

### Thermoplastic composites and structures for transport

#### IMAST members involved:

- **Alenia Aeronautica S.p.A.**
- **CIRA S.c.p.A.** - Italian Aerospace Research Center
- **Elasis S.c.p.A.**
- **AnsaldoBreda S.p.A.**
- **CNR - Institute for Composite and Biomedical Materials (IMCB)**
- **University of Naples “Federico II”** Department of Engineering of Materials and Production (DIMP)

#### Partners:

- **CRF S.c.p.A** - FIAT Research Center
- **Alenia Aermacchi S.p.A.**
- **Consorzio CETMA**

In this project, **new structural thermoplastic composites and their manufacturing processes were developed** for the production of small items for transportation applications. Composite systems were realized by using a mix of computational analyses and experimental testing.

In the **Aeronautical** sector an **emergency door** for a Regional Aircraft ATR42 was manufactured by using

- press **thermoforming process** to realize **Windows Frame** and **structural door components** in PPS (Polyphenylene Sulfide)/Carbon Fibers
- **fiber placement** and **autoclave process** to realize **Skin** of emergency door in Polyether ether ketone (PEEK)/Carbon Fibers.

The developed emergency door meets aeronautical requirements of **hail impact test** and exhibits a **weight reduction of 39% with respect to aluminum solution.**

Moreover, induction and resistance welding have been studied to bond stiffeners to the skin.

In the **Automotive** sector an **all-thermoplastic composite tailgate was manufactured by using** Carbon Fiber Reinforced Thermoplastic (Polyamide, PA matrix). The **developed tailgate meets torsional stiffness automotive requirements** and exhibits a **weight reduction of 30%** with respect to steel solution and a **cost reduction of 20%** with respect to thermosetting prepreg.

In the **Railway** sector a **bumper and a body panel of a mass transit tram** were realized by using thermoplastic composite materials and thermoforming process. The **body panel** was manufactured by using E-glass fiber/Polyetherimide (PEI). Thermoplastic solution **meets fire safety requirements** and exhibits a **weight reduction of 48%** with respect to aluminum solution.

The developed **bumper**, manufactured by using glass fiber/PPS, **improve pedestrian safety** during vehicles travel and exhibits a **weight reduction of 34%** with respect to aluminum solution.

