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Answering the Call of MRO

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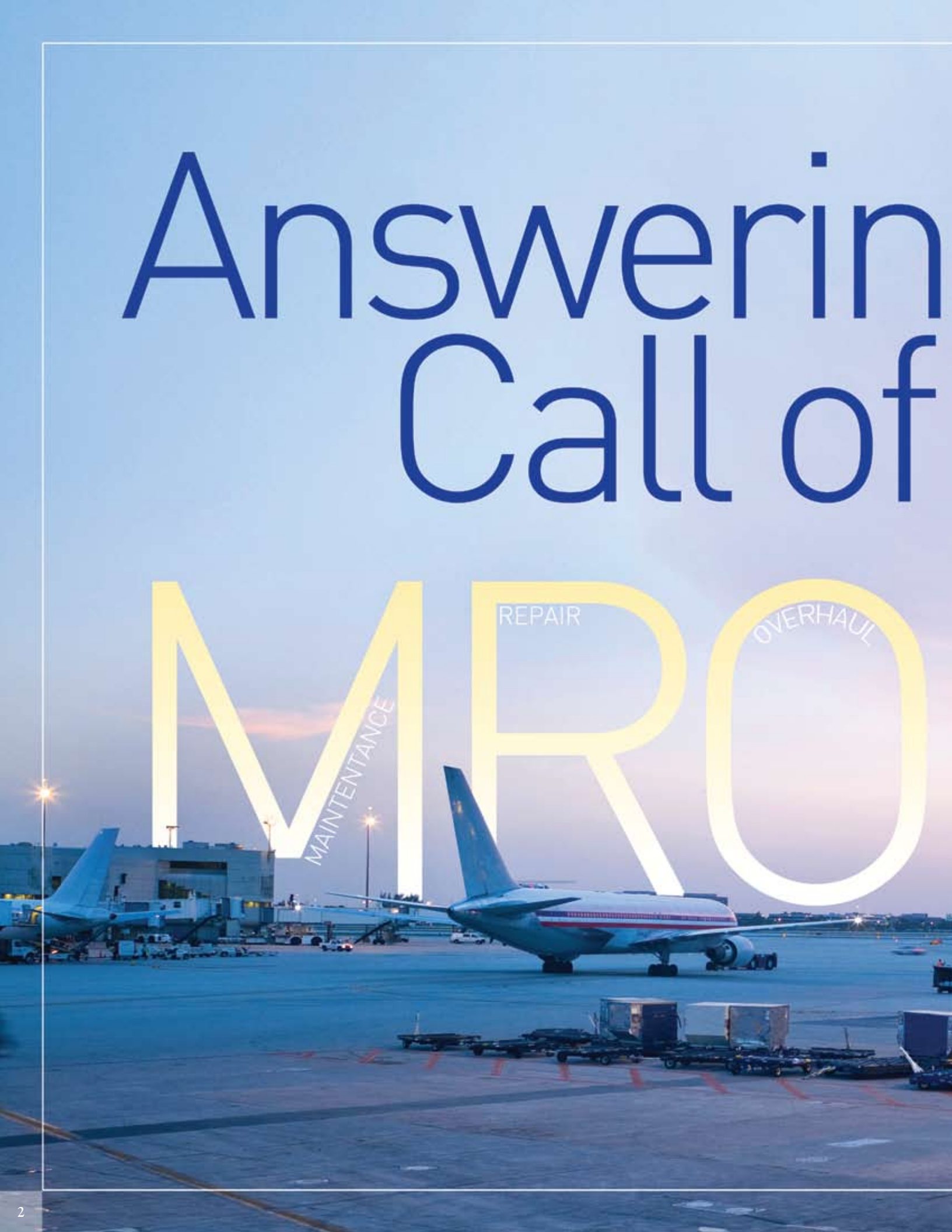

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In the last two years it's become clear that nothing is certain. It's been a roller-coaster ride for businesses worldwide and particularly hard on the travel industry. Airlines have reported record losses. "The airline industry is in precipitous decline – across all regions and categories, from the low-cost carriers to the legacy giants. Even the success stories are doing little more than treading water."* Many airlines have cut flights and parked planes to reduce their fleet size. Aircraft maintenance, passenger to freighter conversions and refurbishment programs have, however, helped maintain demand for one segment of the industry. That segment is the MRO business.

*Outlook for All Airline Sectors Hurt, *Aviation Week*, www.aviationweek.com, 7/17/09

Maintenance, repair and overhaul (MRO) on aircraft refers to aircraft maintenance checks that are periodic checks that have to be done on all aircraft after a certain amount of time or usage. Airlines casually refer to these checks as one of the following:

A Check

This is performed approximately every month or 500 Flight Hours (FH). This check is usually done overnight at an airport gate. The actual occurrence of this check varies by aircraft type, the cycle count (takeoff and landing is considered an aircraft "cycle"), or the number of hours flown since the last check. The occurrence can be delayed by the airline if certain predetermined conditions are met.

B Check

This is performed approximately every three months. This check is also usually done overnight at an airport gate. A similar occurrence schedule applies to the B check as to the A check.

Though MROs seem to be faring better than other players in the airline industry, they face a unique set of challenges.

When an aircraft undergoes a maintenance check, time is of the essence. If an A.O.G. (aircraft on ground) occurs, the aircraft is temporarily pulled from service. This can seriously impact the airline's ability to meet schedules resulting in major financial setbacks. The servicing company must be able to diagnose, dismantle and repair on a moment's notice. Even when a plane is grounded for heavy maintenance and inspection (a service that typically takes 30 days

C Check

This is performed approximately every 12–18 months or a specific amount of actual Flight Hours (FH) as defined by the manufacturer. This maintenance check puts the aircraft out of service and requires plenty of space – usually at a hangar at a maintenance base. The schedule of occurrence has many factors and components as has been described, and thus varies by aircraft category and type.

D Check

This is the heaviest check for the airplane, also known as a Heavy Maintenance Visit (HMV). This check occurs approximately every 4–5 years. This is the check that, more or less, takes the entire airplane apart for inspection. This requires even more space and time than all other checks, and must be performed at a maintenance base. Often, older aircraft being phased out of a particular airline's fleet are stored or scrapped upon reaching their next check.

to complete), it may be 14 or more days into the check before material requirements can be identified. One of the biggest challenges is having the replacement parts and materials on hand. It would be impossible to keep every replaceable part in inventory so the mechanic must determine what he needs early in the process, so he can order it and receive it by the time he is ready to reassemble the aircraft. Stringent FAA safety regulations stipulate specific qualifications regarding what is allowable, seriously limiting the sources for replacement parts and materials. In addition, the qualifications are aircraft manufacturer specific (i.e., Boeing = BMS, Airbus = AIM, etc). M.C. Gill Corporation is qualified to multiple aircraft manufacturers (including Airbus, Boeing, Dassault Falcon, Embraer, Lockheed, McDonnell Douglas, British Aerospace, Bombardier and Northrop Grumman). With purse strings tight, more and more operators are conducting business in a "just-in-time" environment. Many of our materials are interchangeable on multiple aircraft allowing MROs more flexibility with their inventoried materials. This is a critical advantage in an AOG situation. It's also important to get the non-stocked materials on a timely basis.

M.C. Gill: Answering the Challenges of MRO

M.C. Gill Corporation recently added new equipment to its manufacturing plants so that we can quote short lead times on cargo liners, floor panels and other materials. We offer a substantial list of “stock” products for A.O.G.s, and being an organization with vertical integration means we can produce sub-assemblies in-house to react to custom requirements with reasonable lead times as well.

Cargo Liner

Product Number	Description	Specification
Gilliner™ 1066-045001	.045x48x144″	FAR 25.855 Flammability
Gilliner™ 1066-060001	.060x48x144″	FAR 25.855 Flammability
Gilliner™ 1066R030951	.030x48″x150/ft	FAR 25.855 Flammability
Gilliner™ 1066R045951	.045x48″x150/ft	FAR 25.855 Flammability
Gillfab™ 1076A013952	.013x60″x150/ft	BMS 8-2 Class 1 Grade A Type 13
Gillfab™ 1076B045009	.045x60″x144″	BMS 8-2 Class 3 Grade A Type 45
Gillfab™ 1100-070001	.070x48x144″	DMS 1946 Type 1
Gillfab™ 1167-016001	.016X48X144″	DMS 2226 Type 1 Class 1
Gillfab™ 1167-030009	.030x60x144″	DMS 2226 Type 1 Class 1
Gillfab™ 1167-045001	.045x48x144″	DMS 2226 Type 1 Class 1
Gillfab™ 1167-060005	.060x36x144″	DMS 2226 Type 1 Class 1
Gillfab™ 1366-070001	.070x48x144″	BMS 8-2 Class 2 Grade A Type 70
Gillfab™ 1367-050001	.050x48x144″	BMS 8-223 Class 2 Grade B Type 50; DMS 2419 Class 1 Type 50
Gillfab™ 1367-050009	.050x60x144″	BMS 8-223 Class 2 Grade B Type 50; DMS 2419 Class 1 Type 50
Gillfab™ 1367-070001	.070x48x144″	BMS 8-223 Class 2 Grade B Type 70; DMS 2419 Class 1 Type 70
Gillfab™ 1367A013001	.013x48x144″	BMS 8-223 Class 2 Grade B Type 13; DMS 2419 Class 1 Type 13; Airbus 2550 M1M 0008 00 Type 1
Gillfab™ 1367A013009	.013x60x144″	BMS 8-223 Class 2 Grade B Type 13; DMS 2419 Class 1 Type 13; Airbus 2550 M1M 0008 00 Type 1
Gillfab™ 1367A020001	.020x48x144″	BMS 8-223 Class 2 Grade B Type 20; DMS 2419 Class 1 Type 20
Gillfab™ 1367A020009	.020x60x144″	BMS 8-223 Class 2 Grade B Type 20; DMS 2419 Class 1 Type 20
Gillfab™ 1367A030001	.030x48x144″	BMS 8-223 Class 2 Grade B Type 30; DMS 2419 Class 1 Type 30
Gillfab™ 1367A030009	.030x60x144″	BMS 8-223 Class 2 Grade B Type 30; DMS 2419 Class 1 Type 30
Gillfab™ 1367A040001	.040x48x144″	BMS 8-223 Class 2 Grade B Type 40; DMS 2419 Class 1 Type 40; Airbus 2550 M1M 0008 00 Type 3
Gillfab™ 1367A040009	.040x60x144″	BMS 8-223 Class 2 Grade B Type 40; DMS 2419 Class 1 Type 40; Airbus 2550 M1M 0008 00 Type 3
Gillfab™ 1367B026001	.026x48x144″	BMS 8-223 Class 4 Grade B Type 30
Gillfab™ 1367B035009	.035x60x144″	BMS 8-223 Class 4 Grade B Type 40
Gillfab™ 1367C013952	.013x60″x150/ft	BMS 8-223 Class 2 Grade B Type 13; DMS 2419 Class 1 Type 13; Airbus 2550 M1M 0008 00 Type 1
Gillfab™ 1367C020952	.020x60″x150/ft	BMS 8-223 Class 2 Grade B Type 20; DMS 2419 Class 1 Type 20
Gillfab™ 1367C030952	.030x60″x150/ft	BMS 8-223 Class 2 Grade B Type 30; DMS 2419 Class 1 Type 30
Gillfab™ 4422-295010AA-4	.295x72x144″ 013/013	Airbus 2550 M1M 0008 00 Type A
Gillfab™ 4422-307010CC-4	.307x72x144″ 020/020	Airbus 2550 M1M 0008 00 Type B
Gillfab™ 4422-366001AA-4	.366x48x144″ 013/013	Airbus 2550 M1M 0008 00 Type D
Gillfab™ 4422-366013AA-4	.366x60x120″ 013/013	Airbus 2550 M1M 0008 00 Type D
Gillfab™ 4422-386001CC-4	.386x48x144″ 020/020	Airbus 2550 M1M 0008 00 Type E
Gillfab™ 4422-386010CC-4	.386x72x144″ 020/020	Airbus 2550 M1M 0008 00 Type E
Gillfab™ 4422-508001AA-4	.508x48x144″ 013/013	Airbus 2550 M1M 0008 00 Type G

Inserts

Product Number	Description	Specification
Gillfab™ 3072A-70	0.323″ channel x 70″ L	Airbus 2550 M1M 0004 00 Type A
Gillfab™ 3072B-70	0.394″ channel x 70″ L	Airbus 2550 M1M 0004 00 Type B
Gillfab™ 3072C-70	0.516″ channel x 70″ L	Airbus 2550 M1M 0004 00 Type C
Gillfab™ 3072D-70	0.630″ channel x 70″ L	Airbus 2550 M1M 0004 00 Type D

Flooring & Interior Panels

Product Number	Description	Specification
Gillfab™ 4017T400001EB-9	.400x48x144″ 030/015 9#	McDD BZZ 7002 Type III
Gillfab™ 4030-500003CC2T	.500x48x96″ 020/020 2024T3 1/4-4.3#	FAR 25.853 Flammability
Gillfab™ 4109-390001BB-8	.390X48X144″ 015/015 8#	BAeR 3247; McDD 9D0207 Type 1
Gillfab™ 4223-496009IC-9	.496x60x144″ 050/020 9#	Airbus 5360 M1M 0005 00 Type BCC2
Gillfab™ 4405B375001DD-8	.375x48x144″ 025/025 8#	TL53/5000/79 Type PC3-2
Gillfab™ 4417-400001BB-5	.400x48x144″ 015/015 5#	BMS 4-17 Type 1; McDD BZZ 7002 Type II
Gillfab™ 4417-400001BB-9	.400x48x144″ 015/015 9#	BMS 4-17 Type II; McDD BZZ 7002 Type I
Gillfab™ 4417-400001SS-9	.400x48x144″ 020/020 9#	BMS 4-17 Ty III
Gillfab™ 4417-400001EE-11	.400x48x144″ 030/030 11#	BMS 4-17 Ty V
Gillfab™ 4417-400001EE-12	.400x48x144″ 030/030 12#	BMS 4-17 Ty IX
Gillfab™ 4417-665001BB-5	.665x48x144″ 015/015 5#	BMS 4-17 Ty IV
Gillfab™ 4417A400001CC-10	.400x48x144″ 020/020 10#	BMS 4-17 Ty VI
Gillfab™ 4505-374001CC-9	.374x48x144″ 020/020 9#	Airbus 5360 M1M 0006 00 Type PC3
Gillfab™ 4522-374001CB-8	.374x48x144″ 020/015 8#	Airbus 5360 M1M 0005 00 Type CCC1
Gillfab™ 4523-496009JC-9	.496x60x144″ 060/020 9#	Airbus 5360 M1M 0005 00 Type BCC3
Gillfab™ 4709-400001BB-9	.400x48x144″ 015/015 9#	BMS 4-20 Type II
Gillfloor™ 5007C400001HD	.400x48x144″ 045/025	FAR 25.853 Flammability
Gillfloor™ 5040-400001CA2	.400x48x144″ 020/012 2024T3	FAR 25.853 Flammability
Gillfab™ 5042B390001BA7	.390x48x144″ 016/010 7075T6	McDD S3932193
Gillfab™ 5042B390001DC7	.390x48x144″ 025/020 7075T6	McDD S4931863
Gillfab™ 5065-400001EB-G	.400x48x144″ 030/015 1/8 8.5#	McDD BZZ 7002 Type IV; Fed Ex 91-019
Gillfab™ 5065-400013EB-G	.400x60x120″ 030/015 1/8 8.5#	McDD BZZ 7002 Type IV; Fed Ex 91-019
Gillfab™ 5142-390001BA76	.390x48x144″ 016/010 7075T6	McDD S4929905
Gillfab™ 5242-390001CA2	.390x48x144″ 020/012 2024T3	McDD S00096 Rev D
Gillfab™ 5242-390001CA7	.390x48x144″ 020/011 7075T6	McDD S00096 Rev A
Gillfab™ 5424-400001BB-G	.400x48x144″ 015/015 1/8 8.5#	BMS 4-23 Type II
Gillfab™ 5424-400001BB-R	.400x48x144″ 015/015 1/8 6.1#	BMS 4-23 Type I

Gillpatch™ Repair Patches

Product Number	Description	Specification
Gillpatch™ 1367P013001	.013x48x144″	Airbus IPS 08-07-002
Gillpatch™ 6306-055903	.055x5x5″	FAR Part 25 Appendix F Part III; Airbus IPS 08-07-001-01
Gillpatch™ 6306-055907	.055x12x12″	FAR Part 25 Appendix F Part III; Airbus IPS 08-07-001-01
Gillpatch™ 6306-055915	.055x8x8″	FAR Part 25 Appendix F Part III; Airbus IPS 08-07-001-01
Gillpatch™ 6306-055VARK	Assorted Kit - 5x5″, 8x8″, 12x12″	FAR Part 25 Appendix F Part III; Airbus IPS 08-07-001-01

Inserts

Product Number	Description	Specification
TF073	2 piece Torlon insert	GAA588AF-500
T303	2 piece aluminum insert	TYE5319A3-374 Plug & TYE5319A Sleeve
TF20	1 piece aluminum insert	TYE5117AM5-500
TF21	1 piece aluminum insert	TYE5117AM5-380x29

M.C. Gill: Answering the Challenges of MRO

Obviously, having materials available is just one part of the solution. Another challenge is dealing with repair and maintenance issues in a global economy. Planes don't always "misbehave" near their home offices, so locating materials can be a challenge. M.C. Gill Corporation boasts a global sales force that is regionally located and knowledgeable about our products, plus a distributor network that inventories parts worldwide. This means less time determining what is needed and less time in transit once an order is processed.

Even after we've addressed these challenges, M.C. Gill Corporation never rests. We are pioneers in the composites field with a team of diligent R&D scientists watchful for the opportunity to innovate within our field. Evidence of this is the development of a product improvement specifically designed to address a widespread issue in the Boeing 737.

In 2001, Boeing Commercial Aviation Service issued a service letter (737-SL-25-096-A) to all B737 airplane operators. The purpose was to inform them of cargo compartment liner material and floor panel replacement options. "Operators have reported early and frequent damage to the 737 compartment sidewall liners with initial damage in the lower 15 inches of the sidewall. Damage reported is fastener hole tear-out at the lower attach points, material deterioration over frame sections from abrasion, and fractures/ holes in the liner adjacent to the floor."*

The letter threw a spotlight on an ongoing problem that required immediate action.

M.C. Gill Corporation is quick to respond when performance issues arise. We immediately recognized this issue as an opportunity and responded with the development of Gilliner 1076B™. Gilliner 1076B is a high wear-resistant fiberglass cloth-reinforced polyester laminate aircraft cargo compartment liner. This product was specifically developed for the cargo compartment area in the B737. As a major supplier of cargo liners and floor panels, M.C. Gill Corporation understands the severe conditions that exist in a bulk cargo compartment area of an aircraft. Several large MRO customers complained about the need for a more robust product. Operators were experiencing seriously reduced service life from the phenolic fiberglass liners that were in use. The R&D scientists and engineers at M.C. Gill Corporation began working on a solution. Existing M.C. Gill Corporation cargo liners (Gilliner 1076A and Gilliner 1366) met the BMS 8-2 specification but our engineers felt certain there was an opportunity for an improved cargo liner with superior wear resistance.

* Boeing Service Letter 737-SL-25-096-A, Boeing Commercial Aviation Services, June 5, 2001.

Their first step was to scrutinize the severe wear resulting from actual in-service activities in the lower cargo hold of an aircraft. Tests were designed to simulate the activities and subsequent wear brought on by repeated loading and unloading in the lower cargo hold. Of particular concern was the wear-through over frame sections, impact damage and fastener tear-out at attach points. Our chemists agreed that a polyester resin formula would provide better wear and abrasion resistance properties than phenolic. Incorporating a satin-weave fiberglass cloth reinforcement for a resin-rich surface during wet lay-up results in a laminate with exceptional mechanical strength, abrasion resistance and high edge-bearing strength for reduced hole elongation and tear-out.

Proof that our formula was a success has been demonstrated with B737 operators throughout the world. Produced in either sheets or rolls, Gilliner 1076B offered the perfect solution for M.C. Gill Corporation Sales Manager Candi Burdick when she recently traveled to meet with customers in China. Several key airline and MRO customers were experiencing poor in-service performance with a competitor's BMS 8-223 phenolic cargo liner. Based on the weave of the reinforcement and the relatively low resin content of their material, it was not surprising that the material exhibited poor abrasion resistance and required frequent replacement. Burdick scrutinized test results from cargo liners supplied by competitors and assorted local suppliers and ultimately proved that Gilliner 1076B was a lower cost, better performing product. In a competitive environment, that’s a win-win for everyone.

For 65 years M.C. Gill Corporation has been a positive force behind the science of composites. We lead through innovation and partner with our customers for outcomes that are mutually beneficial. We have weathered good times and bad, and welcome the opportunity to continue developing new products, building positive relationships with our customers and facing whatever challenges that lie ahead.

M.C. GILL CORPORATION

Contributes to Success of University Students

LMU | LA
Loyola Marymount University Los Angeles

M.C. Gill Corporation is proud to provide unique support to the engineering schools at various universities around the world. Most recently, we received a request for materials from Loyola Marymount University in Los Angeles, California. The university participates in the Shell Eco-marathon competition for students to design and build prototype-class combustion vehicles. In their first year competing, Loyola placed 15th out of 29 schools. This year the focus was on weight reduction and mechanical reliability. The LMU team entered two vehicles and placed 9th and 15th in a field of 43 competitors. The 2009 design represented a weight reduction of more than 45% over the 2008 entry. The team is made up of students in the LMU Eco Motorsports Club.

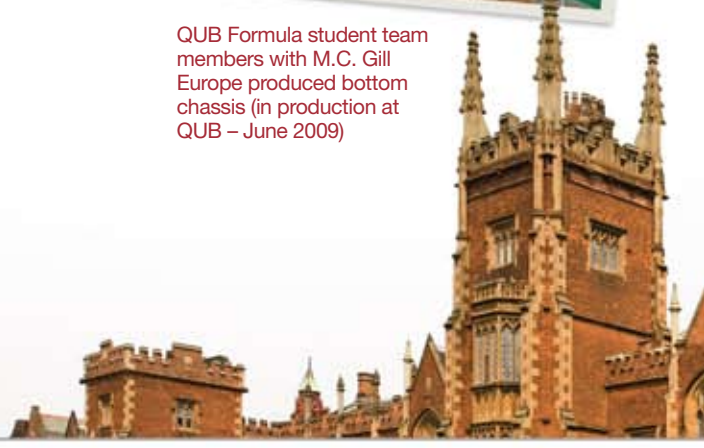
2009 Shell Eco-Marathon Teams. Above: 858.8 MPG. Right: 531.1 MPG.

Queen's University Belfast

Overseas, at Insoleq – M.C. Gill Corporation Europe, our Technical Manager Jason Curran has taken an active role in supporting the Queens University Belfast Formula Race car teams for 2007/2008 and 2008/2009 (see photos). M.C. Gill Europe provided technical assistance on how to integrate composites into the chassis of their race cars including:

- Provided technical assistance on composite materials and methods of manufacture.
- Donation of M.C. Gill Corporation sandwich panel materials for R&D testing prior to material selection and final concept definition.

QUB Formula student team members with M.C. Gill Europe produced bottom chassis (in production at QUB – June 2009)



May 2008 – M.C. Gill Europe presents two custom-built composite floor panels to QUB Formula student team for installation into this year's Queens University Formula student racing car

- Advice on integration of composite panels into race car chassis – methods of supporting and bonding floor panels into position.
- Machining of final design floor panels according to QUB supplied drawings.
- Technical assistance with the technological transition from 07/08 design based on a tubular space frame chassis with composite insert floor to an all-composite chassis for 08/09 competition.
- Advice based on our wealth of experience using the cut & fold method of manufacture with composite sandwich panels.
- Manufacture of scale proof-of-concept demonstrator from Gillfab 4505 material for structural testing.
- Donation of Gillcore HD honeycomb sheets for inclusion in vacuum-formed top-half of vehicle chassis to improve stiffness while minimizing weight.
- Manufacture of full-scale bottom half of chassis to QUB-supplied drawings using Gillfab 4505 material.

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Alcore does not sell sandwich panels. Contact M.C. Gill for these products.

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THE FUNNY SIDE

Murphy's Flight Laws

No flight ever leaves on time unless you are running late and need the delay to make the flight.

If you are running late for a flight, it will depart from the farthest gate in the terminal.

If you arrive very early for a flight, it inevitably will be delayed.

Flights never leave from Gate #1 at any terminal in the world.

If you must work on your flight, you will experience turbulence just as soon as you touch pen to paper.

If you are assigned a middle seat, you can determine who has the seats on the aisle and the window while you are still in the boarding area. Just look for the two largest passengers.

Only passengers seated in window seats ever have to get up to go to the washroom.

The crying baby on board your flight is always seated next to you.

The best-looking woman on your flight is never seated next to you.

The less carry-on luggage space available on an aircraft, the more carry-on luggage passengers will bring aboard

A Dog's Life

A poodle and a collie were walking down the street. The poodle turned to the collie and complained, "My life is a mess. My owner is mean, my girlfriend is having an affair with a German shepherd, and I'm nervous as a cat."

"Why don't you go see a psychiatrist?" asked the collie.

"I can't," replied the poodle. "I'm not allowed on the couch."

No Kidding

Reaching the end of a job interview, the Human Resources Person asked a young Engineer fresh out of MIT, "And what starting salary were you looking for?"

The Engineer said, "In the neighborhood of $125,000 a year, depending on the benefits package."

The interviewer said, "Well, what would you say to a package of five weeks vacation, 14 paid holidays, full medical and dental, company-matching retirement fund to 50% of salary, and a company car leased every two years – say, a red Corvette?"

The Engineer sat up straight and said, "Wow! Are you kidding?"

And the interviewer replied, "Yeah, but you started it."

Dangerous Light

Through the pitch-black night, the captain sees a light dead ahead on a collision course with his ship. He sends a signal:

"Change your course ten degrees east."

The light signals back: "Change yours, ten degrees west."

Angry, the captain sends: "I'm a Navy captain! Change your course, sir!"

"I'm a seaman, second class," comes the reply. "Change your course, sir."

Now the captain is furious. "I'm a battleship! I'm not changing course!"

There's one last reply. "I'm a lighthouse. Your call."