

Class E Cargo Compartment Fire Suppression



Federal Aviation
Administration



Presented to: Sixth Triennial Aircraft Fire and
Cabin Safety Conference. Atlantic City, NJ

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Date: October 25-28, 2010



UPS DC-8
Feb. 7, 2006
Philadelphia, PA



NTSB Recommendation to the FAA

“Require that fire suppression systems be installed in the cargo compartments of all cargo airplanes operating under 14 *Code of Federal Regulations* Part 121. (A-07-99)”

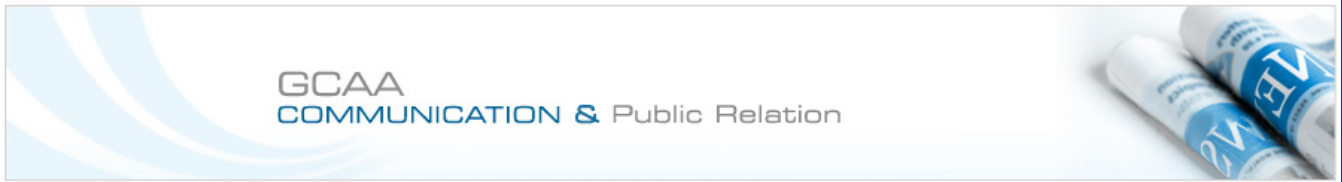
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Detailed News

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GCAA reveals more details regarding the Crash of UPS Boeing 747 - 400 Cargo investigation

Category : GCAA, Date : Sep, 23 2010

Dubai, UAE, 23 September 2010: The UAE General Civil Aviation Authority (GCAA) revealed a new details regarding the UPS Boeing 747 - 400 Cargo crash on 3rd of September.

The GCAA investigation team announced that 100% of the flight recorders from the Digital Flight Data Recorder (DFDR) and the Cockpit Voice Recorder (CRV)(known as black boxes) was successfully downloaded in the USA National Transportation Safety Board (NTSB) laboratories .

Analysis of the data is still in progress by the UAE GCAA, Investigation Section with the assistance of international experts. The investigation is continuing and the teams are focusing on understanding the issues involved around the cargo carried and the associated risks.

Furthermore and based on the information gathered to date, specific areas of the investigation are centered around several aircraft systems and the standard operational procedures, which are reviewed.

The new records show that after the aircraft departure and approached the top of climb, at approximately 19:12 hrs, a Main Deck Fire Warning alarm sounded. The crew initiated the check-list and requested from Bahrain ATC, the nearest airport. They were offered Doha, but the flight crew elected returning to Dubai.

There were sequential systems in the flight deck indicating fire or smoke in the Main Deck and the lower aft Cargo compartment.

The records also shows that during their descent there is an evidence that the crew had difficulties seeing the cockpit primary flight instrument displays due to the thick smoke, There is also evidence to indicate that there was some level of difficulty in the communication process.

The accident aircraft overflew the Dubai runway at approximately 4000 feet, shortly after that performed a right hand turn and in approximately five minutes later the control centre alerted the Emergency Services that there had been an accident at the Nad Al Sheba area .

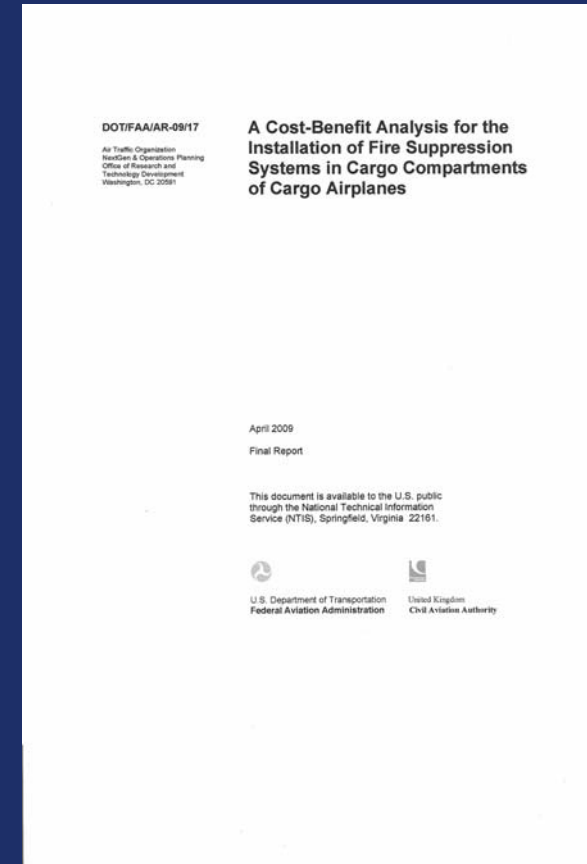
The GCAA revealed that the investigations involves Agencies, Entities and Authorities in the Middle East, Europe, USA and Asia and will continue for another several months.



Cost/Benefit study has been conducted on the installation of a total flood Halon 1301 fire suppression system on freighter aircraft. The study was jointly sponsored by the FAA and CAA. One of the conclusions from that study was:

“It is concluded that Halon fire suppression systems, or alternatives that are likely to be developed for below floor cargo compartments, are unlikely to be cost beneficial for the main deck cargo compartments of cargo aircraft of any weight category.”

Report Link: <http://www.fire.tc.faa.gov/pdf/09-17.pdf>



Another conclusion from the study was:

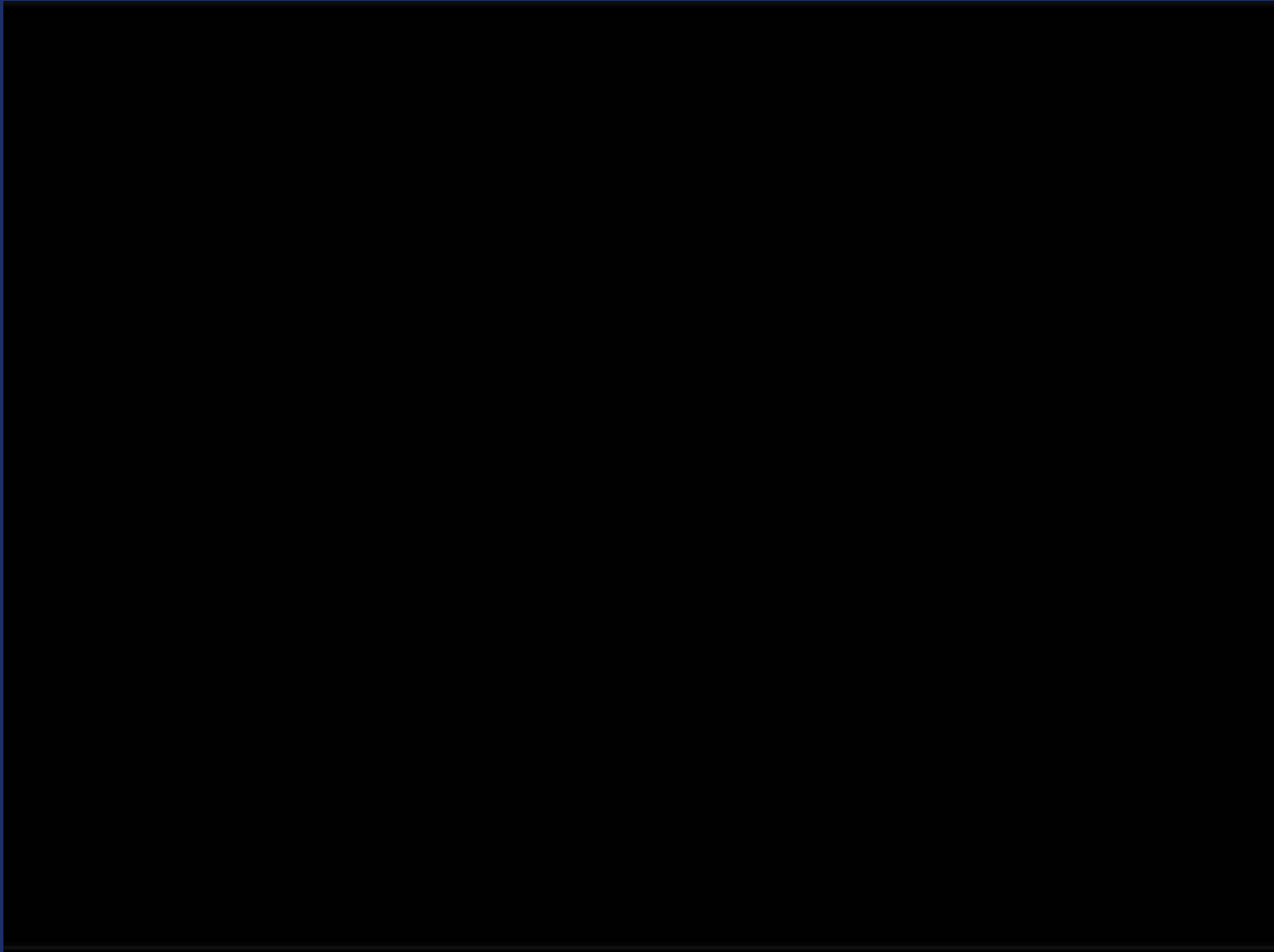
“Fire suppression systems of the kind currently being considered for the cargo compartments of combi aircraft, may prove to be cost beneficial, particularly on larger cargo aircraft.”

FedEx has developed a system that is currently being installed on the main deck of some of their wide body freighters.

A presentation on that system has been given by Mark Petzinger of FedEx during this conference.



Lexan/Aluminum AAY Container



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Suppression Options:

- **Water or other agents with and without inert gases applied to individual cargo containers.**

Agents:

- **Novec 1230 (Boiling Point 120°F)**
- **2-BTP (Boiling Point 93°F)**
- **Foam**

Inert Gases:

- **Nitrogen Enriched Air (OBIGGS)**
- **Argon**

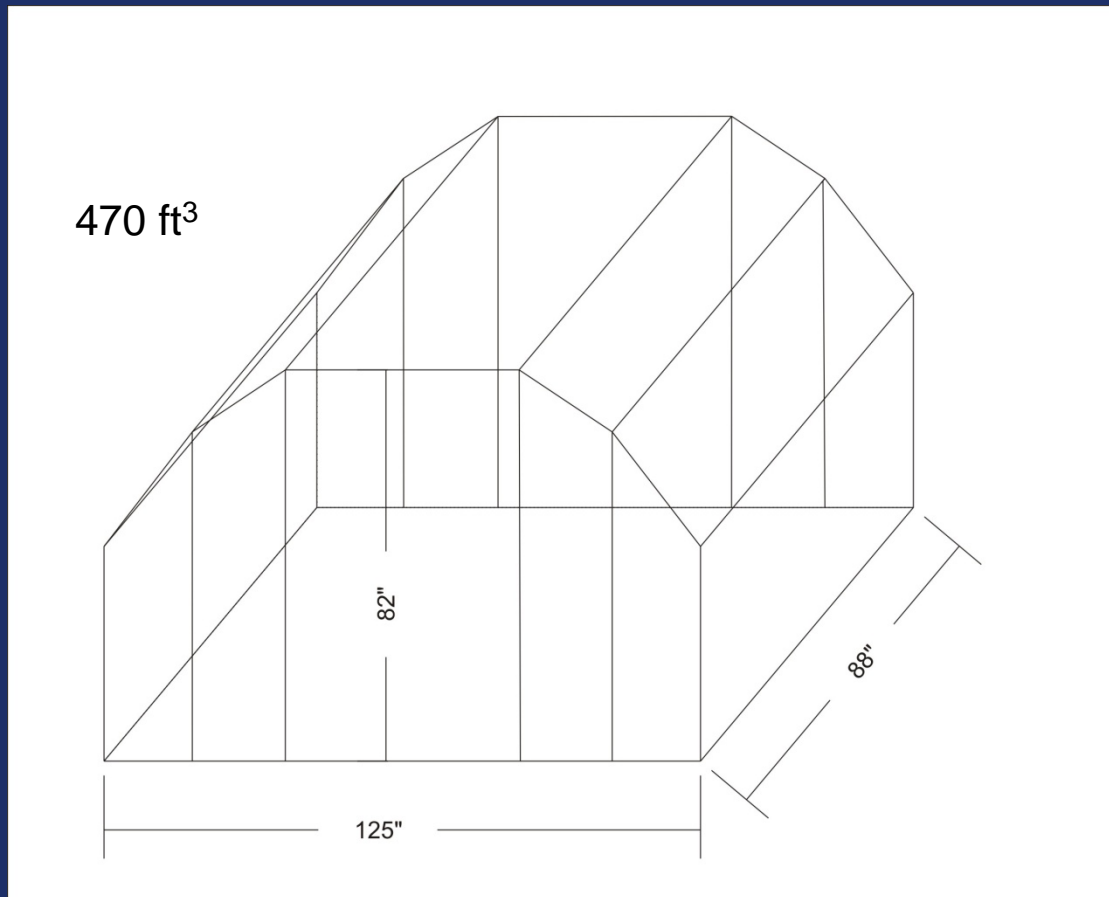


- **Passive Systems.**

Pressurized agents stored in containers that will rupture or mechanically release agent when exposed to heat. Stored in every ULD.

- **Fire resistant containers.**

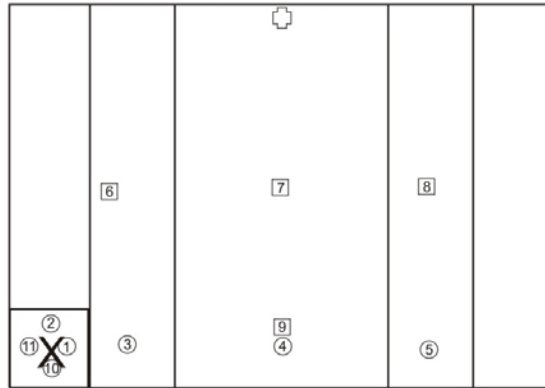








Steel test container frame will be skinned with material of interest (Lexan, aluminum, steel, composite, etc.)

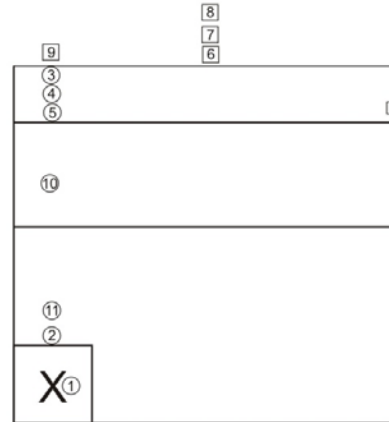
Test Configuration

Top View

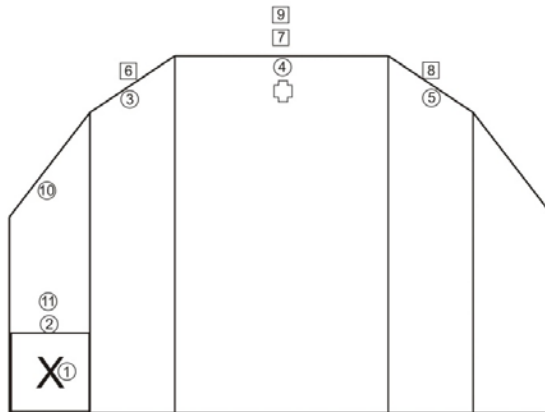


-  Ignited Box
-  Inside Container T/C
-  Outside Container T/C
-  O2 Probe

Side View



Front View



Initial concept tested was a system that would protect individual cargo containers through a hose connection. The hose could deliver an agent of choice to the inside the container from a central reservoir in the aircraft.

A detection system for the activation of the agent discharge has not been tested.



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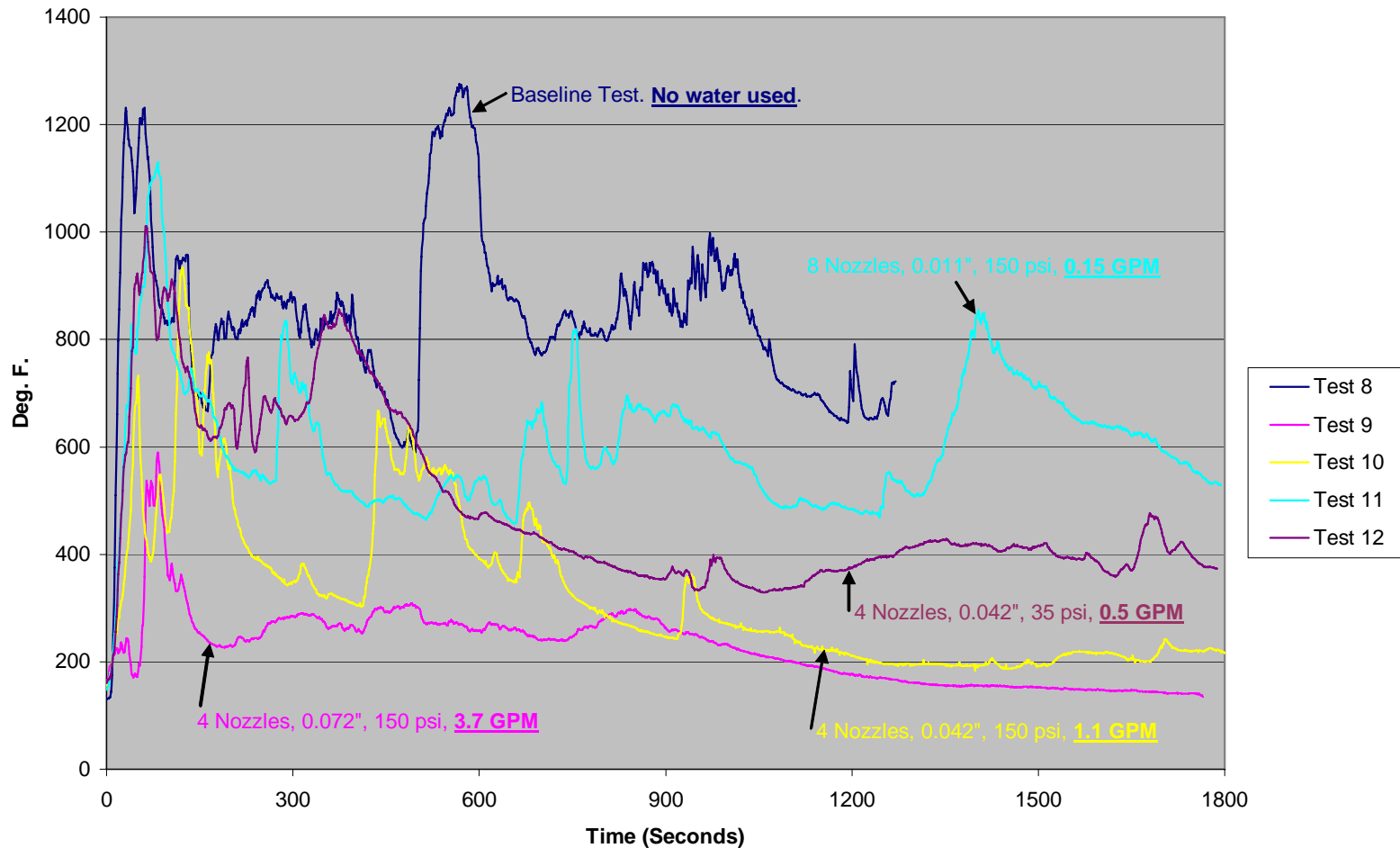
Water spray tests

Test	Nozzles	Nozzle Orifice (inches)	Water Pressure (psi)	Water flow rate (GPM)	Test Duration (mins)
8	N/A	N/A	N/A	N/A	21
9	4	0.072	150	3.7	30
10	4	0.042	150	1.1	30
11	8	0.011	150	0.15	30
12	4	0.042	35	0.5	30



Water Spray Tests

T/C #3



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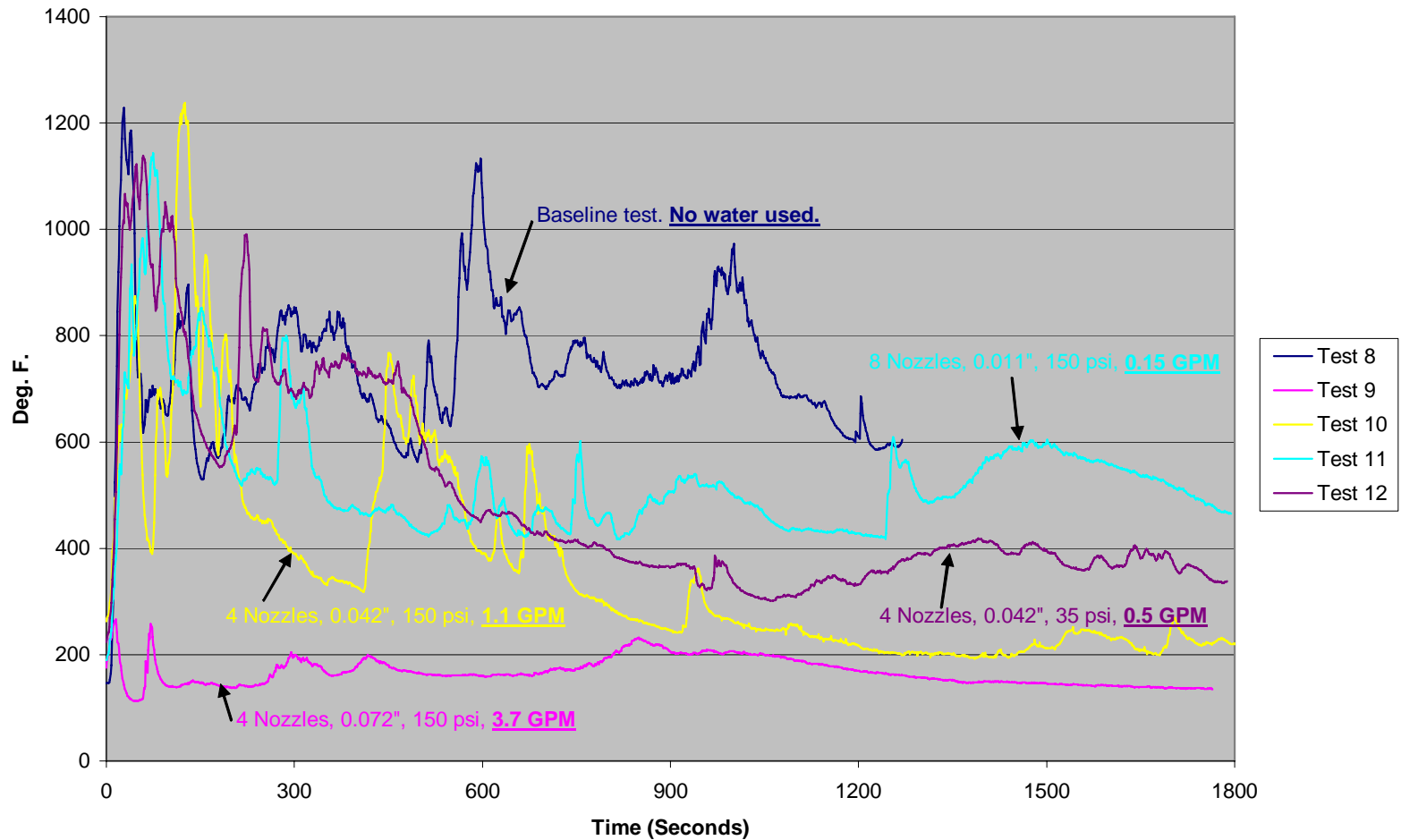
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Water Spray Tests

T/C#10



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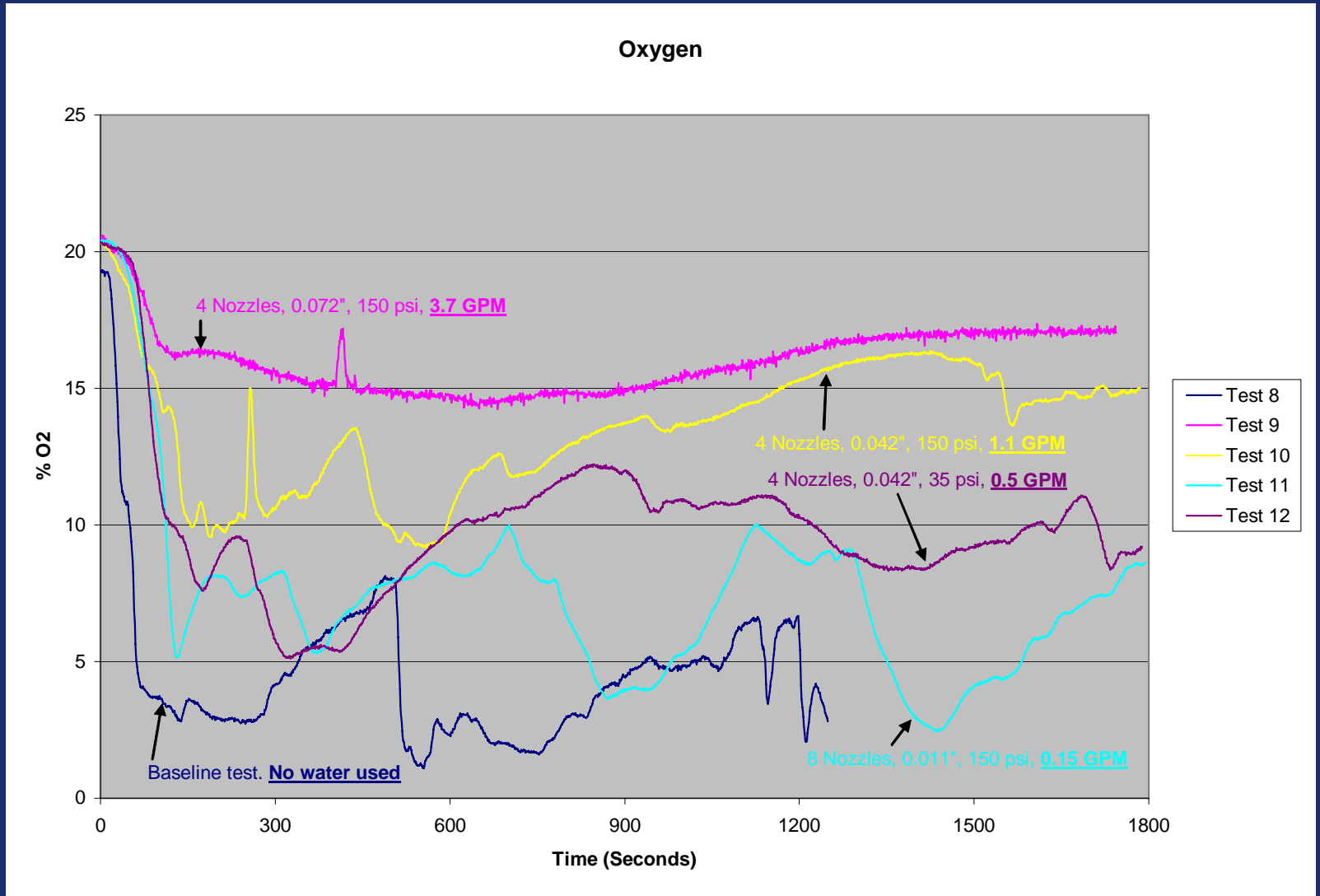
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Initial testing will be conducted with standard fire load of shredded newspaper inside cardboard boxes.

Subsequent testing with promising suppression systems will be conducted with lithium batteries included in the fire load.

Questions?

