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

Morgan's Cloud Mast, Defects and Omissions

I. As at 28th. September 2005

II. Introduction

A. Phyllis and I feel that we contracted for a bomb proof mast and got one that might be adequate for the US East Coast and an occasional trip to Bermuda but will not stand up to the rigors of tens of thousands of miles in the high latitudes.

B. To this end, many of the issues raised below are genuine questions, not dogmatic assertions. We are open to being convinced that the current state of a given area of the mast is indeed bomb proof.

C. Due to the number of errors and omissions found on the mast to date we are worried that GMT is experiencing a quality control problem that may result in many hidden small defects, any one of which may set off a chain reaction of events that could result in damage or even loss of the boat in extreme conditions.

D. Our goal in the arbitration process is not to get even with GMT but rather to get the peace of mind that we do in fact have a mast that will "stand up to anything Mother Nature can throw at it" to quote GMT's Carbonics newsletter.

E. We want to get confidence that we have a mast that meets our original specification as summarised below:

1. Morgan's Cloud is not a yacht, she is an expedition sail boat. Our goals in the new mast and spinnaker pole acquisition are:
    a. Reliability.
        (1) In our experience this usually equates to simplicity.
    b. Ruggedness.
        (1) Some equipment is reliable only if it is treated within very specific guidelines; that is not what we are looking for.
        (2) For example our current vang and boom goose necks are massive and have never given trouble. The new mast should be the same.
    c. Ease of maintenance.
    d. Ease of repair, at least temporary.

III. Current Defects and Omissions

A. Cracks at mast head

1. There are two cracks in the carbon at the corners of the main halyard sheave box (photos available).

2. We need to be sure that this is not a design or fabrication problem that will result in the mast head assembly crushing into the carbon over time.

B. Mast heel

1. It seems as if the mast is only resting on the aft 1.5" of the butt plug.
2. We are concerned that this may indicate that the carbon was not cut straight before the plug was installed or that the plug is machined out of true.
3. We believe that this may be why the mast tends to bend forward low down with more force than seems natural when the shrouds and stays are tightened. This means that the aft lowers need to be kept very tight to stop the mast bending excessively low down.

C. Sheaves

1. The nylon sheaves for the genoa halyard were ground with a coarse disk and reinstalled complete with grinding debris.
2. We question whether nylon sheaves are adequate on a boat of this size.
3. We question if they are large enough.
4. Even if the sheaves are adequate they need to be polished so that they won't collect debris.

D. All electrical wiring is substantially below ABYS spec.

1. The 25 watt trilight is wired with #16 wire and the other lights are wired with #14.
2. All wiring needs to be brought up to ABYS specification which calls for a maximum 3 percent voltage drop on navigation light wiring. This would require #10 and #12 wiring for most lights.
3. It should be noted that this is a legal requirement since undersize wiring will result in the boat's navigation lights not meeting coast guard regulations for visibility range.

E. Shepard's crook for burgee

1. Mounting plates are welded on at the wrong angle resulting in the flag being too close to the wind sensor wand
    a. Welder at Billings says that this can be fixed in about four hours.

F. Mast twist

1. The port lower spreader tip is 6" closer to the stem head fitting than the starboard spreader tip.
    a. This is so extreme that the jib-topsail leach overlaps the lower spreader end on starboard but not on port tack.
2. We are not sure what is causing this but the options seem to be:
    a. The spreaders are installed at the wrong angle.

b. The spreader bases are installed in the wrong place.

c. The mast tube is twisted.

d. The slot in the heel of the mast is cut at an angle.

e. The mast step in the boat is at an angle and the old mast was compensated by cutting the slot in its butt at the opposite angle.

(1) The old mast did not exhibit this problem since the jib-topsail leach had the same overlap each side.

G. Signal halyards

1. Blocks are too close to shrouds resulting in the flag flapping against the upper shroud.

H. Winches

1. In the process of repairing the starboard upper winch which was incorrectly assembled we found that it was full of aluminum fragments.
2. We suspect that the winches were used for a drilling pattern and the fragments not removed.
3. If so, all winches need to be disassembled and checked for aluminum fragments and cleaned.

I. Lower spreader length

1. It appears as if the lower spreaders are slightly too long because they appear wider than the shroud base.
   a. It seems as if the jib-topsail cannot be trimmed as tightly as with the old mast when on the wind.
2. We need to check the tip to tip length in relation to the shroud base and sail plan.

J. Fasteners

1. A disturbing number of fastenings show no sign of any coating including:
   a. Fastenings for mast head (fixed by owner).
   b. Top fastening of mainsail track.
   c. Fastenings holding pole line driver.
2. Several fastenings seem to be drilled at at angle.
3. We are further concerned that fastening holes were made carelessly with blunt drills and taps and therefore are substantially below theoretical strength.
   a. The hole for the top screw of the mainsail track is substantially oversized and the threads very close to stripped.
   b. The drill we were sent to drill holes for the halyard deflector that presumably came from the shop floor at GMT was badly dulled and the cutting face chipped.

4. We believe that a representative number of fastenings should be pulled and checked for proper treatment (either anti-seize or epoxy) and the holes examined for correct drilling and tapping.
5. We are particularly concerned about the boom and vang goose necks where the fasteners go into aluminum. If they are not treated it will be very difficult to remove these assemblies if they ever need repair.

K. Fitting isolation

1. The originally agreed specification called for all fittings to be isolated from the tube.
2. David showed us a black rubber adhesive material and stated that this was to be used for this purpose.
3. As far as we know the fittings are not isolated from the tube.

L. Spinnaker pole inboard end fitting

1. The original agreed specification calls for the inboard end fitting to be constructed so that an athwart movement of the pole while still in the vertical position would not cause undue strain on the fitting and track. This has not been done.
    a. With the current system, even a moderate force inadvertently placed on the outboard pole end while in the vertical position will result in breakage of the car, pole end fitting, and/ or track.
2. It is interesting to note that both Oyster Yachts and Halberg Rassey yachts, both boats designed for reliable operation over long distances, have the swivel fitting angled at 45 degrees to prevent this problem.

M. Halyard clutches

1. Clutches are out of line with halyard exits and winch take-up side.

N. Main halyard sheave

1. The sheave was specified to be of a roller bearing type. It's not.
2. The sheave has an overall 4" diameter and a 3.5" bearing surface diameter.
    a. The rope manufacturer calls for a sheave bearing surface diameter of 8 times or 4".
    b. This means that the sheave is 12% undersized for the rope diameter.
3. The sheave also needs to be checked for appropriate width.
    a. The rope manufacturer calls for a minimum 10% clearance.
4. The sheave is set flush with the aft face of the mast rather than substantially proud of the face.
    a. This results in chafe of the halyard on the top of the mainsail track (photos available).

b. We feel that the supplied halyard deflector is an inadequate solution to this problem and that the correct way to fix it is a larger sheave standing proud from the aft surface of the mast. The old mast was this way.

5. The narrowness of the sheave causes the halyard to bear on the sheave box when off the wind.

6. We feel that all of the above issues make the current main halyard sheave inadequate on an offshore boat and make it unlikely that the halyard would survive even one long passage without damage.

O. Spinnaker halyard chafe

1. The spinnaker halyard is chafing at the entry slot at the top of the mast.

2. The spinnaker has only been in use for about 10 hours this summer, all in winds under 15 knots and yet the damage is already noticeable.

3. A solution needs to be devised so that the halyard can survive a 30 day trade winds passage without damage.

P. Storm trysail track fastenings

1. The storm trysail fastenings have no backing plate and are tapped directly into the carbon.

2. We believe it should have a backing plate because:

a. Both the spinnaker pole track and mainsail track do. It is inconceivable to us how a backing plate can be required for those two tracks but not for the sail that will be used in the most extreme conditions.

b. Screws threaded into aluminum require a thread depth of 1.5 to 2 times the screw diameter to reach full strength and then only if the hole is carefully drilled undersize, reamed to correct size and carefully tapped.

(1) Source http://www.alu-info.dk/Html/alulib/modul/A00509.htm

(2) Since carbon holds screws at about 1/2 the strength of aluminum (source David Schwartz, GMT) it is difficult to understand how the current installation could be adequate.

(3) Even if the current installation is theoretically adequate, this would only be so in fact if the holes had been drilled and tapped perfectly. In light of the level of errors on this mast this seems unlikely.

(4) Finally, the storm trysail is our last line of defense in extreme conditions. Can any of us take the risk on what is at best a barely adequate installation?

Q. Lower area of storm trysail track

1. This area does work to hold the bagged sail and will allow the sail to be hoisted (after I filed several screw heads).

2. However, it is aesthetically ugly and unworthy of a premium product at this price.

R. Clearance through partners at deck

1. The mast is a very tight fit through hole in the deck leaving several concerns:
    a. Stepping and Unstepping.
        (1) We are concerned that the mast may be subject to damage during stepping and unstepping particularly since this operation may have to occur in unsophisticated places that are not used to yachts and with the yacht in the water.
    b. Point loading on the mast.
        (1) We need to evaluate the exact clearance from the mast and from the setscrews retaining the Spartite.
    c. Tuning.
        (1) On Morgan's Cloud, like most boats, the partners are not perfectly in the center of the boat. To get an adequate amount of Spartite around all surfaces of the mast I had to pull the mast out of column. The amount was slight (about 3/8") however it is in direct conflict with the Spartite tuning instructions.

S. Roll pins retaining boom and vang goose necks

1. The roll pin on the vang goose neck has already worked half way out once.
    a. Luckily we noticed this before the vang came loose.
2. Considering the potential for damage and personal injury if one of these pins works out we question their use on a boat like Morgan's Cloud.

T. Boom goose neck hinge pin

1. The boom gooseneck hinge pin is too short so that it is only bearing on half of the surface of the lower plate.

U. Vang goose neck play

1. There is substantial up and down play in the vang goose neck which causes it to make a loud banging sound each time the boat goes over a wave when lightly loaded.
    a. This is so loud that it is impossible for the watch below to get any sleep.
2. The problem seems to be that the plastic spacers provided have failed.
3. We believe that the loads at this point are way too high for plastic spacers and that stainless spacers need to be machined for this purpose.

V. Spinnaker pole topping lift

1. The exit block for the spinnaker pole topping lift is undersize for the rope size.
2. The topping lift is already showing signs of wear from the exit block cheeks.
3. The old mast had a swivel block to allow the topping lift to make a fair lead when the pole was set abeam.

W. Threaded nuts

1. On our old mast all threaded nuts were drilled and secured with split pins.
2. Considering the potential for dismasting and personal injury we question that the nuts on the new mast are only secured by center punching.

X. Spreader Bases

1. The spreader base fabrications are at least one gauge of plate smaller than the old ones.
2. We question if they are adequate for Morgan's Cloud and the type of sailing she is used for.