

## PIROS

**PUBLIC-PRIVATE LABORATORY on Integrated design of multifunctional components for railway applications, associated to Realization Of Special “facilities” for test and qualifications of materials in fire conditions**

### IMAST members involved:

- **Alenia Aeronautica S.p.A.**
- **CIRA – Italian Aerospace Research Center**
- **CNR - Institute of Composite and Biomedical Materials (IMCB)**
- **Elasis S.C.p.A**
- **University of Naples “Federico II”** Department of Aerospace Engineering (**DPA**), Department of Engineering of Materials and Production (**DIMP**) and Department of Chemical Engineering (**DIC**).

### Partners:

- **Ansaldobreda S.p.A**
- **Campec S.c.a.r.l.**

In the frame of the PIROS project a multidisciplinary design methodology, integrating numerical models for predicting the thermo-mechanical, vibration-acoustical and fire degradation behavior has been developed.

A numerical and experimental laboratory for the fire analysis of materials / components was also realized, according to several international standards (ISO, ASTM, etc..), both small and intermediate scale, including also the combustion analysis of effluents.

### Achievements

The developed design methodology and experimental technologies have been validated by the realization of two demonstrators which are representative of significant sub-elements of vehicle system with the following properties:

1. Structural elements of **railway vehicles (floor and side panels)** in polymeric composite with multifunctional characteristics of fire resistance, structural and good acoustic properties.
  - **25% thickness reduction**
  - **18% weight reduction**
  - **39dB acoustic insulation**
  - **fire resistance under structural load: UNI EN 1363-1; REI 15**
  - **structural resistance: max mid-span deflection 3/1000**
2. Permanent-magnet **electric motor** with good electrical insulating properties at high temperatures and emission of noise.
  - **220°C thermal Class**
  - **21% motor size reduction**
  - **18% motor weight reduction**
  - **sound insulation ( $\alpha$ ): 0.8**
  - **Transmission Loss: 8% (38dB)**

