Decision VII/31

Guidelines for Minimising Emissions of Halon

- Evaluate the Retirement of Systems
- Safe and Environmentally
- Use of Current Technology
- Advice on Fire Protection Impacts

Decision VII/12 - Voluntary Measures

(a) Accepting as critical those applications meeting the essential use criteria as defined in Decision IV/25

- Criteria
- Necessary
- Reliant
- Acceptable Levels of Safety
- Justifiable Uses for Recovered Halons

(b) Limiting the use of Halons in new installations - to critical applications

- Non Article 5 Countries - Few Installations Installed
- Critical Applications (Aviation)
- Existing Approved Designs
- Encourage Use of Suitable Alternatives

(c) Accepting that existing installations for critical applications may continue to use Halons for the future

- No intent to reduce regulatory impediments
- HTOC does not recommend indiscriminate mandatory decommissioning of systems
- Reliant on the use of Halon to achieve acceptable levels of safety

In the case of H1301 this will depend on a number of factors:

- Useful life of the protected asset
- The cost of the alternatives
- Benefit through demonstrable sensitivity to environmental issues
- Offering financial or fiscal incentives
- Recognition for users implementing voluntary decommissioning
- Acting to maintain an asset value
- Safety factors

(d) Considering the decommissioning of halon systems in existing installations, which are not critical applications, as quickly as technically and economically feasible

- Decommissioning already taking place
- Consultative process with stake holders
- Australia experience
- Designed to prevent premature emissions
- Viable alternative approaches
- End of life
- Economic feasibility of earlier retrofitting
- H1211 - Portable extinguishers - Alternatives available for the majority of uses
- Difficulty of collecting small amounts

(e) Ensuring that Halons are effectively recovered

- Halons removed from systems must be captured and retained for potential recovery
- Retain market price for recovered halon
- Regulatory Incentives
- Recovery/Recycling process needs to be reliable

(f) Preventing, whenever feasible, the use of halon in equipment testing and for training personnel

- Use of Halon for training almost zero
- Exception is aircraft where airworthiness regulations require it
- Encourage the use of simulants/substitutes for these tests
- No compromise on present safety levels

(g) Evaluating and taking into account only those substitutes and replacements of halon, for which no other more environmentally suitable ones are available

- A variety of measures can be adopted
- SNAP - Self regulation
- UK - Voluntary Code of Practice on:
  The use of HFCs and PFCs between the Fire Industry and Government
- Final choice of agent controlled by:
  - Personnel Safety
  - Fire Suppression Effectiveness
  - Space and Weight
  - Environmental Requirements
  - Costs

(h) Promoting the environmentally safe destruction of halons, when they are not needed in halon banks (existing or to be created)

- Adequacy of banks to meet existing critical uses
- Excess of H1211
- No excess of H1301
- Critical needs (Aviation/Military)
- Current data not accurate to recommend destruction
- Future needs and critical applications
- Parties request for data to determine essential uses/time factors
- Not possible to endorse destruction with current data
- Economies in transition

- HTOC Report

- Essential Use Sub-Group

John O'Sullivan
David Catchpole
David Ball
Tom Bush

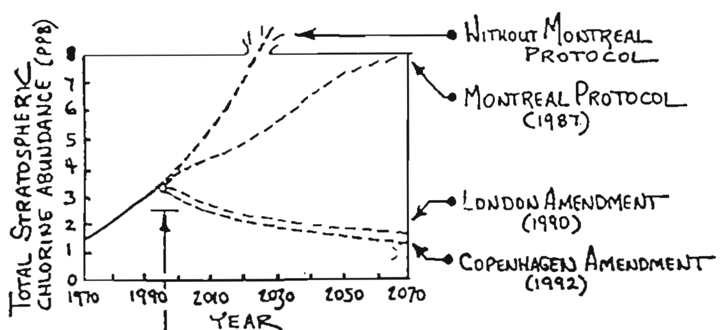
Decision VII/31

Status of recycled CFCs and Halons under the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal.

That the international transfers of controlled substances of the Montreal Protocol which are recovered but not purified to usable purity specifications prescribed by appropriate international and/or national organizations, including International Standards Organization (ISO), should only occur if the recipient country has recycling facilities that can process the received controlled substances to these specifications or has destruction facilities incorporating technologies approved for that purpose.

MAJOR FINDINGS: (B) LOOKING AHEAD

(1) OUR CHLORINE FUTURE

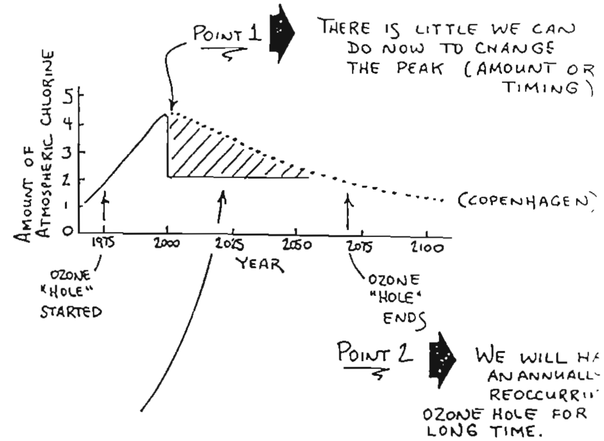


POINT: THE OZONE LAYER WILL BE THE MOST VULNERABLE OVER THE NEXT ~DECADE.

NAMELY:
- PEAK OZONE LOSSES STILL LIE AHEAD ~YEAR 2000
  - 12-13% AT N. MIDLAT'S WINTE[R]
  - UV RADIATION UP ~11%, IF OTHER THINGS REMAIN EQUAL.
- A YEAR-2000 VOLCANO WOULD YIELD LARGER LOSSES FOR A FEW YEARS.
- A LONG. COLD ARCTIC WINTER: LARGER N. LOSS

(2) OPTIONS FOR FURTHER PROTECTION

- THEY ARE RATHER LIMITED...



- BUT, THERE ARE SOME OPTIONS FOR HASTENING THIS FALLOFF (I.E., FOR REDUCING THE SIZE OF THE RED-HATCHED AREA)

"SCIENTIFIC" EXAMPLES:

A. ELIMINATE METHYL BROMIDE EMISSIONS BY 2001 → 13% LESS INTEGRATED OZONE LOSS OVER NEXT 50 YEARS

B. DON'T USE ANY STORED HALONS → 10% LESS ...

C. ELIMINATE HCFCs BY 2004 → 5% LESS ...

Concentration Testing

Task Group Update

Doug Dierdorf
Hamburg, Germany
March 28, 1996

I. Gaseous Agents

A. Halonyzer Testing

1. FAA-USAF Demonstrated Applicability Halon, CF_3I, HFC-125
2. Exceptional Durability ≈400 tests in 4 weeks

B. Questions

1. Variability between tests
2. Values at very high concentrations

II. Gas Generators

A. Demonstrated Capability

1. CO_2 Ten Channels, O_2 Three Channels
2. 10 Hz Sample Rate

B. Planned Improvement

1. N_2 Measurement by Laser Raman
2. 100 Hz Sample Rate (Dry Bay)

III. Water Mist/Aerosols

A. Poor Definition of Requirement

1. Droplet Size
2. Momentum
3. Concentration

B. Certification by Full Scale Test?

IV. Planned Activities

A. Water Mist/Aerosol Measurement Technology Workshop - Coordinate with July Meeting, Suggestions for invitees?

B. Upgraded Halonyzer - New Computer System, Improved Precision

V. Wish List

A. New Technology Halonyzer Sensor

B. Water Mist/Aerosol Measurement Development Funding

Full-scale Engine Nacelle Testing

Lt Jim Tucker

Wright Laboratory, WL/FIVS

1901 Tenth Street, Building 63

Wright-Patterson AFB OH 45433-7506

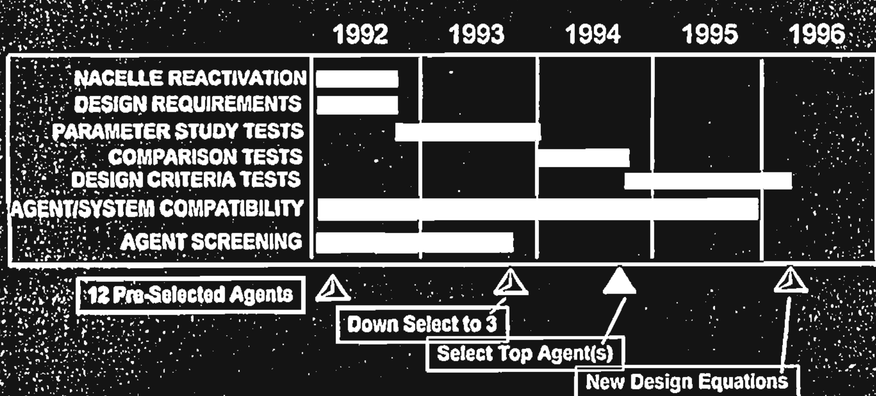
Overview

- Background
- Phase IIIA
- Bracketing Techniques
- Phase IIIB
- Design Eq.
- Summary
- Additional Work

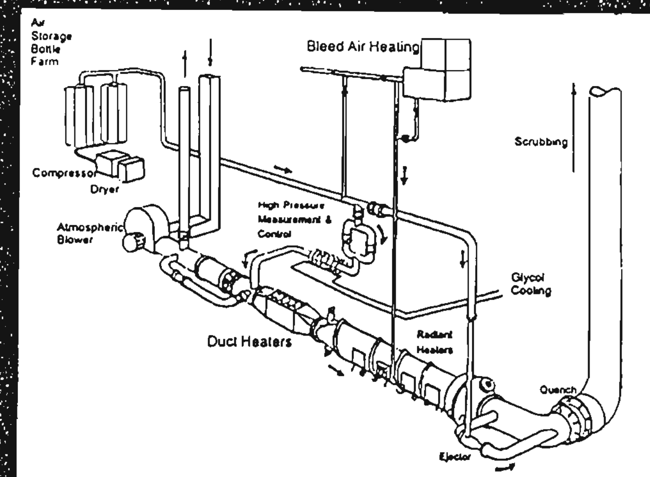
Background

- Aircraft Engine Nacelle Fire Test Simulator (AENFTS)
- Phase I
  - SURFACE TEMPERATURE
  - CROSS SECTIONAL AREA
  - FUEL TEMPERATURE
  - AIR TEMPERATURE
  - FIRE LOCATION
  - INTERNAL AIRFLOW
  - FUEL
  - AGENT TEMPERATURE

Schedule



AENFTS Facility Schematic



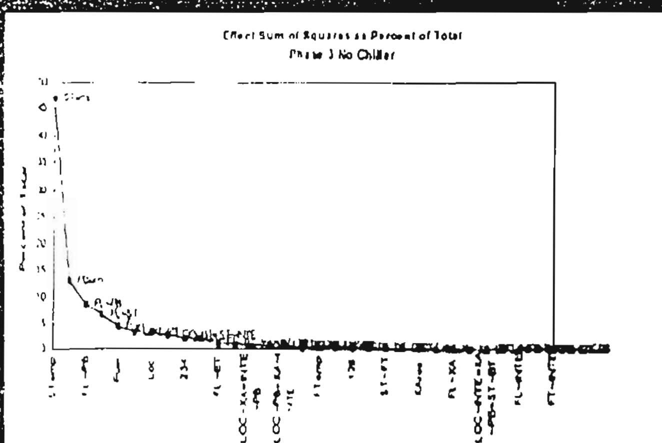
Background

- Phase II
  - FUEL
  - LOCATION
  - SURFACE TEMPERATURE
  - CROSS SECTIONAL AREA
  - FUEL TEMPERATURE
  - INTERNAL AIRFLOW RATE
  - AGENT BOTTLE TEMPERATURE
  - PREBURN TIME

Phase IIIA Matrix and Results

Run	Fuel	Loca	STmp	XAre	FTmp	Inte	BTmp	PBurn	Final1	Final2	Final3
7	83282	Top	1300	5.5	100	0.9	-55	20	7.5	24.5	24.5
8	JP-8	Top	1300	5.5	100	2.7	160	5	1.375	1.375	0.5625
19	83282	Top	175	5.5	200	0.9	160	20	0.9375	0.69	0.5625
20	JP-8	Top	175	5.5	325	2.7	-55	5	2.25	2.25	2.25
21	83282	Bot	1300	5.5	200	2.7	-55	20	9	5.5	11
22	JP-8	Bot	1300	5.5	325	0.9	160	5	9	13	9
1	83282	Bot	175	5.5	100	2.7	160	20	2.25	2.75	2.25
2	JP-8	Bot	175	5.5	100	0.9	-55	5	1.125	1.625	1.875
31	83282	Top	1300	9.42	200	0.9	-55	5	4.5	0.47	3.75
32	JP-8	Top	1300	9.43	325	2.7	160	20	24.5	3.75	2.75
11	83282	Top	175	9.42	100	0.9	160	5	0	0	0
12	JP-8	Top	175	9.42	100	2.7	-55	20	2.25	1.875	1.875
13	83282	Bot	1300	9.42	100	2.7	-55	5	3.75	2.25	3.75
14	JP-8	Bot	1300	9.42	100	0.9	160	20	6.5	4.5	7.5
25	83282	Bot	175	9.42	200	2.7	160	5	1.375	0.41	0.062
26	JP-8	Bot	175	9.42	325	0.9	-55	20	2.625	2.25	2.25
23	83282	Top	1300	5.5	200	2.7	160	5	0.94	0.94	0.94
24	JP-8	Top	1300	5.5	325	0.9	-55	20	3.75	15	3.75
3	83282	Top	175	5.5	100	2.7	-55	5	0	0.062	0
4	JP-8	Top	175	5.5	100	0.9	160	20	0.94	0.469	0.688
5	83282	Bot	1300	5.5	100	0.9	160	5	13	9	13
6	JP-8	Bot	1300	5.5	100	2.7	-55	20	17.065	2.75	21.312
17	83282	Bot	175	5.5	200	0.9	-55	5	0	0	0
18	JP-8	Bot	175	5.5	325	2.7	160	20	0.94	0.69	0.813
15	83282	Top	1300	9.42	100	2.7	160	20	1.63	24.5	24.5
16	JP-8	Top	1300	9.42	100	0.9	-55	5	3.75	11	3.75
27	83282	top	175	9.42	200	2.7	-55	20	0.2812	1.375	1.375
28	JP-8	Top	175	9.42	325	0.9	160	5	0.94	2.25	1.375
29	83282	Bot	1300	9.42	200	0.9	160	20	19.19	11	4.5
30	JP-8	Bot	1300	9.42	325	2.7	-55	5	2.25	2.25	2.75
9	83282	Bot	175	9.42	100	0.9	-55	20	2.75	1.38	2.25
10	JP-8	Bot	175	9.42	100	2.7	160	5	1.875	1.875	1.875

Phase IIIA Scree Plot



Phase IIIA Output Variables

- SURFACE TEMPERATURE
- CROSS-SECTIONAL AREA
- PREBURN TIME
- FUEL TEMPERATURE

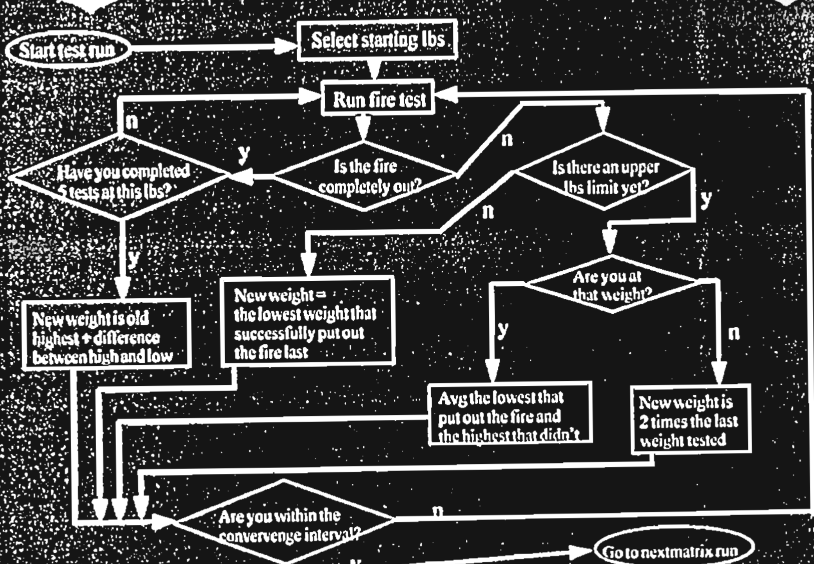
Bracketing Techniques

- Old Technique
  - method of doubling or halving
  - susceptible to "flukes"
  - low statistical confidence
  - 8 to 9 experiments per run (plus replication)
- New Technique
  - minimum of 5 successful tests before dropping to a lower weight
  - more rugged
  - statistical confidence of 85% or greater
  - 25 to 30 experiments per run (replication built-in)

Phase IIIB Matrix and Results

Run #	STemp	XArea	Fuel	Loca	FTemp	AirT	BTemp	PBurn	Inte	Final Weight
1	175	36	Skydrol	BOT	High	275	160	20	0.9	2
[illegible]	175	30	83282	TOP	Low	275	-55	20	0.9	0.3125
[illegible]	175	24	7808	TOP	High	-35	160	5	0.9	1
[illegible]	[illegible]	24	JP-8	BOT	Low	[illegible]	-55	5	0.9	3
[illegible]	[illegible]	36	7808	TOP	Low	275	160	5	2.7	1.88
[illegible]	700	30	JP-8	BOT	High	275	-55	5	1.8	2.5
[illegible]	700	24	Skydrol	BOT	Low	-35	160	20	1.8	1
[illegible]	700	24	83282	TOP	High	35	-55	20	2.7	3.5
[illegible]	850	36	JP-8	BOT	Low	35	-55	20	2.7	5
10	850	30	7808	TOP	High	-35	160	20	1.8	2.5
11	850	24	83282	TOP	Low	275	-55	5	1.8	4
12	850	24	Skydrol	BOT	High	275	160	5	2.7	3
13	1000	36	83282	TOP	High	-35	-55	5	0.9	20
14	1000	30	Skydrol	BOT	Low	35	160	5	0.9	2.5
15	1000	24	JP-8	BOT	High	275	-55	20	0.9	7
16	1000	24	7808	TOP	Low	275	160	20	0.9	3
17	1150	36	83282	BOT	Low	-35	160	20	1.8	49
18	1150	30	Skydrol	TOP	High	35	-55	20	2.7	5
19	1150	24	JP-8	TOP	Low	275	160	5	2.7	2.5
20	1150	24	7808	BOT	High	275	-55	5	1.8	2
21	1300	36	JP-8	TOP	High	-35	160	5	0.9	49
22	1300	30	7808	BOT	Low	-35	-55	5	0.9	5
23	1300	24	83282	BOT	High	275	160	20	0.9	17.06
24	1300	24	Skydrol	TOP	Low	275	-55	20	0.9	10
[illegible]	[illegible]	36	7808	BOT	High	275	55	20	0.9	3.5
[illegible]	[illegible]	30	JP-8	TOP	Low	275	160	20	0.9	1.5
[illegible]	175	24	Skydrol	TOP	High	-35	-55	5	0.9	0.1
28	175	24	83282	BOT	Low	35	160	5	0.9	0.25
[illegible]	700	36	Skydrol	TOP	Low	275	-55	5	1.8	1.75
30	700	30	83282	BOT	High	275	160	5	2.7	5
31	700	24	7808	BOT	Low	-35	-55	20	2.7	2.5
32	700	24	JP-8	TOP	High	-35	160	20	1.8	3

New Bracketing Flowchart



Engine Nacelle Design Eq.

Ln (AGENT) = -4.5041 + .0025STemp - 0.0941 Core + .0308 PBurn + 0.5569Fuel Temp + Fuel Constant

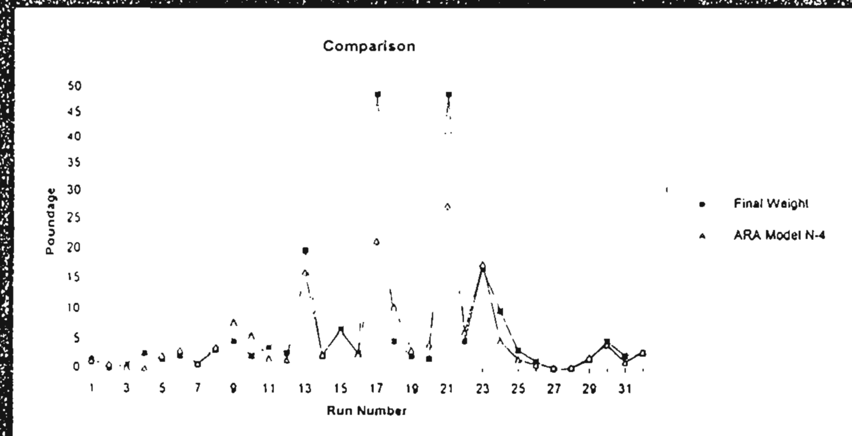
STemp = MAX NACELLE SURFACE TEMP (175F-1300F)
Core = CORE SIZE WHICH GIVES EQUIV "CROSS-SECTIONAL AREA" (24" - 36")
PBurn = PREBURN BETWEEN FIRE INITIATION AND EXTINGUISHER ACTIVATION (5-20 SEC)
FUEL TEMP = 1 IF JP-8=315F, 83282=200F, 7808=325F, SKYDROL=200F
= 0 IF JP-8=100F, 83282=100F, 7808=100F, SKYDROL=100F
INTERPOLATE BETWEEN VALUES
FUEL CONSTANT = .166 IF FUEL IS 7808
= .704 IF FUEL IS 83282
= .475 IF FUEL IS JP-8
= 0 IF FUEL IS SKYDROL

CLEARANCE RECOMMENDED AS SUBSTITUTE DEFINITION FOR "CROSS SECTIONAL AREA" TO BE MORE RELEVANT TO WIDER VARIETY OF AIRCRAFT IN DETERMINING FIRE LOAD

Summary of Engine Nacelle Work

- Phases I, II, and III completed
  - HFC 125 design equation developed
- Concentration data still being analyzed
  - certification recommendations forthcoming
- Final Reports and Design Handbook due soon
- This work will live and grow
  - not the be all , end all solution

Curve Fit



HALON INFORMATION SYSTEM

IMPORTANT NUMBERS

- SURVIAC BULLETIN BOARD PHONE NUMBER 513-255-9672
- BAUD RATE - 14,400 BPS (MAX)
- PARITY - NONE
- DATA BITS - 8
- STOP BITS - 1

ACCESS PROCEDURE

- DIAL UP SURVIAC BULLETIN BOARD
- FILL OUT QUESTIONAIRE TO REGISTER
- RECEIVE USER STATUS
- ACCESS HALON INFORMATION SYSTEM
- ACCESS CURRENTLY LIMITED TO U.S. GOVERNMENT AND CONTRACTORS
- PCs ONLY
-

FIREDASS

Fire Detection and Suppression Simulation

Research and Development Programme for the European Commission

Brite-EuRam III

A Three Year Programme commencing 1996

OBJECTIVES

- Software models will be developed and validated for:
  - A fire model capable of predicting the spread of fire hazards throughout the atmosphere of a forced ventilated enclosure, subject to a fire of prescribed characteristics
  - A model which predicts the activation of fire sensors within a forced ventilated enclosure
  - A water mist/fire atmosphere interaction model
  - A fire suppression model
- This suite of software models will enable fire scenario predictions in various geometric environments and could be used to reduce the design cycle of a fire suppression system

Consortium

- Project Co-ordinator
  - GEC-Marconi Avionics, England
- Partners
  - Cerberus Guinard, France
  - SINTEF NBL, Norway
  - DLR, Germany
  - University of Greenwich, England
  - National Technical University of Athens, Greece
  - Civil Aviation Authority, England
- Subcontractors
  - Ginge Kerr
- Consultants
  - Aerospatiale, British Airways, Swissair

Task 1 - Requirements and Experimental Data

- Objectives
  - To generate requirement specifications
    - generic and specific specifications for models
    - performance requirements for suppression/detection system
  - Review and isolate existing experimental data
  - Generate test data for validation of the generic fire, detection and spray models
    - Test Plan
    - SINTEF fire trials
    - GMAv/DLR fire trials - optional
- Deliverables
  - Specifications, test plans, trials reports
- Timescales
  - February 1996 to November 1996

Task 2 - Fire Model Development

- Objectives
  - Development and evaluation of a generic fire model
    - geometry and boundary specification
    - development of fire model
  - Verification of the generic fire model
  - Development of cargo compartment fire model
  - Verification of fire model for compartment
- Deliverables
  - Specifications
  - Implemented and tested generic and specific fire models
  - Reports on model development, verification and usability
- Timescales
  - July 1996 to December 1997

Task 3 - Interaction Model

- Objectives
  - Development of generic water mist model
  - Verification of generic interaction model
  - Development of cargo compartment model
  - Verification of cargo compartment model
  - Development of surface application
  - Verification of surface application
- Deliverables
  - Specifications
  - Generic and specific models - cargo and maritime
  - Reports on model development, verification and usability
- Timescales
  - August 1996 to April 1998

Task 4 - Detection/activation System Model

- Objectives
  - Improve reliability of current detection systems
  - Define requirements for zone suppression systems
  - Development of sensors
  - Development and verification of sensor model
  - Development and verification of detection/activation system mode
- Deliverables
  - Specifications
  - Sensor model, activation model
  - Reports on verification
- Timescales
  - July 96 to April 98

Task 5 - Validation

- Objectives
  - Define performance requirements for the suppression and detection system
  - Development of suppression and detection system
    - Optimisation of water mist, fire detection/activation system
    - Generate system specification and development of demonstrator
  - System assessment
  - Appraisal and application
- Deliverables
  - Performance and system specification
  - Demonstrator
  - Trials report, performance appraisal, final and exploitation reports
- Timescales
  - March 1998 to January 1999

Introduction

We suggested, during the Rome and Atlantic city's meetings a test chamber which was based on a modified NBS chamber
After different tests it appeared that we weren't able to test extinction systems in normal conditions of use.
It was therefore decided not to continue in this way and to build a bigger test room that will enable us, at the same time, the use of a real extinguisher and an efficient sampling of the decomposition products.

Test chamber

The test chamber size (8 m3) took inspiration from works presented by Adam Chattaway on hidden fires.
Test protocol, choice of fuel box, position of the extinguisher nozzle, were defined with the help of Kidde Dexaéro company which will provide replacement agents.
The following transparencies show a sketch of principle of the test chamber and some photographs of the whole:

- cubic shape 2x2x2 m
- 4 vent-holes in low position (size: 400 x 125 mm)
- 4 vent-holes in high position (same size)
- Extinguisher placed in the centre of the fore-face (Halon 1211, 6kg)
- Fuel pan of 56 cm in diameter (type 8 B, standard NF S 61902) placed in middle position
- Sampling toward Oxygen's analyser
- Sampling toward impingers for decomposition products
- 4 thermocouples type K.: 1 m over of fuel box , at the ceiling, near the extinguisher exit, near the oxygen sampling probes.
- the chosen fuel is ethyl alcohol(1l)
- the tests are filmed
- the chamber is placed in a enclosed space with controlled ventilation

Test protocol

- weighting of the extinguisher without hose nor nozzle
- Positioning of the extinguisher and junction to the nozzle
- starting out of the oxygen sensor, registration of the temperature, video
- t0: ignition of the fire, sampling for a blank impinger n° 1 during 15 s (5 l of air)
- t0 + 1 minute: stationary conditions of fire are reached, simultaneously: discharge of the extinguisher until extinction ($\leq$ 1s), sampling through impinger n° 2, (duration to define)
- stopping of video, oxygen sensor , temperatures registration
- weighting of the extinguisher without hose nor nozzle
- analyses of the impingers solutions by ionic chromatography

Tests Program

1st step

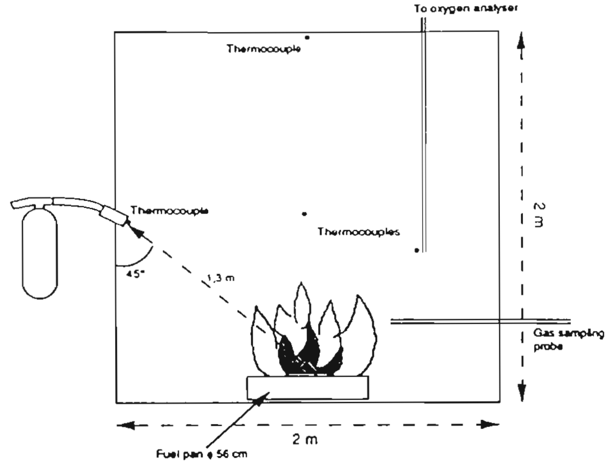
- confidence in the reproduction of the test
- optimisation of sampling (sequences, quantities, speed of bubbling)
- works on Halon 1211 1301 and alcohol

2sd step:

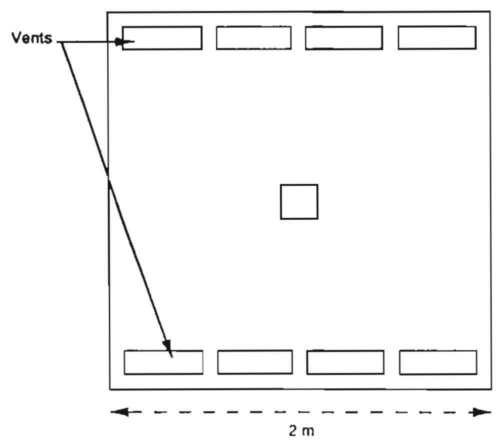
- replacement agents
- N-Heptane fuel

Some results are foreseen for the next meeting.

Side view

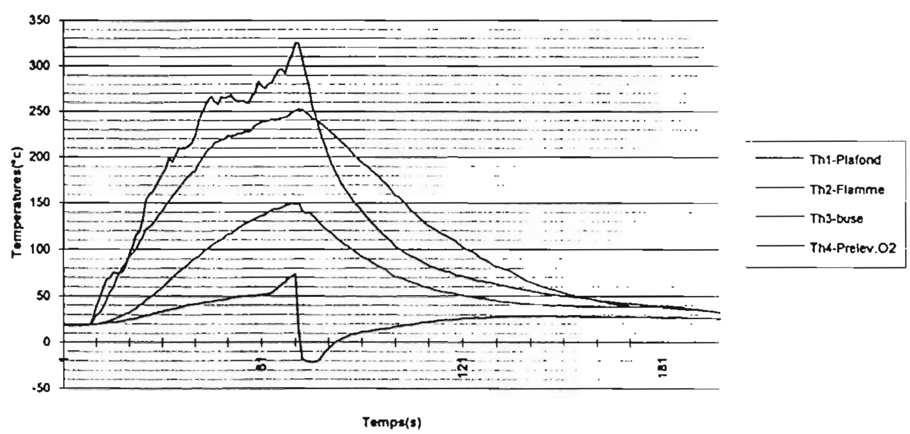


Front view



DGA/CEAT 03/96

HALON 8



"SIMFEU" TESTING GROUND

1 - Origin Simfeu = "Simulation de feu" = fire simulation

In 1981, the STPA technical and programs department of the French directorate for aircrafts) ordered the CEPr (French test centre for aircrafts engines) to study and realise a new testing ground. This testing ground had to simulate a fire in an engine compartment in order to test fire detection and fire ~~protection~~ extinction systems.

Two types of installations were considered .

* first type · for little engines with on overturning that simulate an helicopter engine

- engine diameter 0,3 m
- overturning diameter 0,5 m
- overall length 1 m

* second type . for bigger engines

- engine diameter 0,7 m
- overturning diameter . 1 m
- overall length 2 m

The installations had to

simulate the different fittings and accessories that are mounted on the engine (pipings, diverse housings,...)

simulate the air inlet and outlet of the overturning

. create an airflow between the engine compartment and the overturning and thus create a cooling of the simulated engine

realise fluids flows on the engine surfaces (fluids such as oil, jet fuel, hydraulics fluids...)

the testing ground for little engine was achieved.

2 - Realisation of the testing ground

2.1 realisation of the simulated engine (transparency 1)

Its cold part is realised in ordinary steel.

Its hot part is rc l in refractory stainless steel

This hot part is located on the 3/5 of the overall length.

Its wall has a thickness of 8 mm that give a thermic inertia close to a real engine 's one.

This simulated engine is fitted, around itself, with simple geometric shaped elements tha represent usual equipments really mounted on an engine (pumps, pippings, ignition housings regulators ..).

These elements are mounted on the simulated engine with welding points in order to allow eas replacement or shape modifications.

The different systems that have to be tested can be mounted by
- welding
- tapping
- drilling

A burner working with propane, is located inside the simulated engine body to heat the hot par in refractory steel.

This burner can heat the simulated engine body to a temperature of 600°C (which is higher thar the self ignition value of the different fluids that are used).

The simulated engine is fitted with connecting flanges representing the engine cases anc compressor assembly.

The rear hot part with a 300 mm diameter, is fitted with a moving ~~case~~ cone in stainless refractory steel of 200 mm diameter.

This cone has two functions ·

- break up the burner flame
- allow a change of the heated surface

2 2 Realisation of the overturning (transparency 2)

It is an assembly of two half bases in stainless steel, of 5 mm thickness, with external tighteners and 3 hatches. The overturning is moving in order to allow a variation of the internal pressure through a modification of the out-flow section. The mobility is ensured through a screw activated by a hand wheel and linked to a truck on which the overturning is fixed.

The upper half box is removable so that the installation of different equipments is easier to do

In another connection, there is an inlet that is connected to C02 extinguishers in case of dysfunction of the tested extinguishing system.

2.3 Ventilation (transparency 3)

An engine, mounted inside an overturning is of course ventilated.

That's why the testing ground is fitted with an air generation system.

The airflow generated is 0,4 kg/s.

This airflow is representative of the airflow that can be found on a Turbomeca Makila type engine

The air inlet is realised in front of the engine with a 194 mm diameter piping. Air distribution is realised through various section decreasing from the front to the rear in order to obtain a good spreading of the airflow between the engine and the overturning.

2.4 Combustible fluids tank (transparency 4)

This tank has a capacity of 10 litres. It is realised in stainless steel. It can receive all types of jet fuels, oils, hydraulics fluids.

A nitrogen pressurisation system is able to create a pressurised leak inside the overturning

This leak can be

- sprayed through an injector
- a drip leak (unscrewing of a join)
- a continuous flow through a diaphragm or a bursted piping

2.5 Ignition of a fire inside the overturning (transparency n°5)

The combustion of the different fluids can be achieved with the following methods

- self ignition against the hot surface
- ignition of the air/fuel mixture with a spark gap
- ignition of the air/fuel mixture with a short circuit of an electrical conductive that was previously white-hot.

3 - Running of the testing ground

- filling of the combustible fluid tank
- choice of the ignition type
- definition of different parameters

    . ventilation airflow and air speed
    . hot surface temperature
    . heated surface
    . leak flow

- running of the burner
- adjusting of the temperature
- running of the ventilation
- starting of the leak.

After the starting of the fire, detection and extinction system can be tested.

4 - Possibilities of the installation

- fire detection and study of fire detectors performances

- fire extinction and study of the performances of the extinguishing devices (efficiency time of extinction...,

- study of the resistance to fire of such equipments as pump, filter, electrical connectors, ..

- study of the flammability of fluids in connection with

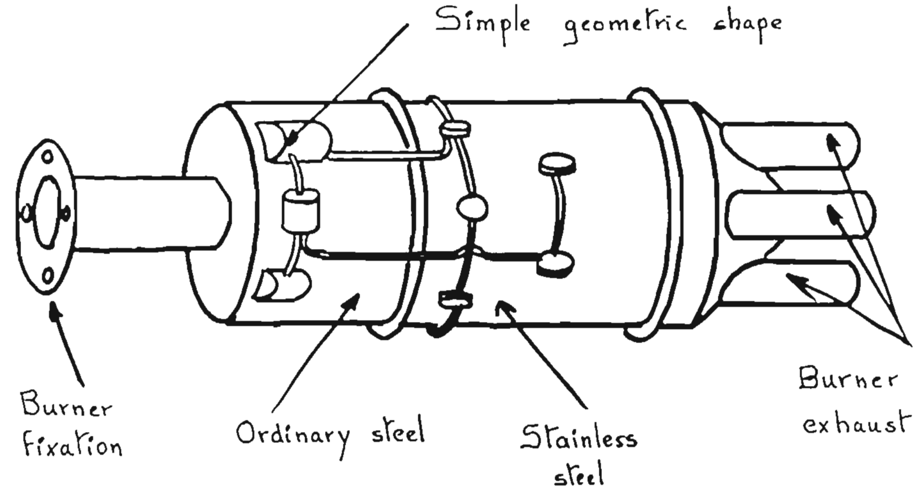
    the ignition type
    the ignition point position
    the leak type
    the ventilation size.

- study of the efficiency of extinguishing devices on real fires in harsh conditions (hot and cold storage, vibrations...)

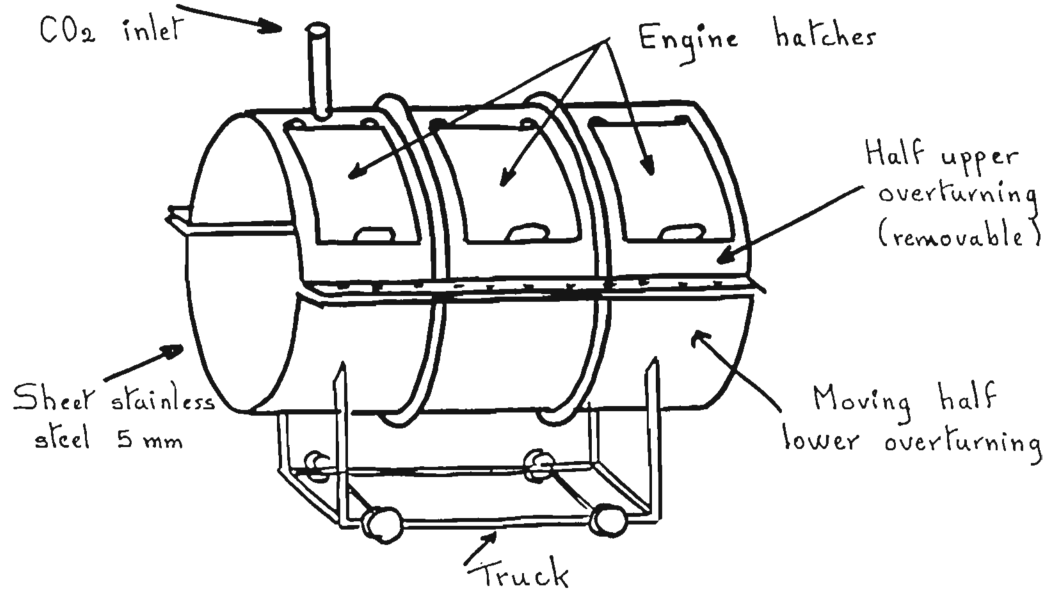
- study of influence of the extinction products concentration

- study of the fire triggering off mechanisms in connection with
    - pressure
    - oxygen content
    - temperature

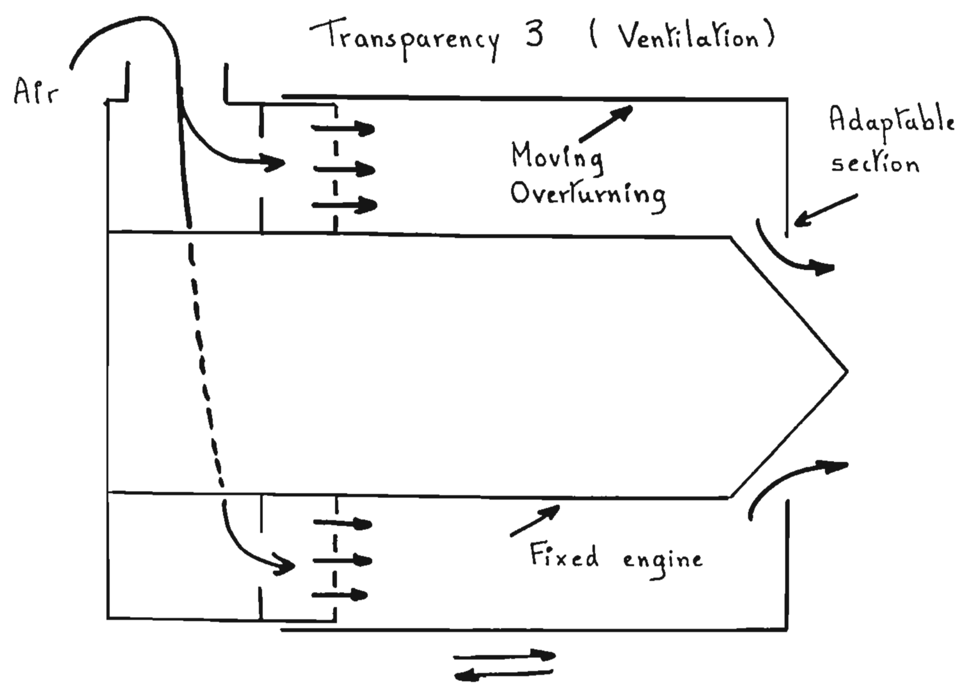
Transparency 1 (Simulated engine)



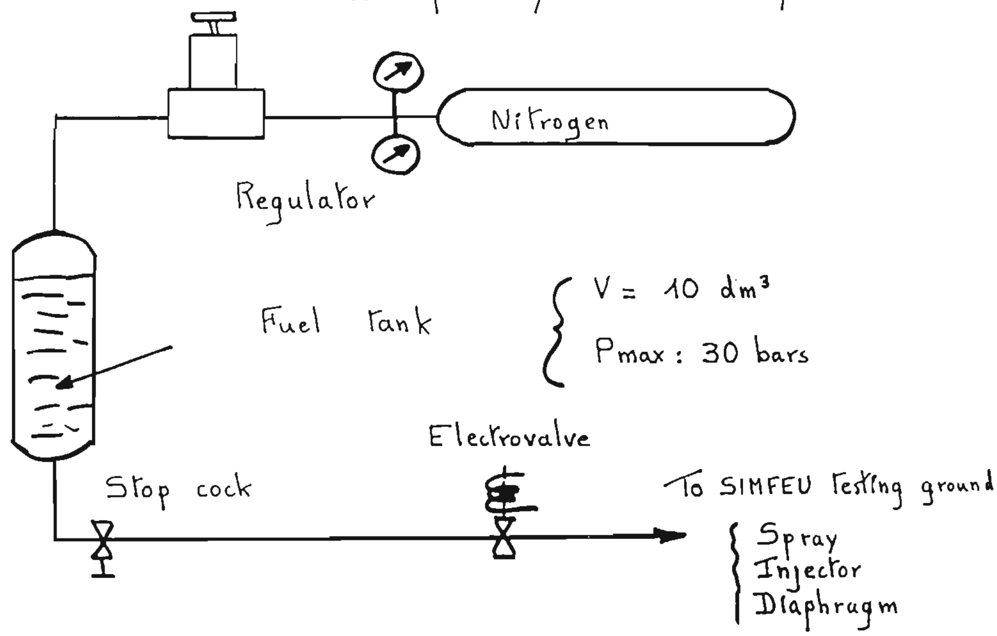
Transparency 2 (overturning)



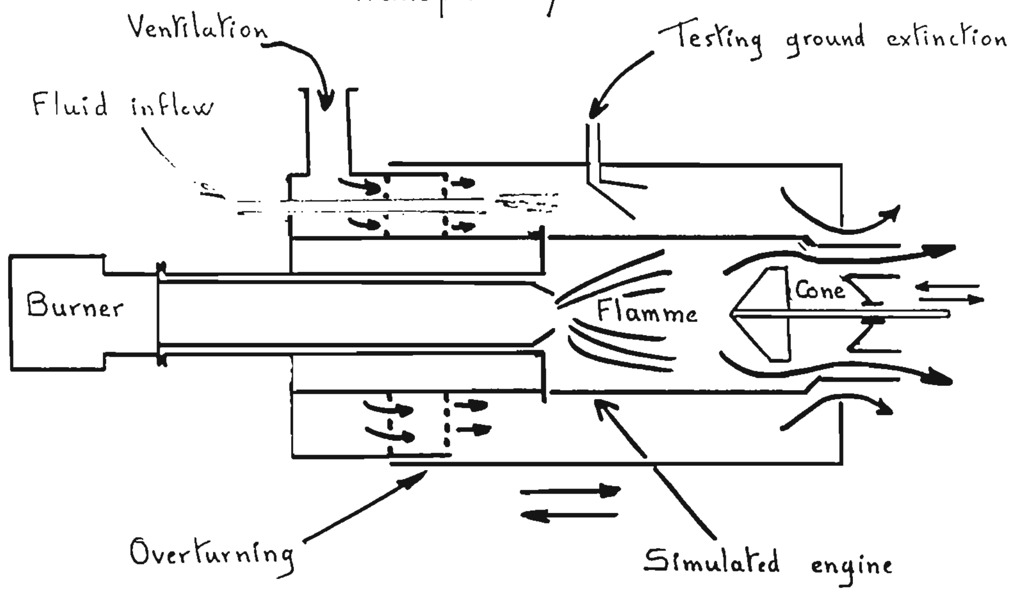
Transparency 3 (Ventilation)



Transparency 4 (Fuel system)



Transparency 5



PRELIMINARY AGENDA

INTERNATIONAL HALON REPLACEMENT WORKING GROUP MEETING

Tuesday and Wednesday, March 26-27, 1996

To be hosted by Lufthansa Tecnik and Airbus Industries

Hamburg, Germany

Tuesday, March 26, 1996

9:00-9:15	Introduction/Background/General Information	
9:15-9:30	Review of Minutes of November 17, 1995 Meeting	
9:30-9:45	Schedule for Halon Replacement Program	
9:45-10:15	Discussion of Schedule	
10:15-10:30	Break	
10:30-12:00	Subgroup Leader Reviews/Presentations	
	10:30-11:00	Cargo - Full Scale Testing
	11:00-12:00	Facility Development at FAATC
		Testing at Wright Paterson AFB
12:00-1:30	Lunch	
1:30-2:30	Handheld	
2:30-3:00	Discussion on Handheld Extinguisher Minimum Performance Standard	
3:00-3:15	Break	
3:15-3:45	Discussion on Cargo Compartment Minimum Performance Standard	
3:45-4:30	Discussion on Engine Minimum Performance Standard	
4:30	Adjourn for Day	

Wednesday, March 27, 1996

9:00-9:30	Comments on Published Reports/Status of Published Reports
9:30-11:30	Task Group Leader Presentations/Updates
	Advanced Alternative Agents - B. Tapscott
	Halon Restrictions Update - J. O'Sullivan
	Agent Concentration - D. Dierdorf
	Simulants - C. Womeldorf/B. Leach
	Engine Work at Wright Paterson AFB - M. Bennett
11:30-12:00	Additional Discussion
12:00-1:30	Lunch
1:30-4:00	Working Group Member Presentations
4:00-4:30	Final Discussion/Next Meeting/Closing