The Doorway

A Publication of The Gill Corporation

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BUSINESS JETS

ANTIMICROBIAL TREATED

The Lockheed Jetstar is considered to be the first private jet available to individuals. However, it was not until the Learjet 23 was launched in 1963 that the private or business jet market became feasible to a larger number of individuals and corporations. Business jet travel enabled high-value passengers the ability to reduce their overall travel times while remaining productive, or well-rested, with a trade-off in very high-costs.

Gulfstream entered the emerging market in 1966 focusing on larger aircraft sizes, luxurious interiors and ultra-comfort. During the following decades, the market expanded with manufacturers adapting their larger commercial aircraft such as the Airbus A380 to A320 series, Boeing 747 to 707 series, and new manufacturers including BAe, Beechcraft, Bombardier, Canadair, Cessna, Dassault, Embraer, Hawker, HondaJet, IAI, Pilatus, Textron, and others. The business jet market has been turbulent and has fluctuated based upon oil prices and embargos, economic growth and decline, global health issues, regional wars, social and political perspectives – leading to consolidation of the manufacturers.

Photo courtesy of JetPix (GFDL 1.2 <http://www.gnu.org/licenses/old-licenses/fdl-1.2.html> or GFDL 1.2 <http://www.gnu.org/licenses/old-licenses/fdl-1.2.html>), via Wikimedia Commons

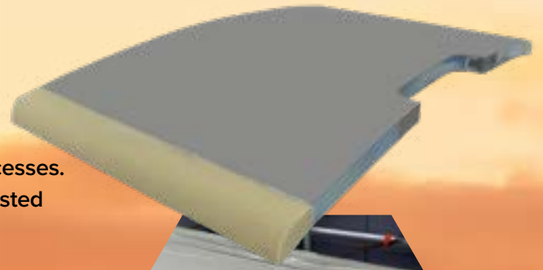
A recent market analysis concluded a demand for almost 8,000 business jets over the next ten years through 2032 with a global market value of almost $260 billion. The forecast estimates annual production will rise steadily during this time.[1]

The Gill Corporation (TGC) has developed materials and products for nearly every business jet manufacturer. Manufacturers, and their Tier 1 suppliers, use TGC materials to make furniture structures such as bar counters, cabinets, doors, storage compartments, walls, ceilings, floors, baggage bays, and throughout the exteriors in moveable flight surfaces, landing gear doors, engines, nacelles, crash pads and much more.

[1] https://flightplan.forecastinternational.com/

BUSINESS JET PRODUCT DEVELOPMENT

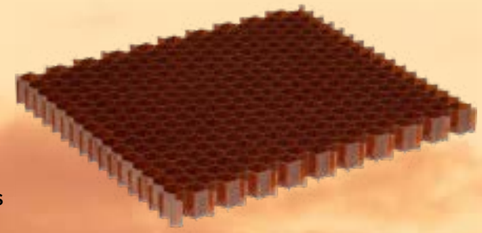
TGC continuously invests in the research and development of chemistries, materials and processes. Some of the recent new product solutions are listed below.



2018 – developed a new product line of complex formed panel substrates that are machined into parts used within the aircraft interior. The substrate panels have multiple radii with unique tooling that utilize a vacuum bag process. The individual parts are subsequently machined from the formed substrates and then fabricated to the final part configuration. These parts are the structural elements of every curved interior surface such as walls, closet doors, cabinets and more.

2019 – launched GillVANA®, “Vibration and Noise Attenuation”, a new product to reduce cabin noise resulting from structural vibration. The solutions are tailored to specific customer requirements that are applied to honeycomb core and sandwich panels.

2021 – offered fiberglass honeycomb core as an alternate to aluminum, meta-aramid and para-aramid honeycomb core materials.



2022 – rapidly developed and qualified a new interior panel product line to meet a customer’s critical schedule to maintain their aircraft production line. The effort highlighted TGC’s commitment to solve customer needs by leveraging vertical integration, research, development and process capabilities to deliver a custom panel construction. The effort spanned several months working under an extremely expedited schedule with multiple rounds of trials and testing resulting in qualification of a product family with varying thicknesses and densities that are used for furniture and other surfaces throughout the interior of the aircraft.

AIRBUS Gulfstream TEXTRON HondaJet IAI DASSAULT AVIATION Piper EMBRAER BOMBARDIER AEROSPACE BOEING

PRODUCTS THROUGH VERTICAL INTEGRATION

Beginning with chemistry and material sciences, additives mixed into custom resins are formulated, then combined with structural filaments that are processed to form composite materials. These materials include prepregs, adhesives, honeycomb core, laminates, liners, and sandwich panels.

Honeycomb

Honeycomb core has provided the highest strength-to-weight ratio of any structural material for decades and is used throughout aircraft interiors and exteriors. With over 50 years' structural core experience, TGC is a leading manufacturer of metallic, meta-aramid, para-aramid, and fiberglass honeycomb. Honeycomb is produced in endless combinations of cell sizes, geometries, densities and dimensions to achieve optimal weight, strength and performance requirements. Honeycomb is available in block and slice form, as well as utilizing value-add capabilities to provide machined core details, bonded core assemblies, sandwich structures, finished parts and end-item assemblies. *(See The Doorway Winter 2021 issue for more information.)*

Sandwich Panels

Sandwich panels are composites made by combining core materials, adhesive layers and skins to create a sandwich construction. TGC utilizes vertical integration to produce proprietary materials that create an almost infinite combination of core, adhesive and skin materials that offer maximum design flexibility and shear strength that meets or exceeds customer specified mechanical and physical properties. Sandwich panels are used in applications where durability and weight saving are necessary throughout the aircraft interior and baggage compartment. *(See The Doorway Summer 2021 issue for more information.)*

REINFORCEMENTS
- Unidirectional glass (E/S)
- Woven glass (E/S)
- Unidirectional carbon
- Aluminum

CORES
- Aluminum honeycomb
- Meta-aramid honeycomb
- Para-aramid honeycomb
- End-grain Basla Wood

RESIN MATRICES
- Epoxy
- Phenolic
- Vinyl Ester
- Polyester
- Nylon

ADHESIVES
- Epoxy
- Phenolic
- Contact

Laminates

Laminates are composites made by combining proprietary prepreg with structural filaments and are used to cover baggage bay interior walls and ceilings, and as the impact absorbing backing for non-textile flooring. Cargo liners are laminates used specifically in baggage bays and are known across the industry as Gillfab® and Gilliner®. These cargo liner materials are comprised of optimized resin formulations with fiberglass or carbon reinforcements. Gillfab® and Gilliner® materials offer superior puncture and corrosion resistance and can feature a polyvinyl fluoride (PVF) overlay where surface reflectivity and resistance to cleaning solutions are desired. *(See The Doorway Summer 2021 issue for more information.)*

Honeycomb Special Processing

Honeycomb can be machined, bonded and formed by special processing for all types of metallic and non-metallic honeycomb cores. TGC has multiple Centers of Excellence that utilize 3-, 5-, and 6-axis CNC machines to produce close tolerance machined core details. Our vast portfolio of value added, special processing capabilities transforms details into contoured bonded assemblies used in flight control surfaces, crash pads, landing gear doors, engine nacelles, and many other parts of the aircraft. *(See The Doorway Spring 2021 issue for more information.)*

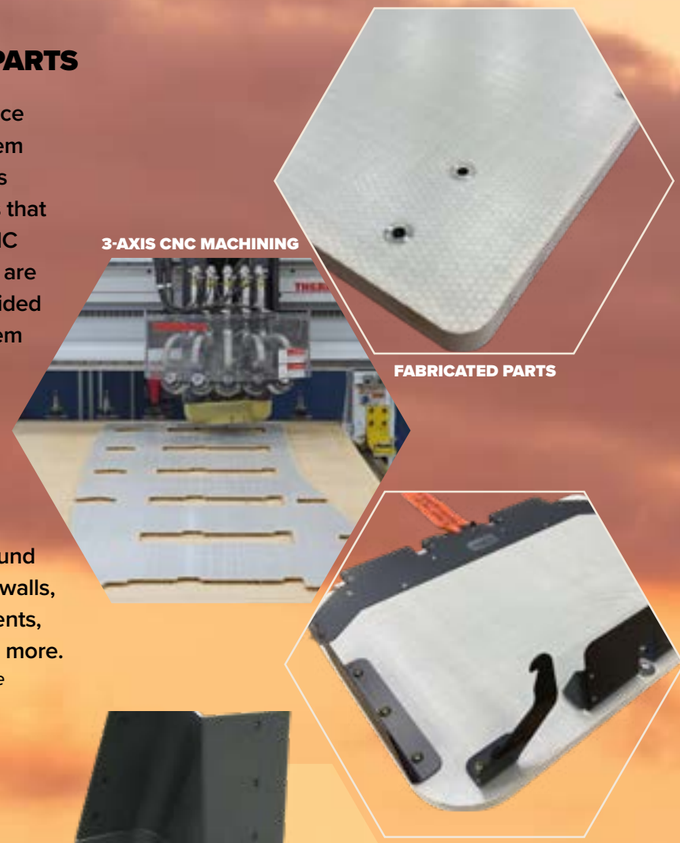
Capabilities Include:
- Planform detail trimming
- Chamfering
- Die cutting
- High-speed, hand routing of doublers or rebates
- Heat forming and heat soaking to contours
- Vacuum bag process for bonding splices, septums and skins
- Potting and densification for hard attach points
- 3-, 5-, and 6-axis CNC machining
- 3-D design and modeling

VALUE-ADD FABRICATED PARTS

TGC has multiple Centers of Excellence to fabricate semi-finished and end-item parts. The fabrication process begins with TGC laminate or panel materials that are machined with modern 3-axis CNC equipment. All required components are installed according to customer provided engineering information. The end-item assembly is inspected then kitted for delivery to the customer as drop-in ready for installation parts. Fabricated parts can be made from flat, formed, or contoured, composite and/or metallic materials. TGC fabricated assemblies can be found throughout aircraft interior furniture, walls, cabinets, doors, baggage compartments, decompression blow out panels, and more. *(See The Doorway Spring 2021 issue for more information.)*

Capabilities Include:

- Machining
- Design and modeling
- Cut and fold process
- Edge fill and edge seal
- Insert installation
- Attachment of insulation blankets, vibration damping and sound damping
- Anti skid tapes, part markings and labels
- Manufacturing and attaching of fittings, intercostals, splice plates



3-AXIS CNC MACHINING

FABRICATED PARTS

CUT & FOLD BAGGAGE ASSEMBLIES

LAMINATES

PRODUCT	CONSTRUCTION	APPLICATION	SPECIFICATION
Gilliner® 1066 1066R	Woven fiberglass cloth with a polyester resin.	Cargo liner.	FAR 25.855 App F Part I
Gilliner® 1567A	Woven E-glass cloth with a polyester resin system.	Cargo liner, bulkhead facings and blowout panel.	BMS 8-2, Cl 1 Gr A; FAR 25.855 App F Parts I and III
Gilliner® 1568A	Woven E-glass cloth with a polyester resin system.	Cargo liner and bulkhead facings of the lower cargo hold.	BMS 8-2, Cl 1 Gr A; FAR 25.855 App F Parts I and III
Gilliner® 1366 1566 1569A	Woven E- and S-glass cloth with a polyester resin.	Sidewalls, ceilings, partition walls and bulkhead facings of the lower cargo hold.	All products: FAR 25.855 App F Parts I and III. 1366: DHMS P1.42 Cl B Gr 1 and 2; MEP 15-046 Type III. 1569A: BMS 8-2 Cl 2 Gr A and B
Gilliner® 1366T 1566T 1570A	Same as Gilliner® 1366 but with a white PVF film overlay on the face side.	Sidewalls, ceilings, partition walls and bulkhead facings of the lower cargo hold.	All products: FAR 25.855 App F Parts I and III. 1366T: DHMS P1.42 Cl B Gr 1 and 2. 1570A: BMS 8-2 Cl 2 Gr A and B
Gillfab® 1050	Fiberglass cloth with an epoxy resin.	General aircraft purposes.	MEP 15-046 Type IV; FAR 25.853 App F Part I
Gillfab® 1367 1367A 1367C	Woven E- and/or S-glass with a phenolic resin system and white PVF film overlay on the face side.	Cargo liner.	FAR 25.853 and 25.855 App F Part I, III, IV and V
Gillfab® 1368A	Woven E- and/or S-glass with a phenolic resin system and white PVF film overlay on the face side.	Cargo liner.	BMS 8-223 Cl 2 Gr B; DMS 2419 Cl 1 and 2; CDM010-09 Cl 2 Gr B; CEMS-1068; CPTI001; TPS 3511; FAR 25.853 and 25.855 App F Parts I, III, IV and V
Gillfab® 1369A	Woven E- and/or S-glass with a phenolic resin system and a white PVF film overlay on the face side.	Cargo liner.	2550 M1M 000800; ABS 5777; AIMS 05-11-001 and AIMS 05-11-004 0; HMS-E2-001; FAR 25.853 and 25.855 App F Parts I, III, IV and V
Gillfab® 1370A	Woven E- and/or S-glass with a phenolic resin system and white PVF film overlay on the face side.	Cargo liner.	CMS-CP-503, Cl 2, Gr B, Ty 13 and 20; ZMS2419, Cl 1, Ty 30, 40, 50, and 70; FAR 25.853 and 25.855 App F Parts I, III, IV and V
Gillfab® 1368B	Woven S-glass cloth with a phenolic resin system and a white PVF film overlay on the face side.	Sidewalls, ceilings, partition walls and bulkhead facings of the lower cargo hold.	BMS 8-223 Cl 4 Gr B; CDM010-09 Cl 4 Gr B; CPTI001; FAR 25.853 and 25.855 App F Parts I, III, IV and V

PANELS

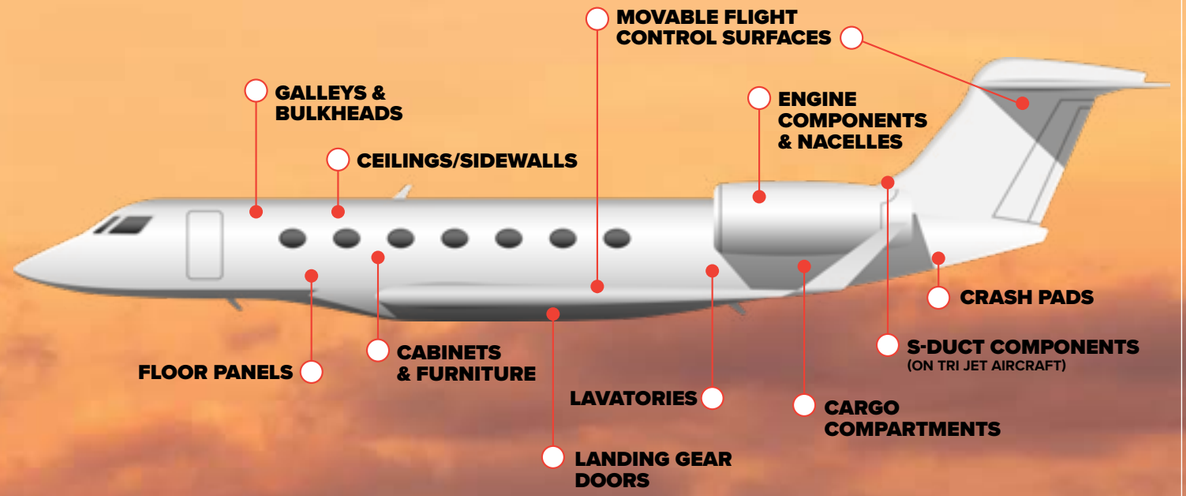
PRODUCT	CONSTRUCTION	APPLICATION	SPECIFICATION
Gillfab® 4004A	Unidirectional fiberglass reinforced phenolic facings / meta-aramid honeycomb core.	Flooring, galleys, and lavatories.	BAER 3232; FAR 25.853 and 25.855 App F Part I
Gillfab® 4017T	Unidirectional fiberglass reinforced epoxy facings / meta-aramid honeycomb core.	Flooring.	BZZ 7002 Ty 1 -3; MEP 15-031 Ty 1-2; FAR 25.853 and 25.855 App F Part I
Gillfab® 4009	Unidirectional carbon fiber reinforced epoxy facings / meta-aramid honeycomb core.	Flooring, underseats, galleys, and bulkheads.	MEP 15-030 Ty 1; FAR 25.853 and 25.855 App F Part I

PANELS (Continued)

PRODUCT	CONSTRUCTION	APPLICATION	SPECIFICATION
Gillfab® 4030 4030G	Aluminum facings / aluminum honeycomb core.	Aircraft interiors - cabinet doors, walls, bulkheads, shelving, and galleys.	4030: CCS1039; DWG F9XJ550042A0; FAR Part 25 App F Part I; C-28- 1145 Amendment #1, Ty 5, 7, 9, and 10; MEP 02-010 Cl I-V. 4030G: CC1039 and GAMPS 8110
Gillfab® 4034 4034A	Unidirectional carbon reinforced epoxy facings / aluminum honeycomb core.	Aircraft interiors - galleys, lavatories, bulkheads, partitions, storage compartments and electronic pocket doors.	4034: DWG 7700262; DWG F9XJ550055A0; FAR 25.853 App F Part I. 4034A: DFJ Drawing 7700355
Gillfab® 4036	Epoxy-fiberglass reinforced facings bonded to aluminum honeycomb core.	Aircraft interiors - wall partitions	DWG 7700253; FAR 25.853 App F Part I
Gillfab® 4037	Fiberglass cloth reinforced epoxy facings / Dura-Core® II aluminum honeycomb core.	Aircraft interiors.	FAR 25.853 App F Part I
Gillfab® 4117 4117A	Woven glass reinforced epoxy facings / meta-aramid honeycomb core.	Aircraft interiors and galley areas.	4117: MEP 15-017 Types I, III, IV-XII; FAR 25.853 App F Part I. 4117A: FAR 25.853 App F Part I and III.
Gillfab® 4122A	Woven glass phenolic facings/ meta-aramid honeycomb core.	Aircraft interiors - sidewalls, cargo compartments, bulkheads, galleys and ceiling panels.	CCS1004; MEP 15-029 Ty I - VI; 365-25-21-92081; Far 25.853 App F Part I, IV and V; Far 25.855 App F Part I and III
Gillfab® 4122S	Woven glass phenolic facings / meta-aramid honeycomb core.	Aircraft interiors - sidewalls, cargo compartments, bulkheads, galleys and ceiling panels.	Far 25.853 App F Part I, IV and V; Far 25.855 App F Part I and III
Gillfab® 4417 4417A 4417G	Unidirectional fiberglass reinforced epoxy facings / meta-aramid honeycomb core.	Flooring, underseats, aisles, entires, galleys and cargo areas.	4417/4417A: BMS 4-17, Ty I – IX; FAR 25.853 App F Part I; FAR 25.855 App F Part I and III. 4417G: GAC101FE
Gillfab® 5101	Aluminum facings / aluminum honeycomb core.	Aircraft interiors.	LES 1277
Gillfab® 5020	Aluminum facings / aluminum honeycomb core.	Aircraft interiors.	DWG F9XJ550044A0; LES 1070, Gr 1-3; FAR 25.853 App F Part I
Gillfab® 5040	Aluminum alloy facings / end grain balsa wood core.	Flooring, galley panels, cargo containers and bulkheads.	Far 25.853 App F Part I
Gillfab® 5071A	Woven glass reinforced phenolic facings/ meta-aramid honeycomb core.	Aircraft interiors.	Far 25.853 App F Part I, IV and V; Far 25.855 App F Part I and III
Gillfab® 5120	Aluminum facings / aluminum honeycomb core.	Flooring, cabinetry and instrument panels in general aviation aircraft.	DWG F9XJ550043A0; FAR 25.853 App F Part I
Gillfloor® 4709 4709S	Unidirectional carbon fiber reinforced epoxy facings / meta-aramid honeycomb core.	Flooring in passenger compartments - Underseat and aisle.	4709: BMS 4-20 Ty II, III and V; FAR 25.853 App F Part I. 4709S: Cessna Drawing S4434
Gillfloor® 4809	Unidirectional carbon fiber reinforced epoxy facings / para-aramid honeycomb core.	Flooring in passenger compartments.	BMS 4-20 Ty VI, VII, VIII, and IX; FAR 25.853 App F Part I
Gillfoor® 5424	Unidirectional fiberglass reinforced epoxy facings / aluminum honeycomb core.	Flooring in passenger compartments.	BMS 4-23 Ty I, II, III; FAR 25.853 App F Part I

HONEYCOMB

PRODUCT	CONSTRUCTION	APPLICATION	SPECIFICATION
Gillcore® HD	Meta-aramid fiber reinforced honeycomb which is coated with heat resistant phenolic resin.	Interior aircraft panels including flooring, sidewalls, ceilings, galleys and lavatories. Exterior aircraft panels including trailing and leading edges, flaps, ailerons, radomes, fairings, helicopter blades, access panels and doors.	BMS 8-124 Cl IV, Ty I; AIM-M-1013; AIMS 11-01-001; ABS5035; AMS 3711; AMS-C-81986; BS23732; CMNP083; 299-947-103; LB0130-022; DHMS P1.26
Gillcore® HK	Para-aramaid fiber reinforced honeycomb which is coated with heat resistant phenolic resin. High shear strength and modulus.	Interior aircraft panels including flooring, sidewalls, ceilings, galleys and lavatories. Exterior aircraft panels including trailing and leading edges, flaps, ailerons, radomes, fairings, helicopter blades, access panels and doors.	BMS 8-124 Cl 6, Ty V and VI; AIMS 11-01-004 ABS5341
Gillcore® HF5035	Fiberglass fabric reinforced with heat resistant phenolic resin.	Engine nacelles and interior aircraft parts where high temperature application up to 350°F (177°C). Heat formability for complex and contour components.	AMS3715, AMS-C-8073
Dura-Core® 5052 and 5056	Aluminum honeycomb that has excellent corrosion resistance and mechanical strength.	Core for sandwich structures of the control surfaces, such as trailing edge of slats.	Dura-Core® 5052 / 5056: BMS 4-4 Cl N, P,ND, Gr I, Ty All; MMS 8010; AIMS 11-02-002. Dura-Core® 5052: AIMS 11-02-002; 299-947-059
PAA-Core® 5052 and 5056	Ultimate aluminum honeycomb that has excellent corrosion resistance and maximum mechanical strength.	Core for sandwich structures of control surfaces and nacelle structures.	PAA-Core® 5052: BMS 4-4 CL NPA, Gr I, Ty ALL. PAA-Core® 5056: BMS 4-25; 299-947-059



This is not an all inclusive list of where TGC products are used. TGC metallic and non-metallic honeycomb cores, panels, and laminates are sold to customers around the world for use in business jet applications.

Fun Facts

Helen Keller is related to Robert E. Lee—her paternal grandfather was his second cousin.

The hummingbird is the only bird that can fly backwards.

Beavers were once the size of bears.

A pigeon's feathers weigh more than their bones.

A crocodile can't move its tongue.

Honeybees navigate using the sun as their compass.

If you sneeze traveling 60 mph, your eyes are closed for an average of 50 feet.

Hawaii is the only state to grow coffee commercially.

The square dance is the official state dance of Washington.

When dinosaurs roamed the earth, volcanos were erupting on the moon.

The only letter that doesn't appear on the periodic table is J.

A single strand of spaghetti is called a "spaghetto."

At birth, a baby panda is smaller than a mouse.

In order to protect themselves from poachers, African elephants have been evolving without tusks.

The spiked dog collar was invented by the ancient Greeks to protect their dogs from wolf attacks.

German chocolate cake is named after an American baker named Samuel German.

The oldest unopened bottle of wine was found in a Roman tomb and was more than 1,650 years old.

The tallest man in recorded history was 8'11.

IKEA is an acronym that stands for Ingvar Kamprad Elmtaryd Agunnaryd: the founder's name, the farm where he grew up, and his hometown.

Starfish don't have blood. They circulate nutrients by using seawater in their vascular system.

The unique smell of rain actually comes from plant oils, bacteria, and ozone.

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