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NUMBER 2


# THE M.C. GILL DOORWAY

*"We try hard enough to make it happen"*

New area code
M.C. GILL CORP., 4056 EASY ST., EL MONTE, CA 91731 • PHONE (626) 443-4022 • FAX (626) 350-5880 • http://www.mcgillcorp.com

## You Have a Question About Cargo Liner?

## You do have a question?

*Well then, step up to the plate and take your cuts. I'm one tough toad who can handle any problem you got as far as liners go! They're just pop flies in my league.*

*For starters, the following pages contain the answers to any question you have about cargo (or, baggage compartment) liner.*

*But, if you answered "no", read on anyway. The information contained in this issue of the Doorway will jar your memory and is just the kind of refresher course on cargo liner you need. You'll learn some things you have forgotten plus others you thought you knew but didn't. I guarantee it!*

*The following pages back me up—they have the answers to any question you may have about cargo liner. Among the subjects covered are the purpose of cargo liner, its history, construction, properties, testing, and how to order.*

*And lastly, should you stagger into a question that is not already answered herein, that's tough! Because nobody knows more than I do.*

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*Pssst...that tough talking blow-hard toad doesn't know everything! (The only reason we tolerate him and his bad attitude is that he's so photogenic). We pride ourselves on our customer service and being among the most knowledgeable in the business. If there is something we have not covered in the following pages let us know and we will get an answer for you post haste. We're here to serve you.*

*(Signed) Top Management*



**Cargo liner (also called baggage compartment liner) is used to cover the interior walls of the baggage and freight compartments of commercial aircraft. Truth be told, there isn't a lot of pizzaz to it. It's flat, it's made of reinforced plastic, and it's usually white (although years ago we did make it black for one customer and tan for another). Many people, even in the commercial aviation industry, wouldn't know what it is unless they see it installed... and there is a chance they still wouldn't know what it's purpose is.**

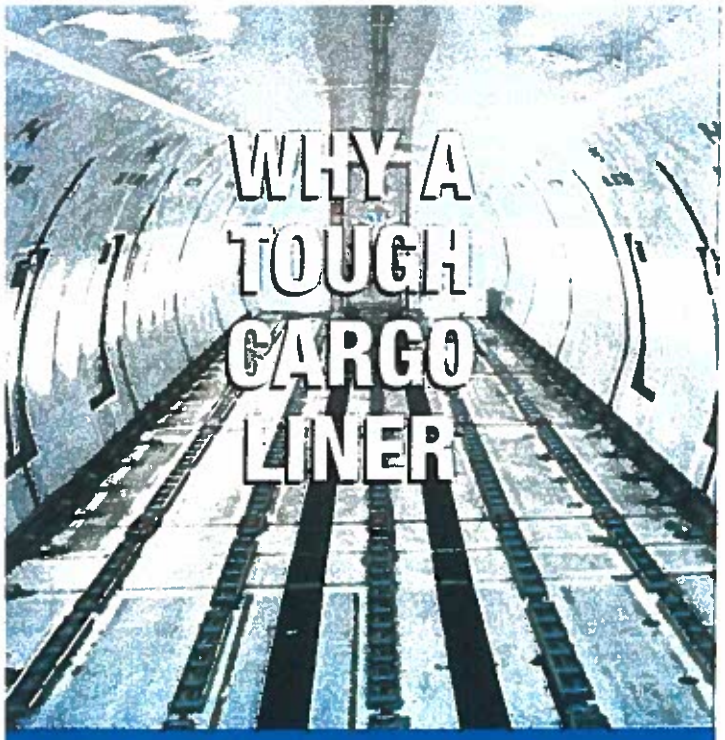
**Without cargo liner there probably wouldn't be an M.C. Gill Corporation. M.C.'s first**

order for cargo liner (from Convair in 1946) ultimately determined the future course to success of the company. As the oldest and largest cargo liner manufacturer in the world, we currently sell hundreds of thousands of square feet per year—to airframe manufacturers as original equipment and as replacement material to virtually every commercial airline in the world, and that's as good as it gets!

Our copyrighted trade name "Gilliner®" has even become the generic term for cargo liner. Its use may not appear to be exciting, but it serves a very important purpose in the aircraft industry.

...Gilliner 1366...face side...mfg 2nd Q'98...Gilliner 1366...face side...mfg 2nd Q'98...Gilliner 1

...Gilliner 1366...face side...mfg 2nd Q'98...Gilliner 1366...face side...mfg 2nd Q'98...Gilliner 1



# WHY A TOUGH CARGO LINER

There are literally miles and miles of hydraulic lines, wiring, tubing, and ducting that run through structural members along the inner side of the outer skin of the aircraft. Cargo liner's primary function is to serve as a barrier to protect those conduits from shifting cargo and the impact of loading or mishandling baggage; and to protect the outer skin of the aircraft. Unless the liner selected has high impact (puncture) and pullout resistance with consistently uniform quality, a potential for real danger exists. Cargo liner covers the lower and upper sidewalls and ceiling (and sometimes parts of the floor) of the entire cargo compartment.

## *Cargo Liner History... Early On*

Probably the first materials used for lining baggage compartments was ABS sheet, aluminum and plywood. These materials of choice had many drawbacks, including rigidity and weight. But the early aircraft builders had other considerations to contend with and cargo lining material was not high on their list of priorities.

We don't know whose idea it was to use fiberglass reinforced plastic (frp) for cargo liner but it was a major breakthrough and a definite improvement over the aforementioned materials.

The original frp products represented a quantum leap in cargo liner quality and performance but they possessed fewer than half of the desired characteristics common to today's materials. They did have low specific gravity, good corrosion resistance, satisfactory flame resistance, repairability, good aging properties, and dent and fatigue resistance, but they were a far cry from the liners available today, which are 50% lighter than the early liners.

## *With Larger Piston Aircraft*

With the advent of the larger four-engine piston driven aircraft such as the DC-6 and DC-7, improvements in basic properties were required. Mechanical properties were upgraded by the use of satin weave fabrics and bolted joint pullout resistance at the edges was increased. Pigments were added to the resin systems to obtain a uniform white color throughout, wide sizes (48" and 60") became standard and much of the surface porosity was reduced so that the sheet possessed greater integrity. Thickness was often the answer to increased puncture resistance, and although thicker meant heavier, weight was not as critical as it is now.

Gillfab® 1018, qualified to Douglas specification 10011 (now obsolete), is a liner that was representative of the era, although sales of that product have evaporated in recent years. Vast improvements in the newer liners have accounted for those decreases–for example, in the last three years sales of 1018 have totaled less than 20 sheets.

## *With the Advent of the Jet Age*

The introduction of jet aircraft to commercial aviation focused attention on weight and improved puncture resistance. Test fixtures, were developed to empirically ascertain comparative values expressed in foot-pounds. Each airframe manufacturer designed its own impact tester, creating confusion when attempts were made to correlate data.

Liners of the last of the piston aircraft and early jets were upgraded by advances in resin technology, proprietary additives, special cloth weaves, and better processing techniques. The advances resulted in improved puncture resistance, reduced weight, better flame self-extinguishing properties, and resistance to shear—all of which combined to greatly prolong service life.

*As the trijets became increasingly popular, cargo liner weight became more and more critical.* Material requirements were met by higher performance reinforcing agents. The goal was to provide a better liner that weighed less, and to improve the following characteristics: abrasion and shear resistance; rigidity for better appearance; flame resistance; and puncture resistance.

Also, surface blemishes, and porosites were eliminated. Gilliner 1166, 1266, and 1366 met almost all the desirable characteristics and represented almost 30 years of concerted effort and specialization in the field.

## *A Quote From the Past*

***"The cargo liner of the immediate future will probably employ a resin which when burned produces little or no smoke or toxic gasses. The reinforcing laminate will have a much higher strength-to-weight ratio and surface abrasion will be greatly improved."***

## *Here And Now*

The above is a direct quote from a past Doorway article, and given what we know now the words don't seem all that profound. But, that article appeared in our Summer 1973 issue! If it sounded prophetic it was, because today's cargo liners use a phenolic resin, which when burned produces extremely low smoke and toxic emissions. These liners, typified by Gillfab 1167, 1167B, 1367, and 1367A all have very high puncture resistance, and good mechanical strength and stiffness. The new phenolic liners meet all the mechanical and physical properties specified by the airframe manufacturers. More importantly, they, along with almost every other M.C. Gill cargo liner, pass the FAA's flame and burn-through tests discussed in a later section of this article.

# CARGO LINER CONSTRUCTION

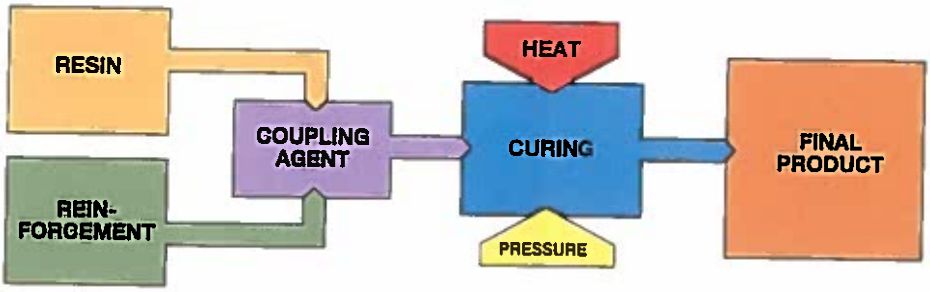
## RESINS

**Polyester resins** have been used since the inception of cargo liners. They are low in cost, easy to process, have fast cure times and no outgassing. They have fairly high mechanical strength and perform well in high impact applications. Polyesters emit high smoke and some toxic emissions in a fire.

**Phenolic resins** are relatively low in cost. Their biggest advantages are low smoke emissions in a fire and high resistance to burning. They have good mechanical strength and fair puncture resistance when modified. They require slow high temperature curing and take longer to manufacture. They are prone to emit volatiles during cure that may result in parts with slightly porous surfaces. Its dark beige color is negated with a film of white Tedlar® on the top surface.

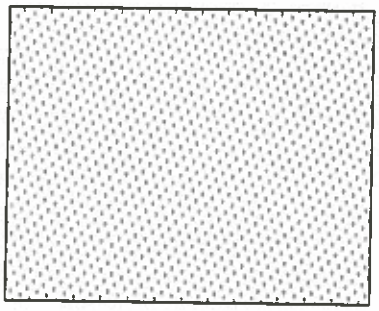
Note: although white Tedlar is by far the most commonly used overlay, a range of colors is available. Also pigments can be added to polyester resin to produce an even greater number of colors.

**Epoxy resins** have excellent adhesive properties. They cure slowly at elevated temperatures and are 100 percent reactive, so there is no outgassing on cure or contaminating by-products. Epoxies are more expensive than polyesters or phenolics and produce high smoke with some toxicity in a fire. They must be covered with Tedlar because they are difficult to color with pigments.

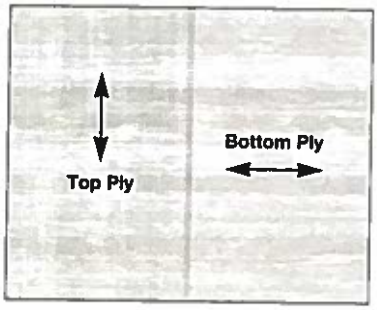



Cargo liner is a composite consisting of a reinforcement, such as two or more plies of glass cloth which provide strength and a resin, or matrix. The cloth is embedded in the resin much as re-bar is embedded in concrete for reinforcement. Resins are usually a polyester or phenolic, and sometimes an epoxy.

# REINFORCEMENTS



*Satin Weave S-Glass Cloth*




*Cross-plied*

The reinforcement is most often fiberglass cloth, either E-glass or S-2 glass. The reason is that most other fibers do not pass the FAA's burn-through test.

**E-glass cloth** was the first and is the lowest cost reinforcement. It has high mechanical strength properties combined with good moisture, chemical and heat resistance.

**S-2 glass cloth** has the same low rigidity of E-glass (compared to aluminum or carbon) but it has considerably higher tensile strength and puncture resistance. It has the best strength-to-weight ratio of cargo liner reinforcements that pass the burn-through test, but is more expensive than E-glass.

Glass reinforcements come in two general forms. Rovings are a ribbon-like collection of parallel continuous strands of filaments and are cross plied. Although cross plied makes a satisfactory cargo liner and its puncture resistance is very good, it is more expensive and therefore its use is diminishing in favor of cargo liners made from woven cloth.

Woven glass cloths normally range in thickness from .004" to .020" and are the standard reinforcements for aircraft laminates. The style and weave affect mechanical properties. Aircraft laminates are usually made with satin weave cloth because they are stronger in flexure.

Once combined, resin and reinforcement are subjected to heat and pressure, and the result is a multi-ply laminate that accomplishes the aforementioned functions.

Airframe manufacturers and airline design/maintenance engineers will point out that the above is somewhat oversimplified because just as there are varying grades of steel and aluminum alloys, the same applies to frp. Only the highest quality liner materials will meet the exacting criteria demanded by the aviation industry.

# CARGO LINER

**In the early days, resistance to corrosion, fatigue, and dents, a flame self-extinguishing feature and a "good appearance" were about the only properties required of cargo liners. Not any more. Every time a new generation of aircraft is introduced it is accompanied by stronger and lighter cargo liner specifications.**

*Some properties are more important than others. From a safety and service standpoint, design engineers determined desirable properties and their values but some of those have little or no relation to in-service use. We believe the only true measure of the product's ability to perform is the "in-service test", where the product is subjected to actual usage, flight after flight, day after day. Based on the experience we've gained since 19-15 on in-service testing, the following properties are those we consider to be most important.*

**Impact, or Puncture, Resistance**

This property relates to the ability of the cargo liner to withstand penetration which could expose the area of the aircraft's interior wiring, cable and ducting behind it. Although there is redundancy in hydraulic and electrical, a puncture could disable the aircraft and pose a danger to its passengers. A hole could also allow smoke and toxic fumes to escape if there were a fire in the cargo compartment. Therefore care must be taken that the lining material is thoroughly tested and uniform in quality.

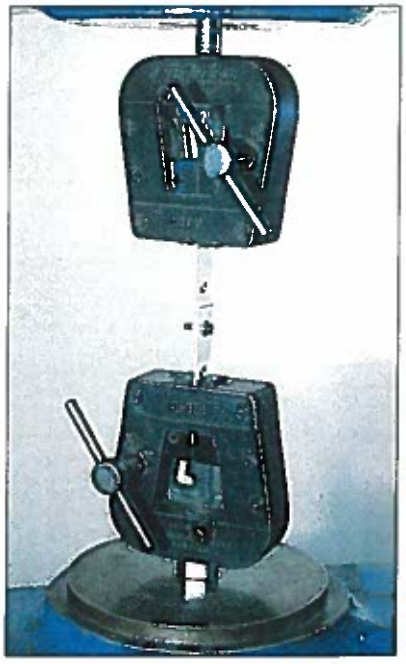
*Impact or Puncture Resistance Test indicates the cargo liner's ability to withstand penetration*

Boeing's impact resistance is measured in foot-pounds (ft-lbs), and is the distance a pointed object with a specified radius and of a given weight is dropped, before it impacts the material. It should be noted that Boeing's test instrument point is not the same as Douglas' and Lockheed's is different still, hence different values are obtained and bear little relationship to each other.

**Bolted Joint Pull Out or Edge Bearing Strength**

Relates to the cargo liner's resistance to the pressure or force required to elongate a hole at the point the liner is fastened to a rib. This elongation can be more serious than puncture damage. High pullout strength means fewer fasteners are required, thus lowering weight and decreasing installation time.

Bolted joint pull out is measured by the total number of pounds required to elongate a fastener hole. Edge bearing strength is measured in pounds per square inch (psi) required to achieve the same result (Boeing).



*Bolted Joint Pull Out Test measures the cargo liners resistance to force.*

*Boeing Test Method*

*McDonnell Douglas Test Method.*

*Both samples were tested to failure.*

# PROPERTIES

*Burn through Test. If flame burns a hole through test specimen the test is considered a failure.*

### Burn Through

The importance of this property is obvious. It means simply that a 1700°F flame will not penetrate or burn through the liner material within five minutes, nor will the temperature behind the liner exceed a maximum of 400°F in the same length of time. If either occurs, the product fails and is deemed unsafe.

### OSU Heat Release

OSU stands for Ohio State University where the testing procedure was developed. The test measures the total quantity of heat released during the first two minutes of exposure and the peak release rate during the same period. The current maximum for each measure is 65 kilowatts per square meter. These values are often expressed as 65/65. As a basis for comparison, when a piece of oak flooring is tested, the results are 130/130—double the above standard.

### Tensile Strength and Modulus

Measures the strength of cargo liner under tension. The sample is measured and placed in test machine grips. The specimen is aligned with the direction of pull and the speed set at the prescribed rate. An extension indicator is attached to obtain a load extension curve. Maximum load is measured at the yield point, if one exists, and/or break.

### Flexural Strength and Modulus

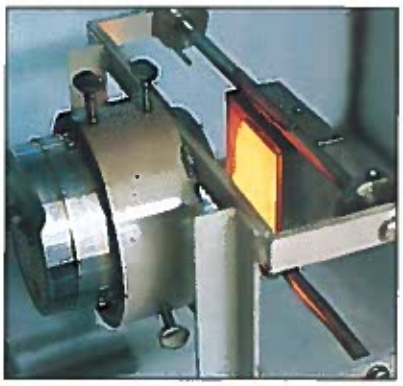
Measures stiffness. The specimen is tested in flexure as a simple beam supported at two points and loaded at the mid-span. The test material is loaded until rupture occurs (maximum stress occurs in the outside fibers at mid-span). A deflectometer is placed at the center of the specimen to obtain a load-deflection curve which is used to calculate modulus (stiffness).

### Water Absorption

This test determines the relative amount of water absorption by liner when immersed. Test results provide a guide to the effects of exposure to water or humid conditions when the product is in service. The material is measured and weighed, and immersed on edge in a container of distilled water at a temperature of 73.4°F, ±1.8°. At the end of 24 hours it is removed, wiped dry, immediately weighed to the nearest 0.001 grams, and percentage of weight increase is calculated.

### Hardness

Measures indentation hardness using a model GYZJ 934-1 Barcol Impressor. Because each test reading is only accurate to ±10 percent, ten readings are taken and averaged to arrive at the value.



*NIST (NBS) Smoke Chamber Test measures smoke density of cargo liner when exposed to heat and flame.*

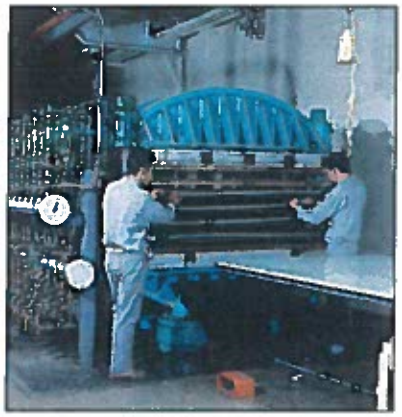
### NIST (NBS) Smoke Emission

Relates to the amount or density of the smoke emitted when a material burns. The higher the density, the thicker the smoke and the harder it is to see and breathe. The smoke density test measures the optical density of the smoke generated by the test material when it is flaming.

The phenolic resin M.C. Gill uses in the manufacture of many of its cargo liners has resulted in a number of liners whose smoke emission values are well below the current standard. Our first phenolic liners were submitted to an OEM in the late 1960's and we are considered by the industry to be a pioneer in phenolic resin technology.

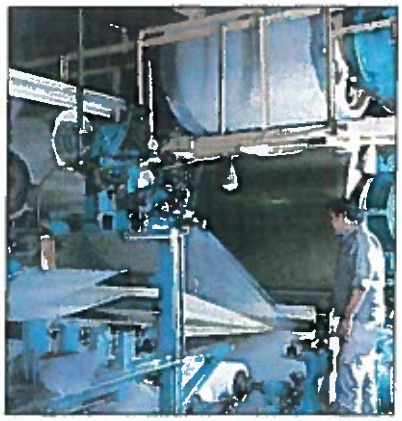
Note: The FAA has established standards that materials used in passenger cabins must meet for smoke emission and heat release but not for cargo liners. Tests prove our liners fall well within the standards that the Agency has established for passenger cabin materials. The M.C. Gill Corporation has always been, and will continue to be, in the forefront of new product development—especially in the area of passenger safety.

# CARGO LINER MANUFACTURE



*There are two basic ways the M.C. Gill Corp. manufacturers cargo liner.*

*The first is a wet layup where the reinforcement, usually fiberglass cloth, is impregnated with resin and then cured under heat and pressure in one of our large presses dedicated to that use. The sheets range in thickness from .011", .016", and 020" and up in multiples of .005" with a maximum length of 168" and maximum width of 72".*



*The press shown here (far left) is one of our busiest and biggest. The platen size of this six-opening press is 74" x 150" with pressure up to 200 psi; temperatures from 60°F to 360°F, and platens parallel to .005 T.I.R.*

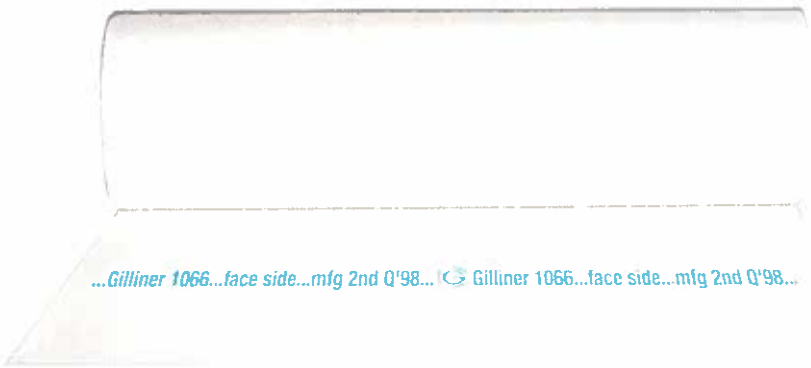
*The second is that made on the Rotocure, (shown center and right above). It continuously presses laminates up to .045" thick, 60" wide (trimmed to exact width) and has the flexibility of producing sheet stock (cut to specified length) or roll stock*

*up to 150' or longer. The roll stock is conveniently packaged in "dispenser" boxes which requires less space for storage and cuts down waste because you pull from the box and cut only the length you need. The rotocure is used to produce Gilliners 1066, 1166, 1366, 1167, 1367, and 1367A, all of which can be surfaced with a Tedlar overlay for color uniformity, cleanability and weathering resistance.*

## *Technology Ahead With Flexibility to Meet Customer Requirements*

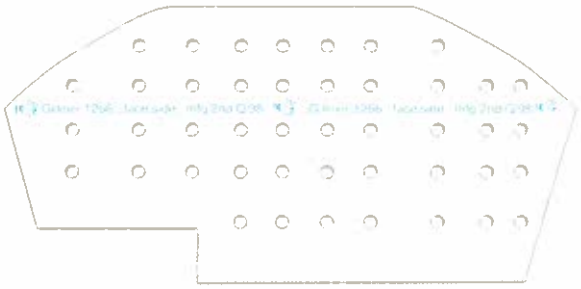
M.C. Gill received orders for cargo liner from his first two customers because he could make the product wider by hand lay up than his competition could with its continuous laminating equipment. Essentially, he was willing to work with his customers and meet their requirements rather than impose inflexible parameters that he established. It has been ever thus and is typical of successful pioneers in any field. This philosophy and the ability to stay at least one technological step ahead of everyone else have given us the advantage needed to remain number one in this field since 1945.

# HOW TO ORDER CARGO LINER




*M.C. Gill manufactures Gilliner in two modes...*
*Raw Sheets (or rolls) and Fabricated Parts.*
*And in the unlikely event you should puncture your Gilliner,*
*don't forget our Gillpatches—they're FAA approved.*

**Raw Stock** means that the end product is available in sheets or rolls of premeasured lengths, widths and thicknesses. Although we'll supply you with almost any length or width you wish, standard dimensions are 36", 48", 60", or 72" widths; 8', 10', 12', and 14' lengths. Generally, roll stock is available in widths up to 60", lengths up to 150', and thicknesses to 0.045". If you require dimensions smaller than these standards, they are cut from the next largest size.



**Fabricated stock** is tailored, or cut, in shapes other than rectangles or squares. To supply you with these shapes we require drawings showing precise dimensions and tolerances. We enter these data into our CAD (Computer Aided Design) program which creates the profiling pattern of the surface, calculates a tool path for cutting, transfers that program to the profiler which then machines the part on our 5-axis CNC profile machines. We can also program the machine to drill holes for inserts or rout cutouts.

We can supply virtually any thickness, which generally is dependent on a particular airframe manufacturer's specification and repair manual. If there is no specification, thickness is usually dependent on its location in the cargo compartment of the aircraft, e.g., the closer to the floor, the thicker the material. If you'd like additional information, we have prepared a six page bulletin on "How to Order M.C. Gill Products." For a copy, write, phone, fax, or e-mail.

Marketing Services Department, 4056 Easy Street, El Monte, CA 91731
Phone (626) 443-4022, Fax (626) 350-5880; e-mail http://www.mcgillcorp.com

# TABLE 1 – PROPERTIES OF SELECTED M.C. GILL CARGO LINERS

| Property | Gill Product Number and Specifications to Which They Qualify | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1066 Proprietary | 1076B BMS 8-2 Cl 2, Gr A | 1100 DMS 1946 | 1266 Proprietary | 1167 DMS 2226 Ty 1, Cl 1 | 1366* BMS 8-2 Cl 2, Gr A LAC-D-22-1248, Cl 2 | 1367 BMS 8-223 Cl 2, Gr B LAC-D-22-1248 Cl 3 | 1367A BMS 8-223 Cl 2, Gr B DMS 2451 LAC-D-22-1248 Cl 3 | 1367B BMS 8-223 Cl 4, Gr B |
| Flex. str., psi | 18,000 | 24,000 | 70,000 | N/A | 64,550 | ** | 30,000 | 39,100 | ** |
| Flex. mod., psi x $10^6$ | 1.0 | 1.4 | 2.9 | N/A | 2.66 | ** | 2.2 | 2.57 | ** |
| Tensile str., psi | 38,000 | 47,000 | 45,000 | N/A | 69,800 | ** | ** | 57.9 | ** |
| Compressive str., psi | 9,000 | ** | 20,000 | N/A | ** | ** | N/A | N/A | ** |
| Bolted joint pull out per DMS 1946, (.030" lam.) psi | 325 | N/A | 350 | 629 | 429 | 350 | N/A | 240 | N/A |
| Edge bearing strength, per BMS 8-262, (.030" lam.) psi | 27,000 | 27,000 | 36,000 | 38,000 (.070") | N/A | 37,100 | 40,000 | 38,000 | 48,500 (.040") |
| Taber abrader grams lost, 2000 cycles, CS10 wheel | .075 | .035 | .028 | .040 | .060 | .041 | N/A | N/A | N/A |
| Weight, lbs./ft.$^2$ (Thickness) | 0.6 (.060") | 0.5 (.045") | 0.6 (.060") | 0.686 (.070") | 0.285 (.027") | 0.292 (.033") | 0.275 (.030") | 0.293 (.030") | 0.32 (.040") |
| Water Absorption, % maximum | 2.5 | 1.0 | 0.65 | 1.66 | 1.1 | 1.6 | 1.78 | 0.9 | 0.581 |
| Barcol Hardness, minimum | 30 | 45 | 60 | 45 | N/A | N/A | N/A | N/A | N/A |
| Impact Resistance: | | | | | | | | | |
| Douglas pendulum Tester #2 (.045" lam.), ft-lbs. | 62 | N/A | 46 (.060") | 45 | 56 | 66 (.040") | N/A | 45 | N/A |
| Boeing dart tester #3 (.030" lam.), ft-lbs. | 10 | 18 (.045") | 5 | N/A | N/A | 31 | 27.5 | 19 | 23 (.040") |
| NBS Smoke Emission $D_S$ @ 4 minutes Flaming (thickness) | 550 (.060") | NA | 319 (.060") | NA | 60 (.030") | NA | 50 (.030") | 31.6 (.030") | 64 (.040") |
| 60 Second Burn | Pass | Pass | Pass | Pass | Pass | Pass | Pass | Pass | Pass |
| 45° Burn | Pass | Pass | Pass | Pass | Pass | Pass | Pass | Pass | Pass |
| Burn through, per FAR 25.855, App. F, Part III Amend. 25-60 | Pass | Pass | Pass | Pass | Pass | Pass | Pass | Pass | Pass |
| OSU Heat Release (kw-mins./M$^2$ and kw/M$^2$ | NA | NA | NA | NA | 38/35 (.030" thick) | 52/42 (.030" thick) | 25/19 (.030" thick) | NA | NA |

* Proprietary product subsequently adopted by and qualified to specifications shown. * *No requirement in specification. N/A – Not Applicable NA – Not Yet Available. Note: Specification values are shown for 1066, 1076B and 1100; typical average values are shown for 1266, 1167, 1366, 1367, 1367A and 1367B.

# A CHRONOLOGY OF M.C. GILL CARGO LINERS

| Year Introduced | Part No. | Customer | Construction* |
|---|---|---|---|
| 1946 | 1038 | Convair | Polyester |
| 1951 | 1018 | Douglas | Polyester |
| 1958 | 1044 | Douglas | Polyester[1] |
| 1961 | 1066 | Douglas, United, Delta | Polyester |
| 1965 | 1076 | Boeing | Polyester |
| 1972 | 1108 | Boeing | Epoxy[2] |
| 1972 | 1138 | Lockheed | Polyester |
| 1972 | 1338 | Lockheed | Polyester[3] |
| 1972 | 1366 | United | Polyester |
| 1973 | 1095/1096 | McDonnell Douglas | Polyester |
| 1977 | 1102 | McDonnell Douglas | Phenolic |
| 1977 | 1102 | McDonnell Douglas | Phenolic |
| 1978 | 1366T | Boeing | Polyester |
| 1978 | 1166 | Proprietary | Polyester |
| 1978 | 1266 | Boeing | Polyester |
| 1979 | 1014 | McDonnell Douglas | Polyester |
| 1980 | 1566 | Boeing | Polyester[4] |
| 1980 | 1076 | Boeing | Phenolic |
| 1981 | 1076 | Boeing | Polyester |
| 1985 | 1167 | McDonnell Douglas | Phenolic |
| 1986 | 1367 | Boeing | Phenolic |
| 1986 | 1367 | Boeing | Phenolic |
| 1991 | 1167B | McDonnell Douglas | Phenolic |
| 1991 | 1367A | Boeing | Phenolic |
| 1994 | 1367B | Boeing | Phenolic |
| 1994 | 1076B | Boeing | Polyester |

*Unless otherwise noted, the reinforcement in the above products is reinforced fiberglass cloth; only the resins are called out. [1] Reinforcement was half nylon and half glass cloth [2] Epoxy unidirectional glass [3] Reinforcement is Nomex® or Kevlar® cloth. [4] Reinforcement is Kevlar®

# WHERE GILLINER IS ORIGINAL EQUIPMENT

| Boeing All 700 Series | | McDonnell Douglas Aircraft as noted in ( ) | | Lockheed L-1011 | |
|---|---|---|---|---|---|
| Part No. | Specification | Part No. | Specification | Part No. | Specification |
| 1076R | BMS 8 - 2, Cl 1 | 1100 | DMS 1946, Ty 1 (DC-10 & KC-10) | 1138 | LAC-C-22-1249, C1 1 |
| 1366 | BMS 8-2, Cl 2 | 1100G | DMS 1942, Ty 2 (DC-9) | 1338 | LAC-C-22-1347, C1 1 |
| 1366T | BMS 8-2, Cl 2, Gr B | 1167 | DMS 2226, Ty 1 & Ty 2 (MD-80 & MD-11) | 1366 | LAC-C-22-1249, C1 3 |
| 1367 | BMS 8-223, Cl 2, Gr B (all types) | 1167B | DMS 2226, Ty 1 (MD-80 & MD-11) | 1367 | LAC-C-22-1249, C1 3 |
| 1367A* | BMS 8-223, Cl 2, Gr B (Types 13, 20, 30, 40) | 1367A* | DMS 2419 (All Douglas aircraft) | 1367A* | LAC-C-22-1249, C1 3 |
| 1367A* | BMS 8-223, Cl 2, Gr C (Type 40) | | | | |
| 1367B | BMS 8-223, Cl 4, Gr B (Types 13, 20, 30) | | | | |

*Universal liner; used in Boeing, Douglas, and Lockheed aircraft

# As M.C. Gill tells it...

# A LITANY OF

**Gilliner wasn't just born whole—ker plop! It evolved from much seeking in the blind alleys of a maze we had trod for almost six years.**

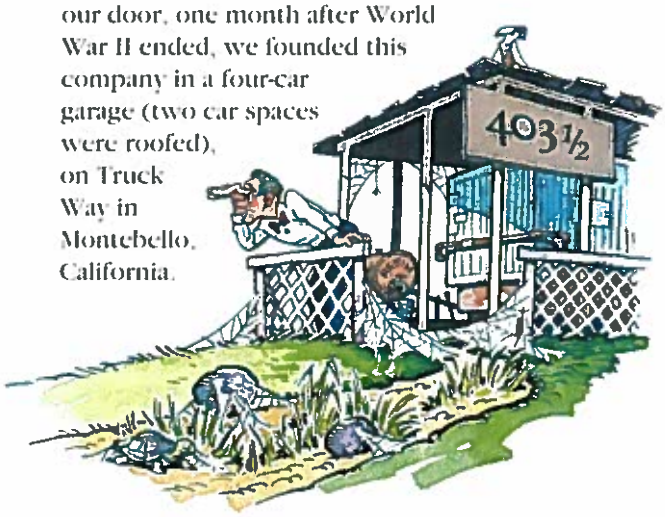
**Our Dilemma** Between you and me, the material we make as raw stock to line the walls of belly baggage compartments of commercial aircraft has about the same level of sex appeal for an article as cottage cheese.

However, you will find this product becomes very interesting when its pedigree as a nonpareil material is studied. Its unique properties make it superior for baggage bin lining no other material has been able to surpass, i.e., superior puncture resistance; high abrasion resistance; no denting; no sharp edges or slivers when punctured; high specific strength to carry some structural load; low specific gravity; non reflective; and, resistance to fire burn through. Plus, corrosion resistance and dimensional stability are a bonus. In short, it's TOUGH AND LIGHT! It is versatile and durable, but if there is a huge market for it in non-cargo liner applications we have yet to find it—and it has not been for lack of trying.

## Tracing the Genealogy of this Wonder Product

Glass cloth/polyester laminate, e.g., cargo liner is our bread and butter. The genesis of FRP laminates, from which cargo liners evolved, is that their first successful end use as a panel to restrain the bladder-like fuel cells in the wings of fighter aircraft during World War II. The unique properties were high specific strength, resistance to aircraft fuel, and its absence of "flare" when punctured. Aluminum, which was heavier (and was used by the enemy) would flare when punctured by a bullet and would not allow the self-sealing bladder to close the hole; thus fuel would leak and the aircraft would burn.

Dazzled by the potential of this miracle material and confident the world would beat a path to our door, one month after World War II ended, we founded this company in a four-car garage (two car spaces were roofed), on Truck Way in Montebello, California.




It was a rookie mistake to found a company with only one product and no capital. We paid a high price in sweat and tears. Anyone with good sense would have quit before learning many business lessons the hard way. Among them, a pioneer must FIND his market. Our product had NO established demand, and it usually takes years and years for product acceptance. As I look back, our early years were like running in a maze with a pot of gold awaiting us when we solved the riddle. Many were the blind alleys we experienced, and it's a lot more fun telling about them now than it was living them.

**•We founded the company to make Wallfab, an indestructible wall covering whereby we laminated a decorative fabric to an opaque paper base with a flexible polyester resin. The product was perfect for the end use and was the forerunner of present day washable wall coverings. Unfortunately, lack of capital, difficulty of installation, high prices, and inadequate merchandising and distribution know-how doomed us from the outset;**

# STRUGGLES, UNTIL GILLINER!

- Made a cone for an Aerojet rocket which fired satisfactorily. Although the rocket got off the ground the product never did;
- Found a small lamp manufacturer and made a lot of shades for him. But they didn't sell well, his retailers returned them for credit, he went belly up, and almost took Peerless Plastic Products (our original name) down with him;
- Designed and made place mats which sold well to friends and relatives, but we didn't have enough of either and they moved too slowly elsewhere;
- Still in the garage, we had a whirl at making laminated flat chips used as valves in irrigation tubes. Although it was a good product for that application, it didn't get us out of the garage either;
- Another beginning entrepreneur engaged us to make a navigation board on which one could write and erase. Alas, he took advantage of our inexperience before he went broke owing us a bundle;
- Found a well-established customer who made rattan furniture. He used our Toughtex material as an overlay for coffee tables. Unfortunately, the tables were similar to their customer base—too small;
- Used our miracle material as a lining for elephant corrals at the Los Angeles Zoo. It worked well but the Zoo never called back. Small consolation, but the numbers of zoos with elephants would never have supported the amount of business necessary to bid adios to the garage;
- Developed and even patented an unpigmented flexible polyester resin/glass cloth Gillaminate. Its bonding to solid propellant grains was facilitated by its translucency. It produced a restriction which controlled the burn rate of solid propellant rockets used as "boosters" for space flights. Space flights were as numerous as elephant corrals, and not nearly enough to get us out of the garage. However, the income generated did help us exist there until we could make good our escape. It was our first truly profitable product which endured for many years.

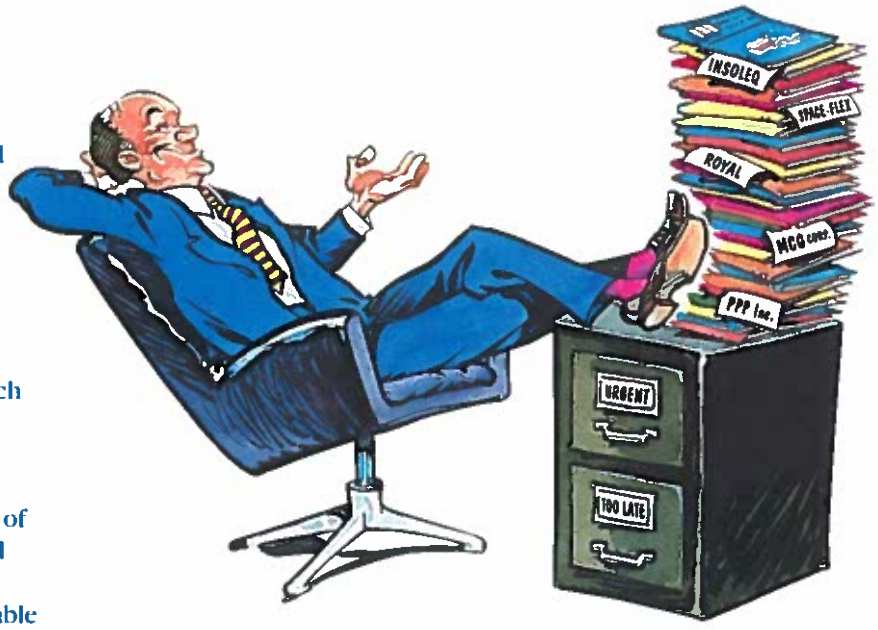
**AT LAST!**

When larger passenger aircraft were produced, a need arose for the material to protect the electrical and hydraulic lines in the support structure of the cargo compartment. We rejoiced! After six tough years we had found an end use that provided the dollar revenue sufficient to support a very small business which, hopefully, would endure. The miracle material's properties and passenger aircraft seemed to be a perfect fit... and commercial aviation appeared to be here to stay. The garage was history!

In retrospect, the physical and mechanical properties of M.C. Gill cargo liner really did fit those early end uses very well. What didn't quite gel was our dream of large volume sales with commensurate revenues. I am grateful to someone for finding the end use for polyester glass cloth laminates and springing us from that discouraging maze in which we were trapped.

So that's life in the far west. A few bumps here and there...800 to 300,000 square feet of manufacturing space...two employees to 450 in only 53 years. A piece of cake, a walk in the park. As good as it gets? HELL NO.

***M.C.***



# Congratulations...

...to Michelle Robison, daughter of Jerel and Linda Robison (Jerel is an M.C. Gill Maintenance Supervisor). Michelle won the $2,000 scholarship awarded by the SPI (Society of Plastics Industries) Western Composites Institute Scholarship Program. It is awarded annually to children and grandchildren of SPI members on the basis of grade point average and community involvement. Michelle, who wants to become a teacher, is a junior at Cal State-Fullerton, maintains a 3.3 GPA and works with hearing-impaired foster children.

## THE FUNNY SIDE

Why do they call it the Department of Interior? Everything they administer is out-of-doors.

★★★★

It's not whether you win or lose, it's how you place the blame.

★★★★

Many problems don't exist until a government agency is created to solve them.

★★★★

Middle age: When your children tell you you're driving too slowly and your parents tell you you're driving too fast.

★★★★

IRS auditor to taxpayer, "The secret is to stop thinking of it as your money."

★★★★

A picture is worth a megabyte.

★★★★

A successful man is one who earns more than his wife spends. A successful woman is one who can find such a man.

★★★★

A bachelor is a guy who thinks Twinkies and beef jerky are two of the major food groups.

★★★★

Then there was the guy who tried to convince his wife that "polyester" was the scientific name for "mink."

## Trivia

Mankind could survive a maximum of six months if there were no more invertebrates.

★★★★

Chibutyrophobia is the fear of getting peanut butter stuck to the roof of your mouth.

★★★★

At age 14 Ralph Waldo Emerson entered Harvard, Alfred Hitchcock quit school, and Joseph Stalin entered Theological Seminary.

★★★★

The U.S. Naval Academy maintains a herd of 350 dairy cows. The Academy's cost of producing a gallon of milk exceeds the average wholesale price by $.30.

★★★★

"J" is the newest letter in the alphabet; "O" is the oldest; "Y" and "Z" were added in the 1st century.

Boeing used to be called Pacific Aero Products; Nike was first known as Blue Ribbon Sports; and Maytag was once the Parsons Bandeutter and Self Feeder Co.

★★★★

600 million people watched the first moon landing on television; 700 million watched Prince Charles and Princess Di's wedding; one billion watch Baywatch every day.

★★★★

M&M's were introduced in the 40's and the only color available was violet.

★★★★