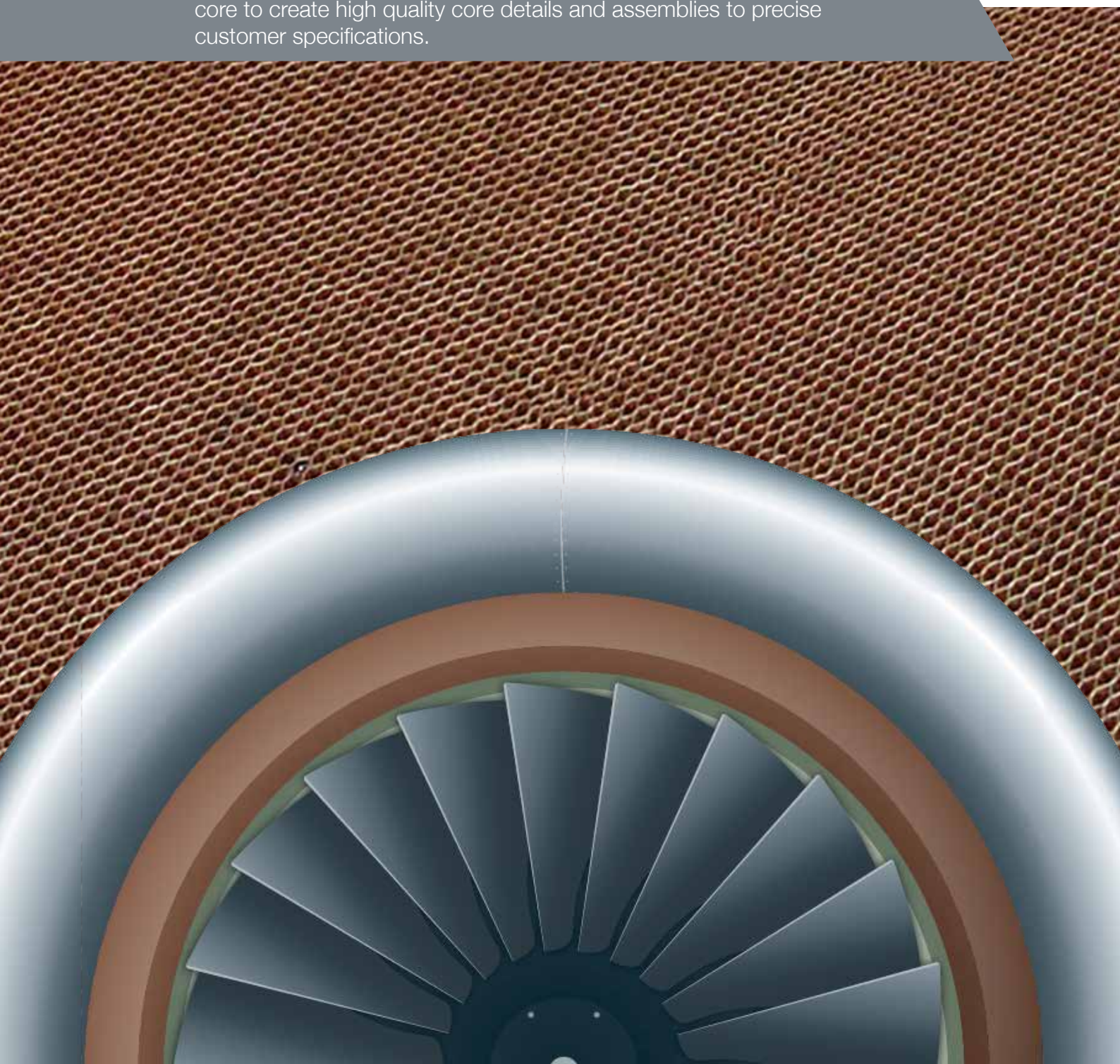
HexWeb® EC
Engineered Core

With advanced computer-aided design and manufacturing techniques, flat core is formed, shaped, machined and/or bonded into engineered core to create high quality core details and assemblies to precise customer specifications.



HexWeb® EC
Engineered Core

- High quality components
- Precise dimensional tolerances
- Fewer manufacturing stages and processes
- Dedicated technical support from HexWeb® EC experts

If you have a concept, HexWeb® EC can give it form. Simply put, HexWeb® EC starts with standard blocks and slices of honeycomb, also known as core. This lightweight material adds stiffness and strength when used as a material in sandwich structures. The core can be formed, shaped, machined and bonded using advanced, computer-aided design and manufacturing techniques to achieve a core that meets specialized customer requirements. The expertise of our manufacturing and engineering staff, combined with extensive research and unique core processing technologies, results in profiled precise complex shapes. These core shapes are then used as semi-finished components in composite parts and structures that can add value to your product in a variety of ways, including:

- Higher quality components
- Precise dimensional tolerances
- Fewer manufacturing stages and processes

At Hexcel, our dedicated HexWeb® EC manufacturing sites create high-quality parts using the broadest array of processing options to meet your specific requirements.

The World's Leading Experts in Engineered Core

HexWeb® EC Includes:

- Core splicing
- Core potting
- Foam filling
- Septumization
- Core stabilization
- Expertise and experience with all core types, foams, adhesives and stabilization systems
- Perimeter trimming and chamfering
- Doubler relief routing
- Arc expanding, heat setting and roll forming
- Core forming
- HOBE machining
- 5-axis CNC machining
- Autoclave processing
- Skin-to-core bonding
- CNC programming
- Tool design and fabrication
- Slotting

Industry Leader

- Our facilities feature the equipment and manufacturing systems to handle the most complex production requirements.
- Our engineering and production staff has the experience, organizational structure and systems in place to manage and support your program.
- Our products are widely used in both commercial and military aircraft.

Value Engineering

- We offer the highest value at competitive costs.

Quality Assurance

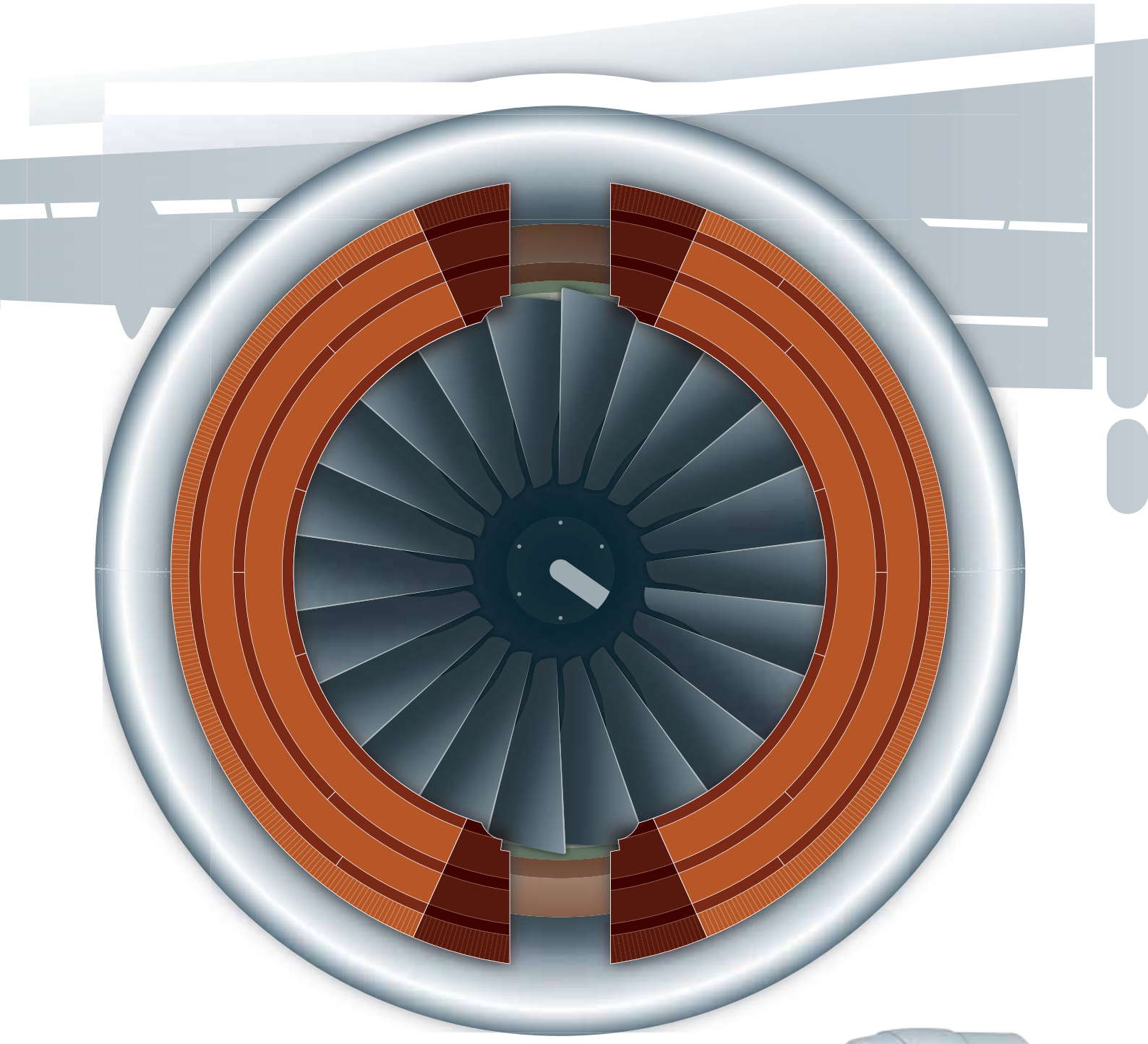
- We are dedicated to providing technical support worldwide.
- We are available to solve problems or assist at any stage, from up-front design assistance, program start-ups or supporting ongoing production.
- Our quality assurance methods accommodate the most stringent conditions found in aerospace and defense specifications.

At the Forefront

- Today's powerful CAD software, combined with the expertise of our customers, results in increasing complex core configurations required to meet performance requirements and aggressive weight targets.
- Utilization of Six Sigma practices throughout our industry has resulted in the drive to reduce manufacturing variation and tighten tolerance requirements.
- Hexcel offers a range of manufacturing capabilities including 5-axis NC machining to meet your core product requirements.

Hexcel's HexWeb® EC Products facilities are ISO9001, AS/EN9100 and NADCAP certified for composites processing.

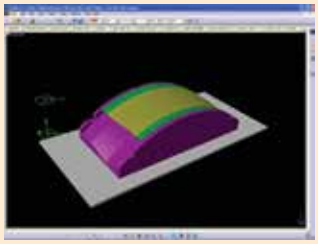
HexWeb® EC Manufacturing



The cowling and fan duct sections surrounding a modern high-bypass airplane turbine engine are collectively referred to as the nacelle. The center image shows a nacelle cowl assembly. Honeycomb is used throughout the nacelle's construction, providing support that withstands vibration, high temperatures and offers sound attenuation.

HexWeb® EC Manufacturing

These six steps illustrate how HexWeb® EC techniques are used in the manufacturing of a typical engine nacelle.



Step 1 - CATIA
The process begins with customer-supplied CATIA (Computer-Aided Three-Dimensional Interactive Applications) 3-D models or IGES data. Hexcel combines these CAD designs with our 5-axis CNC expertise and extensive knowledge of honeycomb core products to manufacture complex honeycomb structures meeting critical customer requirements. CATIA is compatible with all CAD systems, such as UGII, ProE and Cadds 4X through IGES translation.

Step 2 - Raw Materials
A variety of honeycomb core types are used selectively in a typical nacelle application. HexWeb® EC allows designers the freedom to specify distinct core types within the bondment and capitalize on their unique performance characteristics. In this way, the need for localized higher shear loads, noise abatement, thermal conductivity and drainage can be accommodated.

Step 3 - Machining
Along with CATIA V5 CAD/CAM software and VERICUT software, at this stage, Hexcel's 5-axis NC machining is used to carefully cut the nacelle component pieces into the exact size and shape desired. The 5-axis NC machines can be used to create a wide range of products, from tail rotors with lengths less than two feet (0.61 meters), to rotor blades that can exceed 30 feet (9 meters) in length.

Step 4 - Bonding
Next, the core details are carefully checked for fit and spliced together with high temperature bond tools. At this stage, Hexcel can apply film adhesive or prepreg stabilization creating a vacuum barrier for machining or improving bonding and handling characteristics. Core potting can also be performed to densify the cells at attachment points for hinges, latches or fittings. All bonding operations are performed by qualified process technicians in a precisely controlled clean room environment.

Step 5 - Curing
Adhesives, potting and stabilization materials are then cured at elevated temperatures using vacuum bagging techniques to apply external pressure. In qualified vacuum bonding ovens, temperature and vacuum are controlled within fine limits and analyzed for conformity to the customer's cure parameters. In addition to vacuum bonding ovens, Hexcel's HexWeb® EC stands alone amongst its competitors with its autoclave capability, which allows us to produce "fly-away" composite skins for other applications.

Step 6 - Final Inspection
The finished nacelle assembly goes through final inspection to ensure conformity to customer requirements. Quality Assurance procedures require 100% dimensional inspection of all critical features and verification back to the source CATIA data shown in Step 1, thus bringing the manufacturing processes full circle. HexWeb® EC sets the quality standard by which others are judged, giving you confidence that every part will fit perfectly in your final assembly.

HexWeb® EC Capabilities

Having Hexcel produce your HexWeb® EC parts can actually make your company more productive by eliminating the need to invest in core processing equipment, facilities and staff. Instead, your company is free to deploy its resources elsewhere, and you can concentrate on your strategic manufacturing competencies.

Your company can also benefit from our industry-leading honeycomb materials. We manufacture our own HexWeb® honeycomb cores from a full range of raw materials, including fiberglass, aluminum, phosphoric acid anodized aluminum (CR-PAA™), Kevlar®, Nomex®, and others. As a result, we offer the broadest portfolio of cores, all managed from a single source to give you the ease of "one-stop shopping." From start to finish, we manage each stage of honeycomb production. This gives you greater control over your supply base and materials costs. We also provide the highest level of quality.

HexWeb® EC employs a range of techniques. Four of the most common are illustrated here. (Others are described on page 1)

CNC Machining
Computer Numerical Controlled processing allows precise cutting of honeycomb parts in the right size and shape for any project.

HOBE Machining
Milling or cutting a cross section of a HOBE (HOneycomb Before Expansion) slice instead of an expanded slice of honeycomb. Used exclusively with metallic cores, HOBE machining produces excellent bonding surfaces, reduces processing time and simplifies tooling setup.

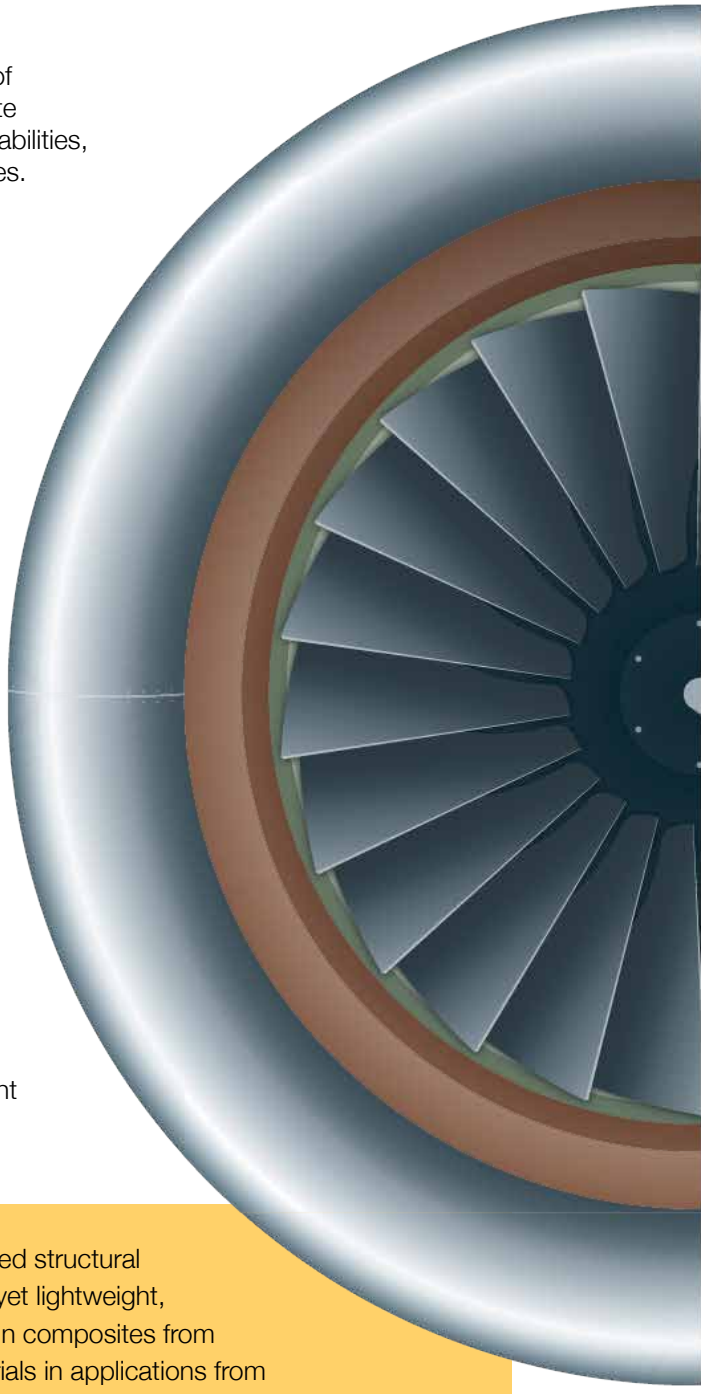
Autoclave Processing
An autoclave uses controlled heat and pressure to bond and cure large assemblies containing prepreg and honeycomb composite parts.

Core Forming
Hexcel employs a variety of techniques to form a wide variety of aluminum and non-metallic cores to contour. A wide range of contours can be achieved from simple curvature to very complex contours depending on final part configuration.

Kevlar and Nomex are registered trademarks of E.I. DuPont de Nemours, Wilmington, Delaware.

The Best Partner in Engineered Core

Hexcel's Engineered Products team specializes in the manufacture of structural HexWeb® honeycomb components and finished composite structures for the aircraft market. Contact us to benefit from the capabilities, experience and resources of three world-class manufacturing facilities.



HexWeb® EC Locations:

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570.429.1741

Burlington, Washington
15062 Steele Road
Burlington, WA 98233 USA
360.757.7212

Welkenraedt, Belgium
Rue Trois Bourdons, 54
B-4840 Welkenraedt
32.87.307.411

If you're looking for a global company that will team with you to develop creative material solutions, a company whose products can give your products "the strength within," HexWeb® EC is the right alternative.

Hexcel is the world's leading innovator and manufacturer of advanced structural materials — "the strength within" our customers' products. Strong yet lightweight, these materials are designed and developed through our expertise in composites from honeycomb to fabrics, fibers and prepregs. You'll find Hexcel materials in applications from such diverse industries as aerospace, defense, wind energy, recreation, automotive and general industrial applications. Our knowledge, depth and breadth allow us to partner with our design, engineering, manufacturing and management counterparts in these industries. This partnership results in the development of thousands of higher quality, cost-effective finished products that take advantage of the exceptional strength-to-weight properties of Hexcel materials. From snowboards to mountain bikes, helicopters to commercial aircraft, Hexcel materials can be found in any product that needs to be durable, light and fast.

Hexcel Product Family

HexTow®
Carbon Fiber

HexFlow®
Resins

HexMC® Molding
Composite

HexForce®
Reinforcements

Polyspeed®
Laminates

HexWeb®
Honeycomb Core

HiTape®
Advanced
Reinforcements

Modipur®
Polyurethane

HexWeb®
Engineered Core

HexPly®
Prepregs

Redux®
Adhesives

HexTool®
Tooling Material

HiMax™
Multiaxial
Reinforcements

For more information

Hexcel is a leading worldwide supplier of composite materials to aerospace and industrial markets. Our comprehensive range includes:

- HexTow® carbon fibers
- HexForce® reinforcements
- HiMax™ multiaxial reinforcements
- HexPly® prepregs
- HexMC® molding compounds
- HexFlow® RTM resins
- Redux® adhesives
- HexTool® tooling materials
- HexWeb® honeycombs
- Acousti-Cap® sound attenuating honeycomb
- Engineered core
- Engineered products

For US quotes, orders and product information call toll-free 1-888-611-4038. For other worldwide sales office telephone numbers and a full address list, please go to:

http://www.hexcel.com/contact/salesoffice

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