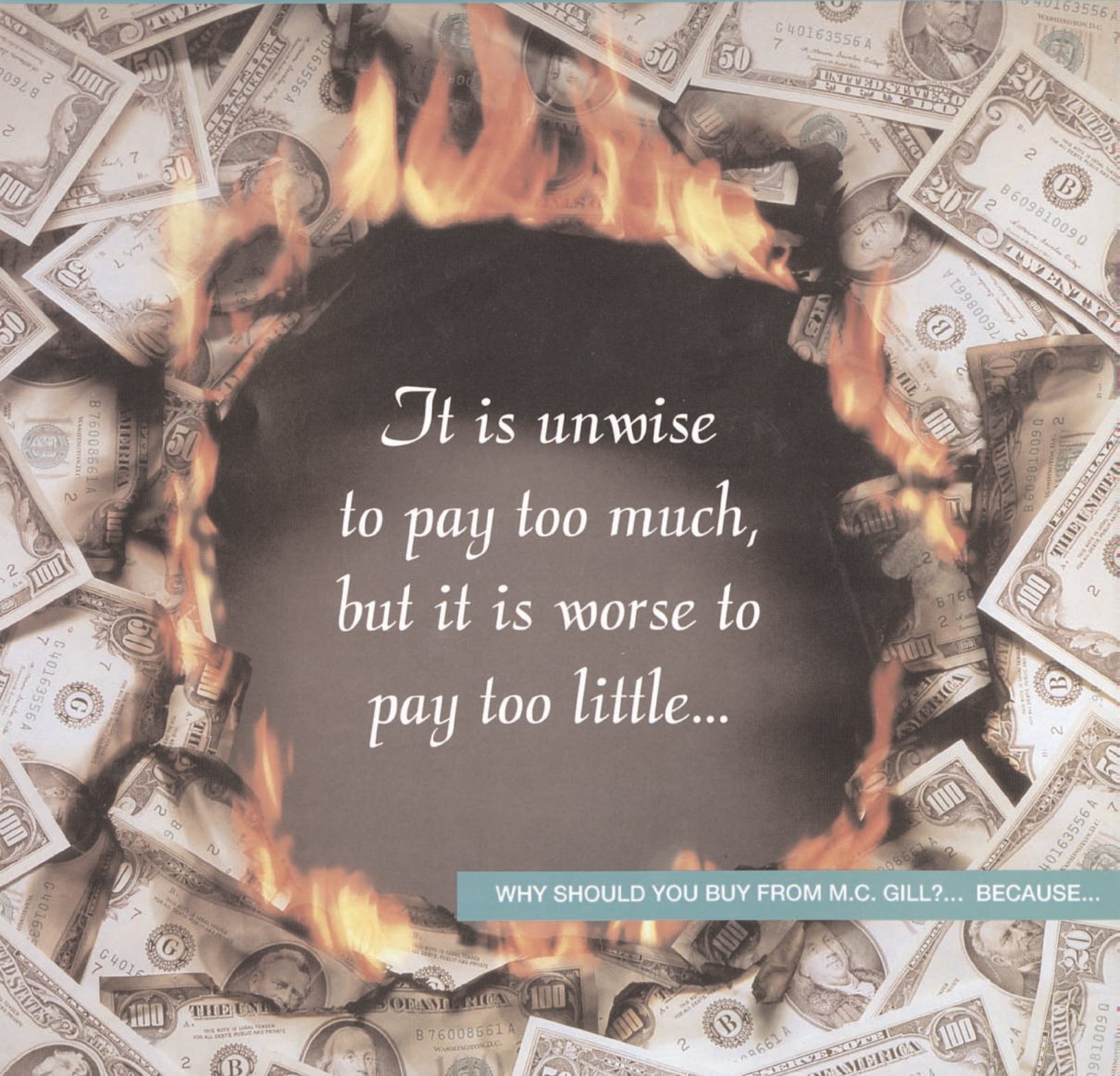


VOLUME 30  
SUMMER 1993  
NUMBER 3



# THE M.C. GILL DOORWAY

M.C. GILL CORP., 4056 EASY ST., EL MONTE, CA 91731 • PHONE (818) 443-4022 • TELEX 67-7467 • FAX (818) 350-5880



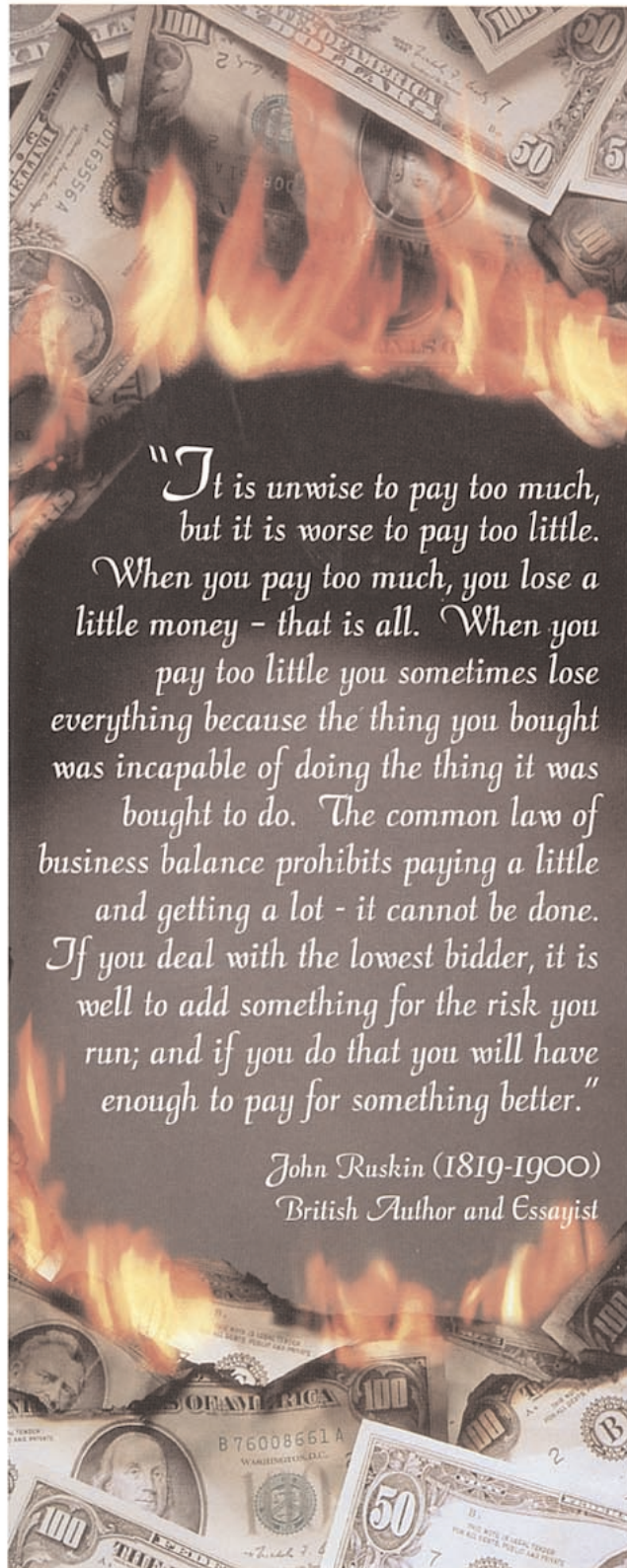
*It is unwise  
to pay too much,  
but it is worse to  
pay too little...*

WHY SHOULD YOU BUY FROM M.C. GILL?... BECAUSE...



# M.C. GILL SALES TRAINING

## CRITERIA FOR SELECTING AIRCRAFT LAMINATES



*"It is unwise to pay too much,  
but it is worse to pay too little.  
When you pay too much, you lose a  
little money - that is all. When you  
pay too little you sometimes lose  
everything because the thing you bought  
was incapable of doing the thing it was  
bought to do. The common law of  
business balance prohibits paying a little  
and getting a lot - it cannot be done.  
If you deal with the lowest bidder, it is  
well to add something for the risk you  
run; and if you do that you will have  
enough to pay for something better."*

*John Ruskin (1819-1900)  
British Author and Essayist*

John Ruskin's words are as valid today as they were almost 100 years ago. We wanted to get that across to our sales agency for Central and South America, **United Aerospace Corporation (UAC)**. Although UAC has been in business for some time, they're relatively new with Gill. So they asked us to conduct a background and product training seminar for some of their key personnel.

Our seminar concentrated on the essence of Ruskin's quotation as it related to products for commercial aircraft, primarily cargo liners and sandwich panels. Whatever we presented to the UAC people would obviously carry over to their customers. And we wanted to impart that here at M.C. Gill we feel strongly about the folly of burning money.

We opened the first session by focusing on answers to the questions all sales personnel face at some time in their careers. In essence:

*"Why should I buy from M.C. Gill? How will I benefit?"*

Persons from purchasing, engineering and maintenance all ask similar questions. Each has a different reason for asking and each is looking for different answers.

We impressed upon the UAC personnel that...

**FIRST...** We're the best in our business, we know our business and we intend to keep it that way.

Which translates:

- Integrity
- Vision
- Leadership

**SECOND...** We've been at it for 48+ years (the world's oldest).

Which means:

- Experience
- Financial Integrity
- Trouble Free Delivery
- OEM Qualifications

**THIRD...** Our goal of Technological Leadership means a heavy R&D commitment.

Which results in:

- State-of-the-art Proven Products
- Constant Product Improvement
- A Worldwide OEM Supplier
- A Worldwide Airline Supplier

**and FINALLY...** As a Pioneer (since 1945), we offer:

- Proven Problem Solving Ability
- Specialization in Aircraft Liners and Interior Panels
- Pride and confidence that our customers Receive The Best Value Available



# NING SEMINAR-PART I

## AS PRESENTED TO UNITED AIRCRAFT CORPORATION

Having said this, we proceeded to enlarge on the key points, as excerpted below.

**Vision and Leadership**, we explained to our UAC guests, allow us to control our own destiny by anticipating future needs for new products and being the first to develop them. For example, we recognized long ago the advantages of vertical integration. Because we make our own prepregs, resins, adhesives and cores we do not have the quality control and raw material delivery problems the competition does. Mr. M.C. Gill is very fond of saying, "If we make a promise to a customer, we intend to keep it." Vertical integration allows the company that luxury.

**Company Stability** means several things, not the least of which is longevity in business and its resultant experience. With more than 48 years experience in the field of advanced composites under the same leadership, the M.C. Gill Corp. is the world's oldest continuous operating company in this field. We're specialists at what we do. If we speak of experience, our employees have an extensive amount. Specifically, the following table shows the average years of experience for 79 (out of 154) Gill employees.

GILL EMPLOYEES	AVERAGE YEARS EXPERIENCE
36	18
21	22
12	27
5	32
3	36
2	39

Stability also means financial solvency. A customer can place an order today with assurance that the company will be in business when the delivery date comes due, and when there'll be a need for re-orders. We will not have been acquired, merged, bought out, or all the other things that give customers nightmares when they try to order and all they hear is the operator say, "We're sorry..."

**Delivery Performance** often depends on the urgency of the customers' requirements. Usually, it is a standard lead time of two to four weeks for custom made products; three to five days for those parts we stock. However, it may mean same or next day shipment for an AOG. Gill has the capability and capacity to meet tight turnaround times, and has proven so many times. Our award from General Dynamics earlier this year (see the Spring 1993 Doorway) is testimony of our delivery performance under stress.

**Technological Leadership** assures our customers they are receiving the latest product advances. For example, phenolic resin based cargo liner has been the material of choice of airframe manufacturers and airlines since the mid-80s, but M.C. Gill introduced the first such product in 1969. Likewise, lighter weight cargo liner. The company is usually sole source for a new product until the generic "me-too" types appear - usually two or three years. By that time we've introduced the next generation.

For example, M.C. Gill introduced a 1367, a high impact, low smoke, fire resistant phenolic cargo liner in November 1986. Since then we have developed five variations of that liner. Each meets a specific need for specific customers. The point is that we offer a full line of products to meet our customers' ever changing requirements. One of those variations, 1367A, recently became the first cargo liner ever to qualify at two major airframe manufacturers. One product for two families of aircraft!

Technological leadership, we told UAC, also allows us to do two things our competition can't. First, we have the ability to improve products. And if in so doing we reduce costs, we'll share the savings with our customers. We had a contract with the Federal Government a few years ago where we made the product better for less money and split the savings with Uncle Sam. Second, we'll provide samples for you to test, so you can prove it for yourself.

**Commitment to Research and Development** is amply demonstrated by the fact that M.C. Gill Corp. budgets between 6 and 8 percent of total sales annually to R&D. Virtually every manufacturing process can be duplicated in the R&D lab with scaled down equipment, but nevertheless duplicated. It is one of the primary reasons the company is the industry leader in new product development. Moreover, a minimum of 90 to 95 percent of qualification testing can be done in the company laboratory. This is where we developed our phenolic cargo liners and our lightweight carbon/Nomex® flooring panels - years ahead of the competition.

**OEM Qualification** can often take months to accomplish if a company is invited to submit its products for consideration. The specifications are demanding and the details to meet them often seem endless. However, M.C. Gill cargo liners appear on the Qualified Products List of virtually every major airframe manufacturer in the world! Moreover, when a new revision is issued by the OEM, more often than not, M.C. Gill is the first to be qualified. This means an airline has to look no further than 4056 Easy Street when seeking the most up-to-date replacement part.



# If An Airplane Uses Cargo Liner

GILLINER IS ORIGINAL  
EQUIPMENT IN THE  
FOLLOWING AIRCRAFT



BOEING

■ All 700 series

M.C. GILL PART NUMBER  
Manufacturer Specification

1076A  
BMS 8-2, CL 1

1366\*  
BMS 8-2, CL 2

1366T\*  
BMS 8-2, CL 2, Gr B

1367  
BMS 8-223, CL 2, Gr B,  
(All Types)

1367A\*\*  
BMS 8-223, CL 2, Gr B,  
(Types 13, 20, 30, 40)

1367A\*\*  
BMS 8-223, CL 2, Gr C,  
(Type 40)

1367B  
BMS 8-223, CL 4, Gr B  
(Types 13, 20, 30)

\* Developed by the M.C. Gill  
Corp.

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

**Problem Solving Ability** is one of M.C. Gill's most important stocks in trade. A pioneer must be a problem solver because he started from square one! Anyone can use an idle press and a few raw materials, and make products in their spare time. Solving customers' problems is an entirely different matter. It requires an experienced staff and the willingness to use that expertise to work with customers. Late last year a major airframe manufacturer asked us to assist them in an effort to warm the cockpit of one of their customer's cargo aircraft. In response, we developed a heated flooring panel system that seems to have solved the problem. We welcome these challenges, whether they arise from a college student's desire to build a better solar powered car or an airframe manufacturer wanting, to reduce flooring weight by fifteen percent. (We solved both problems.)

**Product Quality** is a given. It is often taken for granted with industry leaders and it is just as often difficult to define. Product durability is a major factor. It is imperative that the purchasing agent, design engineer and the maintenance superintendent actually observe product performance. This means going aboard aircraft, as our sales force does, and inspecting cargo liner and flooring panels to determine if the product is holding up well since its date of installation. It's not incidental that we put the date of manufacture on all our proprietary products.

**Product Cost** vividly exemplifies the meaning of Ruskin's quotation. Value does not mean first cost, i.e., low bid. The material is generally the smallest part of the cost. If a customer accepts the lowest price, yet has to replace that part, the cost of removing the old one; preparing the new one (marking, drilling, routing, or cutting) and installing it, will undoubtedly exceed the higher purchase price of a product that will last much longer. Gilliners and Gillfloors are not luxuries — they last longer!

## PRODUCT KNOWLEDGE

The preceding was designed to help the UAC people understand the benefits of buying from M.C. Gill, so that they could pass them on to their customers. Customers legitimately want to know what those benefits are. They want to

have confidence in the products they're using and confidence in the integrity and experience of the company that is manufacturing those products. With that important background covered, most of the remainder of the training session was devoted to those two main product lines for which M.C. Gill is known the world over.

## THE FIRST PRODUCT SESSION WAS A BRIEFING ON CARGO LINERS

### Its Purpose...

A cargo liner's foremost function is to protect the wires, cables and ducts that run between it and the outer skin of the aircraft, as well as the outer skin. Unless the liner selected has high impact (puncture) and pullout resistance, and consistent uniform quality, a real danger potential exists if it is punctured. Cargo liner covers the lower and upper sidewalls and ceiling (even the floors sometimes) of the entire cargo compartment.

### It's Construction...

Cargo liner is a composite consisting of a **reinforcement**, i.e., usually two or more plies of glass cloth which provide strength, and a **resin**, or matrix, which holds the plies together. Resins are usually a polyester or phenolic, and sometimes an epoxy.

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

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

Although white Tedlar is by far the most used



# You Can Bet We're Qualified!

overlay, a range of colors is available. Also, pigments can be added to polyester resin to produce an even greater number of colors. Several years ago M.C. Gill solved a problem for an Alaskan airline by supplying black liner. Reflecting sunlight off snow and thence off white liner was so bright that it was difficult for baggage handlers to see.

Epoxy resins have excellent adhesive properties and adhere well. They cure slowly at elevated temperature and are 100 percent reactive, so there is no gassing on cure or contaminating by-products. Epoxies are more expensive than polyesters or phenolics and they produce high smoke with some toxicity in a fire.

**The reinforcement is almost always fiberglass cloth**, either E-glass or S-2 glass. The reason is that most other fibers fail the FAA's burn-through test.

**E-Glass cloth** is the lowest cost reinforcement and 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 reinforcement comes in a number of forms.

**Rovings** are a collection of parallel continuous strands of filaments and are either unidirectional or woven. Rovings cost less to produce and weave than the finer strands used to weave cloth. They are used more in the marine industry and for ballistic laminates than in aviation related end uses. They offer good puncture resistance, but are normally not used for cargo liner because of their lower shear strength.

**Woven glass cloths** normally range in thickness from .004" - .020" and are the standard reinforcements for aircraft laminates. The style and weave can affect strengths. 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 function.

As any airframe manufacturer or airline design/maintenance engineer will affirm, this is an oversimplification. They will also tell you there are varying grades of reinforced plastic, just as there are varying grades of steel and aluminum alloys. Only the highest quality material will meet the exacting criteria demanded by the aviation industry.

## Cargo Liner Properties...

The early liners represented a real breakthrough in materials, they possessed fewer than half of the desired characteristics common to today's composites. They did have corrosion and fatigue resistance; self-extinguishing capabilities; high strength-to-weight ratio; and, they had a good appearance - these were about the only properties required. Low puncture resistance was offset by using thicker laminates.

With the coming of the jet age, those days are gone forever. The introduction of a new generation aircraft generally is accompanied by a stronger and lighter weight baggage compartment liner. In addition, today's cargo liner must pass rigid specifications for such properties as bolted joint pull out/edge bearing strength, water absorption, burn through, smoke emission and heat release. Minimal values have been established for each of these properties and they are continually upgraded.

However, some properties are more important than others. From a safety and service standpoint, design engineers determined desirable properties and their values but some bear little or no relation to in-service use. We believe the only true measure of the product's ability to perform in a certain type of service is the "in-service test," where the product is subjected to actual usage day after day, flight after flight. Based on our 48+ years of in-service testing we consider the following properties as very important.

GILLINER IS ORIGINAL EQUIPMENT IN THE FOLLOWING AIRCRAFT



McDONNELL DOUGLAS

**M.C. GILL PART NUMBER**  
Manufacturer Specification

■ DC-9  
**1100G\***  
DMS 1942, Ty 2

■ MD-80  
**1167**  
DMS 2226, Ty 1 and Ty 2  
**1167B**  
DMS 2226, Ty 1

■ MD-90  
**1167**  
DMS 2226, Ty 1

■ DC-10/KC-10  
**1100**  
**DMS 1946, Ty 1**

■ MD-11  
**1167**  
DMS 2226, Ty 1 and Ty 2  
**1167B**  
DMS 2226, Ty 1

■ All Douglas Aircraft  
**1367A\*\***  
DMS 2419



LOCKHEED L-1011

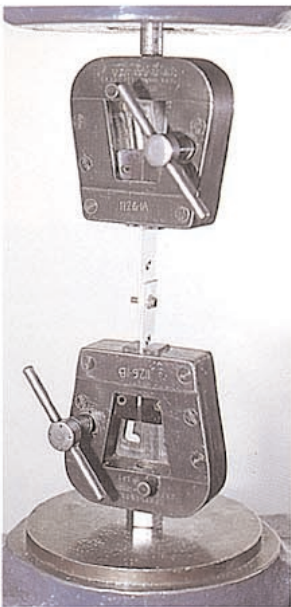
**1366\***  
LAC-C-22-1249, CL 3

**1367/1367A\*\***  
LAC-C-22-1249, CL 3

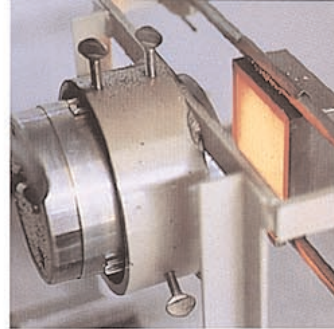
**1138**  
LAC-C-22-1249, CL 1

**1338**  
LAC-C-22-1347, CL 1





**Bolted Joint Pull-Out Test** measures the cargo liners' edge bearing resistance to force.



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

**Bolted joint pullout or edge bearing strength.** Relates to the cargo liner's resistance to the pressure, or force, required to elongate a fastener hole. Once this happens, the effect can be more serious than puncture damage because part of the cargo liner could pull away from the fasteners and expose a much larger area than a puncture. Bolted joint pullout is measured by the total number of pounds required to elongate a fastener hole (Douglas). Edge bearing strength is measured in pounds per square inch required for the same result (Boeing).

**Impact, or puncture, resistance.** This property relates to the ability of the cargo liner to withstand penetration which would thereby expose the area of the aircraft's interior wiring, cables and ducting behind it. Although there is redundancy in hydraulic and electrical systems, a puncture could disable the aircraft and jeopardize its safety as well as the passengers aboard it. 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 resistance is measured in foot-pounds (ft-lbs.) and is the distance a pointed object 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', hence different values are obtained and bear little relationship to each other.

**Burn-through.** The importance of this property is obvious. A 1700° F flame will not penetrate or burn through the 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 happens, the product fails and is unsafe.

**NIST (NBS) smoke emission.** Relates to the amount or density of the smoke that results

when a material burns. The higher the density, the thicker the smoke and the harder it is to see and breathe. The test for this property measures the optical density of the smoke generated by the test material when it is flaming.

Using a phenolic resin, M.C. Gill currently manufactures a number of different cargo liners whose smoke emission values are well below the current standard. We are considered by the industry to be a pioneer in phenolic resin technology. Our first phenolic liners were submitted to an OEM in the late 1960s. As this is being written we are working on new formulations to improve and strengthen our leadership position.

**OSU heat release.** Concerns the amount of heat released over given surface dimensions in fire conditions. The test measures the total quantity of heat released during the first two minutes of exposure and the peak release rate. The current maximum for each measure is 65 kilowatts per square meter. These requirements are often expressed as 65/65. As a basis for comparison, when a piece of oak flooring is tested, the results are 130/130 – twice above standard.

**Note:** M.C. Gill Corp. cargo liners have been and are being developed in anticipation that the FAA will eventually adopt standards comparable to those for passenger cabins. The FAA has established standards for smoke emission and heat release that materials used in passenger cabins must meet, but has not yet included cargo liner in that list of materials.

The manufacturers' specifications listed on these pages are only a partial. No cargo liner manufacturer in the world offers a more complete line of products that qualify to more specifications than M.C. Gill's. We believe that the industry leader must set the standard. Others may follow if they wish.

The remainder of our Training Seminar for United Aerospace Corporation was devoted to sandwich panels. We'll complete our report on the seminar in the next issue of the M.C. Gill Doorway.



*Boeing Test Method.*



*McDonnell Douglas Test Method.*  
Both samples were tested to failure.



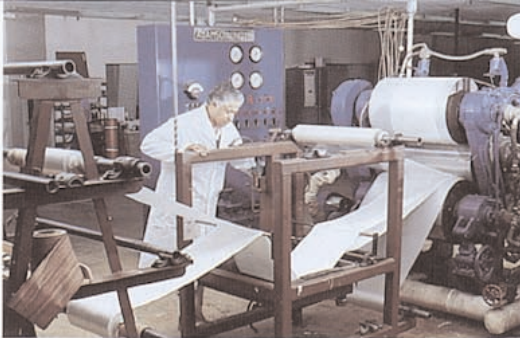
**Impact or Puncture Resistance Test** indicates the cargo liner's ability to withstand penetration.



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



*The Lab Rotocure will continually press laminates in every respect, but size, as the full scale production equipment.*



*New resin formulations are carefully researched and then developed to produce better cargo liners.*



## PROPERTIES OF SELECTED M.C. GILL CARGO LINERS

PROPERTY AT STANDARD CONDITIONS	Gill Product Number and Specifications to Which They Qualify								
	1066 Proprietary	1076A BMS 8-2 CL 1, Gr. A	1100 DMS 1946	1138 LAC-C-22- 1249, CL 1	1166/1266 Proprietary	1167* DMS 2226	1366* BMS 8-2 CL 2, Gr. B LAC-C-22- 1249, CL 3	1367* BMS 8-223 CL 2, Gr. B	1367A BMS 8-223 CL 2, Gr. B DMS 2419 LAC-C-22- 1249, CL 3
Thickness (except where otherwise noted)	.060"	.013"	.060"	.060"	.060"	.030"	.030"	.030"	.030"
Flexural Strength, psi	18,000	**	70,000	32,000	32,000	25,000	35,000	30,000	30,000
Flexural Modulus, psi x 10 <sup>6</sup>	1.0	**	2.9	2.2	2.0	1.4	2.0	2.2	2.2
Tensile Strength, psi	38,000	35,000	45,000	42,000	45,000	54,000	47,000	**	**
Compressive Strength, psi	9,000	**	20,000	20,000	16,000	**	20,000	N/A	N/A
Impact Resistance Douglas Pendulum tester #2 (24 lbs.) (.045" laminate), ft.-lbs.	62	N/A	34	40	40	34	66 (.040")	N/A	45
Boeing dart tester #3 (12 lbs.) (.030" laminate), ft.-lbs.	10	** (.013")	5	10	10	N/A	18 (.040")	16	16
Bolted joint pull-out, per DMS 1946 (.030" lam.), psi	325	365	350	420	400 (.060")	200	350	N/A	240
Edge bearing strength, per BMS 8-262 (.030" lam.), psi	27,000	**	36,000	30,000	32,000	32,000	30,000	33,000	33,000
Taber abrader, grams lost, 2000 cycles, CS10 wheel	.075	.035	.028	.028	.040	.060	.05	N/A	N/A
Weight lbs.-ft. <sup>2</sup>	0.6	0.14	0.6	0.6	0.6	0.3	0.32	0.3	0.3
Water Absorption, % maximum	2.5	1.0	0.65	0.5	0.5	0.5	2.0	10.0	6.0
Barcol Hardness, minimum	30	45	60	50	45	N/A	N/A	N/A	N/A
NBS Smoke Emission Ds @ 4 minutes flaming (thickness)	150/300/550 (.016"/.030"/.06")	140 (.013")	319 (.030")	NA NA	NA NA	40/50/60 (.016"/.025"/ .030")	NA NA	50/50/50 (.013"/.020"/ .030"/.040"/ .050"/.070")	<50/<50 <50/<50 (.013"/.020"/ .030"/.040")
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 <sup>2</sup> and kw/M <sup>2</sup> )	NA	NA	NA	NA	NA	38/35 (.030" thick)	52/42 (.030" thick)	25/19 (.030" thick)	NA

\*Proprietary product subsequently adopted by and qualified to specifications shown.  
\*\*No requirement in specification. N/A — Not Applicable. NA — Not Yet Available.



# NEWS RELEASE

Gillfab 1367A Cargo Liner is now qualified to McDonnell Douglas DMS 2419, Class 1 and 2, all types. It is also qualified to Boeing's BMS 8-223, Class 2, Grade B, Types 13 through 40; and meets Lockheed's

LAC-C-22-1249, Class 3 requirements. Those operators flying Boeing, Douglas and Lockheed equipment can reduce their cargo liner inventories because they can now use 1367A in their aircraft.

## THE FUNNY SIDE

A man applying for a job was asked, "Where were you educated?" The man replied, "Yale." "Terrific," said the interviewer, "What's your name?" "Yim Yohnson," replied the applicant.

★★★★

Overheard after the opera: "That soprano should be charged with mutiny on the high Cs."

★★★★

Sign above allergy remedy display: "Buy now and avoid the rash."

★★★★

Then there's the hypochondriac who received a Valentine and assumed it was from his cardiologist.

★★★★

Property dispute: ground beef.

★★★★

The Sunday school lesson was about Noah's Ark, and the teacher asked the children how they thought Noah might have spent his time during those long 40 dreary days.

"I bet he spent a lot of time fishing," suggested one youngster.

"He couldn't have," argued a young friend. "He only had two worms."

★★★★

Counselor to job seeker: "We'll have to emphasize your good points."

"I was fired from ten jobs."

"What on earth does that prove?"

"I'm no quitter."

★★★★

"Is your advertising getting results?" the ad salesman asked the store owner.

"Sure is," groaned the merchant. "Last week we advertised for a night watchman and the next night we were robbed."

★★★★

Sign on a sandblaster truck: "Call us with your dirty stories."

## Trivia

An estimated 100 referees at children's sporting events are attacked each year by parents.

★★★★

31 percent of telephones in service are in the kitchen.

★★★★

There are 236,800,000 bedrooms in the United States.

★★★★

There are approximately 370,000 icebergs in the world.

★★★★

As of January 1, 1988, the number of snowflakes that have ever fallen on earth is 10 to the 35th power.

★★★★

Sports Illustrated's swimsuit issue ranks first in items stolen most often from U.S. libraries.

★★★★

116,765 cars were abandoned on New York City streets in 1987.

★★★★

Postal workers find 250 wallets per day in Manhattan mail collection boxes.

★★★★

According to the U.S. Postal Service, 96 percent of all first-class mail is delivered on time.

★★★★

407,031 medals were awarded by the armed forces in 1986.

★★★★

In 1987, the Defense Logistics Agency purchased 2.4 million pairs of green socks.

★★★★

A two-income American couple spends an average of 3.2 waking hours together each day.

★★★★

The New York Times food critic spends \$80,000 per year on restaurant meals.

★★★★



M.C. GILL CORP. • SINCE 1945