



FSS - 2nd Public Workshop – 07/11/2018

P7 Mitigating Risks of FS&F

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Content



PROJECT #7

MITIGATING THE RISK OF FIRE, SMOKE & FUMES

TYPE OF PROJECT

Collaborative project

PROJECT MANAGER

ONERA

THEME

Building ultra-resilient vehicles

Introduction

Objectives & overview of P7 Project

Technical Results and achievements

Conclusions

Many fatalities in case of accidents are still fire caused/
related.

Emerging - New trends / new risks :

- More electric aircraft maybe increases risks of in-flight fires
- More organic composites in A/C design with very different behavior compared to metallic materials
- Limited knowledge wrt fire & heat behavior of composites materials

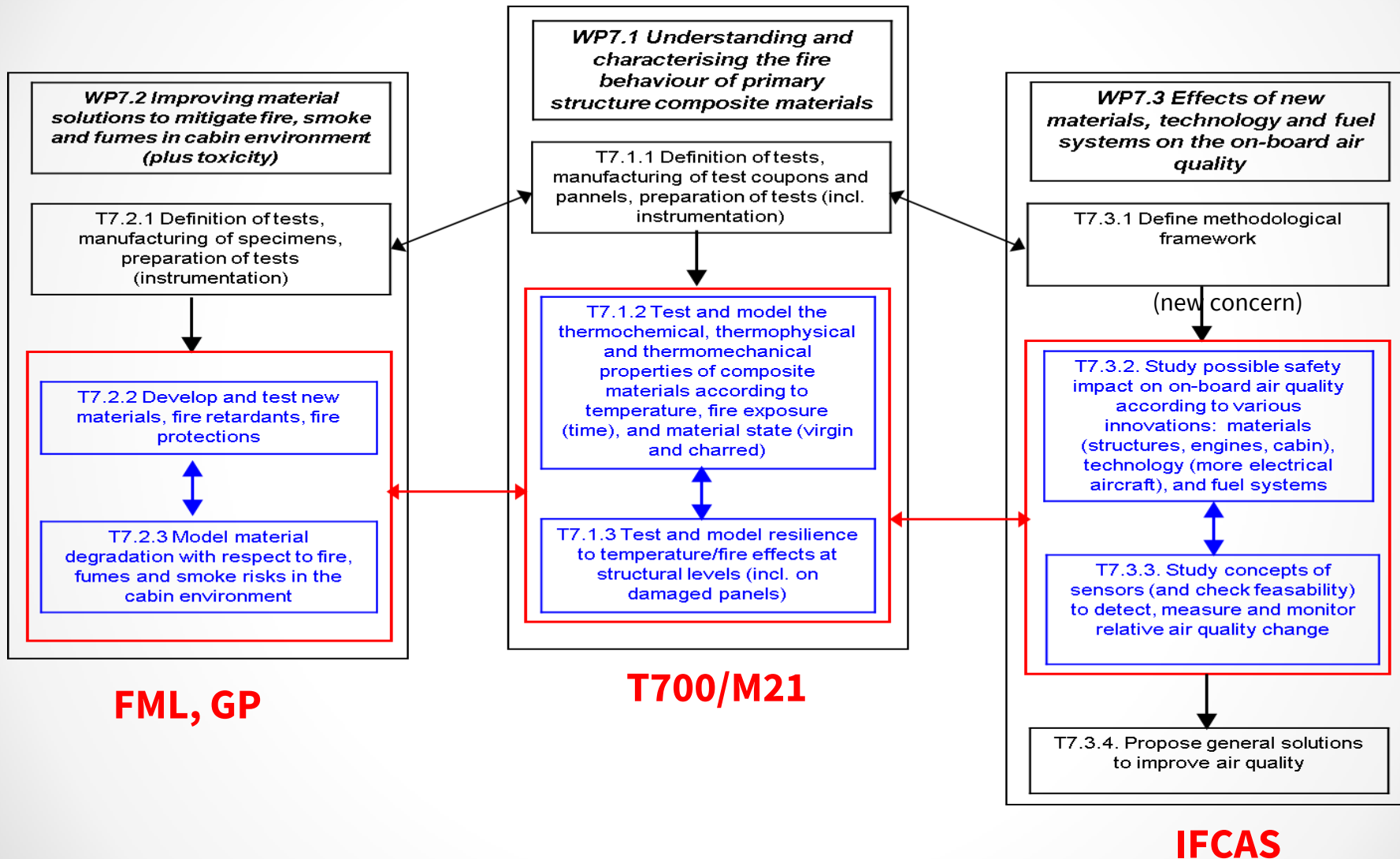
Objectives of P7 Project

To increase safety by ...

- O1 : **Improving knowledge** concerning OMC materials and structures behaviours vs fire
- O2 : **Assessing mechanical properties** of heating/burning/degraded materials
- O3 : **Evaluating the fire consequences** (incl. toxicity, smoke), proposing solutions to mitigate them
- O4 : **Sharing database** for future modelling purposes (expensive tests)
- O5 : **Establishing/giving recommendations**

Short Overview of the P7 Project

JRI Safety - P7 Mitigating risks of fire, smoke and fumes



36 Months (54 incl. EA) # 258 MM

WP7.1: Understanding and characterizing the fire behavior of primary structure composite materials (epoxy resins, standard CFRP)

ONERA, CRANFIELD, CEIIA, CASA, EMBRAER.

- Enhance **knowledge** concerning the fire behaviour and performance of **CFRP primary structure** materials
 - Produce a **comprehensive** experimental **database** on a **reference material (T700GC/M21)**
 - Confront experimental results to **state-of-the-art models** and simulation tools
- **Share the results** within the European research community

D7.4 Primary structure materials – Test Results (1st batch), 2016

D7.7 Primary structure materials – Test Results (2nd batch), 2017

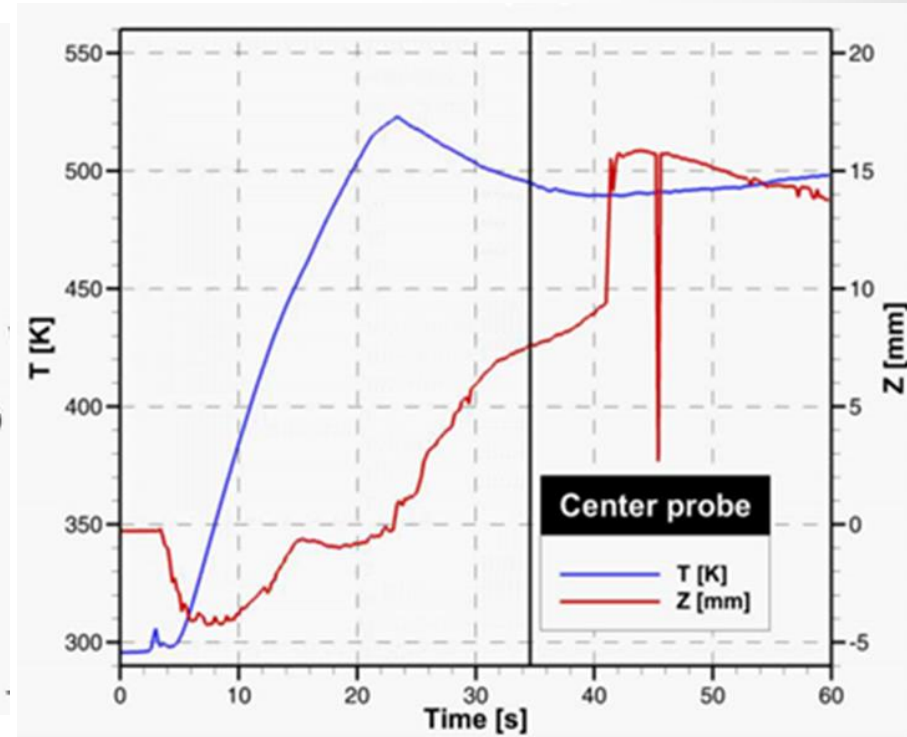
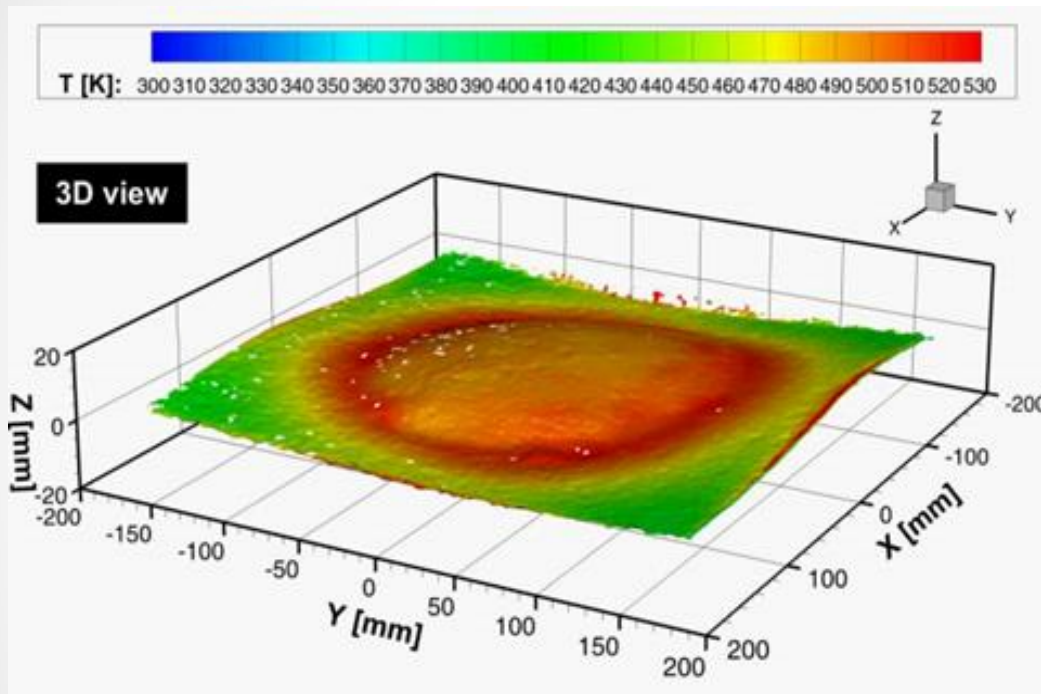
D7.9 Primary structures materials - Models for fire behavior, 2017

WP7.1: Produce a **comprehensive** experimental **database** on a reference material (T700GC/M21)



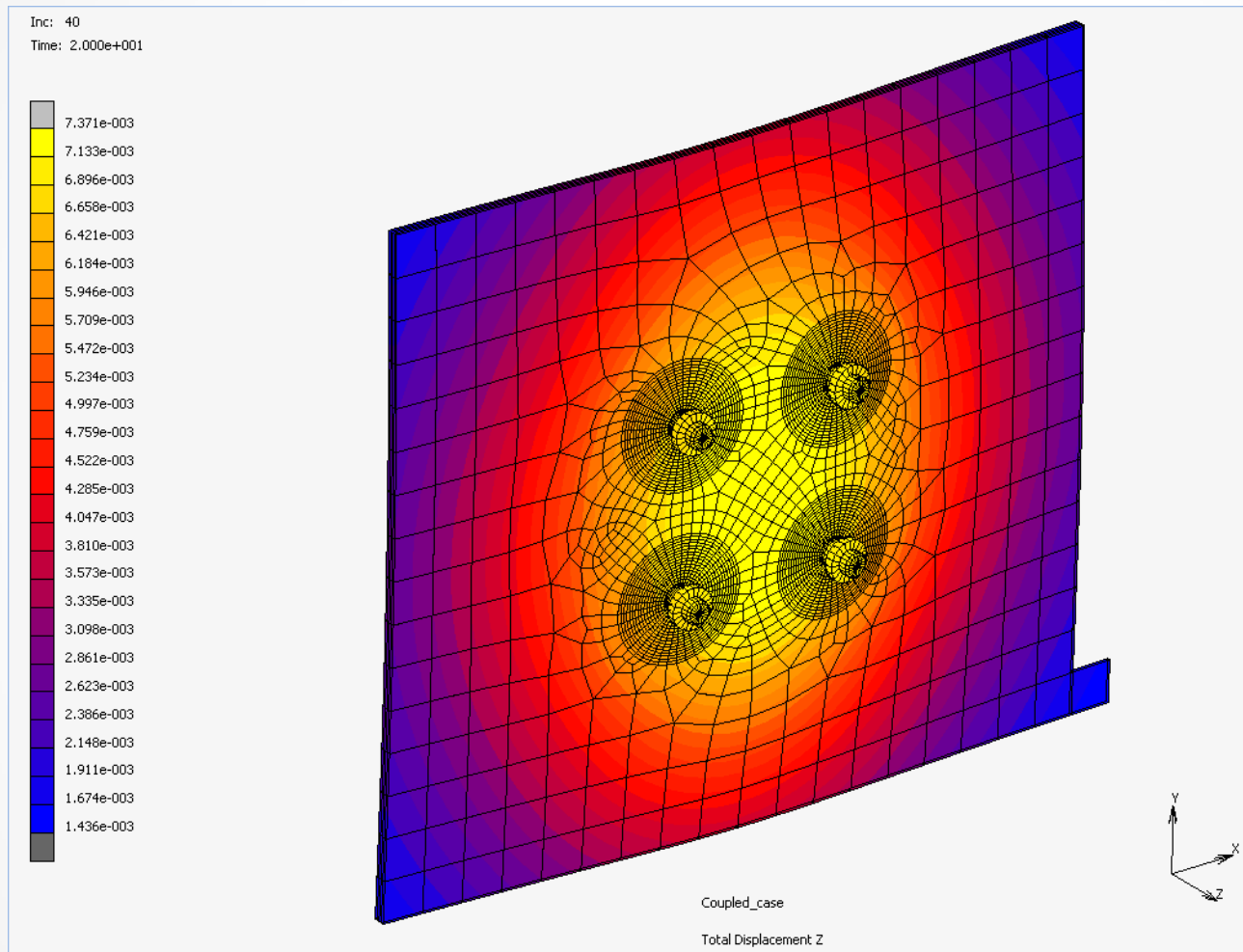
Use of ONERA **research facilities** to study fire exposure of composite plates

WP7.1: Increase experimental insight to improve understanding & codes validation (T700GC/M21)



3D reconstruction of temperature measurements on the back surface of a composite laminate exposed to Fire

WP7.1: Simulate thermomechanical structural response with state-of-the-art simulation tools (T700/M21)



Use of numerical simulation to **reduce** ISO 2685 structural **test loops** (AIRBUS DS)

WP7.2 : Improving material solutions to mitigate fire, smoke and fumes in cabin environment (plus toxicity)

DLR, VZLU, LEONARDO, CAA

- Enhance **passengers safety** through the development and assessment of **new material solutions**
 - **Develop** and characterize new materials and **combinations** of them for improved fire behaviour of **cabin** (and structural) **environment**
 - **Model** new materials **degradation** with respect to fire, fumes and smoke risks in the cabin environment
- **Assess solutions** at material and structural levels **wrt current industrial safety requirements** using **standard** experimental methods and state-of-the art simulation tools

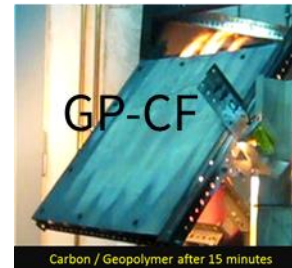
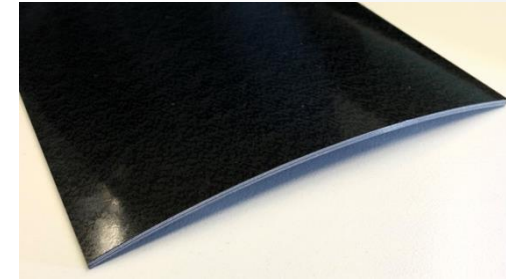
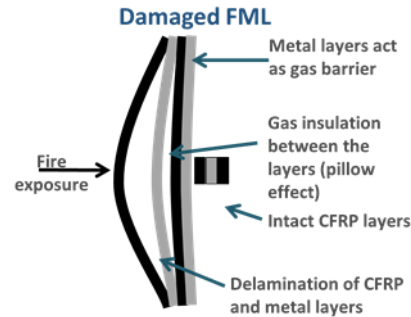
D7.5 New materials for fire protection in cabin environment – Test results 1st batch, 2016

D7.8 New materials for fire protection in cabin environment – Test results 2nd batch, 2018

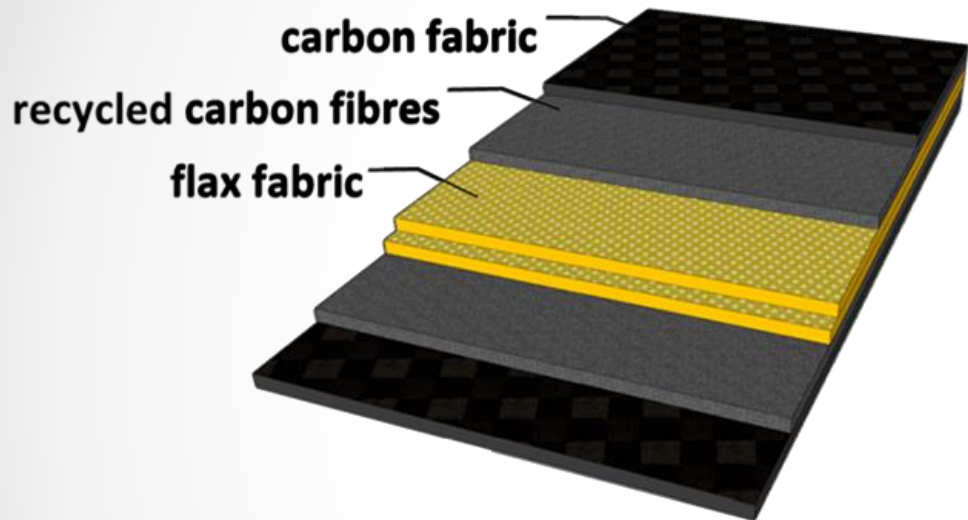
D7.10 Materials for cabin environment protection - Models for material degradation, 2018

WP7.2 : Screen new materials for cabin environment wrt their fire, smoke & fumes properties

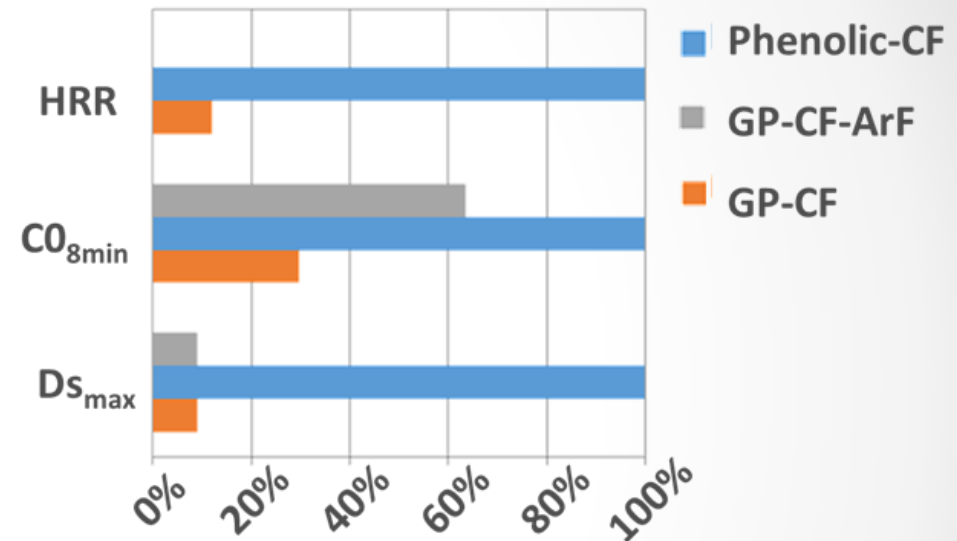
- Fiber metal laminates)
- Geopolymers (resin, foam)
- Natural fibers (cellulosic, linen)
- Recycled carbon fibers (rCF)



WP7.2 : Combine new material solutions e.g. into laminated composites



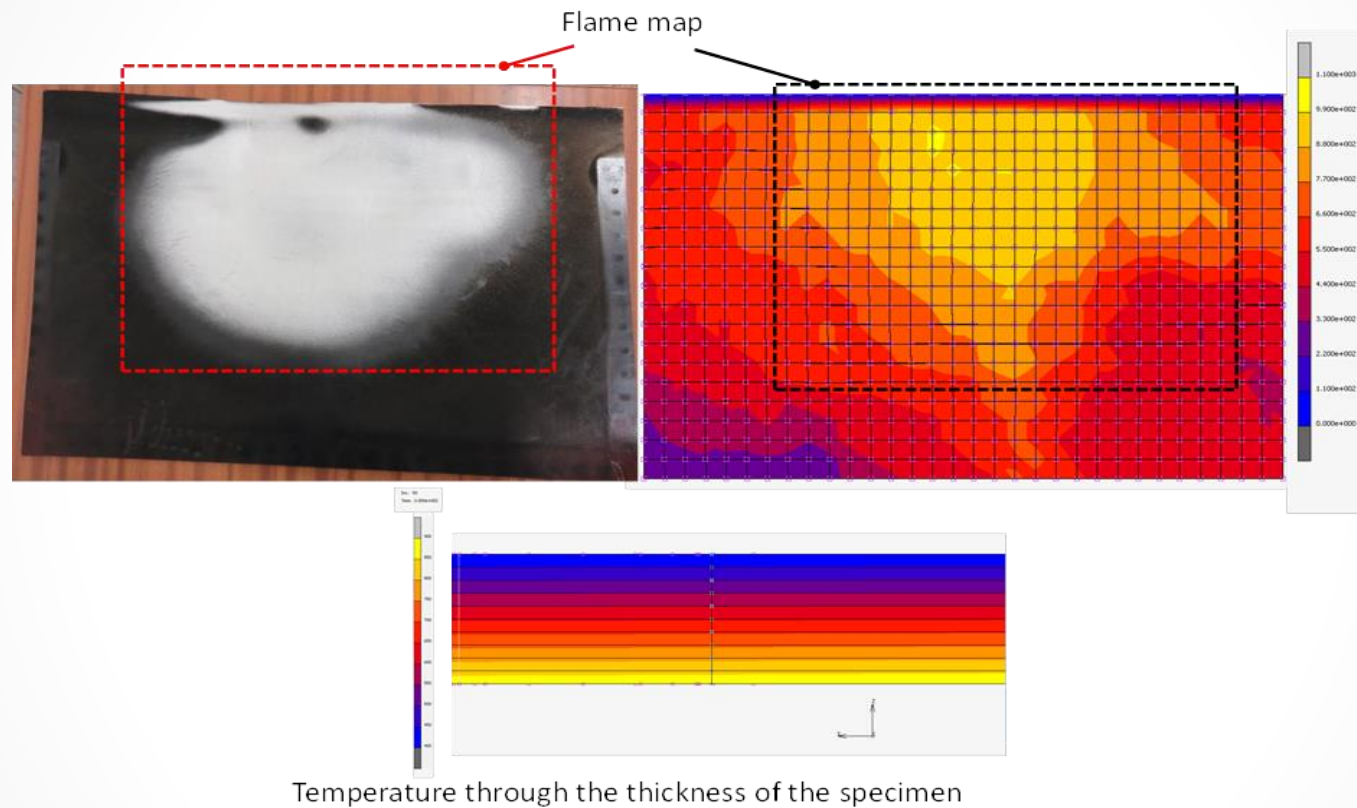
Layup of GP panel demonstrator - natural fibres and recycled carbon fibres applied



Improved FST behavior of GP laminates compared to common phenolic laminates

Design and **assess** new solutions for cabin environment

WP7.2 : Model new material solutions and assess state-of-the-art simulation tools



Comparison of GP / CFGP flame penetration tests with FlamePTM simulation (Leonardo)

WP7.3 : Effects of new materials, technology and fuel systems on the on-board air quality

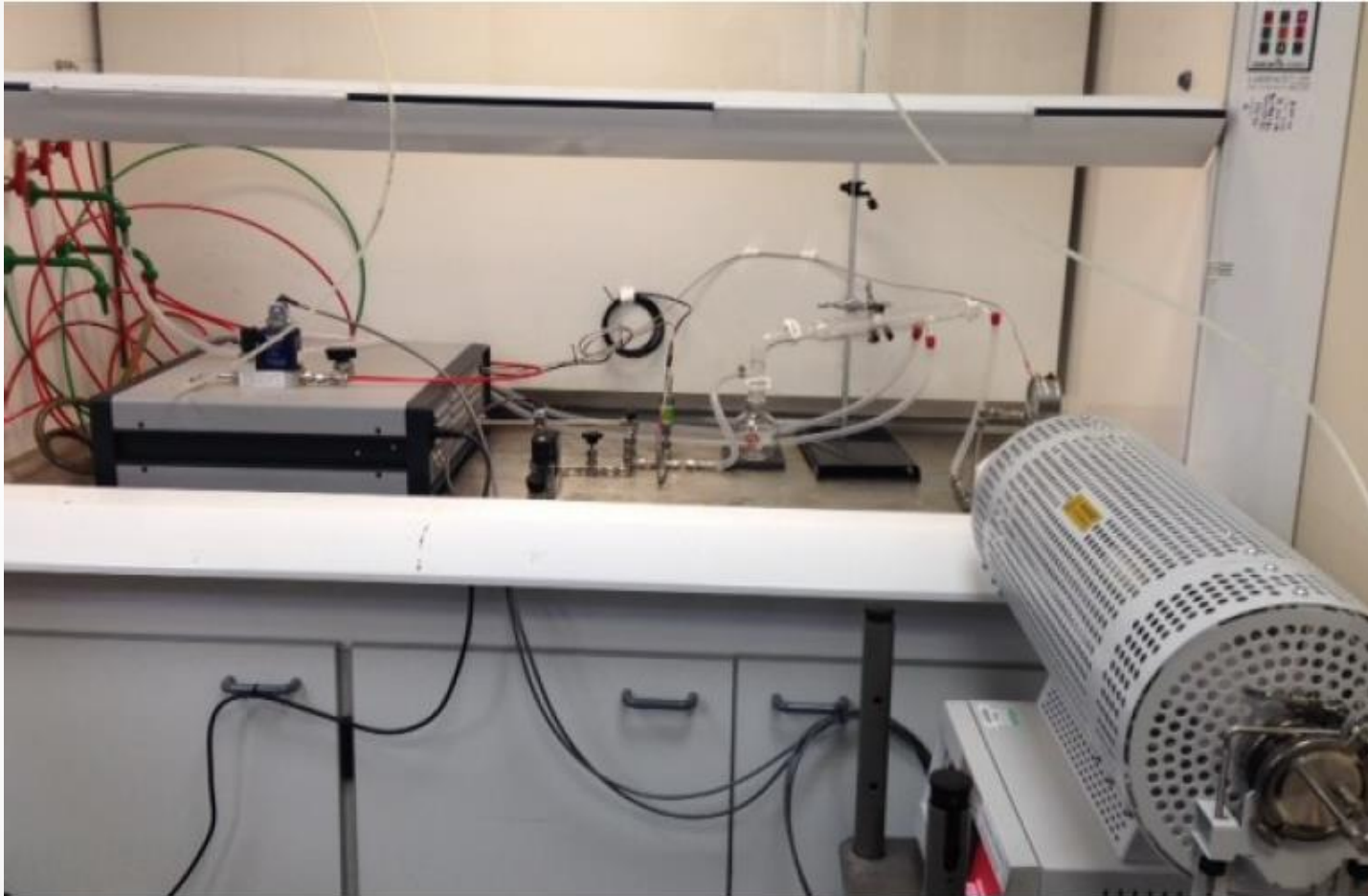
NLR, CEIIA, CRANFIELD, EMBRAER, CAA

- Investigate **opportunities** offered by technical developments **to study air quality**
 - Focussing on comfort/**health**/safety considerations
 - **Better understanding of emission sources** as basis for integrated solutions
 - Investigating **sensing technologies** (incl. COTS)
- Propose **Industrial framework** for monitoring of air quality

D7.6 On-board air quality: Literature review and methodological survey, 2016

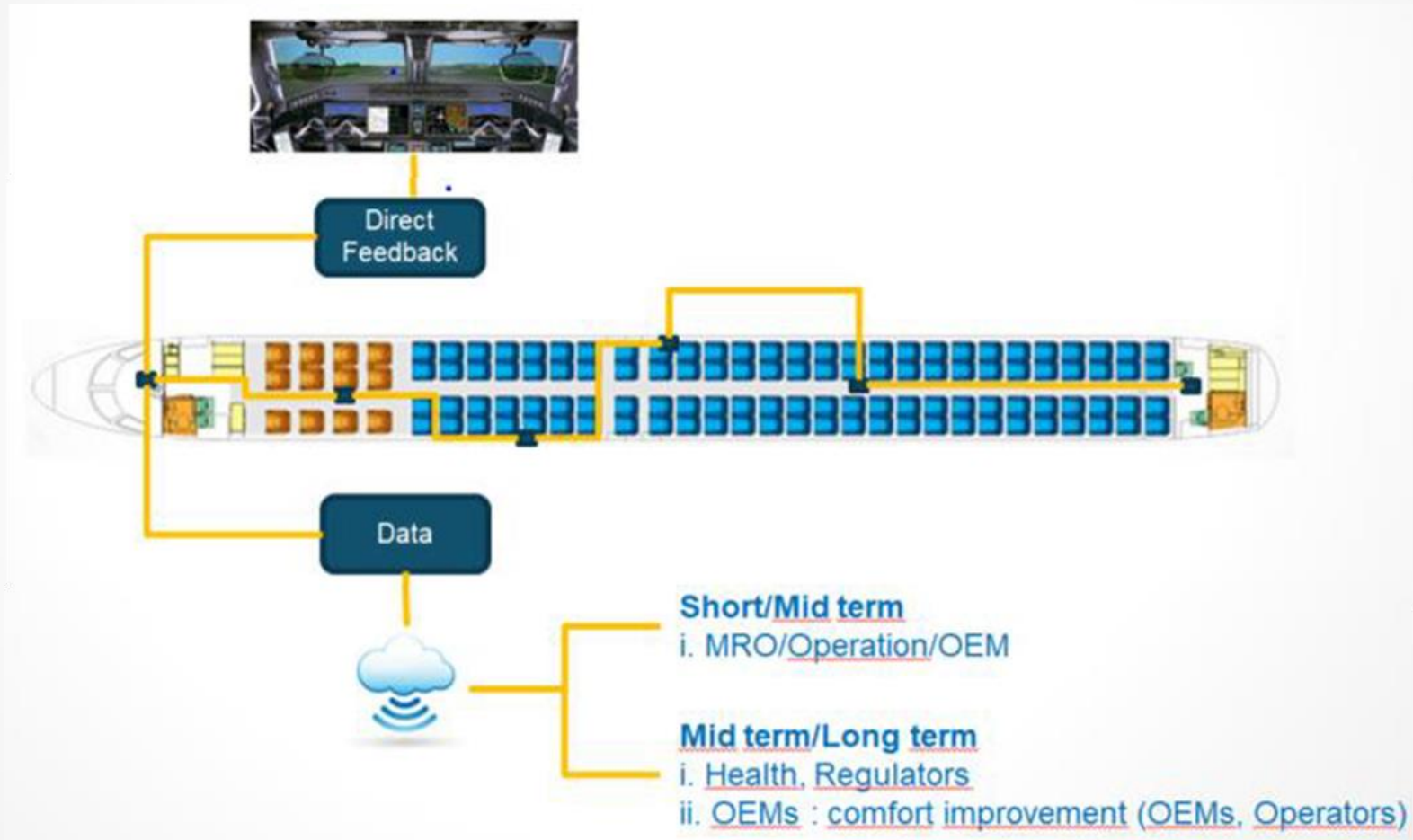
D7.14 On-board air quality – Final report on the effect of new materials, 2018

WP7.3 : Experimental protocol using COTS sensors for real and differed time air quality investigations



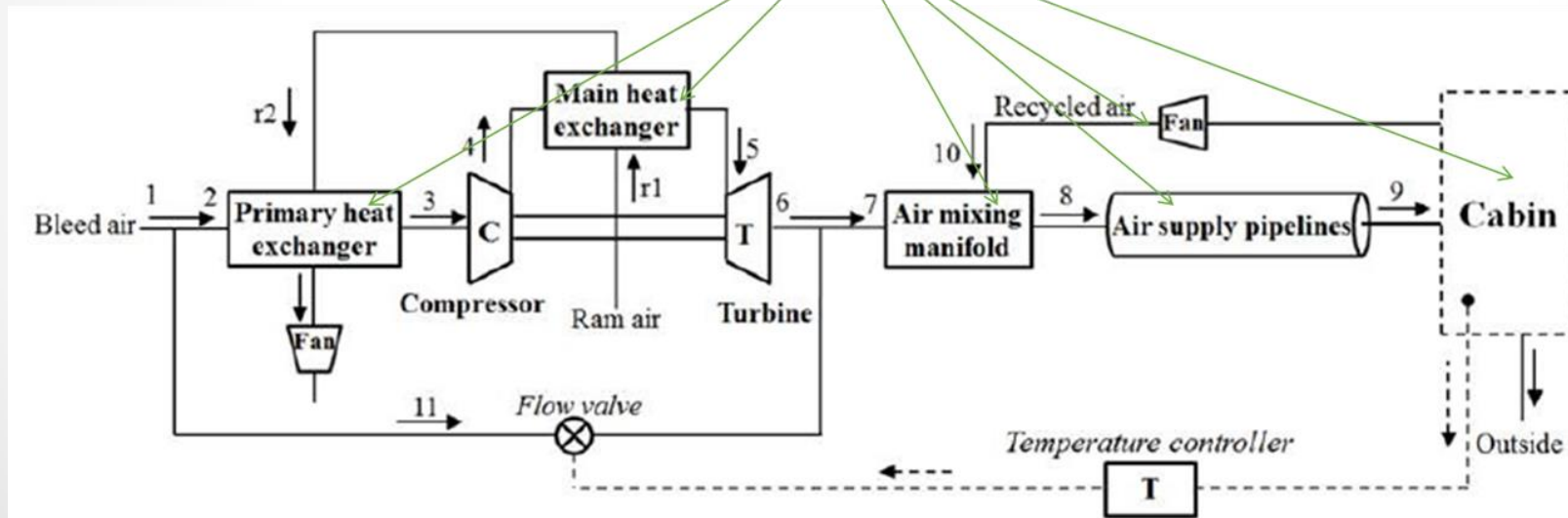
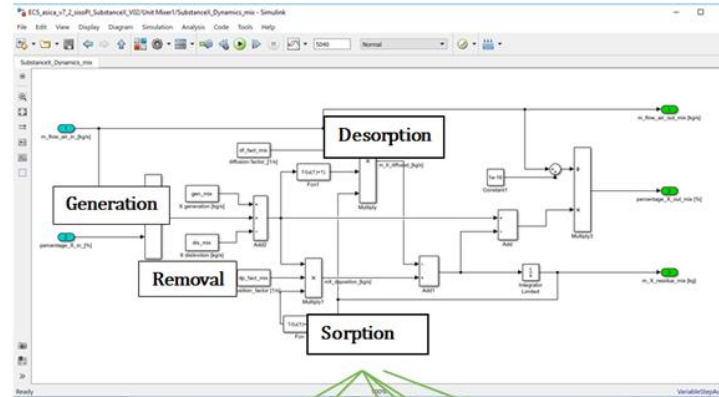
Proof of Concept: measurement of volatiles at normal or elevated temperatures

WP7.3: Frame a feasible pathway to address complex cabin air quality issues



Proposal of Industrial cabin air quality Framework based on Continuous Air quality Sensing (IFCAS)

WP7.3 : Modelling the composition & behaviour of cabin air



Verification of building blocks integration for ECS (environmental control systems) models

Understanding and characterization of the fire behaviour of primary structures composite materials

- Production of a comprehensive experimental database on a reference composite material (T700GC/M21)
- Confrontation of experimental results to state-of-the-art models and simulation tools

Development and assessment of new material solutions that mitigate risk of fire, smoke and fumes in the cabin environment

- Development and characterization of new materials and their combinations for improved fire behaviour of interior and structural materials
- Modelling of material degradation with respect to fire, fumes and smoke risks in the cabin environment

Cabin air quality: using new technological opportunities to address the growing interest in complex issues (comfort, health, safety)

- Industrial cabin air quality Framework based on Continuous Air quality Sensing (IFCAS): feasible pathway to novel applications
- Real-time experimental methodology of air quality at normal or elevated temperatures, for new material investigation and COTS sensor testing

Understanding and characterization of the fire behaviour of primary structures composite materials

Use models to predict primary structure fire response (stiffened curved panels), validate by structural tests ...

Development and assessment of new material solutions that mitigate risk of fire, smoke and fumes in the cabin environment

Increase TRL level of most promising hybrid solutions ...

Cabin air quality: using new technological opportunities to address the growing interest in complex issues (comfort, health, safety)

Further develop IFCAS, relate to Data4Safety project ...

Acknowledgments to EU and P7 team ...



Thank you for your attention !

Any Question *(to the WP leaders ;-)* ?



Consortium

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Centro Italiano Ricerche Aerospaziali
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<http://www.futuresky.eu/projects/safety>

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