

*50 Years  
of Progress*

VOLUME 32  
SPRING 1995  
NUMBER 2

# THE M.C.GILL DOORWAY

M.C. GILL CORP., 4056 EASY ST., EL MONTE, CA 91731 • PHONE (818) 443-4022 • FAX (818) 350-5880 • FAX (818) 279-6051



*Now  
What?*





A defense oriented customer company recently requested lighter, stronger modular housing for the electronic equipment they were supplying the military. Royal Plastic, our division in Minden, Nebraska, took it from there. The result was so innovative and impressive that Royal has expanded on the concept and developed a new system of composite cabinetry.

With Royal's 45 years' experience in designing and manufacturing contoured/fabricated composite parts to meet specific end use criteria, they developed the RP900 series framework for shelving and cabinetry to carry the electronic and avionics equipment in commercial and military aircraft.

Generally, framework and shelving have been made from currently available rack systems – which are limited to standard configurations, none of which are designed to minimize weight.

Certainly, aluminum is an acceptable material, but for some applications and specifications it does not offer the additional benefits required by the more sophisticated user.

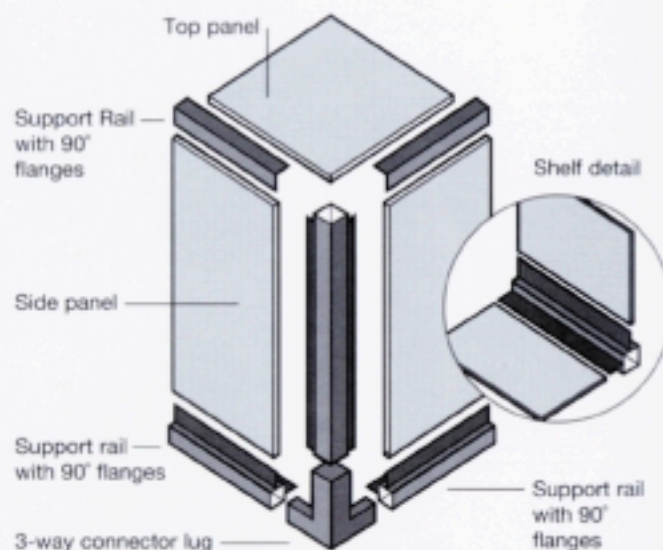
Royal's modular RP900 series utilizes the unique advantages of composites rather than a "me-too" copy of commercial metal racks. Carbon reinforced composite is the primary raw material.

#### **The Ground Rules for Royal's RP900 System**

The parameters were straightforward: light weight and strength designed for specific applications. The RP 900 is adaptable – its basic frame components allow construction in different dimensions and configurations with relative ease. Royal recognizes that different customers have different cabinetry requirements – different sizes, shapes, doors, shelves, side walls, desk tops and floor mounting, to name a few. With this in mind, Royal's engineering staff utilizes FEA (Finite Element Analysis) to optimize and match the design with the customer specifications.

## ***Developed by M.C. Gill's A New Concept***

#### ***The RP 900 system starts with these structural components***



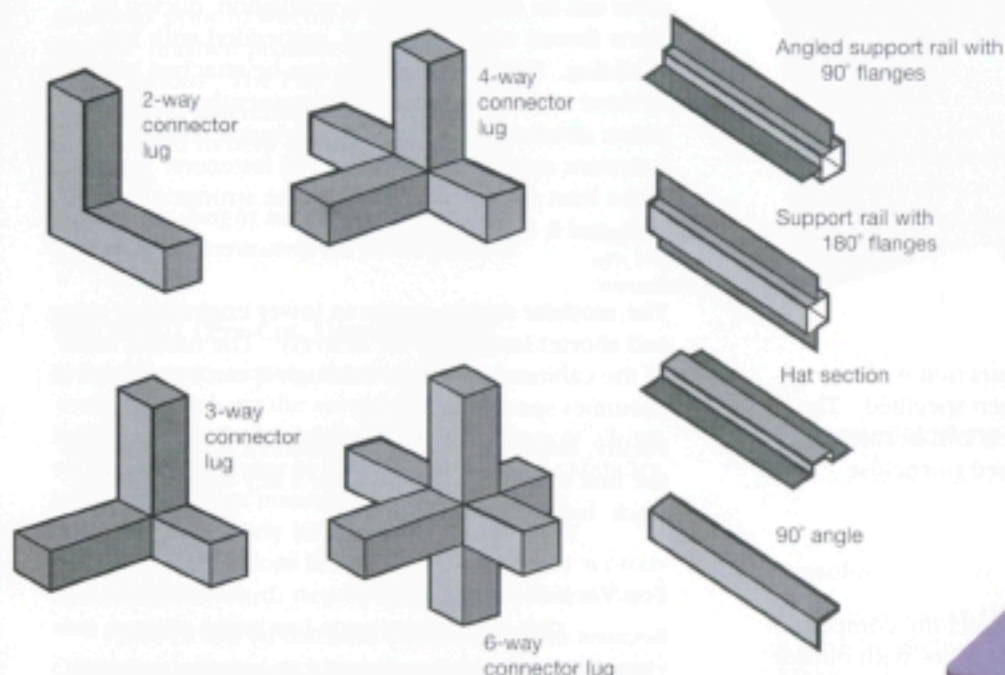
#### ***Allows dimensions and configurations you require***

#### **33% to 60% Lower Weight, Higher Strength**

The framework of an RP900 unit weighs at least one-third *less* than an identical rack constructed of aluminum or steel. This weight saving can increase to 60 percent when the system is tailored for specific applications. Often, metal racks are overbuilt – intended for many applications but, in fact, suitable for few.

Weight reductions are achieved by utilizing the carbon reinforced epoxy (or vinyl ester) composite as the primary material in constructing the component parts of the RP900 series. Each part is compression molded, which results in a much stronger part than if it were extruded or pultruded. The corners of the RP900, which are the limiting factors in overall strength, are reinforced with gussets and interior lugs,

# Royal Plastic Division... in Lightweight Cabinet Systems



A complete unit—typically for enclosed avionics equipment, with optional desk.



or knuckles, inside the hollow rails.

The tubing used for the framework is square. That configuration has the highest strength-to-weight ratio of any profile other than circular. The square shape provides equal strength in four directions, which is important because the cabinetry is sometimes installed in a sideways orientation.

When M.C. Gill sandwich panels, such as Gillfab® 4109, or laminates, such as Gillfab 1186, are substituted for more conventional materials to enclose the unit, weight savings can be even more dramatic. For example, a 0.390" thick floor panel of carbon facings and Nomex® honeycomb core (Gillfab 4109), weighs 0.470 psf versus a 0.190" thick aluminum plate weighing 2.65 psf—a savings of more than 82 percent!

The unit shown is 53.5" high, 27.5" wide, and 46" deep. It is designed to hold more than 750 pounds of instrumentation. The shelving, sides, top and floor of the unit shown are made from Gillfab 4109—unidirectional carbon reinforced phenolic facings bonded to a Nomex honeycomb core. The sidewalls are enclosed with panels as shown, but could be left open or enclosed with a thin laminate. The completed unit is 50 percent lighter than an identical one constructed from aluminum or steel. It can be painted (as shown) to blend or contrast with its surroundings.



## **Lightweight Cabinet Systems** *(continued from page 3)*

### **Versatility**

Vertical rails can be angled or modified to support a shelf for computer console keyboard or other operator-oriented equipment. The customer specifies the space requirements and limitations, and Royal designs the RP900 system to accommodate them.

Either M.C. Gill composite laminates or sandwich panels can be used to enclose the framework. An added benefit is that all materials are manufactured essentially by the same company. Working in concert, Royal and M.C. Gill can ensure that no downtime will result from raw material production or assembly delays.

### **Ease and Speed of Assembly**

As discussed elsewhere, the RP900 can be assembled and shipped from Royal's plant, or component parts can be sent to a customer-specified site for assembly, using Royal's easy-to-follow instructions.

### **EMI Protection**

Electro-magnetic interference protection is also available and can be provided when specified. The shielding material effectively deters EMI because it is embedded into the composites used to enclose the unit.

### **Design Flexibility**

The drawings on pages 2 and 3 depict the component parts of the RP900 system – square tubes with outside tube widths of either 1" or 1-1/2" provide a maximum

opening of 60". Standard corners are 90°, although other angles, such as 135°, are possible. The 60" tubes are cut to specified lengths and normally are made with two flanges to hold shelving in place and for affixing sides, floors and tops. The components are compression molded from carbon cloth and unidirectional tape. All plys are oriented so as to optimize strength.

### **Options for Enclosures**

No matter the material used to enclose the unit, all sides can be slotted to allow ventilation; ducted to allow forced ventilation; and, embedded with EMI shielding. Sides and shelving can be attached in one of three ways. They can be permanently bonded in place; attached with quarter turn/quick release fasteners; or affixed with standard fasteners. Bonding is the least expensive, results in the strongest overall unit, and it is permanent.

The modular design results in lower engineering costs and shorter lead times for delivery. The natural color of the cabinetry is black, although it can be painted to customer specification.

Finally, Royal can design and attach a work station to the unit that will accommodate a key board, mouse, track ball, or writing surface.

### **For Various Uses**

Because of the versatility afforded by the RP900, virtually any type of enclosure can be constructed from its component parts. The only limits placed are those of the design engineer's imagination. A few of the many uses now possible with the RP900 are:

- Shelving for electronic/avionic equipment
- Storage cabinets with shelves, drawers, or both
- Computer work stations or consoles
- Space partitions
- Sound dampening partitions
- Rolling carts
- Open or enclosed shelving structures

Whichever option is selected, the end product will be designed strictly to customer specifications. Light weight and strength will be inherent in the unit(s). And adherence to dimensions will ensure that, once installed, the unit will look as though it was built into the space provided.



*Enclosure for electronic equipment utilizing same structural components.*

### THREE SYSTEM OPTIONS

All three options result in lightweight modular components consisting of individual pieces that when assembled are ready for equipment installation.

#### The RP900 (Pre-Assembled)

Royal personnel assemble the basic unit prior to shipment. The advantages are the greater speed and accuracy. Royal works with the customer to finalize drawings prior to assembly to ensure that the finished product conforms to specifications. The FEA analysis required for assemblies of this nature can be used to help qualify for FAA approval.

*Minimum weight savings over metallic units— approximately 30 to 40 percent.*

#### The RP901 (Pre-Cut, Unassembled)

If for whatever reason, the customer wishes to perform the assembly function, Royal's modular component concept allows an outside fabricator to assemble a piece of cabinetry in a cost efficient manner. Each piece of the framework is clearly labeled with its own part number. Instructions for assembly are clearly written in a straightforward, step-by-step manner. Royal can also provide prints and structural design data.

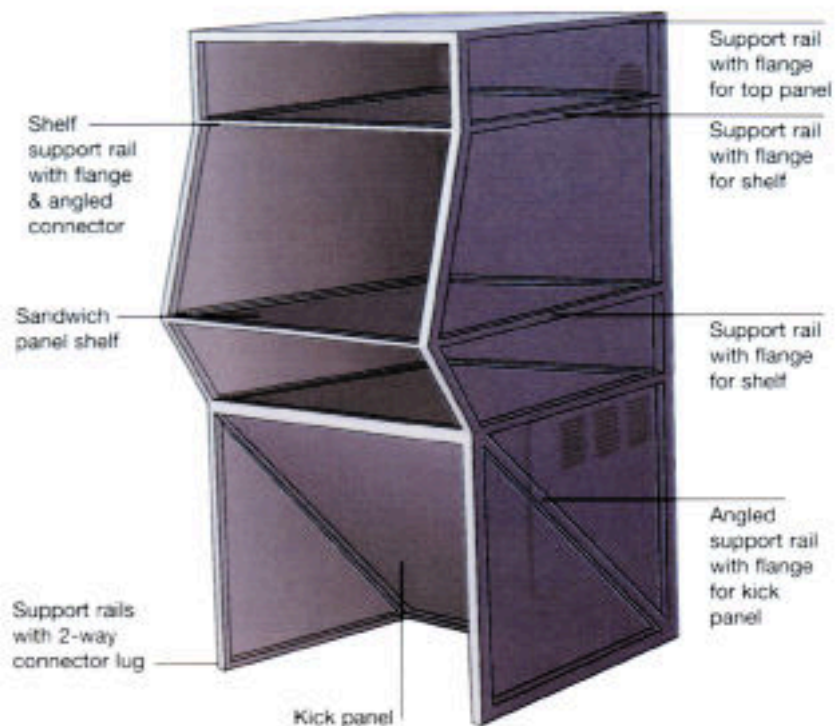
Offered as a "pre-cut" kit approach, the RP901 is the most basic of the series and provides unassembled lightweight composite tubes, lugs and panels, all of which are individually built to meet specified structural loading requirements.

*Minimum weight savings over metallic units— approximately 30 to 40 percent.*

#### The RP902 (Fully Enclosed — Assembled or Unassembled)

If the unit is to be fully enclosed, light weight sandwich panels provide structural strength. This in turn, results in optimal weight savings. The 902 is an excellent approach for many military and other applications requiring maximum payload and minimum supporting cabinetry.

*Minimum weight savings over metallic— approximately 40 to 60 percent.*



*A diagram typifying basic structure*

### Conclusion

Royal Plastic, like the M.C. Gill Corp., has long known it pays to listen to their customers. In the case of the RP900 series, a customer's idea has spawned a new market for the Minden, Nebraska division — one they have only recently entered, in which they have already established a position of leadership. Also like M. C. Gill, they intend to maintain that position through product improvement, innovation, and customer service — a combination that fosters excellence.

For additional information on the RP900 system, call Royal Plastic at 308-832-2760; fax at 308-832-2214; or write to PO Box 380, Minden, NE 68959.





# GILLFAB® FLIES WITH FOKKER

## We have been remiss.

*About a year ago, we received a telefax from Eelco Tienstra of Fokker Aircraft. He expressed his curiosity as to the reason we had never made an announcement in the Doorway concerning M.C. Gill's qualification of Gillfab 4018 and Gillfab 4019 to the appropriate Fokker specifications. He closed by asking that we continue to send the Doorway but asked us to please put Fokker in it. Mr. Tienstra, we hope the following article will serve that purpose.*

## The Early Years of Fokker

Anthony Fokker built his first airplane in 1910 at the age of 20 – a monoplane he dubbed the Spider. Two years later he founded his own company, Fokker Aeroplanbau. During World War I, he produced thousands of fighter aircraft for the German forces. After the war, he turned his attention to the commercial sector of aviation and in 1919 built the F.2, a high winged monoplane that cruised at 100 mph and carried four passengers.

The F.2 was the first of a long line of passenger airplanes that was used all over the world. It was followed by the F.3 and, for the U.S. market the F.4, an 11-seater. The latter initially was flown by U.S. Army Air Service pilots and set world records for endurance, distance and speed.

## Coming to America

In 1921, Anthony Fokker established a branch of his company in America that eventually had two plants in New Jersey and one in West Virginia. By the mid-20's Fokker was a major force in aircraft production for commercial aviation. The Fokker Trimotor, designated the F.7, was an early success and many European, American, and Pacific Rim area airlines operated them and their derivatives. By 1930, 54 airlines were operating Fokker aircraft.

Fokker died in 1939, and production of commercial aircraft was suspended during World War II. Though only 49, Anthony Fokker had established himself with a long list of firsts and other accomplishments that will ensure his place in aviation history.

## Post World War II

Immediately after the war, the company reopened its doors and produced a series of small military training craft including the S.14 Mach Trainer, its first jet design.

In 1958, Fokker re-entered the commercial marketplace with the introduction of the Friendship – the F27 turboprop. It became the best selling turboprop in the world and when production ended in 1986 total sales of the airliner had reached 786. The F28 Fellowship, first short-haul jet aircraft in the world, was introduced in 1969.

The F27 evolved into the Fokker 50 propjet and the F28 into the Fokker 70 and 100 fanjets, currently the mainstays of the company's business.

As of June 1994, almost 250 of Fokker's 100's were in service. Among the 28 airlines throughout the world flying the 100 are American, China Eastern, KLM, Korean Air, Mexicana, Swissair, and USAir.

These airlines account for almost two-thirds of the active 100's and they are all M.C. Gill customers as well.



### For the Airlines and Fokker— Gill Flooring Panels

The airlines above have used the M.C. Gill family of flooring panels on their long haul aircraft. It follows that we would develop and qualify flooring panels that meet Fokker specifications for their short haul jets.

The results of this extensive qualification effort were Gillfab 4018 and Gillfab 4019. The former is used as galley and entry flooring panels and the latter as passenger compartment aisleway flooring in the Fokker 70 and 100.

### The Qualities that Qualify

*Gillfab 4018* is a low-smoke sandwich panel made from unidirectional S-2® glass reinforced phenolic facings bonded to a Nomex® honeycomb core. It has low-smoke evolution in a fire, very high puncture resistance, and a high strength-to-weight ratio.

*Gillfab 4019* exhibits the same features but differs in construction. The core material is the same but the facings are a combination of phenolic reinforced woven glass cloth and unidirectional carbon which provides an added degree of stiffness. The facings of both panels are bonded to the core with Gillstick® A187, a modified epoxy film.

The standard size of each panel is



*The interior of an F100. Gillfab 4019 is qualified as aisleway flooring.*



*Gillfab 4018 used in galley and entry flooring panels*



*Gillfab 4019 used in passenger compartment aisleway flooring.*

48" x 144". Both are available in up to 72" widths and 168" lengths on request. Facing thicknesses on each panel are .028"/.028". Honeycomb core densities are likewise the same—9 pounds per cubic foot. Gillfab 4018 is 0.407" thick and qualifies to Fokker specification FoN 1-4350. The panel is also available with a Tedlar® overlay on the top facing (Gillfab 4018T) and with Tedlar overlays on both top and bottom surfaces (Gillfab 4018S). 4019 is .477" thick and is qualified to Fokker specification FoN 1-4354.

Yes, Mr. Tienstra, the M.C. Gill Corp. is proud to add Fokker Aircraft to the long list of airframe manufacturers to whose specifications we have qualified our products. But, we do apologize for the delay in making the announcement.

ANTHONY FOKKER'S LIFE AND HIS COMPANY'S HISTORY ARE WELL DOCUMENTED. AMONG THE FIRSTS HE AND HIS AIRCRAFT ACHIEVED ARE:

- First successful mechanism that allowed a fighter pilot to fire a front-facing machine gun through the propeller arc without destroying the propeller (1915)
- First nonstop U.S. transcontinental flight (1922)
- First airliner with air cooled engines (1925)
- First flight over the North Pole, Admiral Richard Byrd (1925)
- First flight across the Pacific Ocean from America to Hawaii (1927)
- First Atlantic crossing by a woman, Amelia Earhart, (1928)
- First U.S. to Australia direct flight, via Hawaii and Suva, (1928)



*The Fokker F.VIb-3M Eight-passenger Monoplane.*



*The Fokker F-10 Twelve-passenger Monoplane.*



## NEWS FLASH

Gilliner® 1076A is now qualified to Boeing BMS 8-2, Grade A, Class I, Type 13. 1076A is a fiberglass cloth-reinforced polyester cargo liner. It has good mechanical strength and is puncture and burn-through resistant. If you want additional information, please contact our Marketing Services Department at the address, phone or fax numbers on the cover.

## THE FUNNY SIDE

The dog is half pit bull and half poodle. It isn't much of a guard dog, but it is a vicious gossip.

\*\*\*\*\*

What do sex and golf have in common? Men think they're better at both than they really are.

\*\*\*\*\*

Adam and Eve had the perfect marriage. He didn't have to hear about all the men she could've married and she didn't have to hear about his mother's cooking.

\*\*\*\*\*

If it works, copy it.

\*\*\*\*\*

Fortune teller to customer: "You will be poor and unhappy until you are 42 years old."

"What happens then?" asked the hopeful client.  
"You'll get used to it."

\*\*\*\*\*

A prospective customer went into a Russian car dealer's show room to order a new car and was told it would be ready August 19, 1998.

"Morning or afternoon?" asked the customer.

"The car won't be here for more than three years.

What difference could it make, morning or afternoon?"

"The plumber is coming in the morning", replied the customer.

\*\*\*\*\*

You know your best days are behind you when:

...Your knees buckle but your belt won't.

...You feel like the night before, but you haven't been anywhere.

...You sink your teeth into a juicy steak and they stay there.

...You need glasses to find your glasses.

## Trivia

There have been 10,679 proposed amendments to the U.S. Constitution. 27 have been ratified.

\*\*\*\*\*

Since the Environmental Protection Agency established the Superfund for hazardous waste site clean up in 1980, an estimated 85 percent of the \$6.7 billion spent has gone to lawyers. And 18 percent of the sites have been cleaned up.

\*\*\*\*\*

Missouri ranks first of all states in deaths caused by hot weather.

\*\*\*\*\*

The standard escalator moves 120 feet per minute, about one and one-third miles per hour.

\*\*\*\*\*

Sherlock Holmes was an ophthalmologist.

\*\*\*\*\*

Roquefort cheese is made from the milk of female sheep.

\*\*\*\*\*

Edinburgh, Scotland is located in the crater of an extinct volcano.

\*\*\*\*\*

Meetings, Meetings, Meetings:

...People spend between 20 to 40 hours per month in meetings.

...Executives spend at least 50 percent of their time in meetings.

...On an average day, more than 17 million meetings are held.

\*\*\*\*\*

In 1916, the Loughhead Brothers built a seaplane factory in Santa Barbara, CA. They also constructed a wooden ramp to launch their planes. They later changed their name to Lockheed.

\*\*\*\*\*

The first crossword puzzle ever published appeared in the New York World on December 21, 1913.

