

UTC Aerospace Systems

Cargo Compartment Testing at UTAS FPS

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INTRODUCTION

UTAS FPS has carried out extensive cargo compartment testing against all 4 of MPS elements

Agents

Gaseous (vaporising liquid) agents

Water mist plus Inert gas

Inert gas only

We would like to share our findings with you

INTRODUCTION

Environmental aspects

UN Halon Technical Options Committee (HTOC) has estimated that the worldwide supply of Halon 1301 (“the bank”) is between 13,648 and 16,681 metric tonnes.

This halon bank is being consumed at a growing rate as the world’s aviation fleet continues to grow in size.

It is estimated that this supply will be exhausted between 2041 (best case, low emission rate) and 2034 (worst case, high emission rate)

Now is the time to find a solution.

OVERVIEW OF TESTS

OVERVIEW OF TESTS

Scope of work carried out at UTAS FPS Colnbrook, UK

Exploding aerosol can

Cargo compartment tests

- Bulk load fire

- Containerized fire

- Surface burning fire

EXPLODING AEROSOL CAN TESTS

100 + tests in 6.2 m³ explosion vessel

Agents tested: Halon 1301, 2-BTP, Novec 1230, water mist, inert gas and mixtures of inert gas and water mist



6.2 m³ pressure vessel

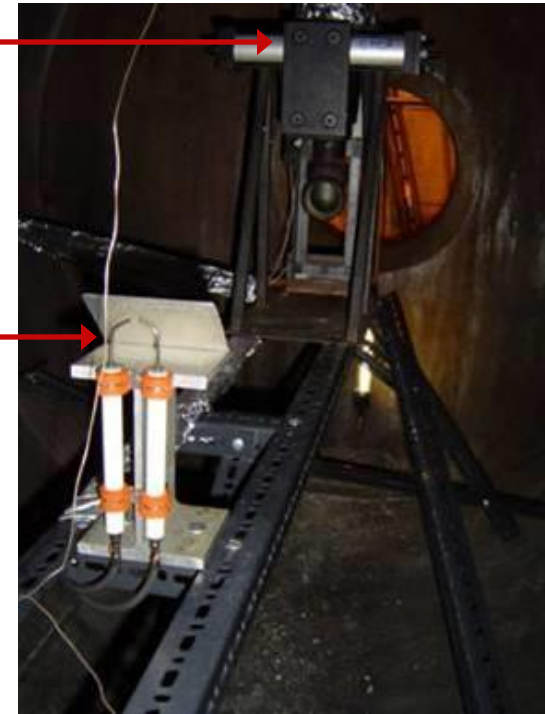
Heater and ignition control unit

Oxygen sampling

Pressure transducer
Explosion pressure

Aerosol can simulator

Spark igniters



EXPLODING AEROSOL CAN RESULTS*

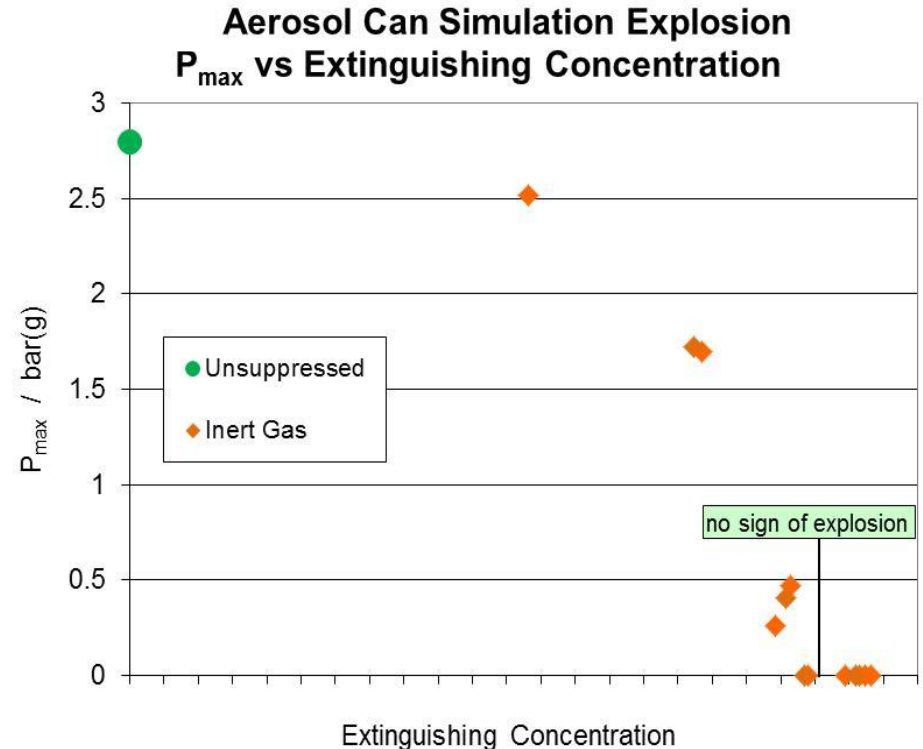
Novec 1230 and 2-BTP at low concentrations enhanced the explosion

Water mist alone could not inert against explosions

Inert gas at low concentrations mitigated explosions

Combining inert gas with water mist still required same amount of inert gas

We selected Inert gas to test in the cargo compartment at full scale



* Alternative means of compliance is to carry out “long version” of cargo compartment test

CARGO COMPARTMENT TESTS

Full scale cargo compartment tests were carried out

High rate discharge: inert gas, water mist, and combinations thereof

Low rate discharge with nitrogen enriched air (OBIGGS)

Bulk load, containerized and surface burning fire threats

In addition tests were carried out to assess the influence of discharge flow rates and geometry of the distribution network

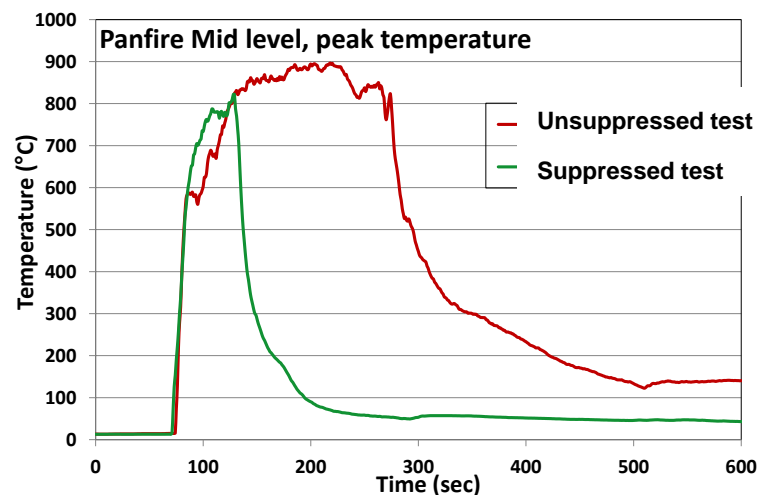
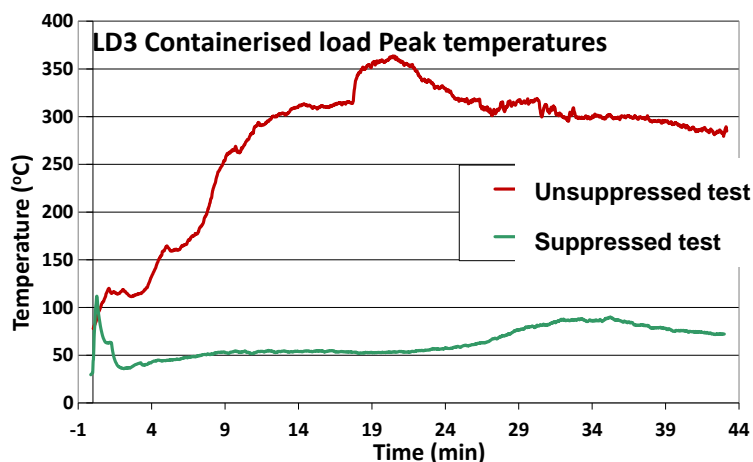
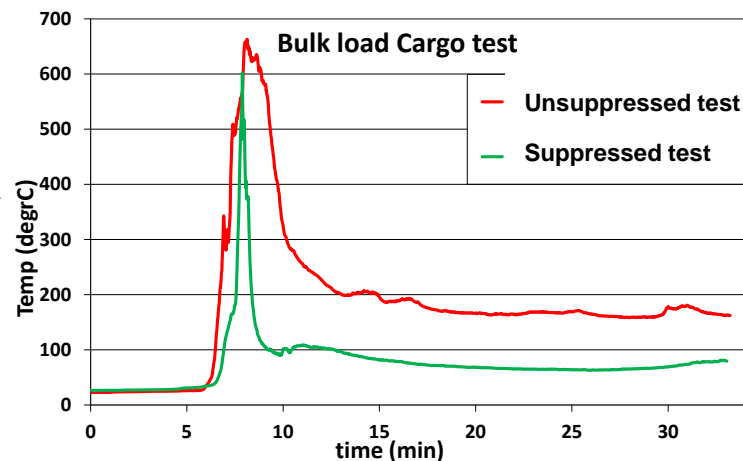


RESULTS

In all three scenarios inert gas alone provided good initial suppression of the open flame stage and rapid cooling of the test chamber.

If the oxygen concentration is then kept below a threshold then effective suppression will be achieved.

MPS can be passed satisfactorily with inert gas alone.



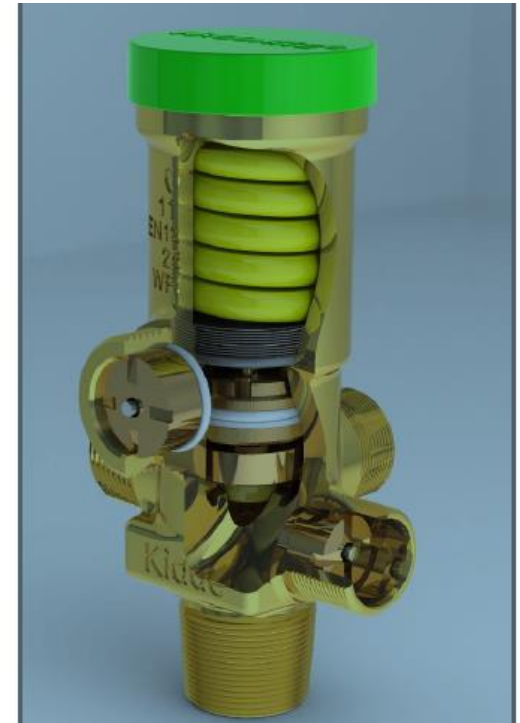
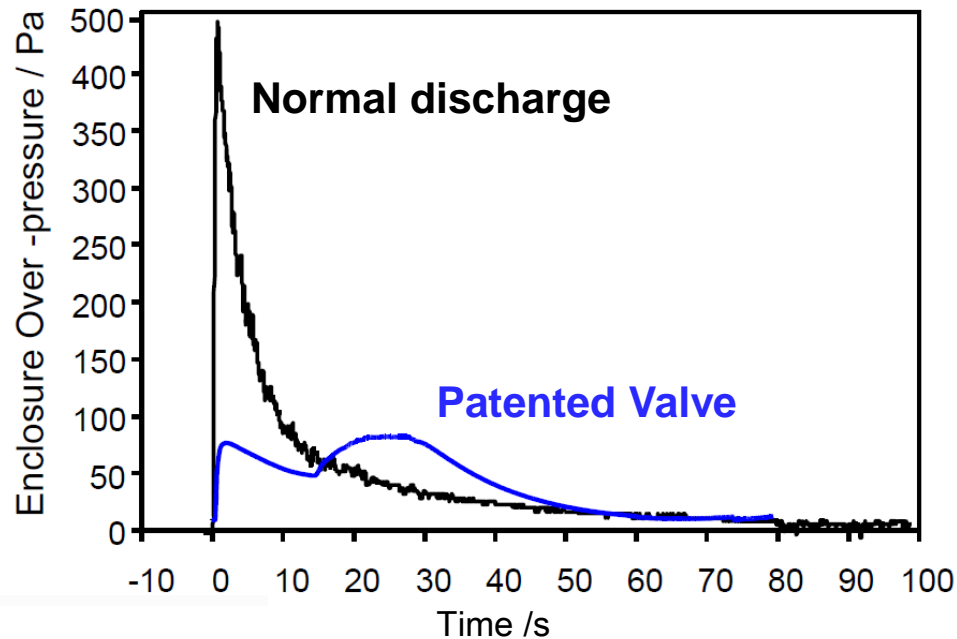
OTHER CONSIDERATIONS

OVERPRESSURE MITIGATION

Patented valve – flow rate can be adjusted

60% reduction in peak mass flow

84% reduction in enclosure overpressure

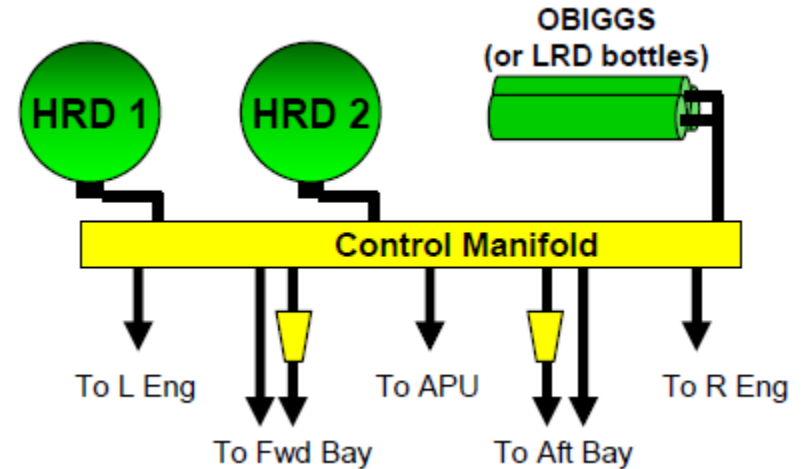


Patented Valve

OTHER CONSIDERATIONS

System Integration

Distribution of the inert gas to engine nacelles, APUs and other areas can bring system level benefits



Certification

Technology exists for easy certification to all possible areas of application



CONCLUSIONS AND SUMMARY

UTAS FPS has a suitable test article and has completed all four of the MPS test elements

Inert gas alone has been shown to be capable of passing the MPS

Adding water mist to inert gas does not provide any benefit in the aerosol can tests

Inert gas could be a simple, straightforward replacement for Halon 1301 in cargo compartment applications

QUESTIONS ?
