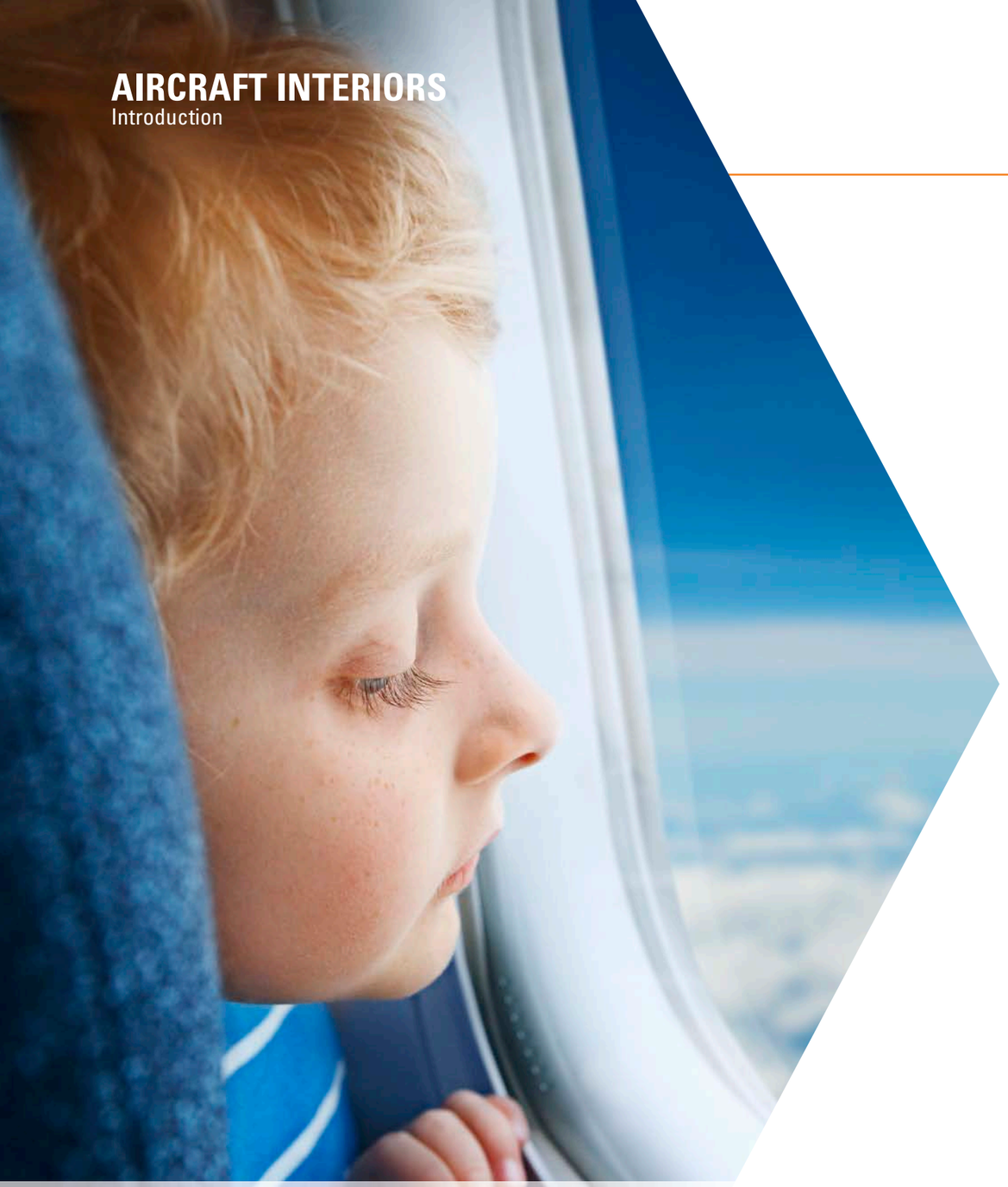
# AIRCRAFT INTERIORS

Advanced Composite Materials Selector Guide


TORAY

Toray Advanced Composites



## OUR OBJECTIVES

- Reduce weight
- Good durability
- Excellent FST performance
- Improve cost-effectiveness

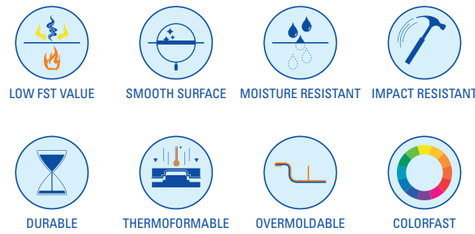
Cetex®

## SHAPING THE FUTURE OF COMMERCIAL AND CORPORATE AIRCRAFT INTERIOR COMPOSITES

**Toray Advanced Composites offers market-leading fire-retardant advanced composites for the aircraft interiors industry. Across the industry, experts use Toray lightweight composite materials in a wide variety of aerospace interior applications to maximize mechanical durability, eliminate secondary operations, and deliver optimal FST safety.**

The Toray Cetex® brand of differentiated reinforced thermoplastic laminates (RTL) and uni-directional (UD) tapes are used in a wide variety of aircraft interior applications, ranging from flooring and cabin seating, to stowage bins and galleys. Thermoplastic composites, reinforced with glass or carbon fibers provide:

- Extremely low FST and OSU properties (OSU < 25/25)
- High-quality surface finishes, substantially reducing the need for filling and sanding before application of decorative trims or sublimation printing
- Excellent moisture resistance leading to improved durability
- Very tough surfaces for improved impact and wear performance, enabling long-term durability
- Fast manufacturing cycles, providing press forming in minutes
- Part count reduction: Overmolding thermoplastics enables consolidation of parts and integration of mechanical fixtures
- Component coloring: An option to deliver “base color” for applications




Tailored to your application needs, Toray Cetex® laminates are consolidated as a single or multi-ply construction to maximize functionality. The RTL semi-finished product incorporates tailored fiber lay-ups, color, and a surface finish ready for service.

**Toray Cetex® TC1000** – Polyetherimide (PEI) resins provide optimum FST and OSU performance, coupled with superior chemical resistance and ideal secondary operation compatibility (welding, jointing, and painting).

**Toray Cetex® TC1100** – Polyphenylene Sulfide (PPS) provides outstanding solvent resistance for structural applications and ideal FST performance.

**Toray Cetex® TC1130** – PolyEtherSulphone (PESU) provides outstanding toughness and FST performance, and can be used to create monomaterial fully recyclable sandwich panels.

**Toray Cetex® TC1225** – Low-Melt Polyaryletherketone (LMPAEK™) resin, (part of PEEK family) offers outstanding structural and thermal performance and compatibility to PEEK for injection overmolding and welding.

Materials can be provided as prepreg rolls or consolidated laminates (RTL) with a format of 3.66 m x 1.22 m (12’ x 4’)

For more product information such as product data sheets, case studies, or technical papers, please use the following resources:

Search for the Toray TAC Product Selector
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**www.toray**tac.com/interiors
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> “...it’s an important seat – because you’re in it.”

*Donald Burr*

# AIRCRAFT INTERIORS
Product Applications

**STORAGE BINS** In an industry where weight and impact performance is paramount, Toray Cetex® is the ultimate solution. Exceptionally durable and lightweight for hardwearing bin surfaces and linings, we also offer an embedded color, eliminating secondary painting and finishing requirements.

DURABLE COLORFAST

**CABIN LININGS** Offering high impact resistance and exceptional durability, Toray Cetex® offers near perfect demold performance, maximizing efficiency for trim by minimizing post-processing (sand/sweep) operations.

SMOOTH SURFACE IMPACT RESISTANT

**DUCTING** For ultimate flow rate performance, Toray Cetex® thermoplastics offer the lowest porosity levels in the lightest materials available. Used in low-pressure systems across the world, our laminates are rolled and seam welded for maximum efficiency.

LIGHTWEIGHT WELDABLE

**CEILING LININGS** Lightweight and stiff, Toray Cetex® thermoplastics offer near-perfect demold performance, maximizing efficiency for large surfaces by minimizing post-processing (sand/sweep) operations.

LIGHTWEIGHT STIFF

**GALLEYS** High-volume and wear applications such as galleys and dividers demand resilient low-maintenance performance. With Toray Cetex® thermoplastics in-color and high moisture barrier technology, your workspace now has new possibilities.

LOW FST VALUE COLORFAST

**CARGO LININGS** With excellent FST performance and exceptional durability, Toray Cetex® thermoplastics offer near-perfect demold performance, maximizing efficiency for large surfaces by minimizing post-processing (sand/sweep) operations.

LOW FST VALUE IMPACT RESISTANT

**SERVICE CARTS** Toray Cetex® thermoplastics are the ultimate solution in an industry where weight and impact performance are paramount. Exceptionally durable and lightweight for hard-wearing cart surfaces, graphics can also be sublimated into the surface, eliminating secondary painting and finishing requirements.

IMPACT RESISTANT COLOR DECORATION

**SEAT STRUCTURES** Capable of fast manufacturing cycles, Toray Cetex® thermoplastics are ideal for high-volume parts such as seat pans, back panels, and arm rests. Materials can also be overmolded with features for process improvement and design integrity. Braided thermoplastic slit tapes are ideal for seat frames and tubular structures.

THERMOFORMING OVERMOLDABLE

**FLOORING** Manufactured in high volumes and prone to abuse, aircraft flooring demands exceptional resilience. Our hybrid system combines the best of lightweight thermoplastic and thermoset technology to deliver exceptional durability and longer service life, withstanding carpet changes without surface degradation.

CHEMICAL RESISTANT IMPACT RESISTANT

# AIRCRAFT INTERIORS
Product Overview

## THERMOSET

| | RESIN MATRIX | DRY $T_g$ ONSET | CURE TIME AND TEMPERATURE | KEY PRODUCT CHARACTERISTICS | OOA/VBO | DURABILITY/ TOUGHNESS | CHEMICAL RESISTANT | OEM QUALIFICATION |
|---|---|---|---|---|---|---|---|---|
| E721-FR | Epoxy | 120°C (248°F) | 60 minutes at 120°C (248°F) | ▸ Fire retardant under FAR 25.853 Appendix F - vertical burn material test criteria (ii)<br>▸ Core bondable | ○ | | ○ | |
| TC264-1 | Epoxy | 124°C (255°F) | 90 minutes at 118-127°C (245-260°F) | ▸ Flame retardancy applications e.g., ducting, decorative enclosures, and composite panel assemblies | ○ | ○ | ○ | |
| BT250E-1FR | Epoxy | 125°C (257°F) | 60 minutes at 121°C (250°F) | ▸ Self-adhesive to honeycomb and foam core<br>▸ Outstanding surface finish with OOA | ○ | ○ | | MIL-R-9300 (BT250E-1) |
| TC250 | Epoxy | 140°C (285°F) 180°C (356°F) with post cure | 130°C (265°F) 2 hours post cure 180°C (356°F) 2 hours | ▸ Aerospace flight qualified<br>▸ Toughened system<br>▸ Post curable for higher Tg<br>▸ Flame-retardant version available<br>▸ NCAMP database on fabric version | ○ | ○ | ○ | |

## TORAY CETEX® THERMOPLASTIC

| | RESIN MATRIX | PEAK $T_g$ | PROCESSING TEMPERATURE | KEY PRODUCT CHARACTERISTICS | SECONDARY OPERATIONS | DURABILITY/ TOUGHNESS | CHEMICAL RESISTANT | OEM QUALIFICATION |
|---|---|---|---|---|---|---|---|---|
| TC1000 Premium | PEI | 215°C (419°F) | 315°C (600°F) | ▸ Excellent FST performance, OSU (< 15/15)<br>▸ Qualified to OEM specifications | ○ | +<br>+ | +<br>+ | ABS 5036<br>ABS 5814 |
| TC1000 Design | PEI | 215°C (419°F) | 315°C (600°F) | ▸ Excellent FST performance, OSU (< 15/15)<br>▸ Ideal for customer qualified design programs<br>▸ Broader color palette and range of textures | ○ | +<br>+ | +<br>+ | |
| TC1100 | PPS | 90°C (194°F) $T_m$ 280°C (536°F) | 320°C (608°F) | ▸ Achieves 35/35 for OSU performance<br>▸ Outstanding solvent resistance for structural applications<br>▸ High impact resistance<br>▸ Ideal for beams and floor panels | | +<br>+ | +<br>+<br>+ | ABS 5045<br>ABS 5222<br>MEP 15-052 |
| TC1130 | PESU | 225°C (437°F) | 320–350°C (610–660°F) | ▸ Recyclable, also as monomaterial sandwich structure<br>▸ Excellent FST performance (OSU < 15/15)<br>▸ Achieves high surface finish<br>▸ Rapid processing with cycle times < 3 minutes | ○ | +<br>+ | +<br>+ | |
| TC1225 | LMPAEK™ | 147°C (297°F) $T_m$ 305°C (581°F) | 325-350°C (615-662°F) | ▸ Outstanding structural and thermal performance<br>▸ Compatibility to PEEK for injection overmolding and welding | ○ | +<br>+<br>+ | +<br>+<br>+ | |

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## TORAY MICROPLY™ FILM ADHESIVES

| | RESIN MATRIX | DRY $T_g$ ONSET | CURE TIME AND TEMPERATURE | KEY PRODUCT CHARACTERISTICS | OOA/VBO | DURABILITY/ TOUGHNESS | CHEMICAL RESISTANT | OEM QUALIFICATION |
|---|---|---|---|---|---|---|---|---|
| TC263 | Epoxy | 110°C (230°F) | 2 hours at 121°C (250°F) | ▸ High peel strength<br>▸ Ideal for metal or composite bonding | ○ | ○ | ○ | |

## NOMEX® HONEYCOMB* AEROSPACE GRADE

| | CONFIGURATIONS CELL SIZE & DENSITY | SHEET SIZE | KEY PRODUCT CHARACTERISTICS |
|---|---|---|---|
| ANA-3.2-29 | 3.2 mm 29 kg/m³ | 1250 x 2500 mm | ▸ Fire resistant and self-extinguishing to FAR 25.853<br>▸ High-temperature strength up to 180°C (356°F)<br>▸ High strength-to-weight ratio and easily formable to shape<br>▸ Nomex® paper sheets are coated and bonded together with a high-modulus phenolic resin |
| ANA-3.2-48 | 3.2 mm 48 kg/m³ | 1250 x 2500 mm | |
| ANA-3.2-64 | 3.2 mm 64 kg/m³ | 1220 x 2440 mm | |
| ANA-4.8-48(OX) | 4.8 mm 48 kg/m³ | 1250 x 2500 mm | |

*Nomex® is a registered trademark of E.I du Pont de Nemours and Company.*

* Cut to customer thickness specifications +/- 0.125 mm.
Offered from Langley Mill, UK. Additional grades can be sourced upon request, subject to minimum order quantities.

For additional honeycomb core grades please refer to our core materials on page 53 of our Aerospace Advanced Composite Materials Selector Guide.

# LOCATIONS AND CAPABILITIES

**SOLUTIONS**
- Thermoplastic composites
- Thermoplastic laminates
- Thermoset composites
- Carbon-free manufacturing
- Parts manufacture
- Sales office

**CERTIFICATIONS**
- ISO 9001:2015
- AS9100D
- ISO 14001:2015
- ISO 45001:2018


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