

CARBONICS

Advanced Composite Engineering & Manufacturing for Marine & Industrial Applications



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Photo: Billy Black/www.billyblack.com

GOSHAWK, a Brooklin Boat Yard 76 entered in the Newport-Bermuda Race, turns on the speed with her GMT spars

GMT TO BERMUDA!

Roughly 10 percent of the record breaking, 264-boat-strong fleet that lined up for the Centennial Newport-Bermuda Race came to GMT for our ultra-reliable carbon parts. These owners know that the Gulf Stream can hand out extreme punishment to boat and crew alike. They wanted peace of mind knowing that light, strong, cost-effective GMT spars and rudders make any boat go faster while minimizing the chance of failure.

After the 2002 race, the crew on Roy Disney's *Pyewacket* (GMT rudder) said that the passage through the Gulf Stream was the roughest sailing they had experienced in three years. Quite a state-

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WHEN LIGHTNING STRIKES

By David Schwartz
GMT president and chief engineer

As composite spars for sailboats become more common, the question of safety during electrical storms arises. The aircraft industry has already addressed the issue and come up with interesting solutions.

Aircraft are frequently struck by lightning, yet military and commercial planes have been flying for years with composite wing, tail, and stabilizer sections. Studies show that the laminate can dissipate the energy of a strike without damaging the composite if the energy is spread out over a wide enough area. Also, the probability of a strike varies; the nose and leading edges are most likely to be hit, while the aft edges are the least likely targets. If concentrated in a small area, lightning can actually puncture a hole through a composite surface. To remove this threat, conductive fibers, foils, or meshes are incorporated in the most likely areas to be struck.

With sailboat masts the solution is different. Because it is highly unlikely that a mast will be struck anywhere but the top, there is no need for a conductive mesh over the mast surface. Instead, a conductive path must be provided to ground so that the electrical energy can be channeled to a safe location. The ques-

GMT-Equipped Boats in the 2006 Bermuda Race

<i>Actaea</i>	Hinckley Bermuda 40	Michael Cone
<i>Alchemy</i>	Andrews 77	U.S.M.M.A.
<i>Ariel</i>	Swan 47	Jim Thompson
<i>Cygne</i>	Swan 46	Ray Peterson
<i>Firefly</i>	Morris 45	Donald Hogan
<i>First Light</i>	Baltic 55	Andre Laus & Jack Dunn
<i>Gaylark</i>	Swan 38	Kaighn Smith
<i>Goshawk</i>	Stephens 76	Richard Schotte & Steve White
<i>Gusto</i>	Paine 44	Jay Cushman
<i>Jacqueline IV</i>	Hinckley SW 42	Robert Forman
<i>Katie G</i>	Martin 40	Eric Goetz
<i>Kinship</i>	Baltic 52	Tom Sellendorff
<i>Kiva</i>	Hinckley SW 51	Mark Stevens
<i>Kodiak</i>	Frers 66	Randy Greene
<i>Plum Crazy</i>	Sabre 38	Michael Berg
<i>Restive</i>	Alden 48	George Denny
<i>Sonny</i>	Empacher 70	Albert Phelps
<i>Spartina</i>	Hinckley 41	Paul Pomerantz
<i>Aphrodite</i>	Swan 46	Chris Otorowski
<i>Wahoo</i>	Corby 41	Henry Fretz
<i>Windwalker</i>	Hood 60	Craig Cullen

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NEW LAUNCHES

GMT has built a broad range of carbon spars and rudders this year, with the common denominator being "schooner." The first launch of the year was the Nigel Irens-designed Covey Island-built 63-foot schooner *Maggie B*. On a chilly February day, not even ice on the deck could deter the hardy boatbuilders from undergoing sea trials off Nova Scotia. *Maggie B* then sailed to Antigua for the Classic Yacht Regatta where she

Tim Wright / www.photobaction.com



scored podium finishes in three races, including first in the Concours d'Elegance two-man gig race.

On March 7th, the masts, Pocket Boom, furling boom, and gaff for the Alden-designed 50-foot schooner *Lookout* (below) were delivered to Brion Rieff Boatbuilders in Brooklin, Maine, along with the rigs for the Alden-designed Brooklin Boat Yard



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48 *Restive* (photo, right) and the Brooklin Boat Yard 34, designed by Bob Stephens.

GMT then delivered a 13-foot-tall by 5-foot-wide e-glass/epoxy/foam



rudder blade with carbon-fiber post (photo, left) built to exceed American Bureau of Shipping standards for the 85-foot Bermudian Schooner soon to launch

at Rockport Marine in Maine.

And ready for delivery to Covey Island Boatworks are the spars for the Chuck Burns-designed 49-foot *Sir Edmund*, to be launched in July. (rendering, next page). Also receiving new GMT spars was the Hinckley Bermuda 40 *Adagio* at Burr Bros. in Marion, MA, and the new Najad 332 (photo, next page) at Rhode Island's Jamestown Boat Yard.

Other new projects of note are a replacement rig for the Tim Kernan-designed Schooner Creek 44, for West Coast racing, and a Pocket Boom for the Nelson/Marek 93 *Patient Falcon*. This 38-foot Pocket Boom is the largest we've built!

LOOKOUT, an Alden-designed 50-foot gaff-headed schooner (left), features cold-molded cedar and mahogany construction, accommodation for two couples, and sailhandling optimized for a shorthanded crew. (below) Loaded on the truck, the GMT "Faux Bois" spars for LOOKOUT head for Brion Rieff Boatbuilders in Brooklin, Maine.



The Alden-designed 48-foot RESTIVE combines graceful good looks with modern technology, including GMT carbon spars

GMT WORKS UNDERCOVER

While not exactly a "new launch," GMT has been awarded a multi-million dollar non-marine project by Northrup Grumman. GMT was selected because of the high level of confidence NG has in our manufacturing and quality assurance procedures. GMT will be manufacturing over a half-mile of carbon tubing. The tubing will be used as the lightweight housing for 1,400 sensors to be produced by Northrup Grumman. We will be bonding stainless, aluminum, and polycarbonate pieces to the carbon; the optics and electronics slide inside the housing. The units will be used to provide unattended ground surveillance for military purposes.

GMT CLIENT SNAPSHOT

ANDRE LAUS & FIRST LIGHT

When Rhode Islanders talk about a long commute, it's usually one-half hour to Providence, maybe a little bit more if the traffic is bad. But Barrington resident Andre Laus, who has offices in Boston and New York City, sometimes travels 200 miles one way!

So when it's time to relax, Andre gravitates to his Baltic 55 *First Light*. "My whole viewpoint on life changes when I get on the boat. Whether racing or cruising, it's truly a great change of pace from the work week." Andre spends about 55-65 days on the water between April 15 and November 15. "I've had this boat ten years, and have made several upgrades with the help of GMT that make the boat faster and easier to handle. First, I installed a GMT carbon fiber Pocket Boom, for ease of sailhandling when cruising with my wife and friends. Before the Pocket Boom, furling the main was always a struggle; now we don't hesitate to go for an afternoon sail, as



A GMT carbon-fiber Pocket Boom enhances the lines of FIRST LIGHT

we just drop the main and it's contained. I also like the aesthetics of the Pocket Boom—it looks sleeker than a conventional boom, and has recessed lights on the bottom to illuminate the cockpit at night.

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"The next upgrade was the GMT carbon rudder, which is thinner in section and deeper than the standard Baltic rudder—it's also 112 pounds lighter, a real plus in the back end of the boat. The new shape enables *First Light* to point about ½ degree higher when hard on the wind; but the real benefit comes on a reach where the load on the helm has been reduced about 15%. The important benefit is more speed, a result of a lot less effort battling weather helm to keep the boat on track. In fact, sailors from a Baltic sistership with the standard rudder have been amazed at the difference when steering *First Light*."

The key change for racing this year was the carbon mast, which saved a staggering 567 pounds aloft! (The standard aluminum mast was 952 pounds, while the GMT carbon spar weighs just 385 pounds.) "While *First Light* struggles a bit in the tight maneuvers of buoy racing due to her 45,000-pound displacement, she really shines offshore. With the carbon rig the boat has become safer, more efficient, and more stable. *First Light* heels 3 to 5 degrees less in a 15-knot sea-breeze, the decks are drier, and the motion through the waves is much smoother—the boat actually drives through the waves, when before she would pound and lose speed."

Racing sailors are always concerned about the rating "hit" when upgrading to a carbon spar, and Andre says his rating increased about 3 seconds a mile. "But the benefits of the carbon mast far outweighed the penalty. We could easily quantify that *First Light*'s speed has increased up to ½ knot in breezy conditions. But because the boat is stiffer, we can keep more sail area



The Chuck Burns-designed 49-foot SIR EDMUND (top) is due to launch in October 2006 by Nova Scotia's Covey Island Boatworks; (above) the new Najad 332 launched by Scandinavian Yachts shows off GMT spars and sprit sailing off Jamestown, RI



up longer and the mast doesn't pump, making it easier to control sail shape. So it's not just the top speed that's impressive, our average speed has increased, too."

The final GMT component Andre added this spring was a carbon sprit, for added downwind performance. "Early tests show the value of the sprit, especially on a broad reach. After the Bermuda Race, we'll have a full report." We are looking forward to hearing more from Andre about *First Light*, and to helping other sailors improve their boat's pace with GMT carbon.

WHEN LIGHTNING STRIKES cont.

tion of protection then is the same for aluminum and carbon spars.

Carbon and aluminum masts have an equal probability of being hit by lightning. In the 15 years GMT has been building carbon masts, only five have been hit, with none suffering structural damage. Once lightning hits an unprotected mast, it can travel down the spar and arc to the rigging or other parts of the boat. Carbon itself is a good conductor of electricity, and if that were the only material used in making the spar it would be fine.

However, since the spar is manufactured using unidirectional carbon fiber pre-impregnated with epoxy resin, the resulting carbon-epoxy matrix is resistant to electricity—about 2,000 times that of aluminum. Local heating can cause damage to either material. In an aluminum section, the metal can melt or lose its temper where arcing occurs. In a composite mast, resin can boil off if local temperatures exceed 500° Fahrenheit. For both types of mast, this local damage can cause failure.

Whether underway or unoccupied, when a boat is hit by lightning the first evidence of a problem is usually damage to the electrical systems. An owner or appraiser should inspect the entire boat to look for any other damage caused by the strike. Spars, whether carbon or aluminum, should be inspected for signs of local heating. It is likely that there would be blistering or discoloration of the paint in any area of the mast that was structurally damaged. There are more sophisticated methods, such as ultrasonic or x-ray tests, that can be employed. However, the entire mast would have to be tested square inch

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by square inch; the cost of testing would be high and the results might very well be inconclusive.

There are steps that should be taken to protect any type of mast. National Fire Protection Association codes and standards of the American Boat and Yacht Council require that sailboats have a lightning protection system. We suggest that all applicable codes be followed. An air terminal should be attached to the top of the mast, either a spike (Lightning Chaser, Tel: 800-448-8090) or a spline ball (SBT from Lightning Eliminators Inc., Tel: 303-447-8122). The conductive part of the air terminal must be electrically isolated from the composite mast. Stranded copper wire (a minimum of #4 AWG) should be run within the mast conduit from the air terminal to the ground plate on the boat. For added protection, electrically connect the cap shrouds, headstay, and backstay to the copper ground wire at the top of the mast.

Unfortunately there is no lightning protection system that will totally eliminate the possibility of a lightning strike. However, we have found that a well-protected spar (lightning rod with #4 AWG copper wire, grounded) should substantially reduce the risk of damage, enabling the mast and boat to survive intact in most cases.



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GMT TO BERMUDA: cont.

ment from a crew that races constantly and all over the world. This year's race featured some rough patches but lighter conditions were the norm. All the GMT boats came through with shining colors. Henry Fretz, in his custom IRC Corby 41 *Wahoo*, took first in class. A number of other GMT boats finished in the money as well. No matter where they finished, our boats, from George Denny's Alden 48 *Restive* (beautifully cold-molded by Brooklin Boat Yard and launched just in time for the race) to Michael Cone's 40-year-old Bermuda 40 *Actaea* with her turbo-charged carbon spar, enjoyed both the Bermuda Race and their GMT Composites experiences.

WELCOME, BUCKY!

GMT is pleased to announce the hiring of Hugh Morgan—or "Bucky," as he is known to friends. With a degree in Economics from Bates College and a solid background in banking and investment services, several years ago Bucky decided that crafting high-tech composites with his hands was more rewarding than crunching numbers.

Prior to coming to GMT, Bucky was with C&C Composites, but the core of his expertise comes from 13 years with Goetz Custom Boats building ten America's Cup boats along with a variety of racers, cruisers, and motoryachts.

"What I learned at Goetz Boats, is applicable every day at GMT—where accuracy, target weight, and quality of the carbon laminate are essential to each part we build." GMT is fortunate to add Bucky's skills and enthusiasm to its veteran manufacturing team, and welcomes him aboard.