

THIS IS ARTICLE WRITTEN BY DEREK KELSALL, THE YACHT DESIGNER FROM SANDWICH, KENT.

Loch Ness has to be a somewhat unlikely setting for what I believe to be the most interesting rig development that I have ever seen or sailed - the Freewing rig.

The man responsible is Richard Glanville.

I first met the Glanville family when they built a number of large Kelsall monos at their board yard in Cape Town. Richard fitted carbon fibre masts to some of these.

Frustrated by the limitations inherent in a stayed masted mono, he designed and built some very innovative craft. Designs that would not have been feasible without the remarkable properties of carbon fibre.

Richard's interest in carbon fibre began when he was a student at the Cape Town University in the early '70s. In 1979 he built a 73 foot, all carbon fibre maxi. I acted as consultant on the design, which at 22 tons saved 10 tons off the weight of contemporary racing yachts. Between 1987 and 1996 he was the senior development engineer at RK Carbon Fibre of Muir of Ord, Scotland.

The first Freewing rig was fitted to Windswift a Kelsall 54 in 1979. Initial scepticism has been dissipated by Windswift's remarkable record in the robust conditions racing around the "Cape of Storms" and "Cape Agulhas".

The Agulhas Race is not for the faint-hearted. Rounding the southernmost point of Africa on both the outward and return leg, sailing conditions are at least as arduous as those encountered on the Sydney-Hobart Race. Windswift, a 54foot 17 ton cruising boat has entered 5 Agulhas races. She has taken overall honours twice and line honours three times. Her owner, a retired engineer, says "It is almost unbelievable how automatic and hassle free coming about has been made. Windswift must be the easiest yacht to handle in really strong winds and her record in many races proves she is no mean performer".

"Skyline", the boat I sailed, came to Scotland from Cape Town via the West Indies, the Med and the French canals. She has logged nearly 20,000 miles including 3,000 miles single-handed in the southern ocean where her best day's run was 238 miles (good for 44 foot monohull in 1983).

This "macho" Sailing is not for all, but I have yet to meet a cruising sailor who does not appreciate an efficient and easily handled rig.

The advantages of Freewing rig are: -

Aerodynamic Efficiency: The large leading edge diameter and the absence of mass induced turbulence, encourage laminar airflow over the mainsail. Also the sails maintain their trim even when the sheet is eased.

Very low weight and low centre of gravity.

Clear decks: A few control lines and the main sheet lead back to the cockpit while the rest of the deck is clear. No chain plates jib tracks. No rigging to hamper one's mobility on deck.

Very low rig induced loads in the hull.

Very low sheet loads and single line trimming of the whole rig.

Enhanced safety. Easing the main sheet allows the entire rig to rotate. Excess power can be dumped very quickly. A single sheet release system is then very effective.

As there is no limit to the boom's travel, this depowering can also be done when reaching or running. The boom can only swing in the horizontal plane. No vang's are needed and there is no danger of dropping the boom on someone while taking reefs.

Reefing can be done without changing course. A very comforting thought while running before a gathering storm. Spinnaker gybes are now a simple job.

A man overboard situation will always be a potential disaster. The problems are compounded if the only person left on board is neither physically strong nor an accomplished sailor. In that situation, the advantages of the Freewing rig could well be a life saver. The remaining crew member can tack or gybe easily and safely. Once the vessel is to windward of the man in the water, letting the main sheet fly instantly depowers the rig. The yacht will lie side on to the weather and drift downwind towards him. Small adjustments in the course can be made by pulling the boom either forward or aft. A lifting line (permanently rove to the end of the boom, and also used to lift the dingy and other heavy equipment aboard) with the carabine hook and/or life sling is then ideally placed to winch him clear of the water and swing aboard.

Sale chafe is greatly reduced. No more padding of spreader ends or trying to keep the spinnaker away from the forestay.

Low maintenance: No longer can a missing splitpin bring the rig down.

Improved helm response: The centre of effort of the rig is near the yacht centre line, even when running.

The Spinnaker pulls the yacht from ahead of the centre of resistance. (With the standard rig the pull is from near the transom, well behind the centre of resistance - an inherently unstable situation. Broaching is no longer a worry with a Freewing rig.

Reduced Windage in Heavy Winds. When a standard rig is reefed, the mast section above the sail has a very bad effect on the yacht's performance. With the Freewing rig, the upper section of the mast is small and lightweight. The drag from its streamlined shape is about 1/30 that from a round section mast, with the same frontal area. (See Larsson and Eliasson "Principles of Yacht Design" page 146).

Not having rigging is also a great help. The parasitic drag from the rigging accounts for 10%-12% of the total drag on modern yacht with the standard rig. (See Marchaj "Aero-Hydrodynamics of Sailing" page 249).

The Ultimate Storm Rig. The mast can be set to maintain a chosen angle to the wind. Unlike a storm sail it cannot flog. Rather than lying ahull with the storm jib backed, the wing mast is set to keep the yacht moving slowly forward. Off a lee shore this could be life saver.

With the mast the windage is very low. The drag from a Freewing mast when it is feathered, is roughly equal to the drag from the forestay on a conventional rig. This reduces the power needed to motor into the wind, and improves the range under power.

Docile at anchor: The Achilles heel of wing masts with restricted rotation has always been their desire to seal about when you least want to them to do so. In close quarters manoeuvring or in a crowded and anchorage this to be very embarrassing, not to say expensive.

The Freewing rig is put to sleep by locking the mast at 90° to the hull. Wind loads on the mast act along the fore and aft line (and can be easily handled by the motor or mooring lines). This aids low speed manoeuvring under power and when at anchor the yacht swings and snubs less than yachts with standard rigs. If required the mast and boom can be set to feather itself by adding a vane to the end of the boom. This reduces windage to a very low level.

The bill is designed to help in collecting rainwater.

Easy Rigging and De-Rigging: With no rigging wires to couple and tune, the mast can be stepped in minutes. There is even an option which allows the mast to be raised or lowered from on board. A great feature allowing access under bridges on the ultimate chicken tactic when faced with extreme weather.

I recently went out and counted twelve fixed stays on one of the most popular masthead rig cats around. When close hauled the drag from all this string must be equal to a high proportion of the drive from the sail. Drag slows the boat and pulls the boat down to leeward. Remove drag, the speed goes up and the angle to the wind is improved, without increasing the heeling moment. Try to hold a halyard straight in a strong wind and you get a good idea of the drag involved.

We sailed "Skyline" on Loch Ness. The first day provided cold, strong to gale force winds directly along the loch, in which I was more than happy to leave the sails furled. We motored up wind and then reached and close reached, across the loch a number of times before turning back to run back to the dock. From the deck, the mast head, naked of rigging, looked a long way up but there was no feeling whatsoever of the mast whipping or of it being less than adequate for the job. There was not enough drive to power through the waves to windward but she was certainly very comfortable close reaching. When we turned down wind we simply set the wing across the boat. We were then able to sail from reach to reach on each track without moving the wing.

The boat speed was between 4.5 and 5 knots. The feeling was of strength and security. The wing rotated very freely on its bearings.

The second day saw just slightly less wind. Just right for a good test under full sail and win.

The feeling of security when sailing downwind was most reassuring. The main sheet was fed out till the boom was well forward of abeam and there was no tendency to broach and no need to watch out for an unintentional gybe even when deliberately sailing 30° by the lee.

With the jib self-tacking there is no sheeting control required when tacking to windward. Because the jib on the spinnaker sheet to the boom, they move with the main. Once the sails are set all the trimming is done with the main sheet.

We will be fitting the rig to a number of catamarans - from 26 feet upwards.

Freewing particularly appeals to me in that I like the concept that the mast is not just a pole onto which we can hang sails but is the driving we in itself.

That it can be unsupported and still be of reasonable weight is due to the materials and the design.

Driving to windward there is the absolute minimum of drag which has to be good news. Off the wind, the fears of broaching are removed. At any time that you want to take power off it can be done without hesitation. The wing is large enough to move the boat whenever there is a breeze. Freewing can be self feathering if required. On "Skyline", when left at the Marina, the wind is set across the boat. This has found to be entirely satisfactory.