

This document supports a complete article on the building, by GMT Composites of Bristol, Rhode Island, of a mast for the sailing vessel *Morgan's Cloud*. It should be read in conjunction with the article, available at:

http://www.morganscloud.com/gear_failures_fixes/gfmast.htm

To learn more about *Morgan's Cloud* and her owners, Phyllis Nickel and John Harries, go to:

www.morganscloud.com

**PROPOSAL FOR
MALONEY MARINE RIGGING**

McCURDY AND RHODES 55FT SLOOP - MORGAN'S CLOUD

TO: Jay Maloney
John Harries

DATE: May 4, 2004 REVISED JULY 30, 2004
Revised September 20, 2004

FROM: Will Rogers
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SPECIFICATION: I = 68.00ft. J = 22.50ft.
P = 59.50ft. E = 20.00ft.
Righting moment at 1 degree = 3326.8 ft-lbs.

Double Spreader Carbon Fiber Mast:

Tube length: 73' 5".
Tube weight: 340lbs

At the partners:

Mast stiffness (lb-in² x 10⁷): 157 X 62
Weight per foot (lb/ft): 4.6
Section size: 14" X 8"

Comparative Mast Data: Main Mast

Aluminum equivalent section: 12 1/2" X 7 1/2"
Aluminum section weight: 807.85lbs.
Weight saving: 468lbs.

Carbon Spinnaker Pole:

Pole Length: 22.50ft
Pole Diameter: 5S
Tube weight: 30 lbs.

GENERAL

1.0 ENGINEERING

- 1.1 Engineering for section moments to be completed by **GMT**.
- 1.2 The location of hardware to be completed by **GMT** and confirmed by Maloney Marine Rigging.
- 1.3 The design and location of all shroud and spreader attachments to be designed by **GMT**.
- 1.4 The tube will be made from standard modulus unidirectional carbon fiber pre-impregnated with toughened epoxy. The composite structure is cured under heat and pressure in an instrumented oven.
- 1.5 The laminate is designed so that the off axis fibers provide shock resistance and add stability to the longitudinal, compression carrying plies. Wall thickness can be tapered over the entire length of the spar.
- 1.6 Local reinforcements for hounds, tangs, exit boxes and spreader bases are integrated into the laminate during construction.
- 1.7 Aluminum fittings will be electrically isolated from the carbon laminate where necessary.
- 1.8 The top of the mast will be tapered. This will be done as an integral part of the laminate without cutting of the fibers so strength will be maximized.

2.0 SERVICE

- 2.1 **GMT** will undertake the responsibility of coordinating the manufacture, operation and service of the components described in this proposal.
- 2.2 **GMT** personnel to be on site during commissioning and sail trials is an option and priced upon request.

3.0 FINISH:

- 3.1 All spars will be fully fared and finished with a Awlgrip paint to buyer's choice of color.
- 3.2 All stainless steel fittings will be polished to a mirror finish.

4.0 WARRANTY:

- 4.1 **GMT** will provide a ONE YEAR WARRANTY on all parts manufactured by **GMT** (detailed warranty available upon request).
- 4.2 Parts manufactured by others carry the warranty provided by the manufacturer of the part.

CARBON FIBER MAST

5.0 MASTHEAD: Main Mast

- 5.1 An aluminum masthead is provided. A lighter masthead made from carbon/epoxy is an option.
- 5.2 One main halyard sheave to accommodate either a 1:1 halyard or a 2:1 halyard.
- 5.3 Two genoa halyard sheaves.
- 5.4 2 spinnaker/MPS cranes. Reuse current block if possible.
- 5.5 Pins for topping lift, headstay and backstays.
- 5.6 1 burgee block. Chafe guard to be determined.

6.0 SPREADERS:

- 6.1 Two sets of aluminum spreaders (carbon spreaders are optional).
- 6.2 Stainless steel spreader bases will be supplied.
- 6.3 Spreader tips to accept discontinuous rigging at S1 and S2. Port and starboard signal halyard blocks.

7.0 TANGS:

- 7.1 Tang locations will be locally reinforced with additional laminate.
- 7.2 New link plates and top tang will be supplied and strap tangs.
- 7.3 Inner forestay tang will be a metal fabrication mechanically fastened to a reinforced area of the spar wall.
- 7.4 Provision for running backstays.

8.0 SHEAVE BOXES:

- 8.1 All sheave boxes will be metal fabrications.
- 8.2 The sheave housing and the exterior of the box will be protected from chafe with stainless steel where necessary.
- 8.3 Sheave pins will be removable for servicing.
- 8.4 Single sheave box for the staysail.
- 8.5 Single sheave box for the pole/topping lift.
- 8.6 Provision for internal halyard for the trysail.

9.0 HALYARD CONTROLS:

- 9.1 Halyard exits will be stainless steel fairleads mechanically fastened to a reinforced area of the spar wall. These should be placed high enough to facilitate jumping the halyard by 6' person.
- 9.2 Three composite winch bases are fully fared into

the mast. Placement should be optimal for a 6' person standing.

9.3 6 halyard stoppers will be provided.

10.0 MAST STEP AND COLLAR:

10.1 GMT has determined from a cross sectional drawing of the partners that the proposed mast will fit in the collar without modification. Existing mast step to be modified to secure fore and aft movement.

10.2 GMT supply of butt plug to fit existing mast step tongue.

10.3 Mast **must** be chocked at partners with Spartite or rubber mast wedge material.

11.0 GOOSENECKS:

11.1 The gooseneck for the main boom will be a metal fabrication mechanically fastened to a reinforced area of the spar wall. Carbon/composite goosenecks are optional. The toggle is included.

11.2 The gooseneck for the vang is also provided and is similar to the boom gooseneck.

11.3 THE BOOM AND VANG GOOSENECKS MUST BE IN EXACTLY THE SAME POSITIONS, RELATIVE TO THE MAST HEEL AS THEY ARE ON THE OLD MAST.

12.0 ELECTRICAL: TO BE DETERMINED.

12.1 To ensure total protection of the wiring, a conduit with messengers will be attached to the inside of the spar.

12.2 Navigation light package (12 V) to include:

12.2a Reuse Tri-color light.

12.2b Reuse deck/steaming and spots where possible. SS guards where appropriate.

12.3 Provision for owner supplied masthead electronics.

12.3a VHF antenna and cabling.

12.3b Wind Instruments

13.0 SPINNAKER GEAR:

13.1 Reuse existing spinnaker track and car/dick with additional lengths for track charged as needed.

13.2 Antal line driver will be supplied and installed with appropriate line.

13.3 Delrin standoff and stainless steel bracket for mast mounted pole. Confirm system with John Harries.

13.4 Spinnaker pole will be reinforced so it can be used as an emergency rudder.

13.5 Forespar TS and GP end fittings are supplied.

14.0 MAINSAIL TRACK:

- 14.1 Reuse existing Fredericksen track for existing batt car system.

15.0 STORM TRYSAIL SYSTEM:

- 15.1 Antal trysail track to be installed on the port side of the mast with suitable end stop at the lower end of the track. Track on new mast should extend 8" down from existing measurements.
- 15.2 A separate sheave box and halyard positioned below the masthead for this project.

16.0 LIGHTNING PROTECTION:

- 16.1 The mast will be protected from a lightning strike with a #4 AWG copper wire and lightning rod. Connection of the wire is to be determined.

17.0 Miscellaneous:

- 17.1 Water dam to be installed for above deck drainage.
- 17.2 Lazy jack hardware supplied and mounted.
- 17.3 Mast to be designed to accept a GMT pocket boom at a later date. The bottom edge to be no lower than existing boom.
- 17.4 Harness pad eye on front face of mast. Pad eyes on port and starboard side of mast for harness attachment. Placement depending on winch placement.

STANDING RIGGING

18.0 The new spar will reuse existing side standing rigging. However if in the opinion of spar builder a part is deemed unusable, the mast builder will confirm with Maloney Marine Rigging before replacing. Stainless steel strap tangs and spreader tip connectors are supplied to fit existing rigging. The backstay will be reused but a new headstay will be provided by MMR.

19.0 The existing mast and standing rigging to be transported to GMT Composites from Billings Diesel so a careful measurement and part removal can be performed on site by GMT.

PROPOSAL

Carbon fiber Main mast.....	\$54,500
Spinnaker Pole.....	\$ 4,995
Shipping from Billings Diesel.....	\$ 770
Shipping to Billings Diesel.....	\$ TBD

Notes:

Quote is valid for 30 days.

Quote is ex-works Bristol RI.

Specification subject to refinement.

Mast is finished ready for standing rigging & tangs.

Options: Ask for pricing if interested in any of the following:

Carbon fiber spreaders

Carbon fiber masthead

Carbon fiber boom

Carbon fiber goosenecks