



LEADING EDGE

BY MATTHEW SHEAHAN

Standing rigging is a drag. How to reduce this is the latest issue to exercise the minds of top racing designers. Aerofoil-shaped fairings to fit over the standing rigging is one new development

For all the attention paid to reducing windage aboard the world's top grand-prix racing boats, one big issue still remains, the drag of the standing rigging. An Open 60 looking to hack half a day off an Atlantic crossing or a TP52 shaving nine seconds off the first beat of a typical windward leeward course, could be the order of saving through drag reduction.

Running halyards below decks; fitting snug neoprene socks around gooseneck fittings; fastening the standing rigging on the inside of the mast wall are all ways of reducing aerodynamic drag. But these are small details compared with hauling metres and metres of circular-sectioned rigging through the air.

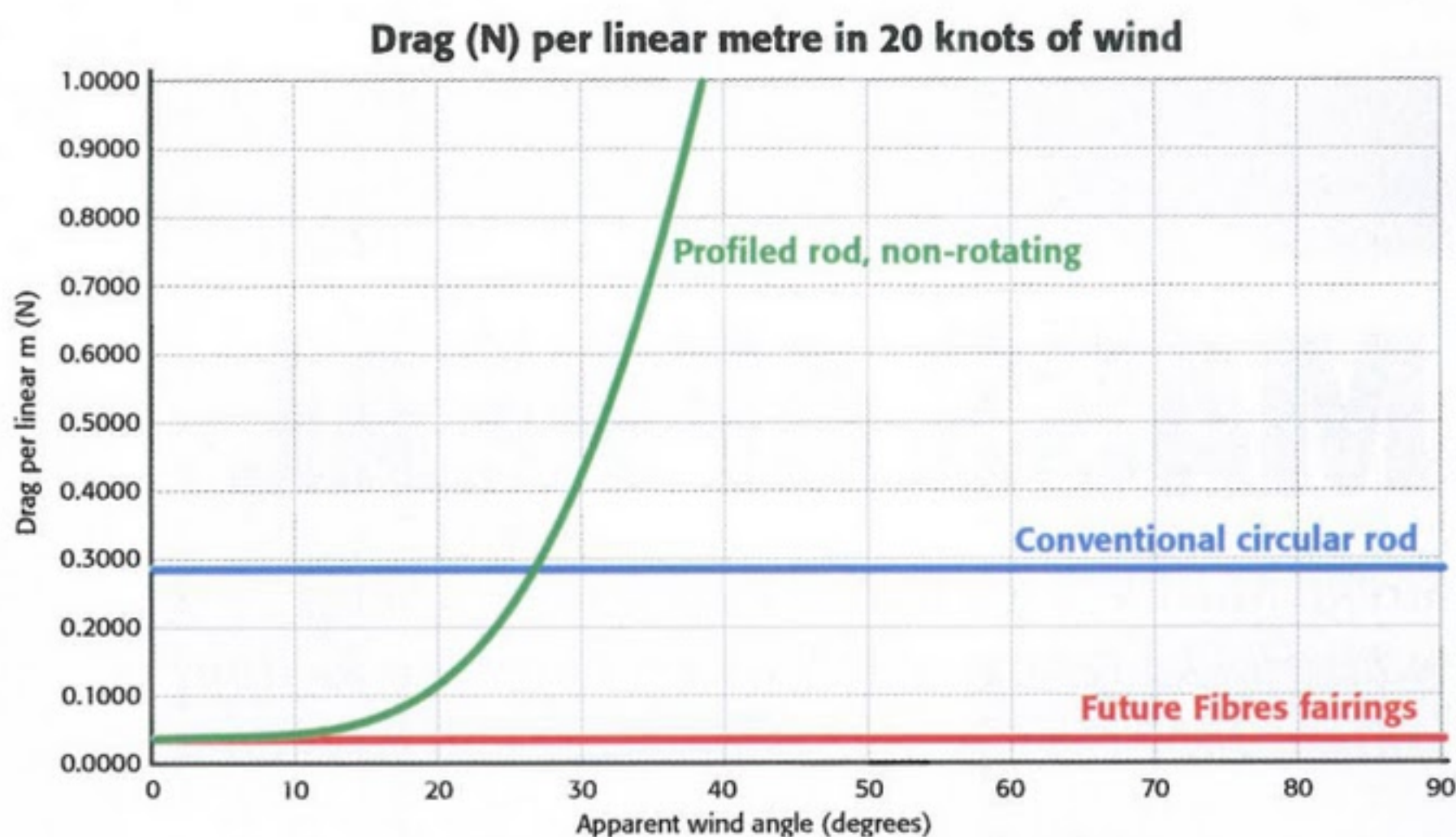
The aviation industry has known this for some time. For more than half a century aircraft manufacturers have been fitting streamlined-section wing struts, spats to undercarriage wheels and fairing devices anywhere that the breeze can slow them down.

Until fairly recently the apparent wind speeds in which typical racing boats operate have been significantly lower than those of light aircraft. But not any more.

The world's most popular light aircraft, the Cessna 172, has a stall speed of around 45 knots and can be comfortably flown at around 60 knots. The world's top grand-prix boats smoke downhill with ease at 20 knots plus in a similar breeze and drag the apparent wind angle so far forward that they can easily be experiencing 40 knots across the deck. Clearly some are considerably faster.

Given that the wind speeds are similar and the relationship between drag and wind speed is exponential, there is now plenty of incentive to take this issue seriously.

Until now the only way of reducing drag from the rigging was to profile the rigging itself rather than to use circular rods. In the 1980s some boats experimented with lenticular section rod. Today some manufacturers are doing a similar thing with carbon rod. But the trouble is that the drag is only reduced on profiled rigging when the angle of attack of the breeze on the stay is less than 25°. Above this and the drag increases rapidly to beyond that of a circular section. Add to this the problem of wind shear aloft, which alters the angle of attack of the breeze on the stay over the height



of the mast and the potential benefits start to diminish (see graph, above).

The problem has led composite rigging experts Future Fibres to develop a novel solution. By fitting super lightweight aerofoil fairings over the rigging, the company claim a 75 per cent reduction in aerodynamic drag.

The NACA (National Advisory Committee for Aeronautics) aerofoil-sectioned fairings, which have been developed by former F1 engineer Dan Primrose, come in 2m lengths, fit over the existing standing rigging and are free to rotate. It is this last aspect, in particular, that is at the heart of the drag reduction as the foils are always aligned to the breeze. And they are amazingly light – a development set fitted to a 100ft superyacht added just 1kg in total.

“When the aerofoil sections are in use and you’re looking up the rig, you can see the different angles that the fairings adopt as they fly to the various apparent wind angles,” says Primrose. “In fact, on the leeward side, small adjustments in genoa trim can result in big changes in the angles on the fairings, which helps to illustrate just how complex the air flow is and how much it varies.”

So far the company have fitted fairings only to vertical stays during their trials, which means the overall drag reduction is less than the full 75 per cent when comparing an exposed rod with a faired one, but trials are ongoing.



NACA sectioned fairings are each 2m long and free to rotate to the breeze. Note the different angles of attack up the rig



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