

# Aircraft Fire

# Fire Safety

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## New combustion modes in aeronautical turbines

### Combustion

Propulsion

Turboreactor

Turboengine

helicopter

Electric power  
generation

Auxiliary power unit (APU)

Fuel cell (generation of H<sub>2</sub> from kerosene)

### Problematic

- Development of advanced combustion chambers
- Reduction of fuel consumption  
≈CO<sub>2</sub> ↓ and fuel cost, of  
pollutant emission (NO<sub>x</sub>, CO,  
Unburnt fuel particles, VOC..),  
of noise,...

FIRE SAFETY, EXPLOSION

### FIRE PROTECTION

In cabin  
and cargo

In engine

## Fire safety researches in aeronautics

- Great differences in comparison with **building fires**  
scenarios of fire development, detection, *flashover*, *back draft*,  
materials, structure behaviour, ...
- Risk is weak  
but not acceptable      { **Prevention**: avoid fire triggering  
   **Protection**: to minimize fire consequences

## Why the fire risk is increasing?

- Full electrical plane (cable fires, ...)
- Increasing of electronic systems onboard (TV, electronic games, internet)
- The increase of composite materials and magnesium alloys
- The use of halon is soon forbidden (fire development in hidden zones)
- Post-crash fire

## Fire prevention

- **Passive**: Non flammable and **non toxic** cabin material, hot surface insulation, double skin for **drainage**
- **Active**: forced ventilation, hot air leak detection

Evaporation and ignition



Flame stabilization processes



⇒ Hazardous flammable fluid quantity

## Fire protection

- **Passive**: firewalls (composite?), cargo liners,...
- **Active**: Extinction systems (water mist, inerting systems), smoke detection and propagation

Detection / extinguishing / inerting systems in hidden areas

## Conclusion

**Aircraft fires are specific fires, where the risk is not acceptable**

**Main criteria:** to satisfy the regulations and to manage a problem

## Needs of

- **Experimental studies:** better understanding of tests results
- **Flow Modeling** (evaporation, ignition, flame stabilization, fire development, flame-material heat transfer)

**High scientist potential, research networks already exist in Europe**

**Adaptation of the knowledge to specific aeronautics problem**

**A project was proposed at the two first calls of FP7**