AIP PRECISION MACHINING
A Michelin Group Company

ADVANCED AEROSPACE PLASTICS: CRITICAL SELECTION GUIDE FOR STRUCTURAL COMPONENTS

Aerospace plastics can reduce aircraft weight by 50% compared to metal parts, significantly improving fuel efficiency and operational costs.

This remarkable performance explains why the global aerospace plastics market reached $7.61 billion in 2023 and is projected to grow to $13.89 billion by 2030.

AUGUST / 2025

PRECISION MATTERS

AEROSPACE & DEFENSE NEWSLETTER

LATEST AEROSPACE POLYMER RESEARCH REVEALS SURPRISING MATERIAL PROPERTIES

Surprising material properties and their role in reshaping aerospace engineering.

WHY HIGH-PERFORMANCE POLYMERS ARE MAKING METAL OBSOLETE IN eVTOLs

Why leading eVTOL manufacturers are choosing advanced polymer solutions over metals.

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WE'RE NOT YOUR REGULAR MACHINISTS. WE CARE.

Here at AIP Precision Machining, we're not your conventional machine shop. We offer state-of-the-art technology, extensive material expertise through our skilled and caring professionals and the utmost quality while delivering quick turn-around times and cost-effective results.

Our team of highly-skilled engineers, machinists and programmers aren't just problem-solvers, they're precision-machining craftsmen—they'll believe in your project's potential as much as you do. We take engineering consultancy seriously and will give an honest recommendation that's best for the project over what's best for AIP's pockets.

We love what we do. With 40+ years of experience working with numerous different polymers and geometries, we're ready to take on any customer challenge and we take pride in discerning the most appropriate material and process solutions to meet your needs, and with our expertise machining polymers into complex geometries, we aim to exceed your expectations every time.

AIP PRECISION MACHINING
Unrivaled Expertise. Unparalleled Results.

John MacDonald
President

LATEST AEROSPACE POLYMER RESEARCH REVEALS SURPRISING MATERIAL PROPERTIES

As aerospace engineering pushes the boundaries of performance and sustainability, materials innovation plays a critical role. Among the most transformative trends is the rise of aerospace-grade polymers and fiber-reinforced composites, offering aircraft designers unprecedented combinations of strength, weight savings, and adaptability.

With over 14,000 additive manufacturing studies published in 2024 alone, and nations like the U.S., China, and Germany leading polymer-focused research, it's clear that polymer-based materials are defining the next era of flight.

From morphing wing structures to recyclable cabin components, this article explores how high-performance polymers are reshaping aerospace engineering—and what it means for material selection, machining, and regulatory compliance.

Thermoplastics vs. Thermosets in Aerospace

Aerospace composites fall into two primary categories: thermoplastics and thermosets. Thermosets dominate current applications—making up over 95% of aerospace prepregs. These materials cure into permanent, cross-linked structures with high heat and chemical resistance, commonly used in wing skins, bulkheads, and structural panels.

Thermoplastics, however, are gaining traction for several reasons:

- Remeltable and weldable, allowing design flexibility and in-field repairs
- High impact resistance and fatigue durability
- Faster processing with no required cure cycle

Common aerospace thermoplastics include PEEK, PEI (ULTEM™), and PEKK—each known for flame resistance, dimensional stability, and temperature

Choose the appropriate composite material for aerospace applications

Thermosets

Dominant, high resistance

Thermoplastics

Emerging, flexible and fast

performance. These materials are increasingly used in brackets, ducting, clips, and fasteners where weight and heat resistance are critical.

Fiber-Reinforced Polymers: Strength Without the Weight

Fiber-reinforced polymers (FRPs) have become the cornerstone of lightweight aerospace structures. Aircraft such as the Boeing 787 and Airbus A350 incorporate over 50% composites by weight, cutting fuel burn and enabling longer ranges.

The strength of these materials lies in their architecture. Continuous carbon or glass fibers, embedded in a polymer matrix, deliver structural stiffness while allowing tailored mechanical behavior. Autoclave curing remains the benchmark for producing void-free laminates, although energy demands and cycle times have led to growth in out-of-autoclave (OOA) processing and thermoforming.

For aerospace engineers, FRPs offer more than performance—they deliver freedom to shape aerodynamic surfaces and load-bearing structures without the density penalties of metals.

Smart and Sustainable: Next-Generation Polymer Systems

The future of aerospace materials isn't just about performance—it's about environmental responsibility and functional intelligence.

Biopolymers and Natural Fiber Composites

Materials derived from plant fibers and biodegradable resins are gaining interest for non-critical components. These natural fiber composites reduce reliance on petroleum-based materials and offer low-density alternatives for cabin interiors, panels, and packaging.

Challenges remain: moisture sensitivity, dimensional instability, and lower mechanical strength require surface treatments like acetylation or Duralin® processing. With continued R&D, these materials could become standard for disposable or semi-structural aerospace parts.

Recycled Aerospace Polymers

Recycled composites are emerging as viable materials for tooling, housings, and secondary structures. Tests show that recycled FRPs retain up to 80% of their mechanical properties near

Tg, and absorb up to 25% impact energy before failure—comparable to virgin materials in some conditions.

Post-industrial (PI) waste streams are more predictable and cleaner, making them ideal for recycling into durable aerospace components without sacrificing performance integrity.

Function-Driven Design: Polymers in Action

Jet Engine Components

Polymers like PEEK and epoxy-carbon composites are helping reduce jet engine weight significantly. The CFM LEAP engine is a standout example, using advanced composites to shed 450 kg from its predecessor—improving fuel efficiency by 15–20%.

Polyimides and thermoset resins also serve in heat shields, abradable linings, and containment structures, combining thermal stability with design flexibility.

Morphing Wings with Shape Memory Polymers (SMPs)

Smart materials like SMPs are unlocking adaptive wing technology. When heated above their glass transition temperature (Tg), these polymers soften and change shape—then revert when cooled. Their application in morphing wing skins allows real-time aerodynamic adjustments, reducing drag and improving control in unmanned and next-generation aircraft.

Carbon fiber reinforcement enhances load capacity, while precise fiber distribution preserves shape-changing capabilities.

Cabin Interiors: Fire Resistance Meets Weight Reduction

Interior components like seats, partitions, and bins must meet FAA vertical burn standards while contributing as little mass as possible. Thermoplastics like PEI and flame-retardant PA6 deliver this balance. They also offer recyclability—an essential attribute as airlines replace interiors multiple times during an aircraft's life cycle.

Machining and Manufacturing Considerations

Polymers require specialized machining techniques to maintain dimensional integrity, especially for aerospace tolerances.

- CNC milling and turning with carbide or diamond tools prevent fiber pull-out in composites
- Post-machining heat treatment relieves internal stress in high-performance polymers
- Moisture control (pre-drying) is critical for materials like PEEK and PA to prevent hydrolysis

AIP Precision Machining specializes in tight-tolerance polymer components with ISO 9001 and AS9100 certifications, leveraging cleanroom environments and controlled thermal processes to deliver aerospace-ready parts.

Scaling Up: Additive and Hybrid Manufacturing Challenges

Additive manufacturing (AM) allows for complex geometries and part consolidation—but scaling remains difficult. Issues include:

- Thermal gradients causing warping
- Non-uniform material properties across layers
- Long qualification timelines for flight tification

Hybrid strategies—such as machining printed components to final dimensions—are emerging as practical solutions. Aerospace OEMs are also exploring porous polymer structures for improved heat dissipation and weight reduction.

Conclusion: Materials That Propel the Future

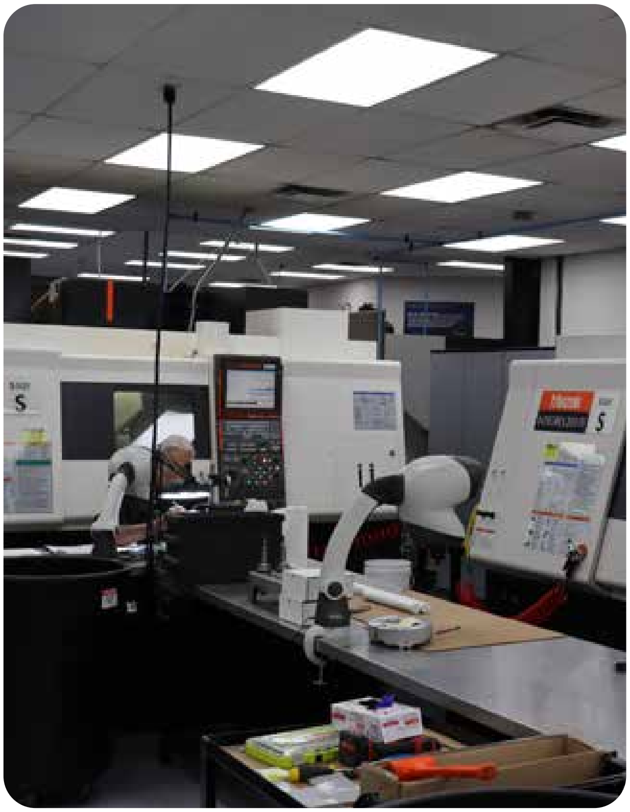
Aerospace polymers are no longer niche materials—they are strategic enablers of next-gen aircraft performance. From lighter fuselages and intelligent wing skins to sustainable cabin interiors, polymers offer unmatched design and performance flexibility.

As additive manufacturing matures and regulatory frameworks adapt, aerospace-grade polymers will continue expanding into critical roles—built for altitude, precision, and a more sustainable aviation future.

Read the full article here:

AIP PRECISION

STATE-OF-THE-ART MACHINERY FOR PRECISION MACHINING



ADVANCED AEROSPACE PLASTICS: CRITICAL SELECTION GUIDE FOR STRUCTURAL COMPONENTS

The aerospace industry has long pursued innovations that push the limits of strength, weight reduction, and thermal resilience. Increasingly, these demands are being met not through metals, but through high-performance polymer materials. Advanced aerospace plastics like PEEK, Torlon®, Vespel®, and Ultem® are not only displacing aluminum and steel in structural and mechanical parts—they are redefining performance standards in commercial and defense aircraft systems.

In 2023, the global aerospace plastics market was valued at $7.61 billion. By 2030, it is projected to reach $13.89 billion—a clear signal that OEMs and Tier 1 suppliers are turning to lightweight, high-strength, and chemically inert plastics for critical components across airframes, propulsion systems, and cabin interiors.

Why Aerospace Plastics Are Gaining Ground

At the heart of this shift is weight reduction. Replacing metal parts with high-performance plastics can cut component weight by up to 50–60%, which translates to significant improvements in fuel efficiency, payload capacity, and emissions. Equally important, engineered polymers offer reduced maintenance cycles—up to 20% lower—due to their resistance to corrosion, fatigue, and chemical degradation.

But the value proposition extends beyond mechanical performance. These polymers are also thermally and chemically resilient, electrically insulative, and in many cases, compliant with FAA, DoD, FDA, and NSF regulatory standards. As aerospace platforms become more electrified, thermally efficient, and modular, these materials are playing a vital role in enabling those transitions.

Performance Criteria: What Aerospace Demands of Plastics

Selecting the optimal material for aerospace components involves a detailed analysis of operating conditions, service life, and regulatory exposure. AIP routinely supports clients through this process, offering Design for Manufacturability (DFM) guidance and precision machining across 100+ plastic materials. For aerospace applications, the top selection criteria include:

Thermal Load Resistance

Jet engine environments, electrical housings, and control surfaces are routinely exposed to high and fluctuating temperatures. Materials like PEEK can operate continuously at 500°F (260°C), while CELAZOLE® PBI offers short-term stability near 750°F (399°C). Torlon® PAI retains mechanical strength at 500°F and offers superior impact resistance at cryogenic temperatures, making it ideal for thermal isolators and fasteners.

Understanding glass transition temperature (Tg) and melting point (Tm) is critical. Thermosets, in particular, maintain structural integrity without melting, providing a distinct advantage over thermoplastics in pressure- and heat-intensive environments.

	Max Operating Temperature	Key Feature
PEEK	500°F (260°C)	Continuous operation at high temperatures
CELAZOLE® PBI	750°F (399°C)	Short-term stability at extreme heat
Torlon® PAI	500°F	Cryogenic impact resistance

Chemical Compatibility

From fuel tanks and hydraulic systems to de-icing fluid lines, aerospace components are frequently exposed to aggressive chemicals. Polymers like Polysulfone and PEEK resist jet fuels, hydraulic oils, steam, and radiation. Low moisture absorption is another key factor—materials such as PEEK, PPS, and PAI exhibit <0.5% water uptake, preserving dimensional stability in high-humidity or submerged environments.

Mechanical and Fatigue Strength

Aircraft experience constant mechanical loading: vibration, pressure cycling, and impact. Aerospace plastics must offer high tensile strength, stiffness, and long-term fatigue resistance. Composites and reinforced thermoplastics (e.g., carbon- or glass-filled PEEK) extend the performance window, with fatigue limits in the range of 25–30% of ultimate tensile strength. For collision-critical components, impact toughness is a non-negotiable requirement.

Comparing Aerospace-Grade Polymers

Each high-performance plastic brings a unique balance of mechanical, thermal, and chemical properties. Here's how the most common aerospace materials compare in real-world applications:

PEEK (Polyetheretherketone)

- Continuous-use temp: 480–500°F
- Tg: 143°C | Tm: 343°C
- Advantages: High strength-to-weight ratio, excellent chemical resistance, radar transparency, low smoke/toxicity
- Typical applications: Flight control components, engine seals, cable insulation, electrical connectors

PEEK's resistance to fuels, hydraulic fluids, and steam make it invaluable in propulsion and fuel management systems. In stealth applications,

its radar-absorbent properties support electromagnetic interference shielding.

Vespel® (Polyimide)

- Operates up to 500°F continuously, 900°F short-term
- Tg: ~360°C (varies by grade)
- Advantages: Low outgassing, extreme heat tolerance, self-lubricating
- Typical applications: Bearings, bushings, high-vacuum seals, thermal insulators

Vespel® is a go-to material in jet engines and vacuum environments where metals and other plastics fail due to outgassing or thermal creep.

Torlon® (Polyamide-Imide)

- Continuous-use temp: 500°F
- Tg: 280°C | Tm: Not defined (amorphous
- Advantages: High compressive strength, wear resistance, electrical insulation
- Typical applications: Blocker door bushings, fuel system connectors, EMI-transparent fasteners

Torlon outperforms PEEK and Vespel® under combined pressure and velocity conditions. It is especially well-suited for rotating or load-bearing parts that must operate across a wide thermal gradient.

Ultem® (Polyetherimide / PEI)

- Continuous-use temp: ~340°F
- Tg: 217°C
- Advantages: Flame resistance, FDA/NSF compliance, thermoformability
- Typical applications: Cabin latches, food service units, electrical insulators, seat components

Used widely in commercial aircraft interiors, Ultem® meets strict FAA flame-smoke-toxicity requirements while offering high impact strength and processability.

Application Mapping: Where These Materials Excel

- **PEEK** is used in high-load, high-temperature applications like engine components, convoluted tubing, and thrust washers
- **Torlon®** excels in powertrain assemblies, fuel connectors, and critical fastening systems in fighter jets.
- **Vespel®** is selected for turbine seals, high-temperature bearings, and vacuum-insulated components.
- **Ultem®** is ideal for passenger-facing parts in cabins, including food equipment and oxygen system housings.

Each material offers proven performance, but only when it is precision-machined to exact specifications. AIP's ability to hold tolerances down to ±0.002 mm ensures reliability under the most demanding conditions.

Manufacturing and Processing Considerations

The performance of aerospace plastics is tightly linked to their processing methods.

- CNC Machining: Offers tight tolerances, complex geometries, and no mold costs—ideal

for low-to-medium volume production.

- Injection Molding: Suitable for high-volume components with consistent design requirements.
- Post-Curing (Torlon®): Required to achieve full mechanical properties; untreated parts are brittle and wear-prone.
- Thermoforming (Ultem®): Enables rapid, cost-effective production of lightweight structural elements with high design freedom.

AIP's facility is exclusively dedicated to polymer machining, eliminating the risk of metal contamination—a critical factor in aerospace and medical compliance.

Future Trends: Composites, Additive, and Sustainability

Innovation in aerospace plastics is accelerating across three key fronts:

- Additive Manufacturing: Using technologies like FDM with PEEK and Ultem®, aerospace OEMs are reducing lead times by up to 80% while enabling rapid iteration.
- Composite Reinforcement: Glass- and carbon-fiber reinforced thermoplastics are now being used for primary structures, offering performance equal to metals at half the weight.
- Sustainability: Thermoplastic composites enable more energy-efficient processing and recyclability. Programs like Airbus' PAMELA project and the HELACS initiative aim to increase aircraft recyclability to over 90%.

Partnering for Performance

The transition to high-performance polymers requires deep material knowledge, regulatory understanding, and ultra-precise manufacturing. At AIP Precision Machining, we deliver all three. Our AS9100- and ISO 13485-certified facility is purpose-built for mission-critical applications across aerospace, defense, and beyond.

From prototyping to full-scale production, we support every stage of the product lifecycle—starting with material selection and DFM, through final machining and inspection. Whether you're replacing legacy metal components or developing new aerospace platforms, our team is ready to deliver high-performance plastic solutions that meet your exact specifications.

Conclusion

Advanced aerospace plastics are reshaping aircraft design by delivering substantial weight savings, thermal stability, and mechanical performance. By replacing metal components, these polymers reduce structural weight by up to 50%, improving fuel efficiency and lowering emissions and operational costs.

Material selection demands careful consideration of thermal and chemical resistance. PEEK withstands up to 500°F, while CELAZOLE remains stable at 750°F. These materials must also endure exposure to fuels and fluids, along with the mechanical stress of flight cycles.

Each polymer serves a unique purpose—PEEK in control systems, Torlon® in high-stress powertrain parts, and Ultem® in flame-retardant cabin interiors. Precision manufacturing methods like CNC machining ensure tight tolerances, while processes like injection molding suit higher production volumes. Post-curing, especially for Torlon®, must be integrated into planning.

Looking ahead, additive manufacturing and fiber reinforcement will drive further weight reductions and production efficiency. Although sustainability challenges persist, circular programs like Airbus PAMELA signal progress.

With the aerospace plastics market projected to grow from $7.61 billion in 2023 to $13.89 billion by 2030, these materials will continue to enable the next generation of efficient, high-performance aircraft.

Contact us to explore engineered polymer solutions for aerospace systems requiring thermal resistance, dimensional control, and lightweight performance.

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CASE STUDY

SITUATION

Fuel costs are the largest operating expense for aircraft, making weight reduction essential for improving fuel efficiency. Despite advancements in engine technology and aerodynamics, reducing aircraft weight remains a key driver for cost savings. The American Society of Mechanical Engineers estimates that converting to plastic parts by replacing aluminum with plastics, leading to %60 in costs, with weight savings of up to %50 to %25 can save .significant energy savings

CHALLENGE

Polymer and composite materials offer substantial weight reduction potential but come with challenges. Aircraft delivery delays are often due to the complexity of manufacturing custom polymer components quickly. Traditional methods like injection molding are costly and time-consuming, while additive manufacturing faces material and quality limitations.

SOLUTION

AIP Precision Machining offers a robust solution with machined polymer and composite components made from aerospace-grade materials such as PEEK 450G, ULTEM™, TORLON®, and RADEL. With over 40+ years of expertise, AIP specifies readily available and certified materials for applications that need to meet or exceed FAA approval for stringent aircraft interior Flame, Smoke, and Toxicity safety requirements (FAR 25.853 & OSU 65/65).

Machined polymer components are replacing metal parts in various aircraft sections, including electrical components, cargo areas, galleys, lavatories, wiring harnesses, cockpits, passenger seating, fuel systems, flight control wear components, and engines. This transition results in significant weight reduction, lower operating costs, and extended aircraft range.


DOOSAN

WHY HIGH-PERFORMANCE POLYMERS ARE MAKING METAL OBSOLETE IN EVTOL AIRCRAFT DESIGN

The electric Vertical Take-Off and Landing (eVTOL) market is reshaping the future of aerospace transportation. With over 250 aircraft programs under development globally and market projections soaring from $8.5 billion in 2021 to $30.8 billion by 2030, the race to design lightweight, efficient, and certifiable aircraft is well underway.

At the core of this innovation is material selection. To meet the rigorous demands of vertical flight and urban air mobility, manufacturers are increasingly turning away from traditional metals and embracing high-performance polymers. These materials are not only 40–70% lighter than metal counterparts—they often exceed metals in strength-to-weight ratio, fatigue resistance, and design flexibility.

As a precision machining partner for mission-critical polymer components, AIP Precision Machining supports leading aerospace innovators with application-specific solutions engineered for rotor systems, avionics, battery housings, and structural supports in next-generation aircraft.

Weight Reduction and Its Impact on Battery Life and Flight Range

Urban air vehicles face unique operational challenges. Unlike conventional aircraft, their weight does not decrease during flight (due to fuel burn-off), making lightweight construction essential for maximizing battery range and payload. In parallel, these aircraft operate in urban environments where noise, emissions, and compact form factors are tightly constrained.

Advanced polymers such as TORLON® (PAI), ULTEM™ (PEI), VESPEL® (PI), and PEEK are answering these challenges with impressive performance metrics:

- Up to 5x the fatigue strength of aluminum
- Noise reductions of up to 50% in cabin systems
- Continuous use at elevated temperatures (500°F / 260°C+)
- Corrosion and chemical resistance without coatings
- Reinforced variants deliver specific strength surpassing titanium

Structural and Thermal Performance: Application-Specific Advantages

TORLON® in Rotor Systems and High-Stress Components

TORLON® offers tensile strengths between 100–180 MPa and maintains mechanical integrity at 500°F (260°C), far beyond the thermal limits of 6061 aluminum (which begins to degrade above 170°C). These characteristics make TORLON® ideal for dynamic applications such as rotor hubs, control linkages, and bearing surfaces that endure continuous cyclic loading during vertical takeoffs and landings.

Unlike metals that fatigue or embrittle over time, TORLON® maintains toughness under cryogenic and elevated temperatures alike—a valuable asset in aerospace environments where thermal cycling is constant.

ULTEM™ for High-Altitude and Electrified Systems
ULTEM™ (PEI) is engineered for thermal and dimensional stability. With a glass transition temperature of 217°C and initial degradation above 496°C, it is exceptionally stable across a broad thermal envelope. This allows ULTEM™ to be used in airframe insulation panels, sensor housings, and avionics mounts where thermal shifts can compromise accuracy.

In eVTOLs operating at variable altitudes, ULTEM™ ensures dimensional accuracy—an essential attribute for maintaining control surface alignment and electrical isolation over repeated flight cycles.

VESPEL® for Corrosion-Exposed and Humid Environments
VESPEL® polyimide exhibits long-term dimensional and chemical stability in humid or chemically aggressive environments—without the need for protective coatings. Operating continuously at 260°C (500°F) with transient tolerances up to 900°F (482°C), VESPEL® excels in sealing and bushing applications exposed to rain, de-icing fluids, or elevated humidity.

NASA- and Air Force-approved VESPEL® SP-21 (graphite-filled) is commonly applied in airframe components and thrust bearings where high PV (pressure-velocity) performance and low outgassing are required.

Weight Reduction = Greater Range and Battery Efficiency

PEEK vs. Titanium and Aluminum: Component-Level Savings
PEEK offers weight reductions up to 55% vs. titanium and 40% vs. aluminum without sacrificing stiffness. When reinforced with carbon fiber, Cfr-PEEK delivers up to 70% weight savings over stainless steel. In eVTOL systems, such savings are directly proportional to increases in range, payload capacity, and battery lifespan.
For example, replacing aluminum cable brackets with PEEK variants has resulted in 20% mass reduction per part. Scaled across the airframe, this means thousands of pounds in cumulative savings—an essential factor when every gram impacts lift efficiency.

Battery Life and Flight Range
Lightweight polymers allow for strategic reallocation of mass toward battery packs without sacrificing flight duration. Since battery degradation accelerates with fast charging, minimizing flight energy demand through lighter materials extends both range and pack longevity. Every gram saved in structural design enables greater energy availability, mitigating the steep cost of early battery replacements (often required after 1,000 cycles).

In fact, replacing 100 meters of hydraulic piping with PEEK composites has been shown to save approximately $3,300 annually in fuel—or battery usage—per aircraft.

Acoustic Performance: Reducing Urban Noise Footprint
Noise pollution is a critical concern for urban air mobility. PEEK-based cabin panels and impeller housings have shown SPL reductions of 7–15 dB, improving passenger comfort and enabling compliance with municipal noise regulations. Beyond comfort, these acoustic benefits play a regulatory role in enabling air taxi operations in densely populated areas.

Machining Considerations for Flight-Critical Polymer Components

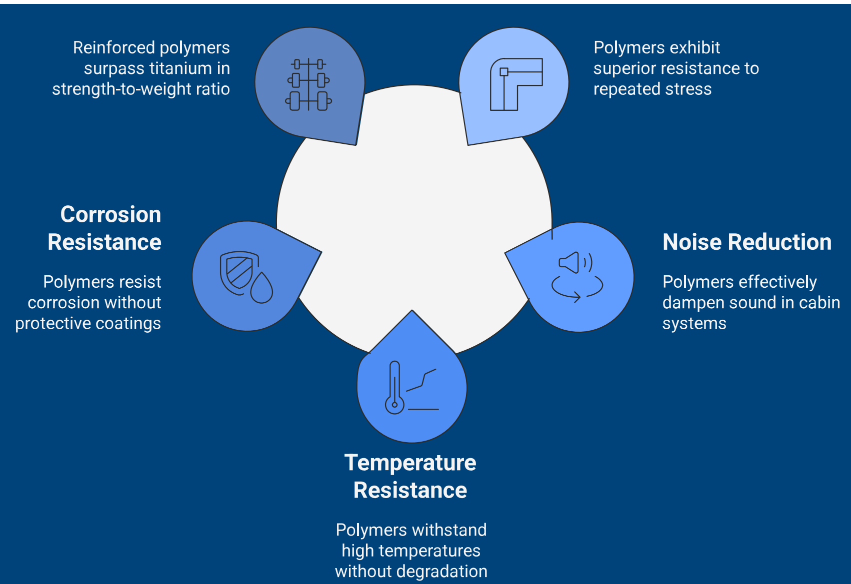
Annealing and Stress Relief
Proper thermal treatment is essential. PEI and PAI materials must be annealed post-machining to relieve internal stress and prevent dimensional drift during service. For example, ULTEM™ components require staged heating up to 400°F

with incremental hold times based on cross-section.

Likewise, TORLON® components gain improved flatness and wear resistance when annealed between rough and final machining operations—critical for rotor blade inserts and alignment fixtures.

CNC Machining Parameters
High-performance polymers demand specialized tools and feeds:

- **TORLON®**: <400 SFPM speeds, carbide tooling, continuous cooling
- **ULTEM™**: Slow feed rates with high clamping precision to manage thermal expansion



- **PEEK**: Requires chip evacuation and dry finishing for tight-tolerance sealing surfaces

AIP's dedicated polymer machining facility eliminates metal contamination risk and supports tolerances down to ±0.002 mm, ensuring each component meets aerospace-grade consistency.

Environmental Considerations: Moisture, Thermal Cycling, and Fatigue

Moisture absorption—even at low levels—can cause swelling or dimensional drift in polymers. AIP mitigates this through controlled storage, glass fiber reinforcement, and barrier coatings. Reinforced PEEK and PEI limit expansion to ~0.1% per inch vs. 0.6% for unfilled grades.

Thermal cycling tests on hybrid polymer-metal assemblies confirm structural integrity under repeated transitions. Additionally, fatigue studies show that polymer hinges and rotor supports outperform metal analogs in long-term cyclic stability.

Limitations and Certification Challenges

Despite these advantages, polymers are not universally applicable. Key limitations include:

- Lower stiffness vs. metals, limiting use in primary structural load paths
- Thermal softening at temperatures >260°C in non-reinforced variants
- Certification complexity, particularly for structural or flame-exposed parts

Certification standards (e.g., §25.603, §25.853) require exhaustive material traceability, flammability testing, and damage tolerance validation—processes that extend development timelines. Even minor design changes may reset validation cycles, prompting many OEMs to begin with hybrid or non-structural use cases.

Conclusion: A Strategic Advantage in the eVTOL Race

High-performance polymers are not simply substitutes for metal—they are strategic enablers for the eVTOL sector. From reducing structural weight and battery loads to extending fatigue life and minimizing noise, these materials are vital for unlocking the promise of clean, quiet, and scalable urban air mobility.

AIP Precision Machining partners with leading aerospace developers to machine and deliver flight-critical components from PEEK, ULTEM™, TORLON®, and VESPEL®—with full traceability, AS9100 certification, and mission-specific consultation.

Whether you're developing a next-gen air taxi or scaling production for electric rotorcraft, precision polymer components are essential to your success.

Read the full article here: