Presented by

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UP-DATE ON AIRBUS FIRE SAFETY RESEARCH AND DEVELOPMENT

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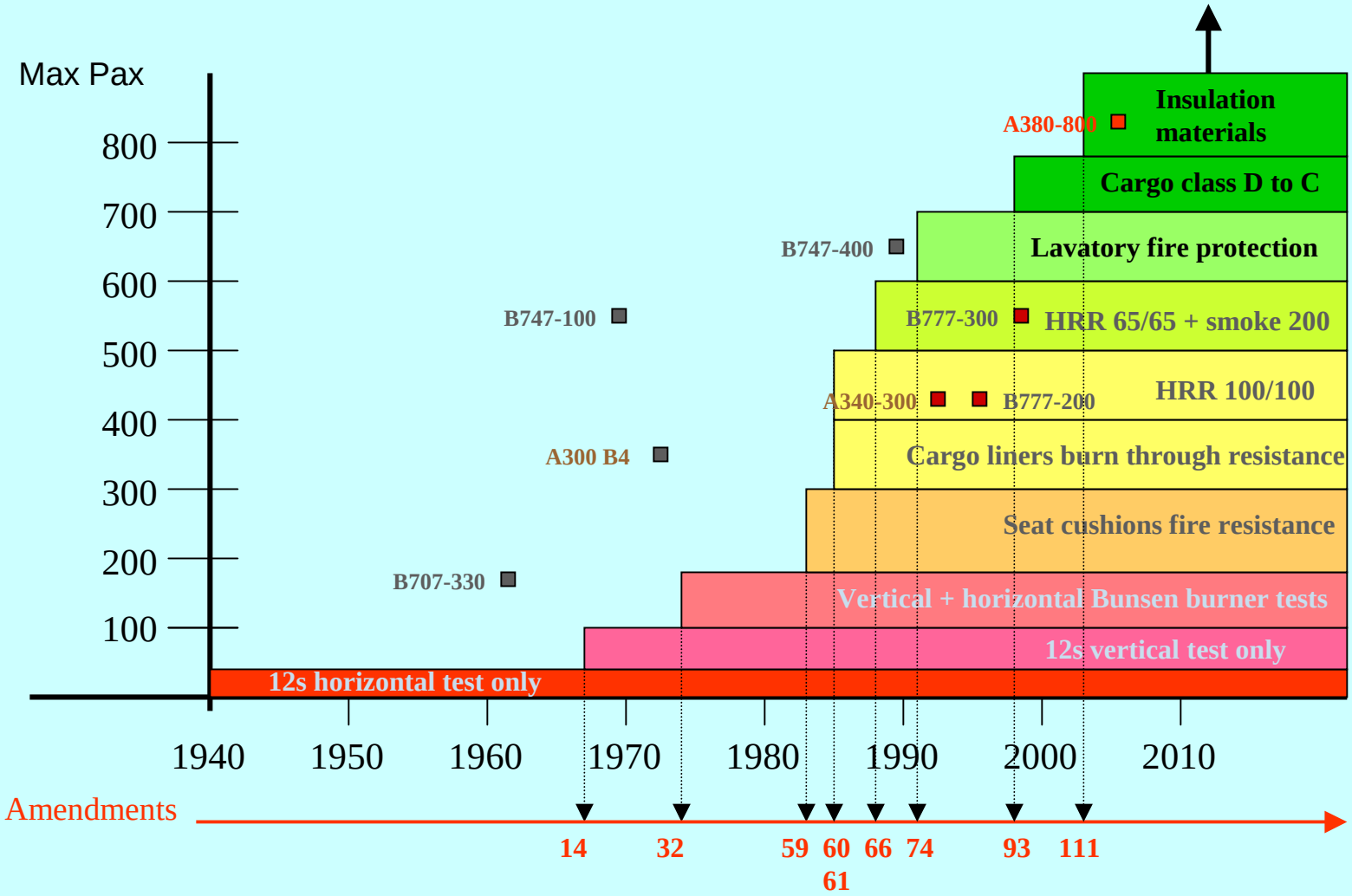
Content

- **Introduction**
  - Evolution of Regulation
  - Airbus Fire Safety Specification
- **Areas of Future Research**
  - Materials in Hidden Areas
  - Smoke/Fire Detection Systems
  - Halon Replacement in cargo compartments
  - Halon Replacement in engines and APU
  - Alternative to Oxygen on Board
- **Conclusion**

Introduction

Fire Safety: Rule Evolution



Introduction

Airbus FST Specifications Development

A/c	Specification	Content
 2005	**ABD0031 Issue F**	**Applicable FAR/JAR § + FST requirements on all non-metal parts in the pressurized section incl. structural components + optical fibers and IFE equipment parts**
 1994	**ABD0031 Issue A**	**Applicable FAR/JAR § + FST requirements on all non-metal parts in the pressurized section incl. structural components**
 1979	**ATS 1000**	**Applicable FAR/JAR § + FST requirements on all non-metal parts in the pressurized section**

Introduction

Airbus FST Specifications

Thermoplastics
Transparencies

Cabin lining panels incl. Secondary insulation

Textiles

Floor panels and non-metallic structural parts

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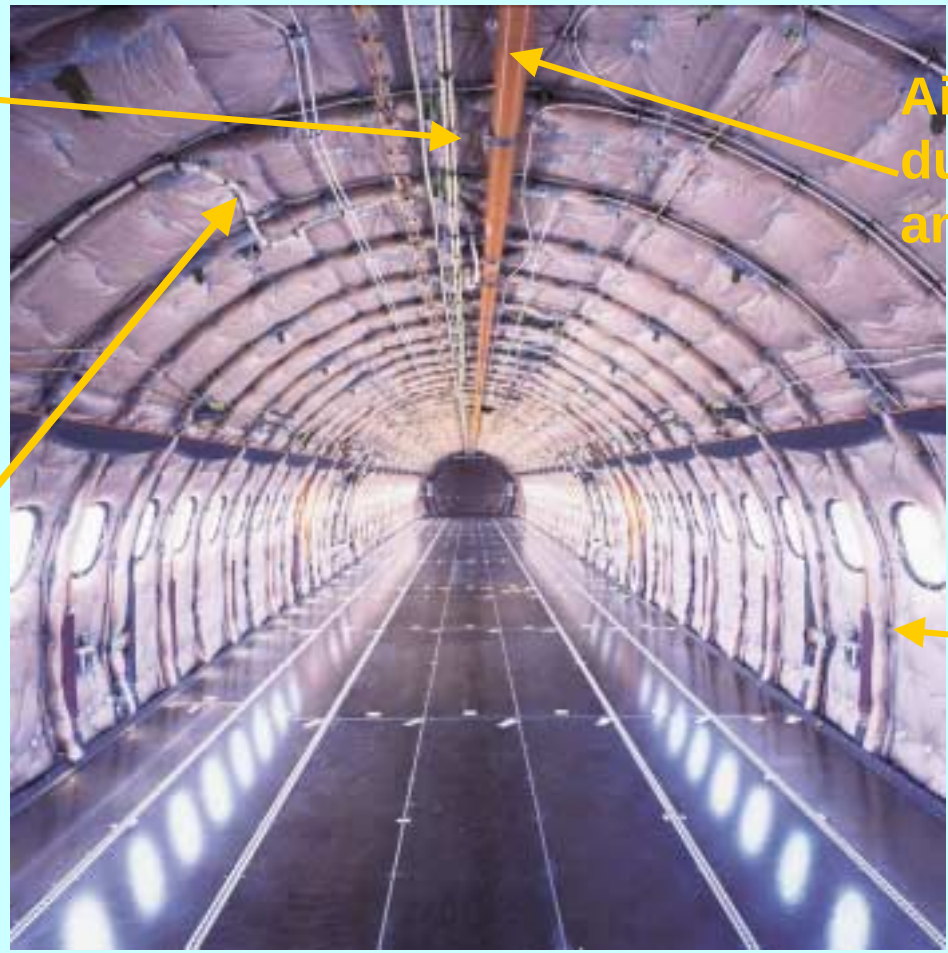
Introduction

Airbus FST Specifications



Introduction

Evolution of Airbus FST Specifications

Consider Fire Prevention in Hidden Areas vs Electrical Equipment Installation

Installation Guidelines

Establish selection / integration criteria based on:

- ✈Equipments' intrinsic Fire Characteristics / Properties
- ✈Installation Precautions
  - ✈Define Adequate Environment
  - ✈Provide Ventilation
  - ✈Provide Detection (smoke, heat,…)
  - ✈…

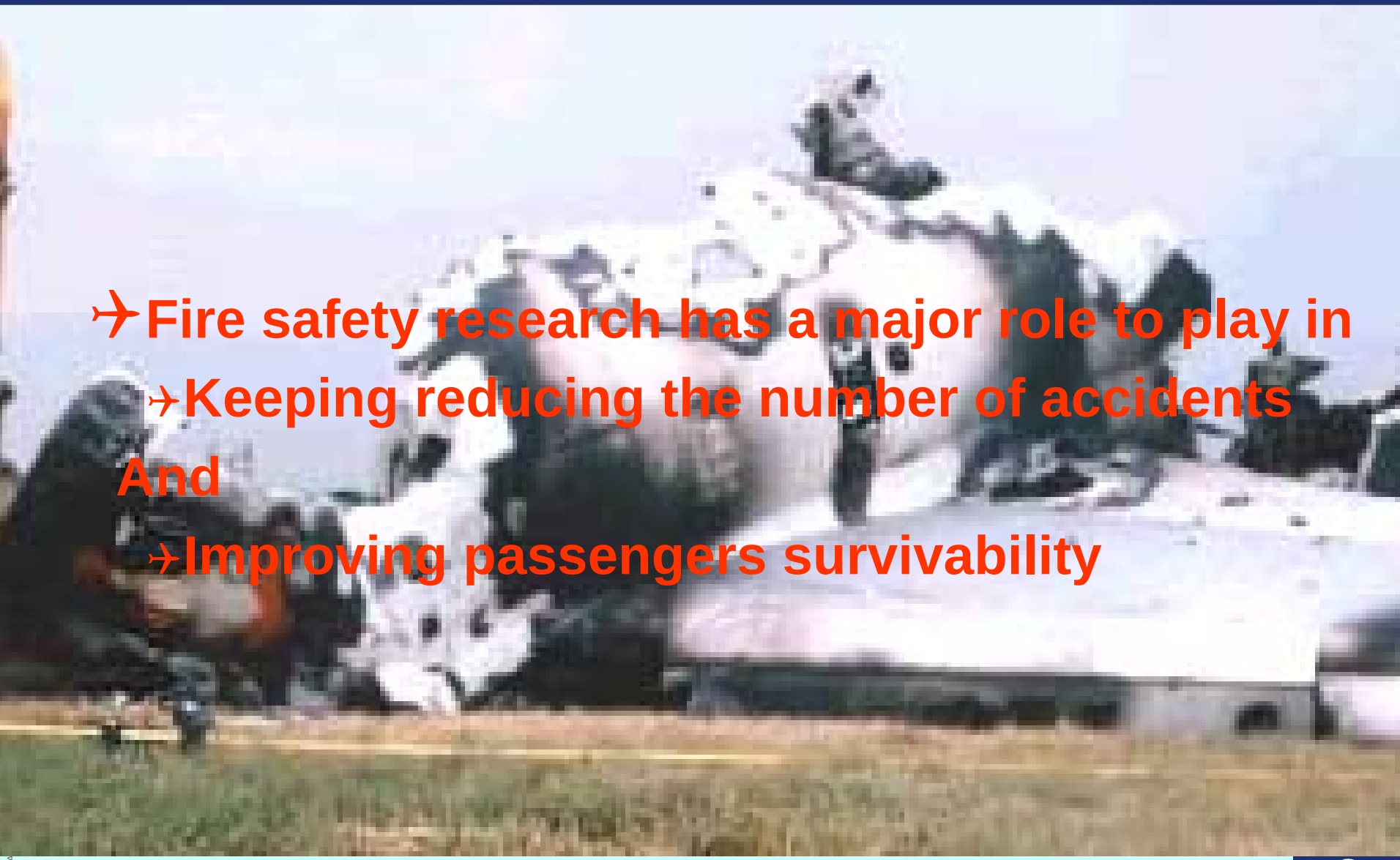
Introduction

- **Tremendous improvements in aircraft safety have been introduced since the past 25 years.**
- **Air transport has become along the years, the safest means of mass transport ever.**

BUT

- **If the current accident rate remains unchanged, the statistical reality is that the number of accidents will increase.**

Introduction



- Fire safety research has a major role to play in
  - Keeping reducing the number of accidents

And

  - Improving passengers survivability

Areas of Research

- **In pressurized zones**

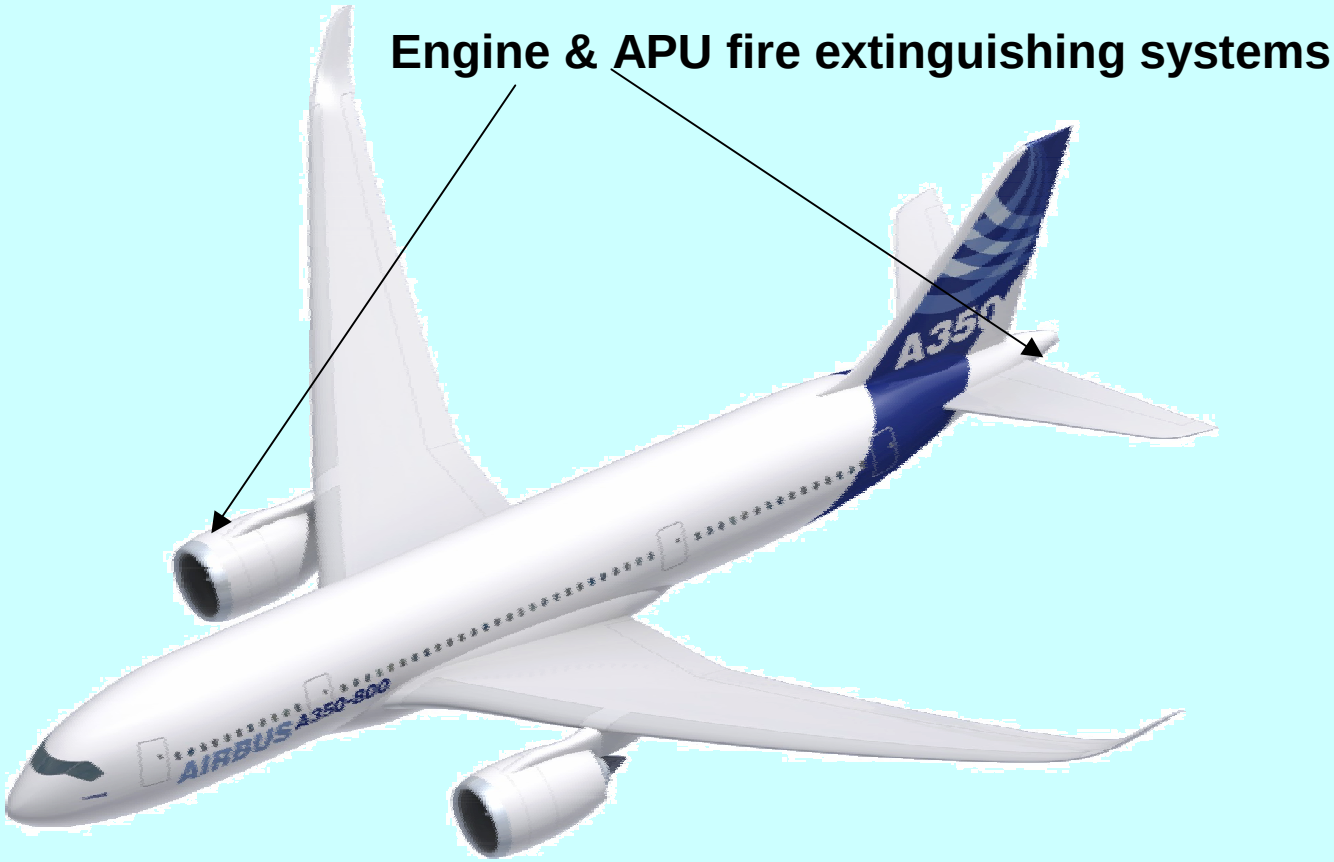
Hidden areas

Oxygen

Cargo Smoke/Fire Detection
Halon replacement

Areas of Research

✈In unpressurized zones:



Materials in Hidden Areas

Materials in Hidden Areas

State of the Art

Hidden Areas not specifically identified in Regulations (compartment interiors & cargo or baggage compartments)

Except for Insulation materials since flame propagation/penetration Rules

Airbus FST Specification applies to the Pressurized Section of the Fuselage
(incl. Hidden Areas)

Materials in Hidden Areas

Identified Issues

- Hidden Areas are Non-Accessible Areas
- Potential for Non-readily identified Fire Hazard exists

Since publication of the insulation materials rule

- What about other than insulation materials?
- What is their contribution to flame propagation?

Materials in Hidden Areas

Research Objectives

- Test other materials under the test conditions required for thermal acoustic insulation materials
- Evaluate the interest of the Radiant Panel Test method for these materials and
- Explore modified test conditions:
  - increased heat flux level
  - electrical ignition sources and
  - pre-heating
- Airbus contribution to
  - DGAC/JAA Research Program on “Hidden Fires” (presentation by S. Le Nevé – CEAT)

Smoke/Fire Detection Systems

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

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

New Generation Smoke Detector – introduced on A380

- Multiple optical measurement paths (using scattering light principle)
- Sensors to measure ambient climatic conditions (e.g. humidity, …)
- Local processing unit for false alarm discrimination algorithms ….

Siemens Ambient Smoke Detector

Smoke/Fire Detection Systems

- A380 Smoke Detector and Halon Nozzle Arrangement in Cargo Compartment
  - Improved design assures that no Halon enters into the smoke detectors

Smoke/Fire Detection Systems

AOA Apparatebau Gauting
Ambient Smoke Detector

Next Generation Smoke Detector

Enhanced EMI Protection: 3000V/m for conducted and radiated susceptibility

Halon Replacement: Cargo

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

Identified Issues

- Halons belong to the CFCs which deplete the stratospheric ozone layer
- Montreal Protocol has banned Halon production and use since January 1994
- Suitable alternative are today available for “small” extinguishing systems like:
  - Lavatory waste bins “potty bottle”

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 applied research
  - Pressurized zone: Cargo Compartments
  - Un-Pressurized zones: Engines and APU
    - **ECOLOG**

Halon Replacement – Cargo Hold Fire Protection

AIRBUS ACTIVITIES

- Market observation to identify new environmentally friendly replacement agents and new technologies
- Participation in the International Aircraft Systems Fire Protection Working Group (IASFPWG)
- Present Airbus studies are mainly focused on hybrid system concepts:
  - Halon – Nitrogen Enriched Air
  - Novec™ – Nitrogen Enriched Air
- Tests performed according to Minimum Performance Standards (MPS) developed by IASFPWG

Halon Replacement: Engines and APU

Halon Replacement: Engines and APU

Halon Replacement: Engines and APU

ECOLOG

Extinguishing **Co**ncept **L**owering **O**zone depletion and **G**reen house effect

HALON^{1301} replacement for ENGINE and APU fire extinguishing systems

objective: to bring a concrete response to Halon replacement, by studying and developing a durable solution for an engine & APU fire extinguishing system which is friendly for men and environment.

Halon Replacement: Engines and APU

Current status

- Successfully tested at the FAA TC
- Since 2006, extension of the R&D project to a Feasibility Study for deployment/integration onto airplanes
- Feasibility Study includes system design performance for applicability onto A350XWB.

Future

- Extension of agent to other fire extinguishing applications (lavatory, handheld, cargo…)
- Research on a combined fire extinguishing system covering APU, engines and cargo: new concept

Presentation by: R. Deletain and Ch. Fabre – Airbus/France

Alternative to Oxygen on Board

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

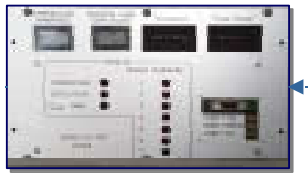
Solutions under Investigation:

OBOGS “On-Top” to refill on-board O2 Cylinders

Alternative to Oxygen on Board

ON TOP prototype - A/C Integration

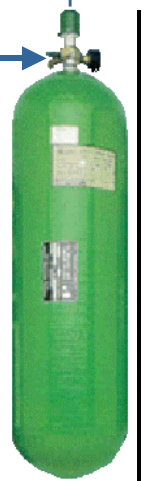
115V-3P supply (1 kW max)



28V supply (50W max)

HP line to be added (with non-return valve if needed)

HP Filling port



Cockpit System

PAX System

AIR LIQUIDE

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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

Thanks for your attention