AIRBUS

Future Trends in Fire Safety Research -a Manufacturer's View-

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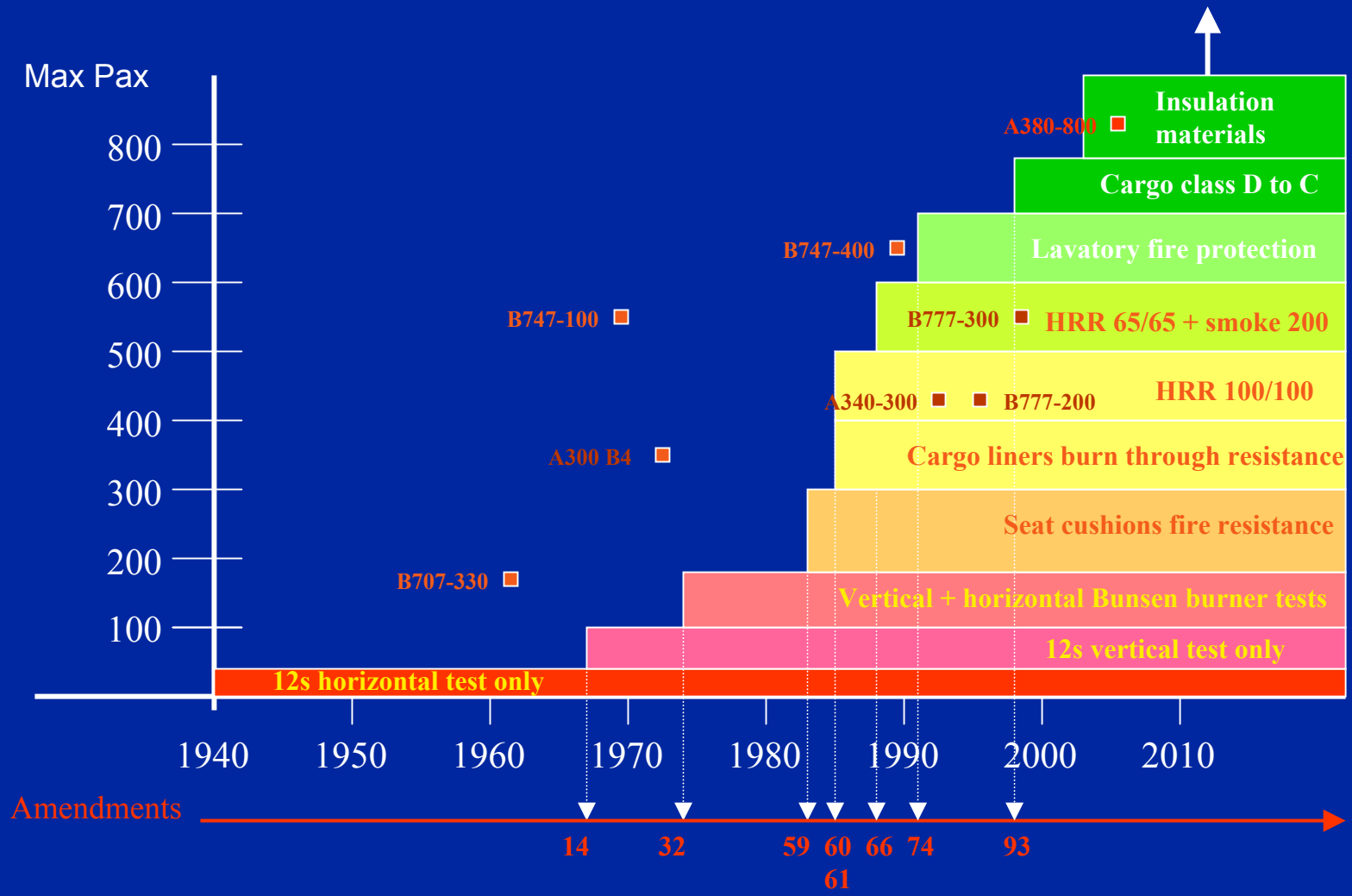
Introduction

A/C Size / Regulation Development



Introduction

Airbus FST Specifications

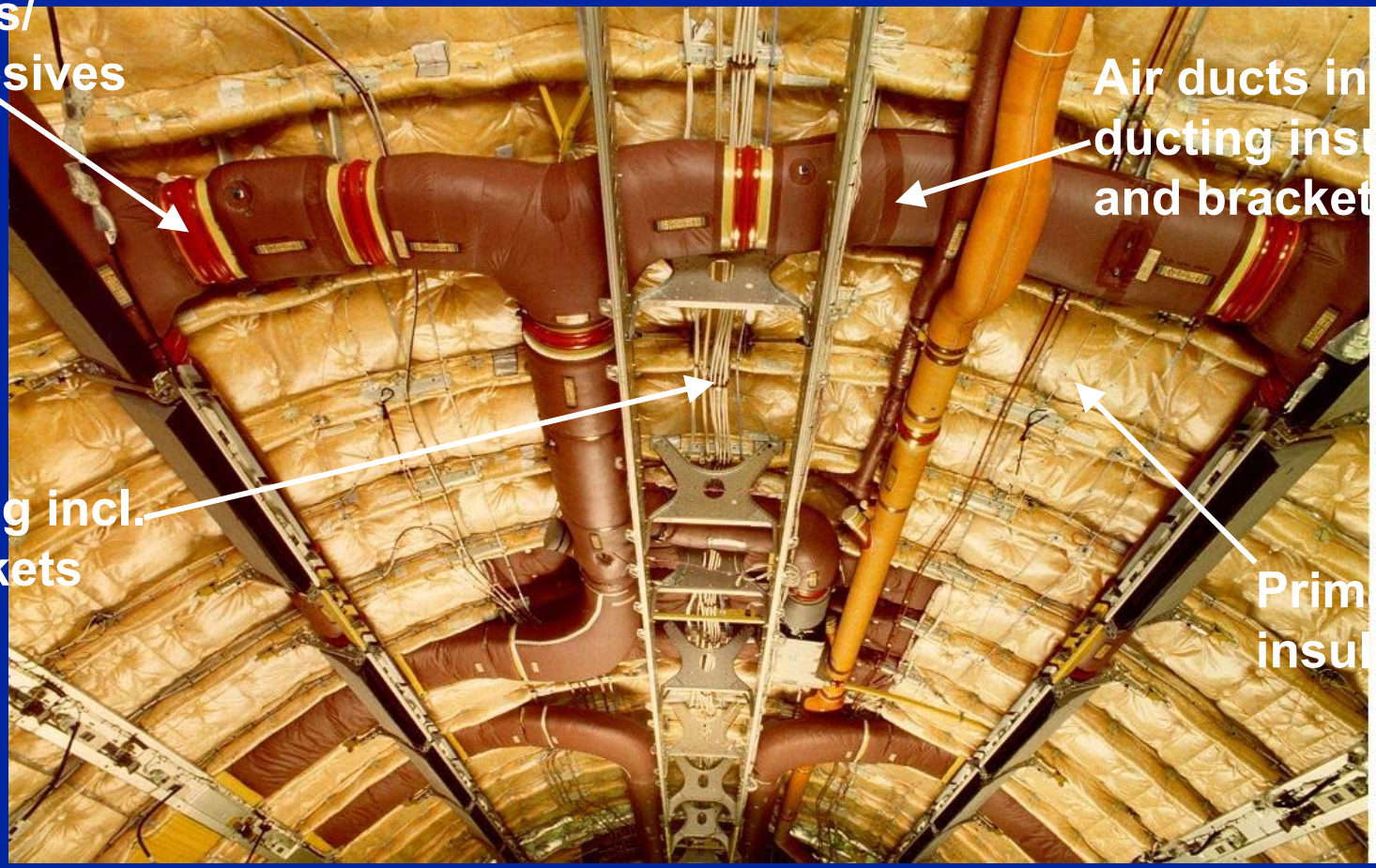
- Introduced 1979 as ATS 1000
- Superseded in 1994 by ABD0031
- All Airbus Programs
- Specific Smoke & Toxicity Criteria
- All Non-Metallic Components in the Pressurized Section

Introduction

Airbus FST Specifications

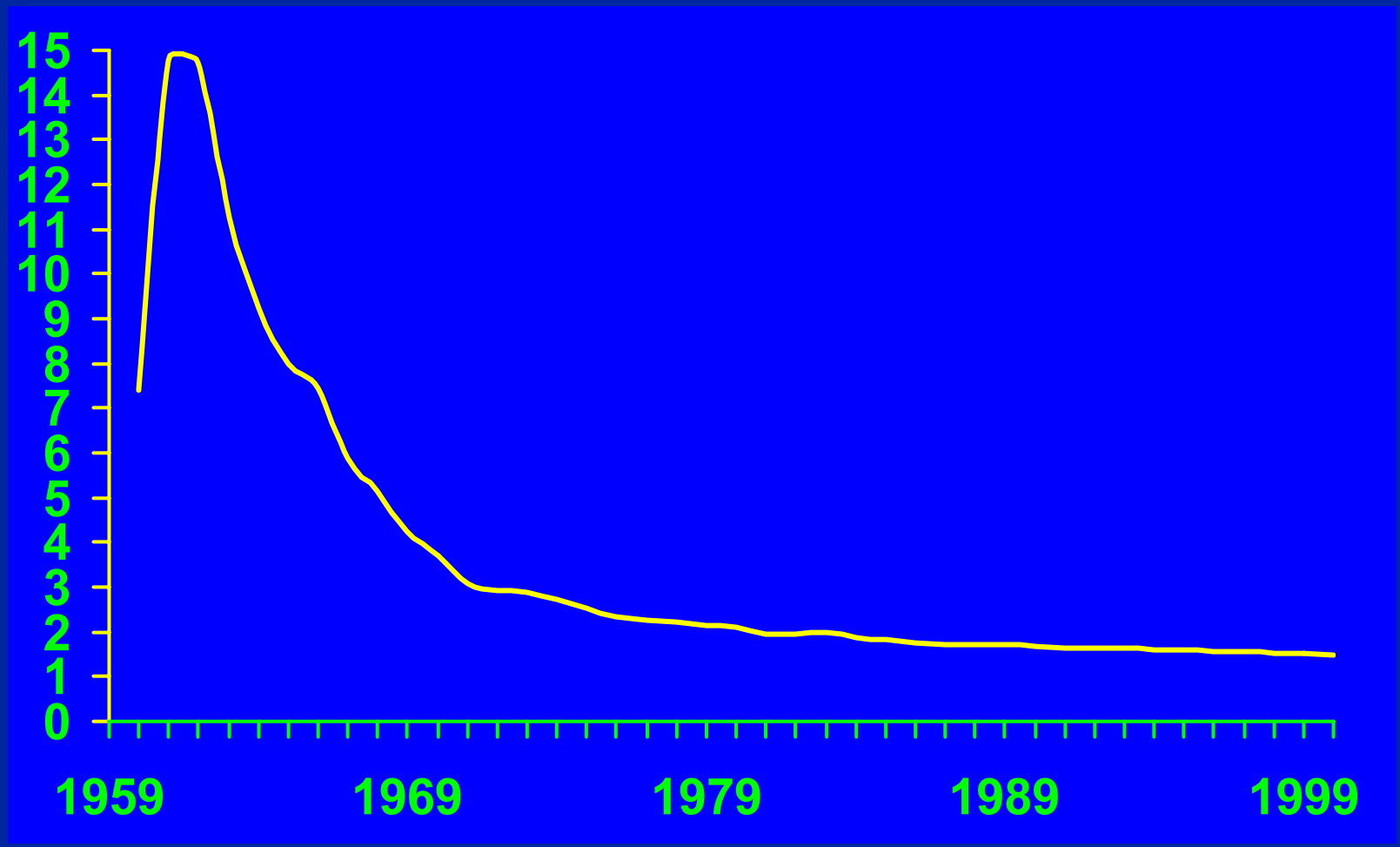
Introduction

Airbus FST Specifications



Introduction

Accidents per Mill. FH



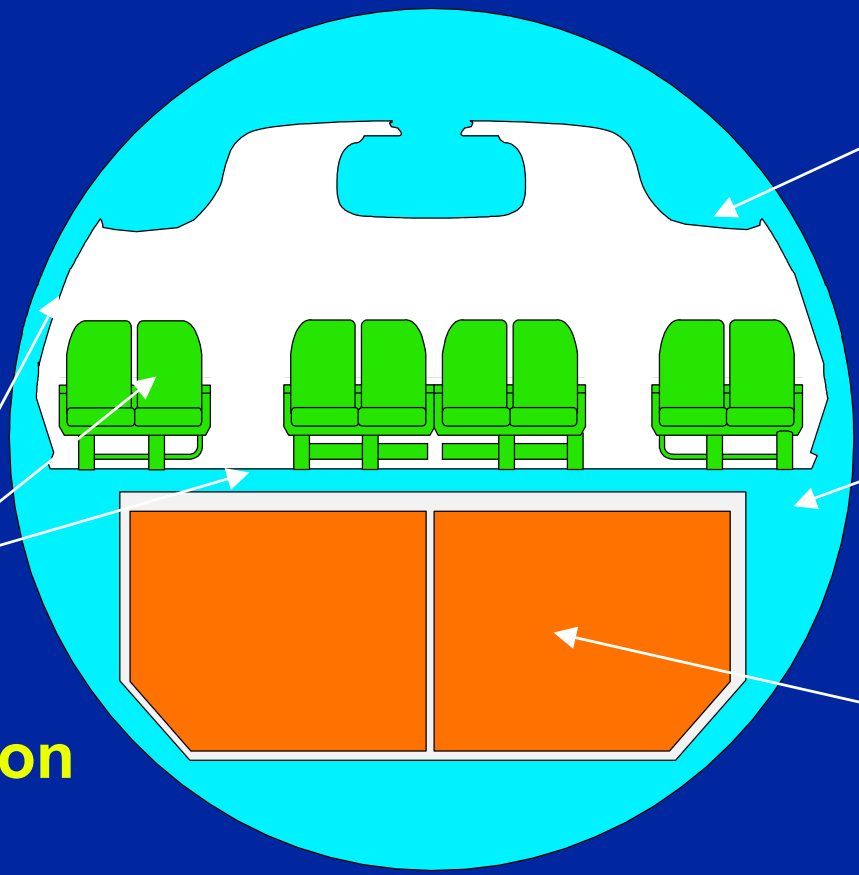
Introduction

- These efforts in fire safety have contributed to a significant reduction of the number of accidents.

BUT

- Further effort in fire safety research is required in order to keep reducing the accident risk.

Areas of Research



Oxygen

Hidden areas

Cargo Smoke/Fire Detection Halon Replacement

Evolution of FST Specification

Materials in Hidden Areas

State of the Art

- Hidden Areas not specifically identified in Regulations (compartment interiors & cargo or baggage compartments)
- Airbus FST Specification applies to the Pressurized Section of the Fuselage (incl. Hidden Areas)
- No In-Service Report on Fire Propagation in Hidden Areas of Airbus a/c

Materials in Hidden Areas

Identified Issues

- Hidden Areas are Non-Accessible Areas
- Potential for Non-readily identified Fire Hazard
- Materials must not propagate Fire
- Fire Test Criteria must address the potential Threat

Materials in Hidden Areas

Research Objectives

- Identify effective Contribution of Materials to Fire Spread
- Evaluate Fire Test Methods & Criteria vs Potential Fire Threat
- Airbus contribution to
  - IAMFTWG - sub working group on “Hidden Areas”
  - DGAC/JAA Research Program on “Hidden Fires”
  - German National Research Program “TIPPS”

Smoke/Fire Detection Systems

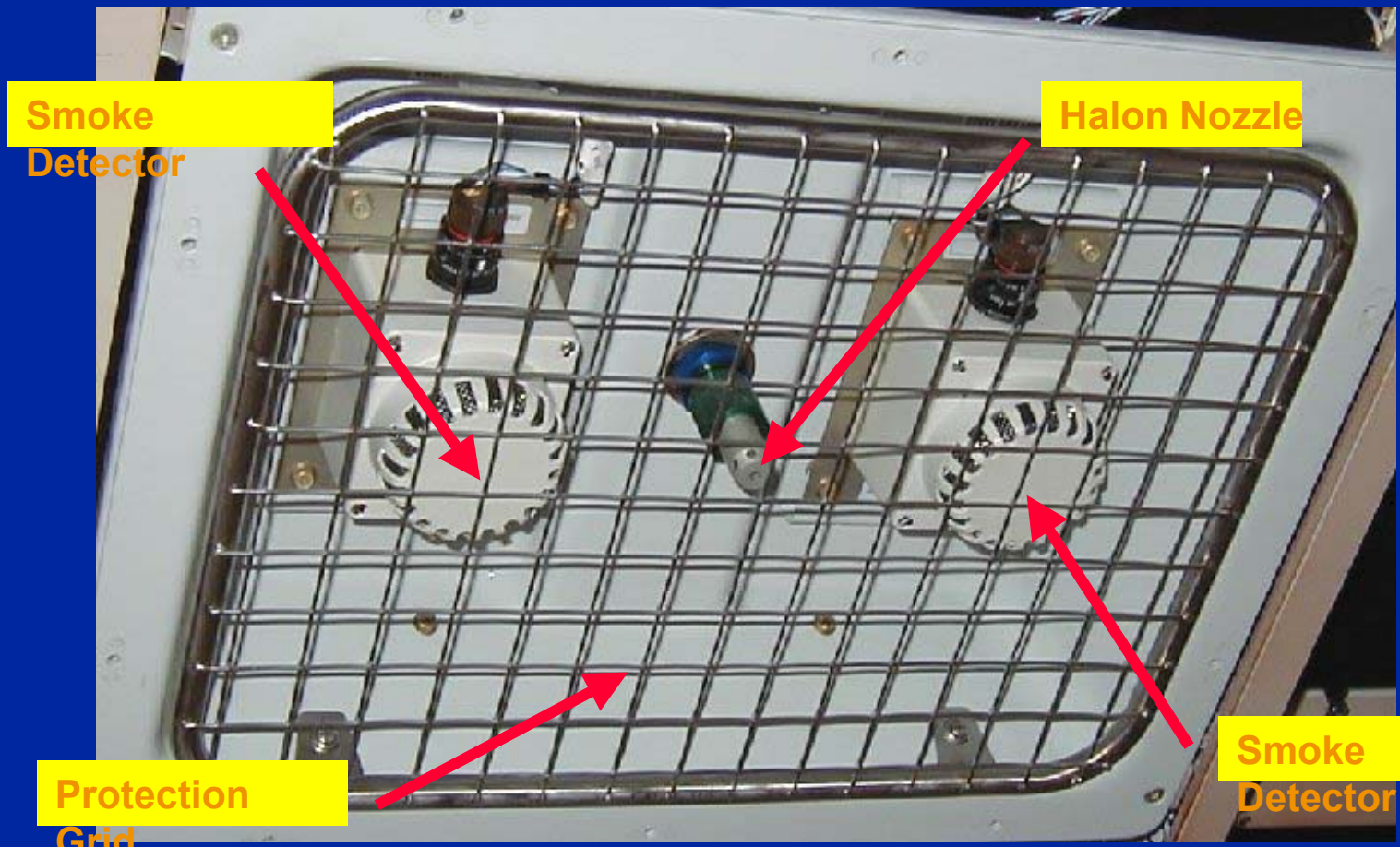
State of the Art

- Regulation requires that warning be provided within 60s after the start of a fire

- All fire sensors in the fuselage are smoke detectors (ionisation- and photoelectric sensors)

Smoke/Fire Detection Systems

Smoke Detector and Halon Nozzle Arrangement in Cargo Compartment



Smoke/Fire Detection Systems

Identified Issues

- False alarm rate is high (due to dust, cargo condensation, …)
- A/c turnbacks, emergency landings, evacuations, Halon discharge, AOG,
- Detection of smoldering fires in electronic bays is not possible with today's systems

Smoke/Fire Detection Systems

Research Objectives

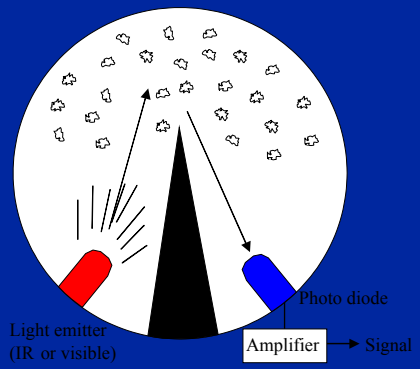
- Suppression system – compatible fire and smoke detection for cargo compartments with drastically reduced false alarm rate
- Technology for „electrical wire overheat“ detection
- Means for visualisation of status inside cargo compartment

Smoke/Fire Detection Systems

Fire Detection: Technology

Particle Sensing

- Photoelectric Sensor
- Laser Particle Sensor
- Light Attenuation Sensor
- Ionisation Sensor

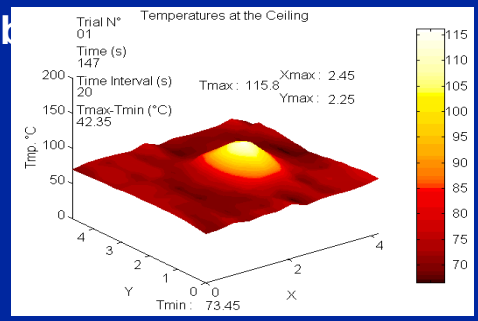


Gas Sensing

- Semicond. Metal Oxide Sensor
- Infra Red Sensor

Temperature Sensing

- Metallic Resistors
- Thermistors
- Silicon Semicond. Temp. Sensor
- Thermoelectrical Devices
- Piezoelectrical Devices
- Temperature Radiation Sensing
- Fib



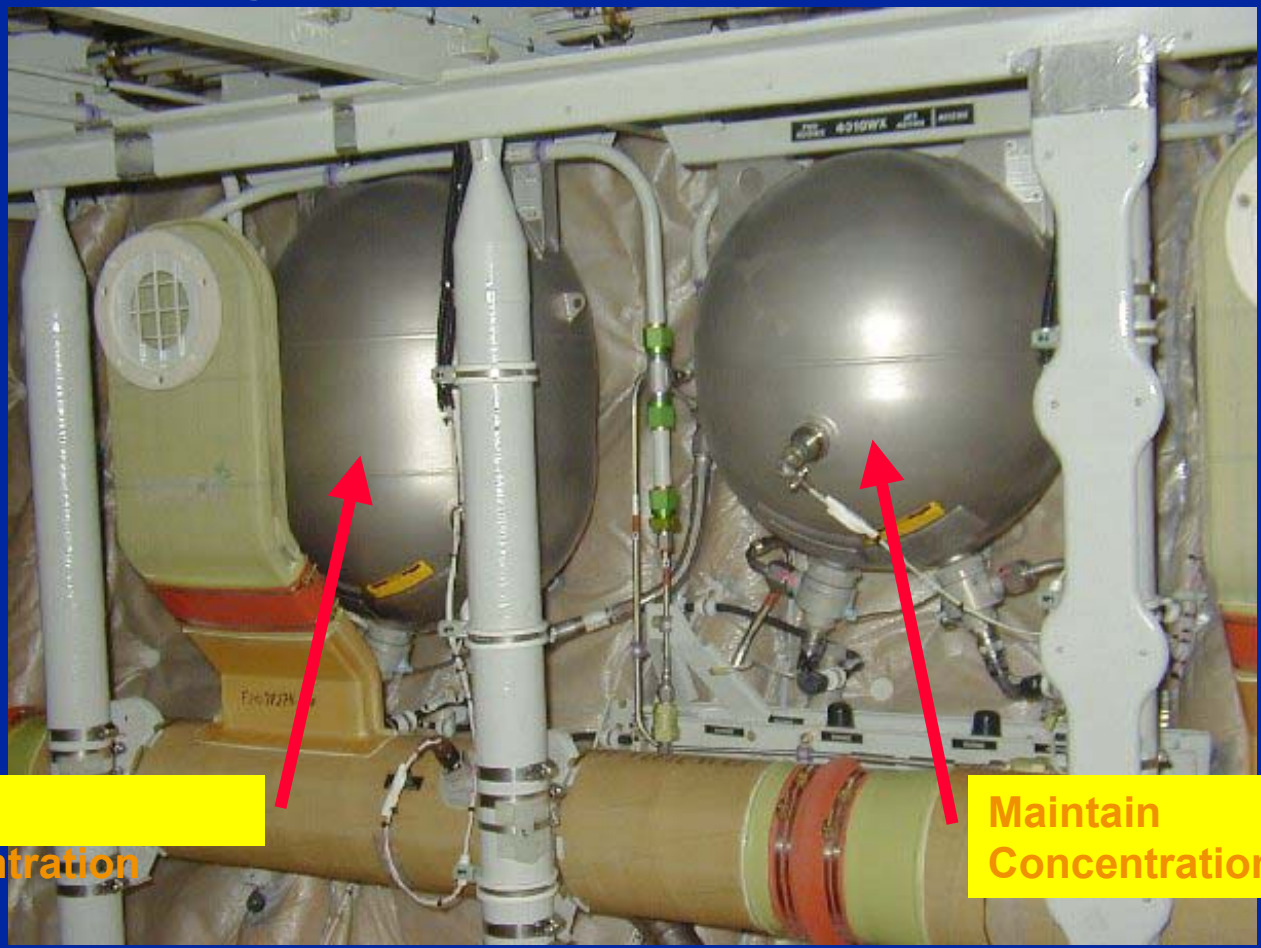
Halon Replacement

State of the Art

- Since more than 40 years Halons are used successfully for fire fighting
- Excellent compromise between extinguishing efficiency and toxicity
- In all modern aircraft Halons are used for fire fighting applications

Halon Replacement

Installation of Halon Cargo Fire Extinguishers



Halon Replacement

Identified Issues

- Halons belong to the CFCs which deplete the stratospheric ozone layer
- Montreal Protocol has banned Halon production and use since January 1994
- A suitable alternative is not available for aviation, due to special requirements like:
  - Toxicity
  - Maintaining visibility
  - Necessary extinguishing mass/volume

Halon Replacement

Research Objectives

- Environment friendly (non - halon) fire extinguishing system that :
  - provides the same level of safety
  - creates limited disadvantages vs Halon
  - is fully compatible with the a/c environment
- Airbus contribution to
  - European research program “FIREDETEX”
  - International Systems Fire Protection WG

Alternative to Oxygen on Board

State of the Art

- Oxygen on Board : Gaseous or Chemical Generators
- Regulations require significant Quantity of Gaseous Oxygen for certain Operational Scenarios
- Significant Safety Precautions are required for Oxygen System Installation

Alternative to Oxygen on Board

Identified Issues

- Oxygen can contribute to Fire Development

  (eg B737 USAir Los Angeles 1991)

- Servicing or Maintenance Incidents have been reported

  (eg B727 DELTA Salt Lake City 1989)

Alternative to Oxygen on Board

Research Objectives

- To reduce Quantity of Gaseous Oxygen or Chemical Generators on board
- To reduce the Risk of inadvertent Release of Oxygen
- Solutions under Investigation:
  - OBOGS “On-Top” to refill on-board O2 Cylinders
  - OBOGS “On-Line” to generate O2 on- demand

Evolution of Airbus FST Directive

Considering

- Upcoming Rule on Insulation Materials to be considered
- Introduction of non-metallic structural parts in the pressurized Section
- Increase of electrical Systems (IFE, Passenger Service…)
- Extended use of Optical Fibers

Conclusion

- Further effort in fire safety research is required in order to keep reducing the risk of accident.
- Manufacturers are committed to play a Major Role in current and future Fire Safety Research Programs
- Fire Safety Research must also consider industrial Feasibility and impact on aircraft Performance