The Doorway™

A Publication of The Gill Corporation

High-Performance Composite Products Since 1945 • www.thegillcorp.com

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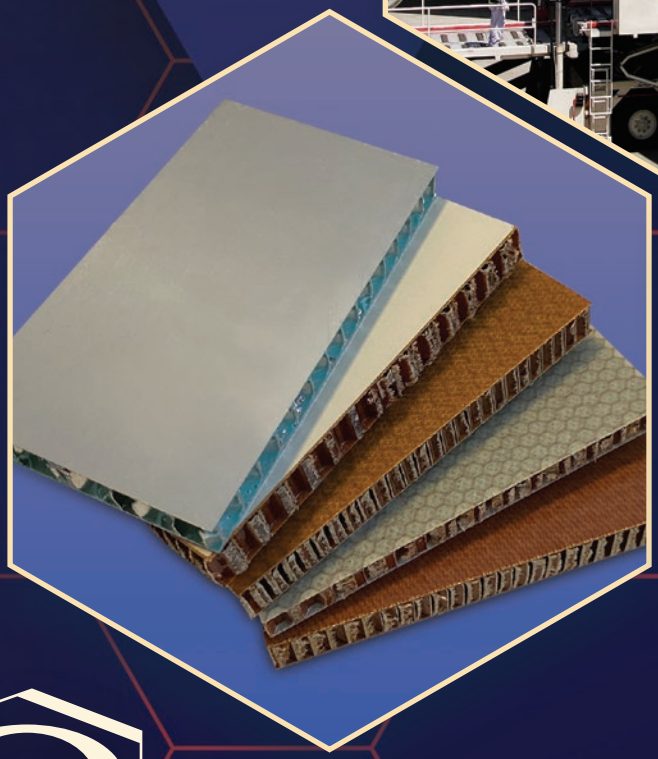
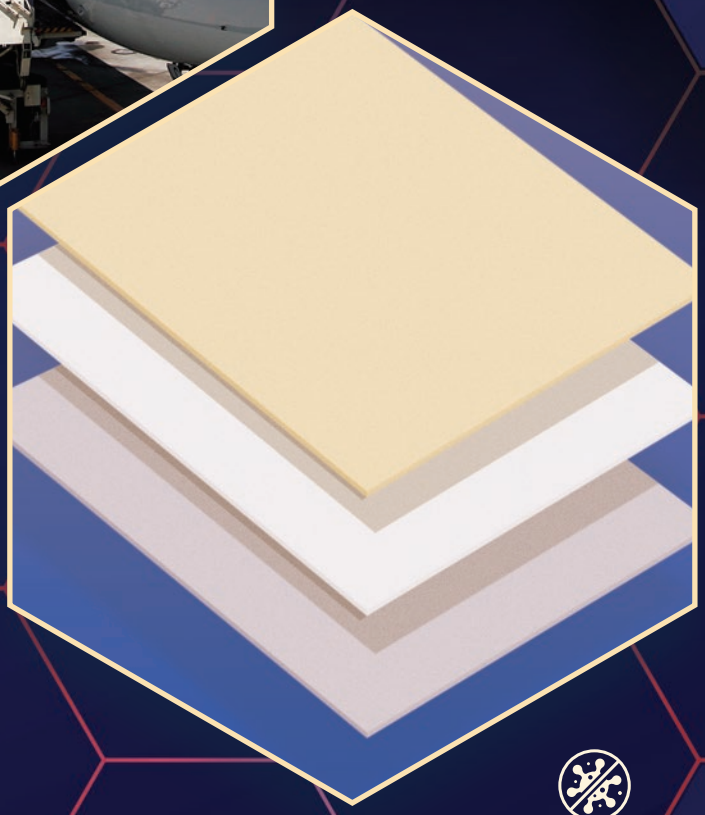
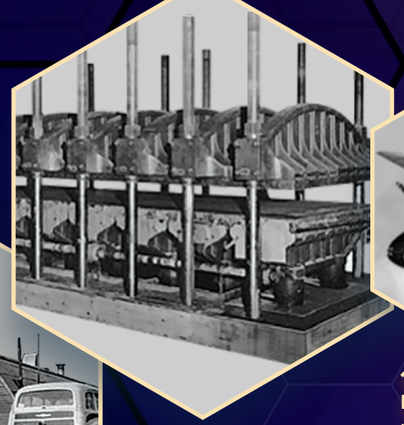
LAMINATES & PANELS





ANTIMICROBIAL TREATED

1945
M.C. Gill started, “Peerless Plastics, Inc.” in a rented 4-car garage in Montebello, CA



1955
Purchased 6’x14’ steam heated press, largest in the industry

1952
DC-6 started using our proprietary cargo liners

1959
Developed Secret Cargo Liner formulation for Gilliner® 1066

In the early 1950’s, the Douglas Aircraft Company asked if The Gill Corporation (TGC) could make a 48” wide laminate for lining the inside of the cargo compartment of their DC-6. We could and we did using a resin formulation of our own design. Several years later, while working on a new and better resin, we discovered a secret ingredient that greatly increased the mechanical values of our laminate – Gilliner® 1066.

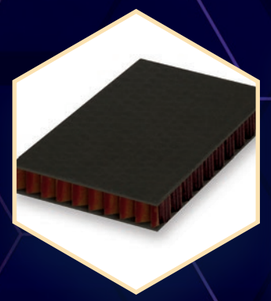
Since then, TGC expanded Research & Development, and production to become the leading supplier of cargo lining solutions for almost every aircraft in service.

TGC took its Fiber Reinforced Plastic (FRP) expertise to the next level and developed sandwich panel constructions that meet a broad spectrum of strength, weight, and environmental conditions.

Today, TGC is a globally recognized leader in sandwich panel solutions used as sidewalls, floors, and construction of monuments and assemblies.

TGC can provide optimized materials for existing, modification, conversion, derivative and new aircraft programs. Our value added offerings include full fabrication capabilities to provide detailed parts, assemblies and entire shipset kits.

Sandwich Panel



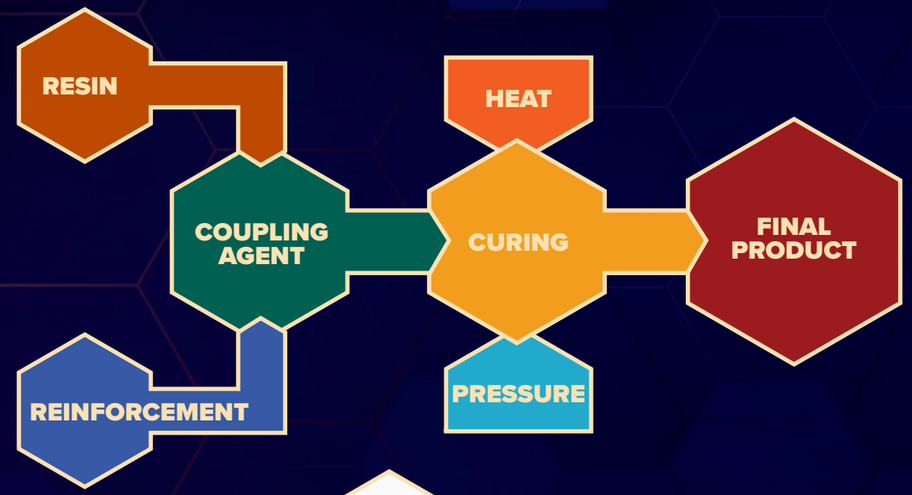
Passenger Compartment

FIBER REINFORCED PLASTIC (FRP)

Fiber reinforced plastics combine a polymer resin matrix with a fiber reinforcement to yield a high strength, lightweight composite material that is suitable for structural, and abrasion resistant fire barrier applications. The reinforcement allows for a variety of mechanical and physical properties to be designed into the laminate while the resin matrix surrounds and supports the reinforcement for optimum translation of the fiber properties. The resin mix can be modified with additives to improve characteristics such as flammability, impact and edge bearing strength.

Fiber reinforced plastics are the foundation of TGC’s cargo liner and sandwich panel designs and can be tailored to meet a specific set of requirements by modifying:

- Resin matrix
- Type of reinforcement
- Amount of reinforcement
- Orientation of the fiber
- Surface veil
- Fabrication process



Cargo Liner

Cargo Bay

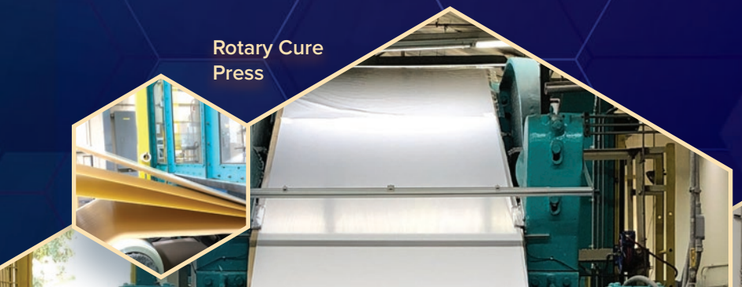
LAMINATION AND PRESSING

Fiber reinforced composites are produced with processes established specifically for the resin matrix chemistry and product construction. All TGC designs feature themorsetting polymer resins that are cured using precise heat and pressure combinations.

TGC engineering established critical production processes to blend resin with reinforcement to ensure uniform fiber coating before the matrix is thermoset. This is accomplished by using either wet lay-up or pre-impregnating the reinforcement with resin in a partially polymerized state known as B-stage prior to lay-up.

Polyester and vinyl ester laminates are produced in sheet or roll form. The roll form involves a rotary cure press where dry reinforcement is submerged in the resin to saturate the fibers. This ‘wet’ reinforcement transfers onto the heated pressing belt to cure the laminate. For phenolic laminates produced on the rotary press, pre-impregnated reinforcement is used instead of wet lay-up materials.

Polyester and vinyl ester panels are produced where dry woven reinforcement plies are ‘wet out’ with polymer resin in a manual process. The wet lay-up materials are transferred into multi-opening platen presses where heat and pressure cure the product.

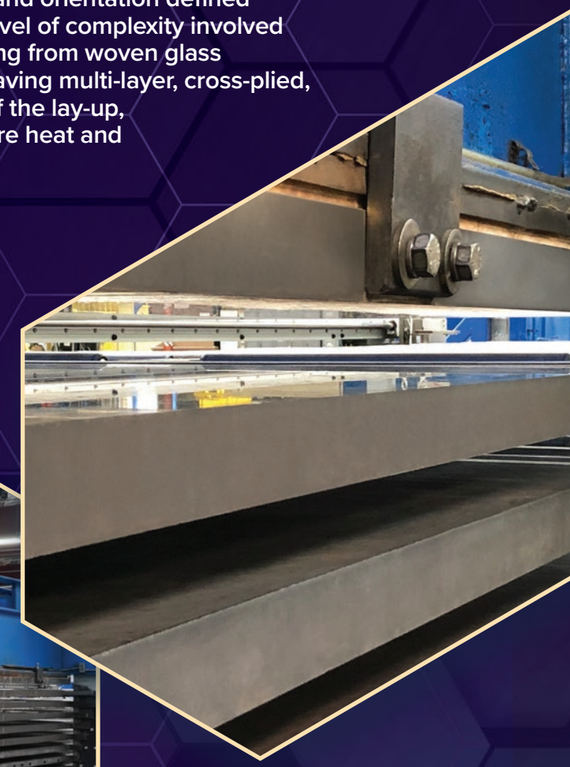


Rotary Cure Press

Material Lay-up

Epoxy, phenolic, and nylon materials are produced using a multi-step process where resin is pre-impregnated using an automated process into the reinforcement, then partially cured prior to the lay-up step. TGC’s automated process can pre-impregnate woven and unidirectional reinforcements.

The final step before lamination and pressing is lay-up, a manual operation performed by production operators in an environmentally and temperature controlled area. During lay-up, constituent materials (e.g.unidirectional and woven prepregs, honeycombs, film adhesives) are assembled directly onto a caul sheet, according to the sequence and orientation defined by the process specification. The scope and level of complexity involved in lay-up varies by product construction, ranging from woven glass reinforced laminates to sandwich structures having multi-layer, cross-plied, unidirectional facings. Following completion of the lay-up, panels are transferred into a platen press where heat and pressure are applied to cure the composite.



Multi-Opening Platen Press

SPECIALTY LAMINATES AND CARGO LINERS

Cargo liner is used to cover interior walls and ceilings of aircraft baggage and freight compartments. The liner provides fire protection as required by 14 CFR 25.855 when installed in Class B-E cargo compartments of passenger, combi and freighter aircraft. The fiberglass layers of the liner prevent cargo bay fire propagation to passenger or crew occupied aircraft areas before the fire suppression system can contain the fire. Secondarily, the liner creates a sealed environment encapsulating hazardous levels of smoke while helping to maintain an adequate concentration of fire extinguishing agents.

CRITERIA WHEN DESIGNING A LINER

- Impact/Puncture Resistance
- Edge-Bearing Strength
- Abrasion Resistance
- Flexural Strength (lower sidewall applications)
- Flammability, Smoke, and Toxicity (FST)
- Weight
- Cost

SPECIALTY LAMINATE APPLICATIONS

- Edge-attachments for aircraft windshields and transparencies
- Fuel cell lining
- Backing for non-textile flooring (NTF)
- Overhead stowage bin repair
- High-performance Laminates
- Abrasion, Impact and Fire-barriers
- Fiberglass – Epoxy/Phenolic/Polyester resins

For detailed product info, please visit our online catalog at www.thegillcorp.com

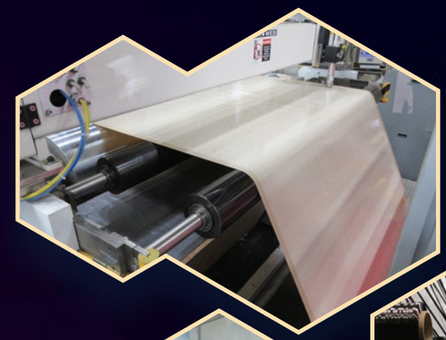
RESIN MIXING, FILM ADHESIVE, AND PREPREG PROCESSES

Polymer chemistry expertise of resins, adhesives and prepregs enable TGC to tailor optimal solutions that provide the lightest, strongest materials. TGC capabilities include

- Mixing vessels and reactors for compounding proprietary resin systems.
- Full complement of analytical testing equipment for controlling rate of cure, viscosity, chemical composition and rheometry.
- Proprietary adhesive systems produced on film coater - adaptable to different sandwich panel requirements.
- Ability to handle polyester, vinyl ester, phenolic, epoxy, and nylon resin systems.
- Ability to prepreg virtually every commercially available reinforcement - including: aramid, E- glass, S-glass, carbon, and hybrids, utilizing multiple resin systems.

R&D – Analytical Testing

Adhesive Coater



Mixing Vessel

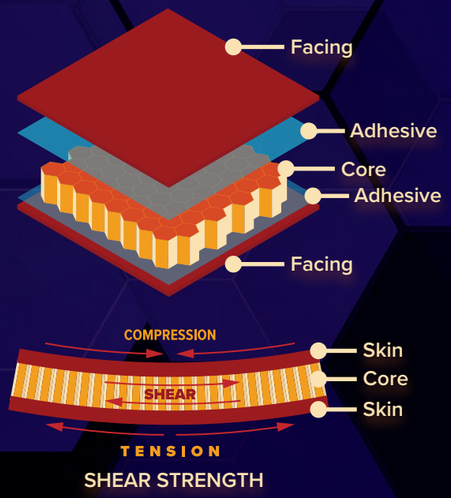
Woven Prepregger

Uni-Directional Prepregger

SANDWICH PANELS

Sandwich panels are bonded structures consisting of facings, adhesives with a core material. TGC's vertical integration capabilities allow for production of all composite facings using prepreg processes, adhesives and metallic and non-metallic core materials. The sandwich structure is similar to an I-beam where the facing act as flanges to transfer bending loads, while the core acts as the web to transfer shear loads.

Sandwich panels offer maximum design flexibility and shear strength whereby specific mechanical and physical properties can be achieved using different cores, facing materials and build-ups. Through vertical integration, we produce a variety of constituent materials to meet even the most rigorous strength and weight requirements.



SHEAR STRENGTH

EVALUATION CRITERIA

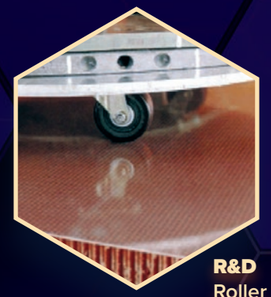
Considerations in evaluating sandwich panels may include:

SAFETY—Fire resistant; low toxicity and smoke emissions in a fire.

WEIGHT—Low initial weight; minimal weight gain when exposed to moisture, or when fastening systems and edge sealing are added.

DURABILITY—Corrosion and abrasion resistant; resistant to repetitive loading, e.g., fatigue from flexural stresses, point loads such as stiletto heels or rolling cart wheels; dent and puncture resistant; environmental resistance; no loss in strength from fabricating or from the addition of fasteners.

COST—Ease of fabrication from raw stock panel to "ready to install," e.g., simple installation of fasteners and rapid cutting with proper tools; inexpensive installation accessories such as inserts or other fasteners and edge sealant or close-out; high yield from raw stock panels, e.g., panel dimensions can be made compatible with finished sizes and resistant to edge damage during cutting using accepted cutting procedures.


R&D
Roller cart test


SAFETY
Resistance to fire and toxic smoke is an advanced feature of TGC's woven glass phenolic with aramid core honeycomb panel.


WEIGHT
Extreme light weight and strength combine to afford fuel savings in aircraft and other transport vehicles.


DURABILITY
Resistance to repeated heavily loaded caster wheels and high heels provides the durability feature.

APPLICATIONS – MEETING FST REQUIREMENTS WHERE REQUIRED

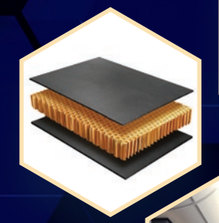
Sandwich panels are used in applications where durability and weight saving are necessary such as in aircraft, building and construction, transportation, automotive, and other structures.

CARGO BAY

- Floor panels
- Sidewalls
- Ceilings
- Partition walls
- Bulkheads
- Cargo linings
- Decompression Panels
- And other applications

PASSENGER COMPARTMENT

- Floor panels
- Class dividers
- Lavatory
- Galley
- Monuments
- Side walls
- Stow bins
- And other applications




PANEL DESIGNS

Any combination of material types built from material such as:

REINFORCEMENTS

- Unidirectional glass (E/S)
- Woven Glass (E/S)
- Unidirectional Carbon
- Aluminum

RESIN MATRICES

- Epoxy
- Phenolic
- Vinyl Ester
- Polyester
- Nylon

CORES

- Aluminum Honeycomb
- Meta-Aramid Honeycomb
- Para-Aramid Honeycomb
- End-Grain Balsa Wood

ADHESIVES

- Epoxy
- Phenolic
- Contact

As illustrated, sandwich panels have the potential to outperform monolithic structures, offering better rigidity and higher strength to weight ratio:

	1x	2x	4x
Relative Rigidity	1.0	7.0	37.0
Relative Flex Strength	1.0	3.5	9.2
Relative Weight	1.0	1.03	1.06

RATIOS OF THICKNESS TO STRENGTH AND WEIGHT

QUALIFICATIONS

We offer a list of “stock” products for AOGs and being a vertically integrated manufacturer, we can produce sub assemblies in house to meet your custom requirements.

PANELS

OEM	PRODUCT	SPECIFICATION	CONSTRUCTION
Airbus	Gillfab® 4123	5360 M1M 000500 Type MDC2	Woven glass phenolic facings/meta-aramid honeycomb core
	Gillfab® 4223	5360 M1M 000500 Type BCC2	Woven glass phenolic facings/meta-aramid honeycomb core
	Gillfab® 4405A/B	TL 53/5000/79 Types PC3-1, PC3-2	Woven glass epoxy facings/meta-aramid honeycomb core
	Gillfab® 4422	2550 M1M 000800 Types A-N	Woven glass phenolic facings, Tedlar/meta-aramid honeycomb core
	Gillfab® 4505	5360 M1M 000600 Type PC3	UD carbon phenolic facings/meta-aramid honeycomb core
	Gillfab® 4522	5360 M1M 000500 Type CCC1	Woven glass phenolic facings/meta-aramid honeycomb core
	Gillfab® 4523	5360 M1M 000500 Type BCC3	UD, woven glass phenolic facings/meta-aramid honeycomb core
	Gillfab® 4605	5360 M1M 000600 Type PC1	UD carbon phenolic facings/meta-aramid honeycomb core
	Gillfab® 5509	ADET 0096 Types I-III	UD carbon phenolic facings/para-aramid honeycomb core
AVIC	Gillfloor® 4417	ZMS4417 Types I-III	UD glass epoxy facings/meta-aramid honeycomb core
	Gillfloor® 4809C	ZMS4416 Type II	UD carbon epoxy facings/para-aramid honeycomb core
		AAMS3705 Types II, III	UD carbon epoxy facings/para-aramid honeycomb core
Boeing	Gillfloor® 4417	BMS 4-17 Types I-V, IX	UD glass epoxy facings/meta-aramid honeycomb core
	Gillfloor® 4417A	BMS 4-17 Type VI	UD glass epoxy facings/meta-aramid honeycomb core
	Gillfloor® 4518	BMS 4-17 Types X, XI	UD glass epoxy facings/para-aramid honeycomb core
	Gillfloor® 4709	BMS 4-20 Types II-IV	UD carbon epoxy facings/meta-aramid honeycomb core
	Gillfloor® 4809	BMS 4-20 Types VI-XI	UD carbon epoxy facings/para-aramid honeycomb core
	Gillfab® 5040	BMS 4-10 Type I	Aluminum facings/end-grain balsa wood core
	Gillfloor® 5424	BMS 4-23 Types I-III	UD glass epoxy facings/aluminum honeycomb core
	Gillfab® 5433E	BMS 7-326 Type VII	Aluminum facings/woven glass epoxy core
British Aerospace	Gillfloor® 4017T	MAT 003 Types I, II	UD glass epoxy facings/meta-aramid honeycomb core
	Gillfab® 4109	BAER 3247, BAER 3231	UD carbon phenolic facings/meta-aramid honeycomb core
C&D Aerospace	Gillfab® 4030	CDM200-92	Aluminum facings/aluminum honeycomb core
COMAC	Gillfab® 4223	CMS-CP-501 Type I, Class I	Woven glass phenolic facings/meta-aramid honeycomb core
	Gillfab® 4422C	CMS-CP-504 Types I-II	Woven glass phenolic facings, PVF /meta-aramid honeycomb core
	Gillfab® 4505	CMS-CP-502 Type I	UD carbon phenolic facings/meta-aramid honeycomb core
	Gillfab® 4522	CMS-CP-501 Type II	Woven glass phenolic facings/meta-aramid honeycomb core
	Gillfab® 4605	CMS-CP-502 Type II	UD carbon phenolic facings/meta-aramid honeycomb core
	Gillfab® 4809C	CMS-CP-505 Type I	UD carbon epoxy facings/para-aramid honeycomb core
Dassault	Gillfab® 4030	DWG F9XJ550042A0	Aluminum facings/aluminum honeycomb core
	Gillfab® 4034	DWG 7700262	UD carbon, woven glass epoxy facings/aluminum honeycomb core
	Gillfab® 4034	DWG F9XJ550055A0	UD carbon, woven glass epoxy facings/aluminum honeycomb core
	Gillfab® 4034A	DWG 7700355	UD carbon, woven glass epoxy facings/aluminum honeycomb core
	Gillfab® 5020	DWG F9XJ550044A0	Aluminum facings/aluminum honeycomb core
	Gillfab® 5120	DWG F9XJ550043A0	Aluminum facings/aluminum honeycomb core
Embraer	Gillfab® 4009	MEP 15-030	UD carbon epoxy facings/meta-aramid honeycomb core
	Gillfloor® 4017T	MEP 15-031 Types I, II	UD glass epoxy facings/meta-aramid honeycomb core
	Gillfab® 4030	MEP 02-010 Classes I-V	Aluminum facings/aluminum honeycomb core
	Gillfab® 4117	MEP 15-017 Types I, III-XIX	Woven glass epoxy facings/meta-aramid honeycomb core
	Gillfab® 4122A	MEP 15-029 Types I-VI	Woven glass phenolic facings/meta-aramid honeycomb core
	Gillfab® 5040	MEP 02-011	Aluminum facings/end-grain balsa wood core
Goodrich Corp	Gillfloor® 4809	4E7873-1, -2, -3	UD carbon epoxy facings/para-aramid honeycomb core
Gulfstream	Gillfab® 4030	CCS1039	Aluminum facings/aluminum honeycomb core
	Gillfab® 4122A	CCS1004	Woven glass phenolic facings/meta-aramid honeycomb core
	Gillfloor® 4417G	GAC101FE	UD glass epoxy facings/meta-aramid honeycomb core
Learjet	Gillfab® 5101	LES1277	Aluminum facings, primed/aluminum honeycomb core
	Gillfab® 5020	LES 1070, Grades 1-3	Aluminum facings/aluminum honeycomb core
McDonnell Douglas	Gillfloor® 4017T	DWG BZZ7002 Type III	UD glass epoxy facings/meta-aramid honeycomb core
	Gillfab® 4022A	DWG 9D0059 Types 1A, 2A	Woven glass phenolic facings/meta-aramid honeycomb core
	Gillfab® 4109	DWG 9D0207 Types I, II	UD carbon phenolic facings/meta-aramid honeycomb core
	Gillfab® 4417	DWG BZZ7002 Types I, II	UD glass epoxy facings/meta-aramid honeycomb core
	Gillfab® 5042B	DWG S3932193	Aluminum facings/end-grain balsa wood core
	Gillfab® 5042B	DWG S3932195	Aluminum facings/end-grain balsa wood core
	Gillfab® 5042B	DWG S4931863	Aluminum facings/end-grain balsa wood core
	Gillfab® 5065	DWG BZZ7002 Types IV, V	UD glass epoxy facings/aluminum honeycomb core
The Gill Corporation	Gillfab® 4321	FAR 25.855 Flammability	UD, woven glass epoxy facings/meta-aramid honeycomb core
	Gillfab® 4623	FAR 25.855 Flammability	UD, woven glass epoxy facings/meta-aramid honeycomb core
	Gillfloor® 5007C	FAR 25.855 Flammability	Woven glass, mat polyester/end-grain balsa wood core
	Gillfloor® 5007D	FAR 25.855 Flammability	UD, woven glass mat polyester facings/end-grain balsa wood core
	Gillfab® 5071A	FAR 25.853 Flammability	Woven glass phenolic facings/meta-aramid honeycomb core
	Gillfab® 5075	FAR 25.853 Flammability	Woven glass phenolic facings/meta-aramid honeycomb core

LAMINATES

OEM	PRODUCT	SPECIFICATION	CONSTRUCTION
Airbus	Gillfab® 1369A	2550 M1M 000800 ABS 5777	Woven glass phenolic, Tedlar 1 side
	Gillfab® 3072	2550 M1M 000400	Woven glass phenolic ‘h’ profile, Tedlar 1 side
AVIC	Gillfab® 1002	ZMS 1556	Woven glass phenolic
	Gillfab® 1042	ZMS1558 Type I	Woven glass phenolic
	Gillfab® 1342	ZMS 1558 Type III	Woven glass phenolic with peel ply
	Gillfab® 1370A	ZMS2419 Class 1	Woven glass phenolic, Tedlar 1 side
Boeing	Gilliner® 1076C	BMS 8-2 Class 1, Grade A	Woven glass polyester
	Gilliner® 1366C	BMS 8-2 Class 2, Grade A	Woven glass polyester
	Gillfab® 1137	BMS 8-13 Type I	Woven nylon nylon
	Gilliner® 1366F	BMS 8-2 Class 2, Grade B	Woven glass polyester, Tedlar 1 side
	Gilliner® 1076D	BMS 8-2 Class 3, Grade A	Woven glass, matte polyester
	Gillfab® 1368A	BMS 8-223 Class 2, Grade B	Woven glass phenolic, Tedlar 1 side
	Gillfab® 1368B	BMS 8-223 Class 4, Grade B	Woven glass phenolic, Tedlar 1 side
	Gillfab® 1368E	BMS 8-223 Class 2, Grade A	Woven glass phenolic, Tedlar both sides
	Gillfab® 1368G	BMS 8-223 Class 5, Grade B	Woven glass phenolic, Tedlar 1 side
C&D Zodiac	Gillfab® 1368A	CDM010-09 Class 2, Grade B	Woven glass phenolic, Tedlar 1 side
	Gillfab® 1368B	CDM010-09 Class 4, Grade B	Woven glass phenolic, Tedlar 1 side
	Gillfab® 1368E	CDM010-09 Class 2, Grade A	Woven glass phenolic, Tedlar both sides
	Gillfab® 1368G	CDM010-09 Class 5, Grade B	Woven glass phenolic, Tedlar 1 side
Cessna	Gillfab® 1368A	TPS 3511	Woven glass phenolic, Tedlar 1 side
COMAC	Gillfab® 1370A	CMS-CP-503 Class 2, Grade B	Woven glass phenolic, Tedlar 1 side
De Havilland	Gilliner® 1366	DHMS P1.42 Class B, Grade 1	Woven glass polyester
	Gilliner® 1366T	DHMS P1.42 Class B, Grade 2	Woven glass polyester, Tedlar 1 side
Embraer	Gillfab® 1050	MEP 15-046 Type IV	Woven glass epoxy
	Gilliner®1366	MEP 15-046 Type III	Woven glass polyester
Honeywell	Gillfab® 1368A	CEMS-1068	Woven glass phenolic, Tedlar 1 side
McDonnel Douglas	Gillfab® 1002	DMS 1556	Woven glass phenolic
	Gillfab® 1042	DMS 1558 Type II	Woven glass phenolic
	Gillfab® 1100	DMS 1946 Type I	Woven glass polyester, Tedlar 1 side
	Gillfab® 1167	DMS 2226 Type I, Class 1	Woven glass phenolic, Tedlar 1 side
	Gillfab® 1368A	DMS 2419 Class 1, 2	Woven glass phenolic, Tedlar 1 side
Military	Gillfab® 1002	MIL-P-25515	Woven glass phenolic
Sierracin	Gillfab® 1302	MAT 277	Woven glass phenolic
	Gillfab® 1002	MAT 350	Woven glass phenolic
	Gillfab® 1109	MAT 723 Type I	Woven nylon epoxy
The Gill Corporation	Gilliner® 1066	FAR 25.855 Flammability	Woven glass polyester
	Gilliner® 1366D	FAR 25.855 Flammability	Woven glass, scrim polyester

For detailed product info, please visit our online catalog at www.thegillcorp.com

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