AIRCRAFT INTERIORS
Advanced Composite Materials Selector Guide

BEAUTY IS ON THE INSIDE

TORAY
Toray Advanced Composites
AIRCRAFT INTERIORS

Introduction

AIRI CRAFT INTERIORS

INTRODUCTION

Good durability Excellent FST performance

OUR OBJECTIVES

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

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.

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.

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Toray Cetex® TC925 FST – Polycarbonate (PC) resins provide a cost-effective solution that combines strong FST and OSU results with excellent impact performance.

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® TC1225 – Polyaryletherketone (PAEK) resin, (part of PEEK family) offers outstanding structural and thermal performance and compatibility to PEEK for injection overmolding and welding.

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
- Visit our online resource center for product data sheets and technical resources.

www.toraytac.com/interiors

“...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.

STORAGE BINS

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.

CABIN LININGS

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.

CARGO LININGS

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.

SERVICE CARTS

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 roller and seam welded for maximum efficiency.

DUCTING

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.

CEILING LININGS

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.

GALLEYS

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.

FLOORING

DURABLE COLORFAST
SMOOTH SURFACE IMPACT RESISTANT
LOW FST VALUE IMPACT RESISTANT
IMPACT RESISTANT COLOR DECORATION
LIGHTWEIGHT WELDABLE
LIGHTWEIGHT STIFF
LOW FST VALUE COLORFAST
THERMOFORMING OVERMOLDABLE
CHEMICAL RESISTANT 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.

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.

SEAT STRUCTURES
## THERMOSET

<table>
<thead>
<tr>
<th>Resin Matrix</th>
<th>PEAK Tₚ</th>
<th>Processing Temperature</th>
<th>Key Product Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>TC925 FST</td>
<td>PC</td>
<td>153°C (307°F)</td>
<td>&gt; Good FST performance, GSU (&lt; 25/25)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>280°C (536°F)</td>
<td>&gt; White color option for visual aspect</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>&gt; Value based solution</td>
</tr>
<tr>
<td>TC100 Premium</td>
<td>PEI</td>
<td>215°C (419°F)</td>
<td>&gt; Excellent FST performance, GSU (&lt; 15/15)</td>
</tr>
<tr>
<td>TC100 Design</td>
<td>PEI</td>
<td>215°C (419°F)</td>
<td>&gt; Qualified to OEM specifications</td>
</tr>
<tr>
<td>TC1100</td>
<td>PPS</td>
<td>90°C (194°F)</td>
<td>&gt; Achieves 35/25 for OSU performance</td>
</tr>
<tr>
<td></td>
<td></td>
<td>280°C (536°F)</td>
<td>&gt; Outstanding solvent resistance for structural applications</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>&gt; High impact resistance</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>&gt; Ideal for beams and floor panels</td>
</tr>
<tr>
<td>TC1225</td>
<td>PAEK</td>
<td>147°C (296°F)</td>
<td>&gt; Outstanding structural and thermal performance</td>
</tr>
<tr>
<td></td>
<td></td>
<td>305°C (581°F)</td>
<td>&gt; Compatibility to PEEK for injection overmolding and welding</td>
</tr>
</tbody>
</table>

### Key Product Characteristics
- OOA/VBO
- Durability/Toughness
- Chemical Resistance
- OEM Qualification

### Examples
- **E721-FR**
  - Epoxy
  - 120°C (248°F)
  - 60 minutes at 120°C (248°F)
  - Fire retardant under FAR 25.853 Appendix F
  - Core bondable
- **TC24-1**
  - 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
- **BT25E-1FR**
  - Epoxy
  - 125°C (257°F)
  - 60 minutes at 121°C (250°F)
  - Self-adhesive to honeycomb and foam core
  - Outstanding surface finish with OOA MIL-R-9300 (BT250E-1)

## THERMOPLASTIC

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<tr>
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<tr>
<td></td>
<td></td>
<td>315°C (600°F)</td>
<td>&gt; Ideal for customer qualified design programs</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>&gt; Broader color palette and range of textures</td>
</tr>
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<td>TC1100</td>
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<td>&gt; Achieves 35/25 for OSU performance</td>
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## TORAY MICROPLY™ FILM ADHESIVES

<table>
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<tbody>
<tr>
<td>TC283</td>
<td>Epoxy</td>
<td>110°C (230°F)</td>
<td>&gt; High peel strength</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2 hours at 121°C (250°F)</td>
<td>&gt; Ideal for metal or composite bonding</td>
</tr>
</tbody>
</table>

## NOMEX® HONEYCOMB® AEROSPACE GRADE

<table>
<thead>
<tr>
<th>Configurations</th>
<th>Cell Size &amp; Density</th>
<th>Sheet Size</th>
<th>Key Product Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANA-3.2-29</td>
<td>3.2 mm 29 kg/m²</td>
<td>1250 x 2500 mm</td>
<td>Fire resistant and self-extinguishing to FAR 25.853</td>
</tr>
<tr>
<td>ANA-3.2-48</td>
<td>3.2 mm 48 kg/m²</td>
<td>1250 x 2500 mm</td>
<td>High-temperature strength up to 180°C (356°F)</td>
</tr>
<tr>
<td>ANA-3.2-64</td>
<td>3.2 mm 64 kg/m²</td>
<td>1220 x 2440 mm</td>
<td>High strength-to-weight ratio and easily formable to shape</td>
</tr>
<tr>
<td>ANA-4.8-48(DX)</td>
<td>4.8 mm 48 kg/m²</td>
<td>1250 x 2500 mm</td>
<td>Nomex® paper sheets are coated and bonded together with a high-modulus phenolic resin</td>
</tr>
</tbody>
</table>

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.

## HYBRID PANEL SOLUTION

Toray Cetex® TC1000 can also be supplied as part of a hybrid panel solution (patent pending), benefiting from the surface properties of the Reinforced Thermoplastic Laminate (RTL) capping a traditional Toray thermoset epoxy prepreg/Nomex® honeycomb core structure.

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](www.toraytac.com/interiors)
[Go to our online resource center for case studies and technical papers](www.toraytac.com/interiors)
LOCATIONS AND CAPABILITIES

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

CERTIFICATIONS
- ISO 9001:2015
- AS9100D

Morgan Hill - California, United States
Fairfield - California, United States
Camarillo - California, United States
Nijverdal, The Netherlands
Toulouse, France
Beijing, China
Guangzhou, China
Taichung, Taiwan

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Nottingham, NG16 4BE, UK
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explore@toraytac-europe.com

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