

Presented by

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Airbus

# UP-DATE ON AIRBUS FIRE SAFETY RESEARCH AND DEVELOPMENT



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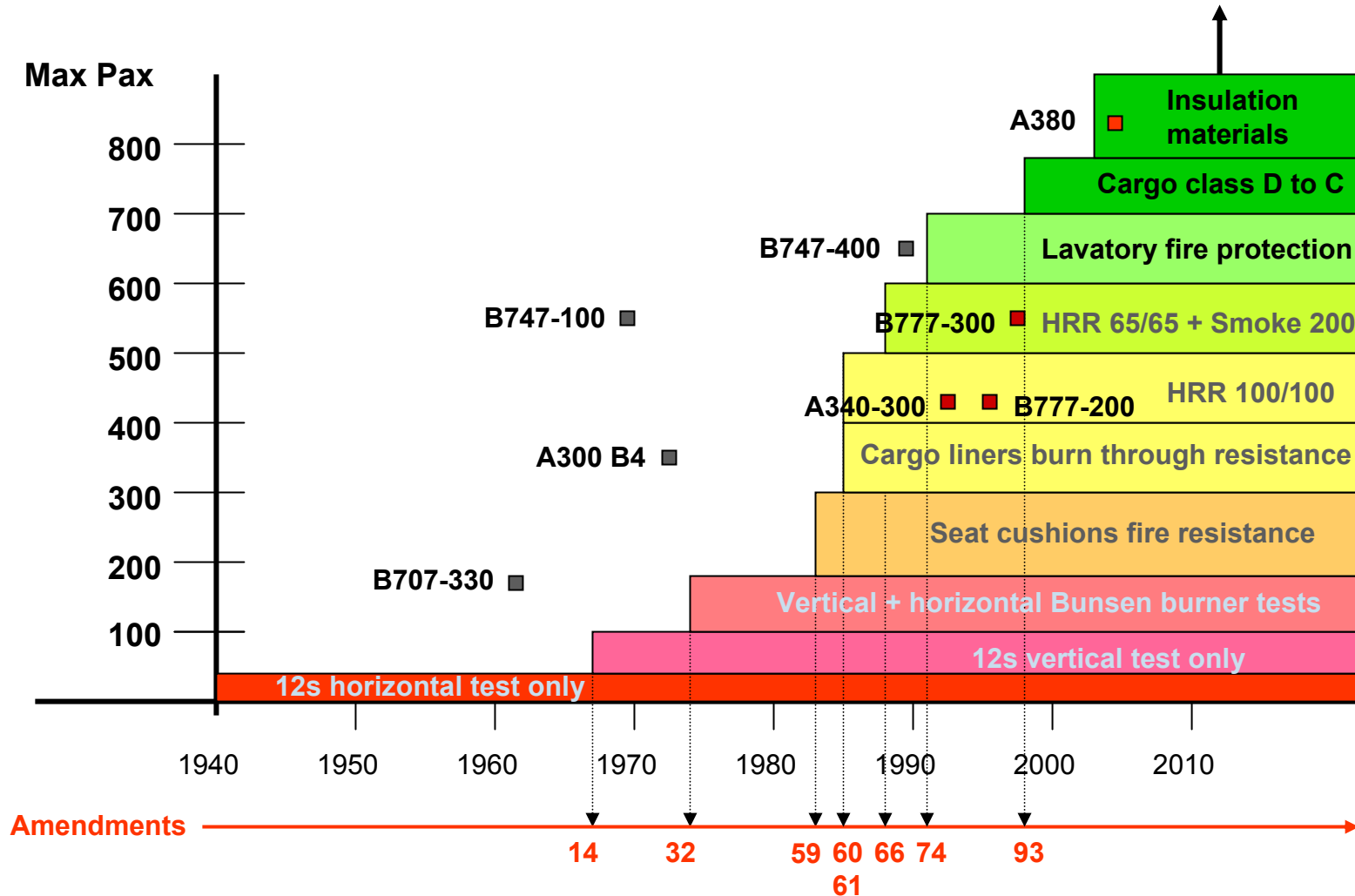
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## A/C Size / Regulation Evolution



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# Introduction

## Airbus Fire Safety Specification

### Airbus Internal FST Requirements

Airbus Directive (ABD 0031) contains fireworthiness design criteria for use inside the pressurized section of the fuselage.

More stringent requirements for smoke emission and toxic gases

ABD0031



Airbus Directives (ABD) and Procedures

### Fireworthiness Requirements Pressurized Section of Fuselage

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# F-S-T Requirements

## FAA/EASA

- 60 s Flammability
- Heat Release
- Smoke emission



## Airbus

### Side wall panel

- 60 s Flammability
- Heat Release<sup>\*)</sup>
- Smoke emission<sup>\*)</sup>
- Toxicity

**\*) more stringent requirements**

- 60 s Flammability
- Heat Release
- Smoke emission test

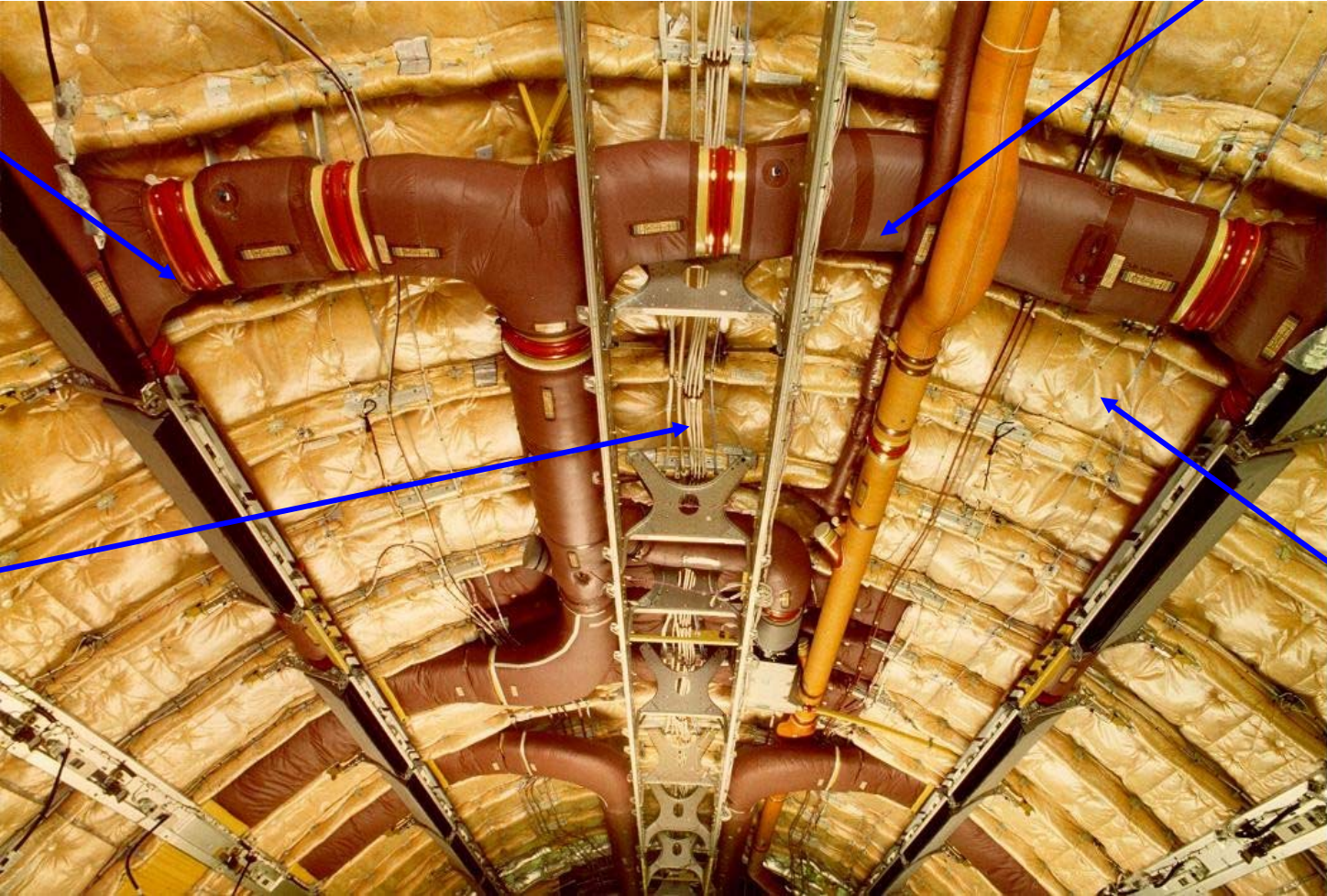


### Overhead Bin Door

- 60 s Flammability
- Heat Release<sup>\*)</sup>
- Smoke emission<sup>\*)</sup>
- Toxicity

# Introduction

## Airbus Fire Safety Specification



Tapes/  
Adhesives

Wiring incl.  
brackets

Air ducts incl.  
ducting, insulation  
and brackets

Primary  
insulation



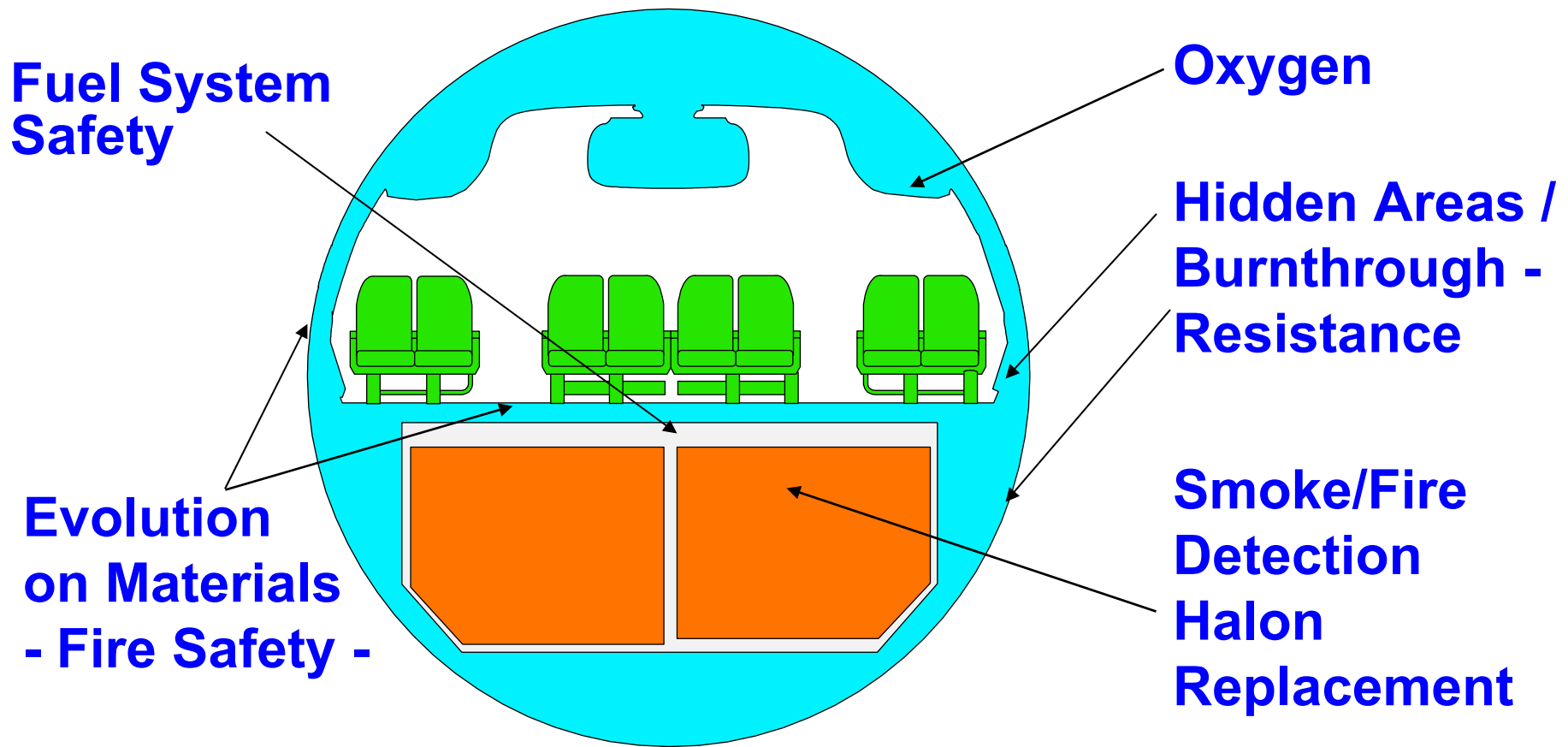
# Introduction

- Tremendous improvements in aircraft safety have been introduced since the past 20 years
- Air transportation has become along the years, the safest means of mass transport ever

## But

- Further efforts in fire safety research are required in order to keep reducing the risk of accidents

# Areas of Current and Future Research





# Evolution on Material Fire Safety



**Cabin Interior 80 years ago**

# Evolution on Material Fire Safety



**Cabin Interior today**

# Hidden Fire Research

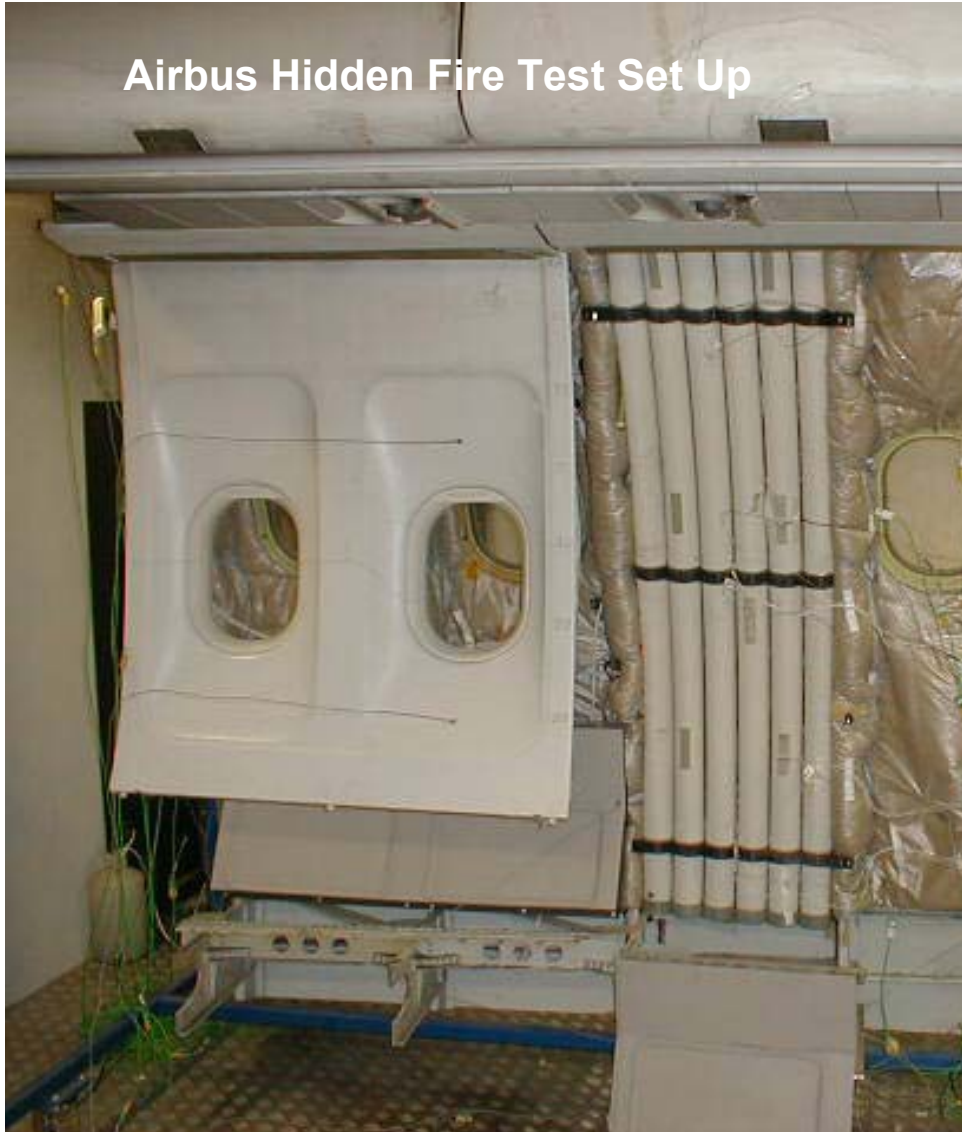
## Research Objectives

- Upgrade of materials in hidden areas to the level of fire resistance as proposed for insulation materials
- Develop new Fire Test Method based on “Radiant Panel Test”

## Status

- Full scale and radiant panel test program in progress to evaluate the flame propagation behavior of state of the art materials

# Hidden Fire Research Full Scale Test



Airbus Hidden Fire Test Set Up



Window Frame with Heating Element



Air Ducts with Heating Element

# Fuselage Burnthrough Resistance

## Research Objectives

- To prolong a safe environment of the passengers inside the cabin in the event of a post crash fire scenario
- To develop adequate materials and designs to improve burnthrough resistance

## Status

- Various burnthrough configurations tested ( e.g. burnthrough between decks )
- Much of upper part of A380 burnthrough protected by GLARE

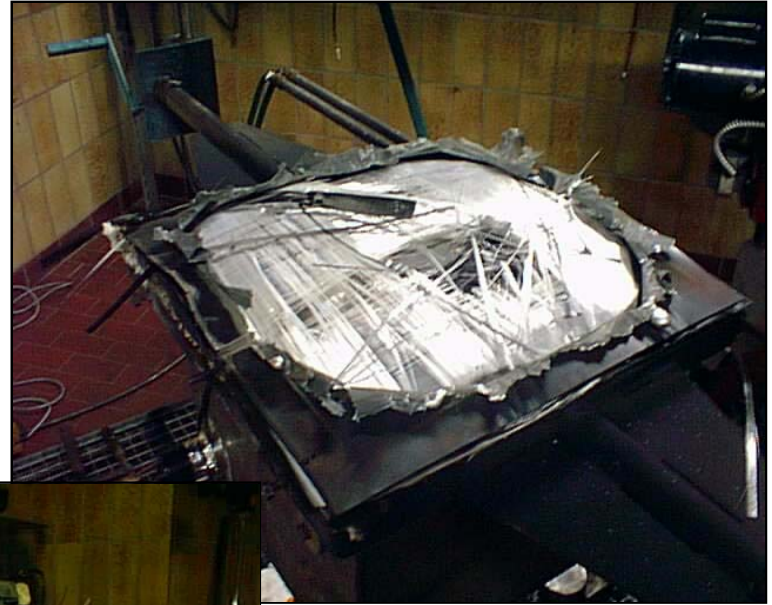
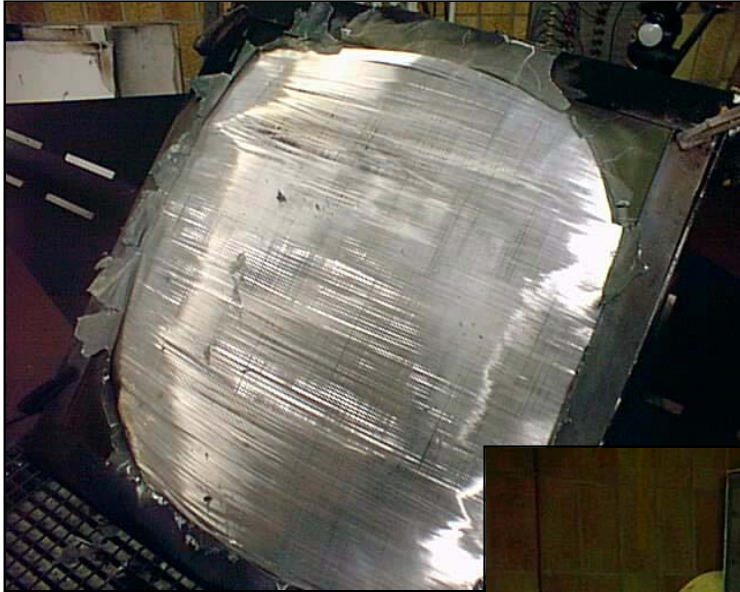
# Fuselage Burnthrough Resistance

<u>Fuselage Materials</u>	<u>Burnthrough Time (sec)</u>
Aluminium, 1.8 mm	37
Aluminium, 1.8 mm (incl. insulation + lining)	150
GLARE, 2.4 mm	no flame penetration
CFRP, 3.0 mm	no flame penetration



# Fuselage Burnthrough Resistance

## GLARE Burnthrough Test Pieces



**No burnthrough  
within 7 min**



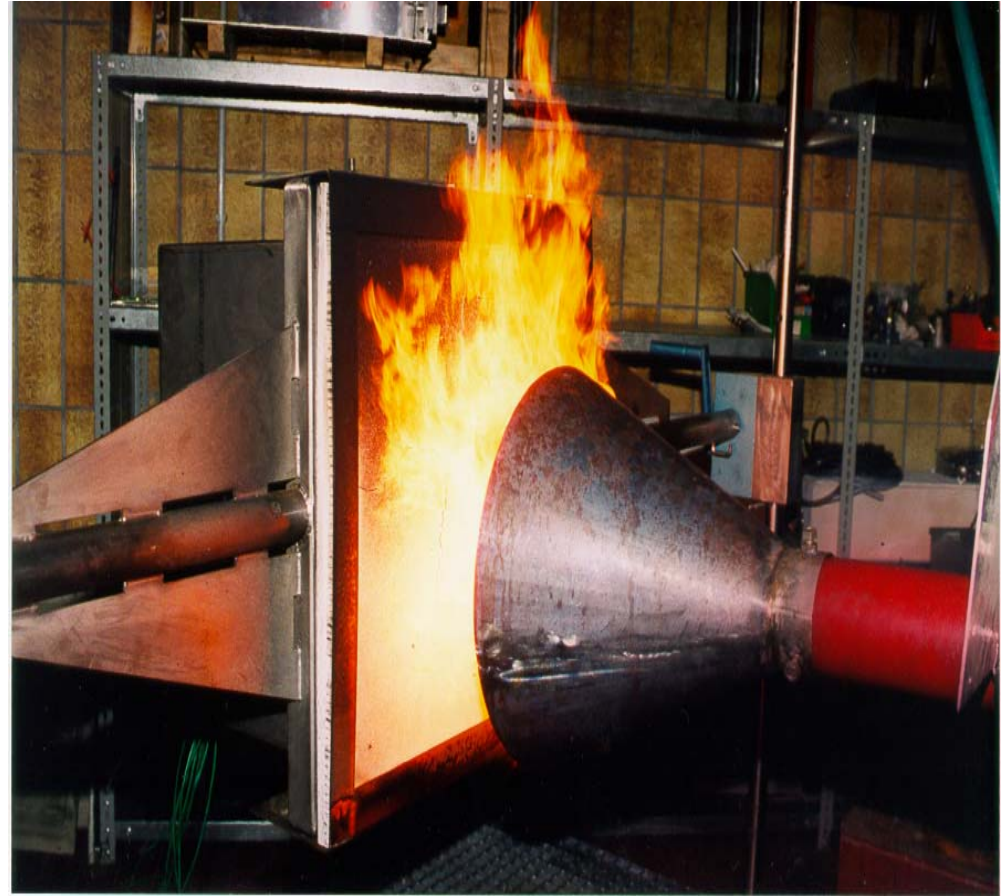
- **Low Smoke**
- **Low Toxicity**



# Small Scale Burnthrough Test

**Test method to evaluate  
burnthrough characteristics  
of materials / designs**

**Sample size: 600 x 600 mm**



**Suitable testmethod for pre-selection of materials and design**

# Full Scale Burnthrough Test



# Smoke/Fire Detection Systems

## Research Objectives

- Fire and smoke detection system with drastically reduced false alarm rate
- Multi - Criteria - Smoke Detection System
- Means for visualisation of status inside cargo compartment

## Status

- Multi - Criteria – Smoke Detection System on A380
- Video camera aided fire and / or smoke indication developed

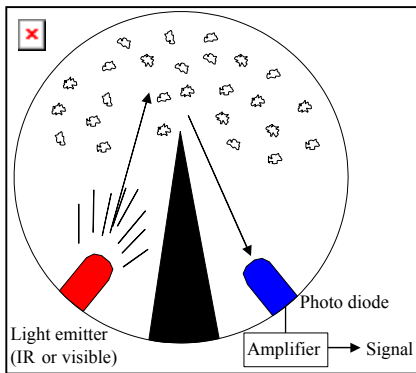


# Smoke/Fire Detection Systems

## Fire Detection Technology

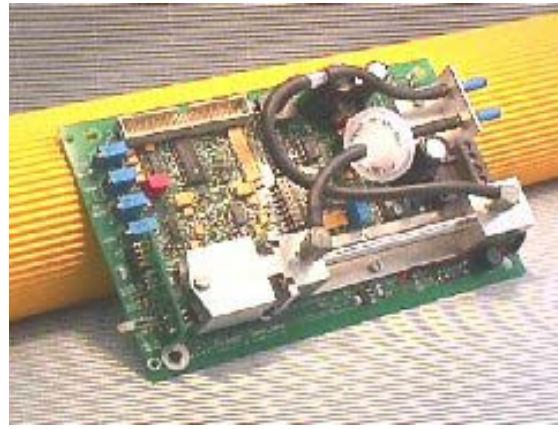
### Particle Sensing

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



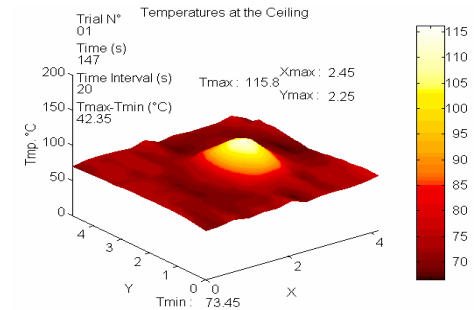
### Gas Sensing

- Semicond. Metal Oxide Sensor
- Infra Red Sensor
- Electrochemical Cell



### Temperature Sensing

- Metallic Resistors
- Thermistors
- Silicon Semicond. Temp. Sensors
- Thermoelectrical Devices
- Piezoelectrical Devices
- Temperature Radiation Sensing
- Fibre-Optical Cables



# Halon Replacement

## Research Objectives

- Environment friendly (non-halon) fire extinguishing system that :
  - provides same level of safety
  - creates limited disbenefits / Halon
  - is fully compatible with the A/C environment

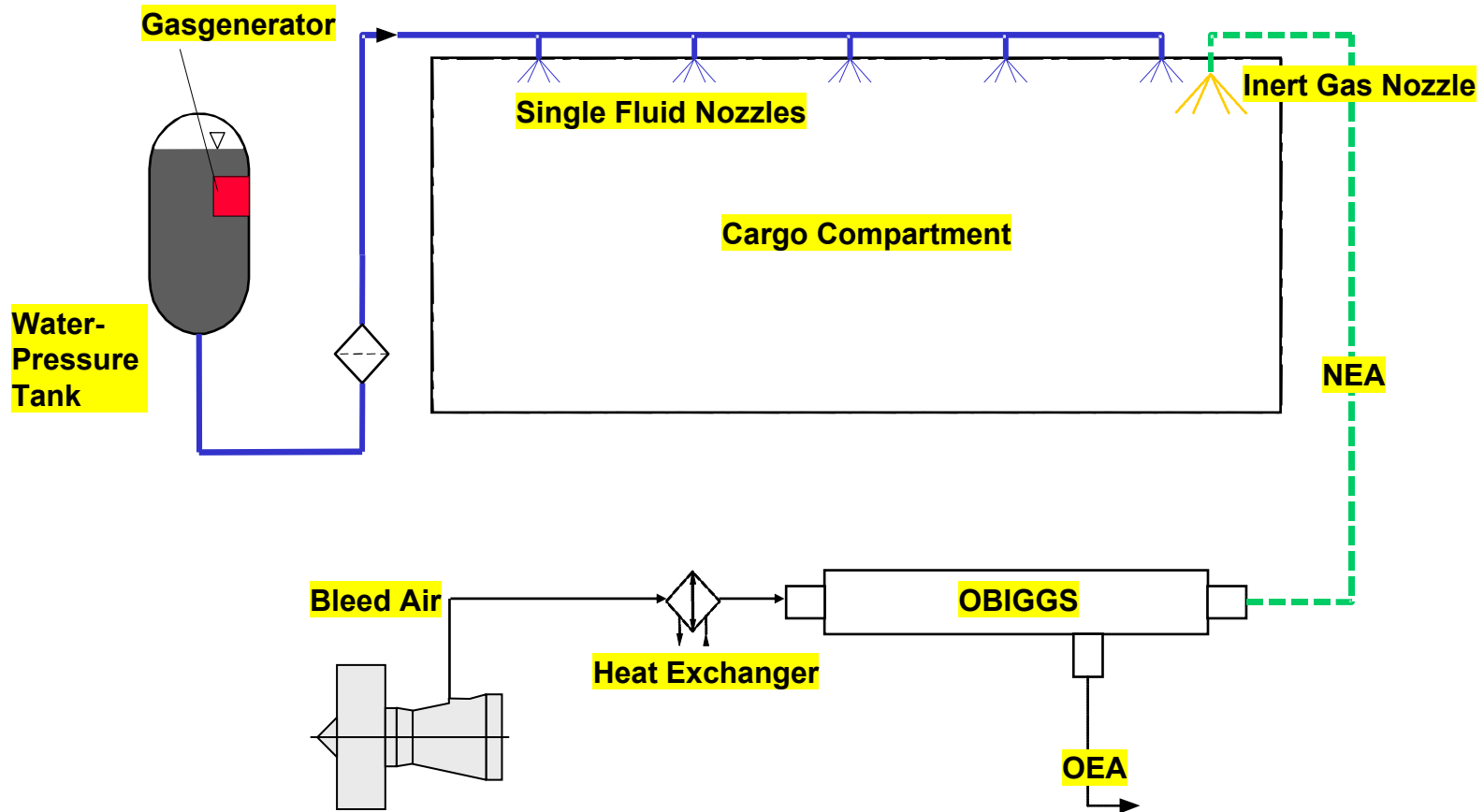
## Status

- Halon replacements for cabin fire extinguishing purposes available
- Alternatives for cargo fire suppression system under study

# Halon Replacement

## Research on OBIGGS and Water Mist System

### OBIGGS: On-Board Inert Gas Generating System



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# Fuel System Safety

## Research Objectives

- Prevention of ignition source within fuel tanks
- Demonstrating functionality of an On-Board Inert Gas Generating System (OBIGGS) on an Airbus A320 (OBIGGS developed by FAA)
- FAA / Airbus joint ground / flight test program

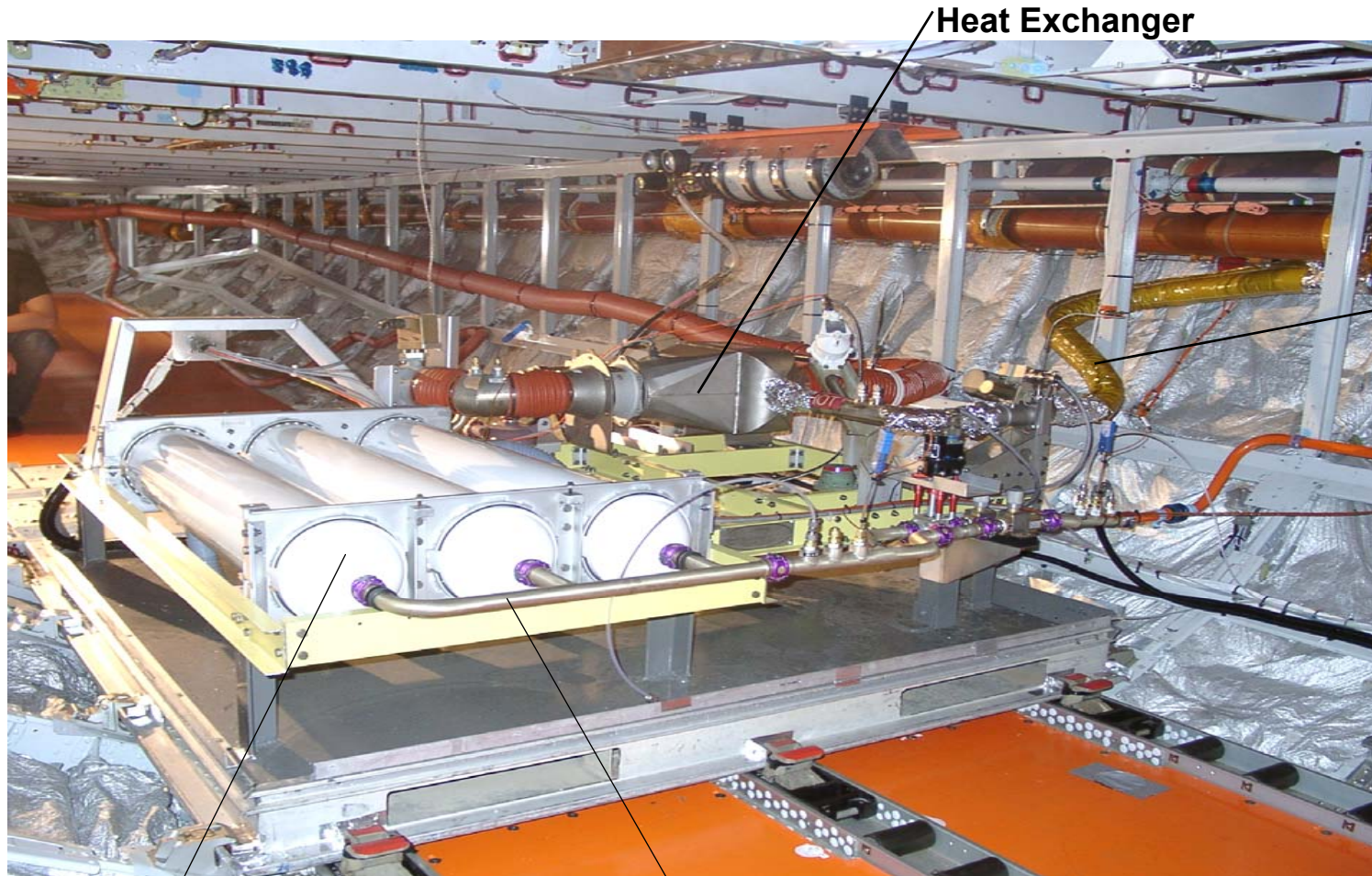
## Status

- Ground / Flight tests have demonstrated the functionality of the system



# Fuel System Safety

## Airbus A320 OBIGGS Flight Test Installation



Heat Exchanger

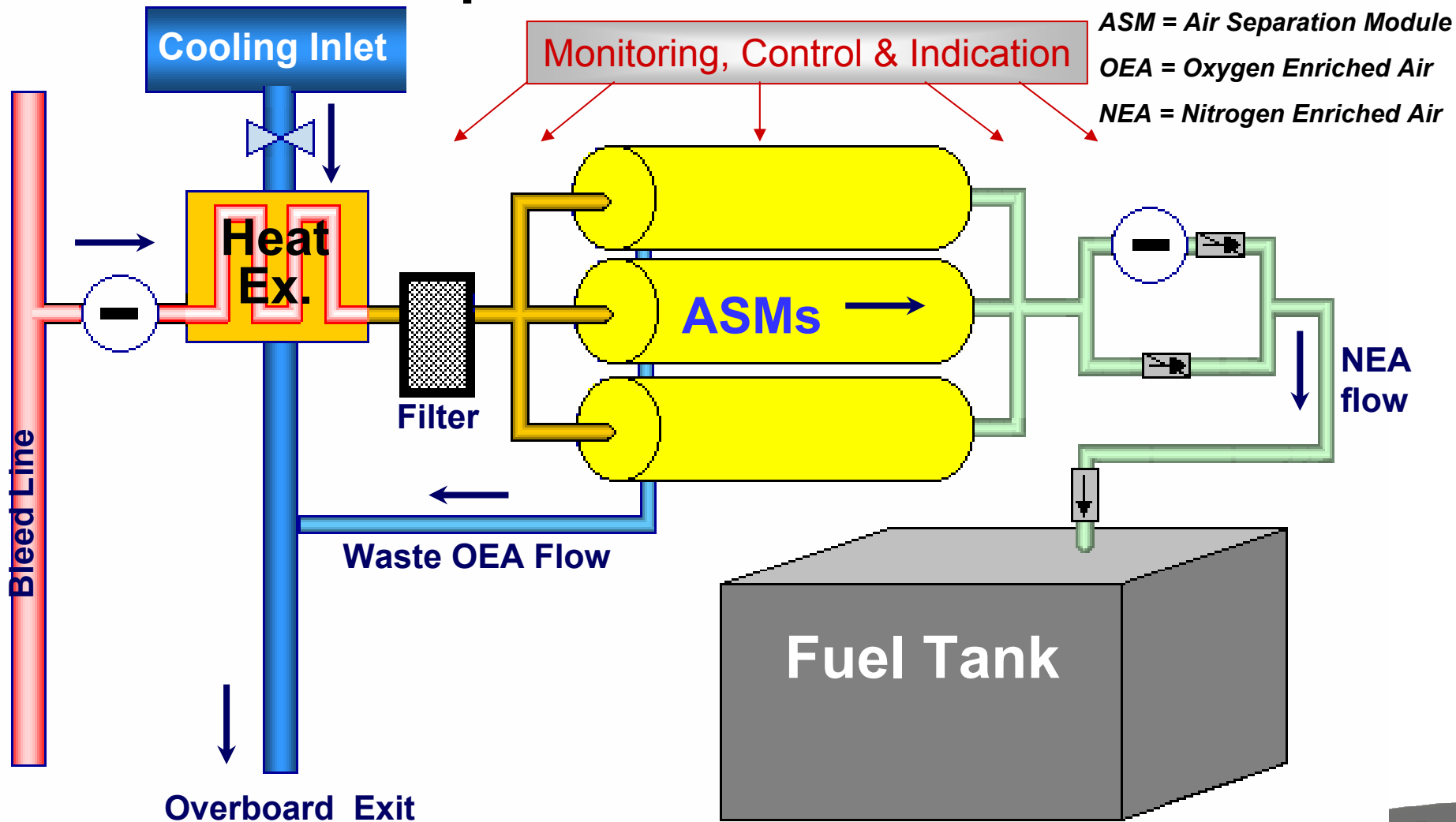
Bleed Air

Air Separation Modules

Nitrogen Enriched Air Exit

# Fuel System Safety

## OBIGGS Principle



# Alternative Oxygen on Board

## Research Objectives

- To reduce quantity of gaseous oxygen or chemical generators on-board

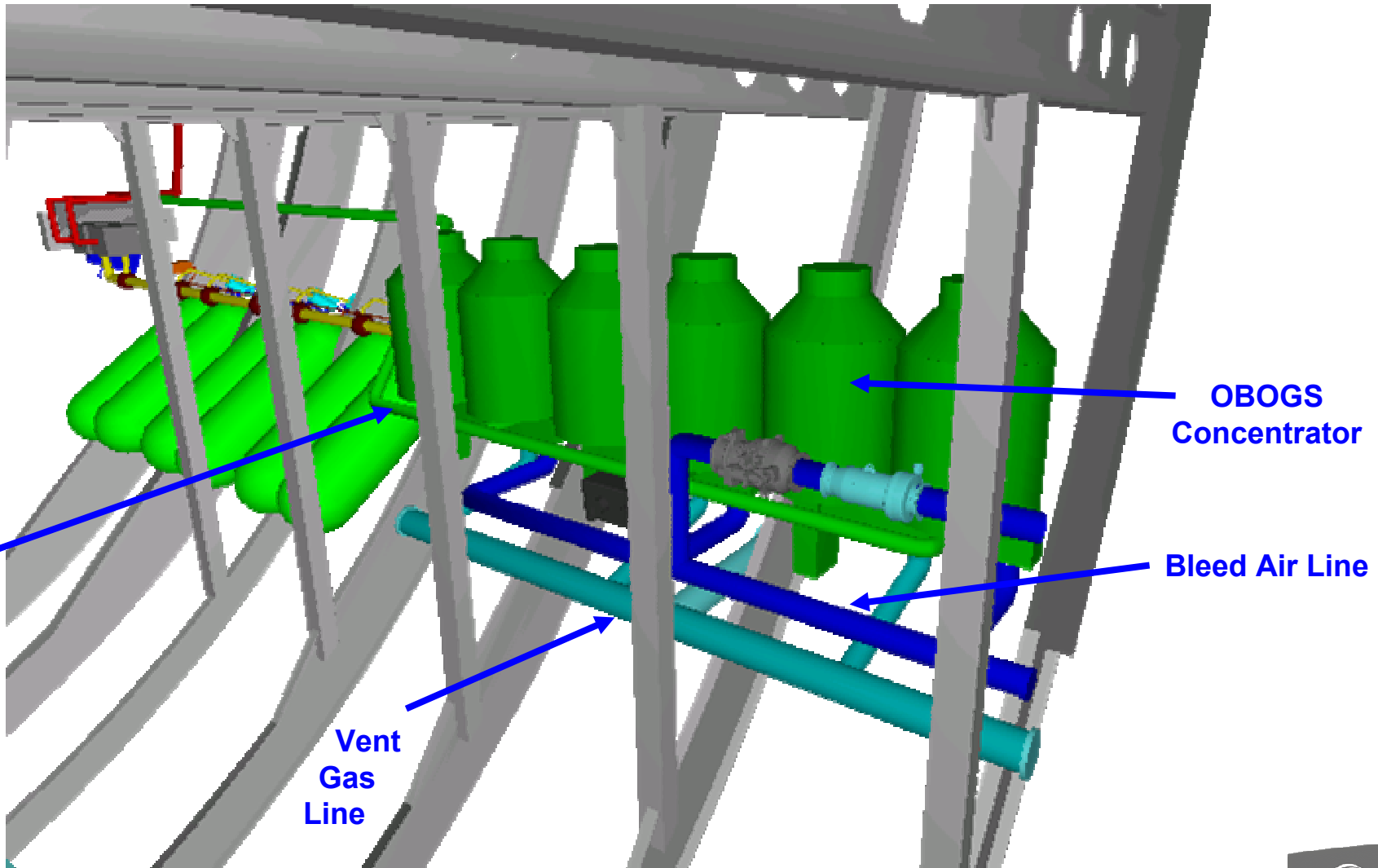
## Status

- Solutions under investigation:
  - OBOGS “On-Top” to refill on-board oxygen cylinders
  - OBOGS “On-Line” to generate oxygen on demand
- Flight test program running at **Air Liquide** company

**OBOGS:** On-Board Oxygen Generating System

# Alternative Oxygen on Board

## Typical OBOGS Installation (On-Line Configuration)



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# Conclusions

- **Prevention of incidents/accidents by anticipating and solving problems before they occur**
- **Continued efforts to improve fire safety required**
- **Manufacturers are committed to Fire Safety Research**
- **Balance of aircraft safety / economics and performance**

*Thank you*



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