



Łukasiewicz
Institute
of Aviation

Thermoplastic composites

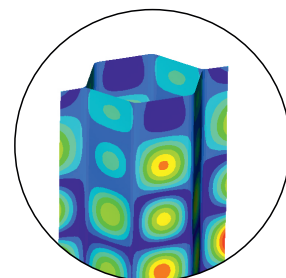
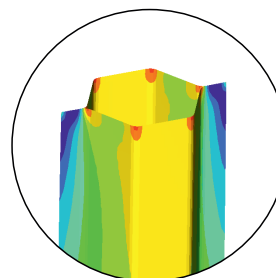
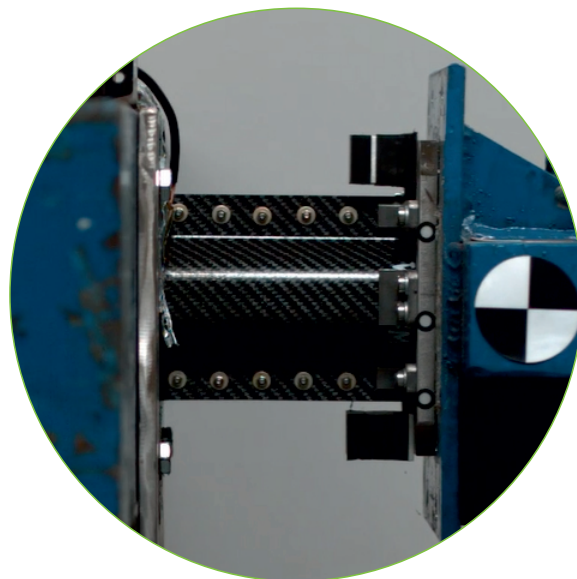
IMPACT ENERGY ABSORPTION TECHNOLOGY

CHARACTERISTICS

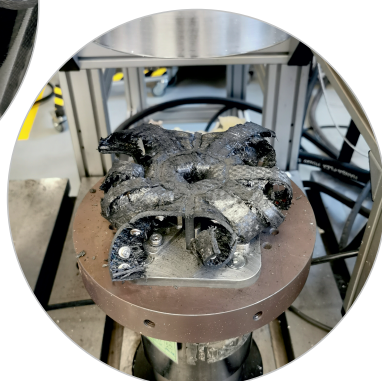
Łukasiewicz Research Network – Institute of Aviation has developed a technology for manufacturing impact energy absorbing components using thermoformed composite materials. The solution provides a stable energy absorption characteristic and enables the absorber design to be tailored to specific performance requirements.

KEY FEATURES

- Stable energy absorption characteristic without large peaks.
- Design based on numerical analyses and experimental testing.
- Possibility to tailor the absorber design to specific energy absorption requirements.
- Wide range of available glass and carbon fiber composites based on PA6, PC, PPS, PEI, and PEEK polymer matrices.
- Weight reduction compared to steel structures (up to 70%) and aluminum structures (up to 40%).
- High corrosion and chemical resistance.
- Flexible joining method: mechanical fastening, adhesive bonding, and welding.
- High-rate manufacturing using hydraulic press or rapid-heating oven processes.
- Recyclable material enabled by reprocessing the thermoplastic matrix.



Visualization of absorber structural analyses.



Composite energy-absorbing structure after Specific Energy Absorption (SEA) compression testing.

APPLICATIONS

Composite energy absorbers can be applied across various industries, particularly in the aerospace and automotive sectors.

- **Aircraft Seats (helicopters, GA aircrafts, UAVs, etc.).**

Enhanced passenger protection during crash landings or impacts.

- **Aircraft floors and landing gear.**

Reinforced with lightweight beams incorporating composite energy absorbers for improved impact energy dissipation.

- **Automotive front and back crash boxes.**



The Łukasiewicz Research Network – Institute of Aviation offers a wide range of specialized research, engineering services and products. We provide comprehensive solutions, ranging from dedicated analyses, simulations, engineering design, through the selection, testing and certification of materials and structures, to rapid prototyping and additive manufacturing.

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