Props, Struts, and Shafts

PART II: Reducing Drag for Light-Air Performance

In the last issue, we looked at the charteristics of a good shaft and strut installation, and considered some of the problems associated with fixed-blade props. We concluded Part I by examining the advantages of folding and feathering props. Now let's look at the other side of the coin.

Disadvantages Of Low-Drag Props

One of the biggest problems with folding propellers is their poor efficiency in reverse gear. Granted, the amount of time any boat spends backing down is relatively small compared to the time spent going forward, but when reverse is needed, it is often needed in a big way.

The manufacturers of folding props have spent a great deal of time working on the reversing problem, and the current generation of folding props is significantly improved over early folding props in this respect. In our experience, however, folding props still have significantly less thrust in reverse than they do in forward gear.

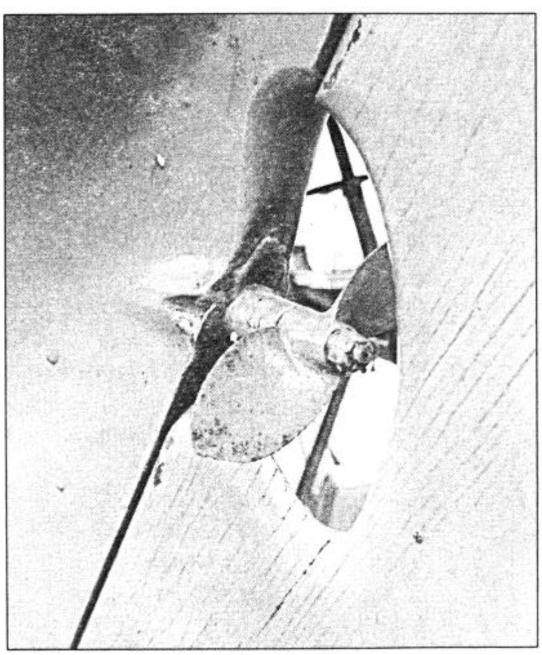
When a feathering prop is reversed, however, exactly the same blade face is presented to the water in exactly the same configuration, as the blades reverse themselves 180 degrees. This means that a feathering prop, all other things being equal, should generate the same motive or stopping force in reverse as in forward. In practice, a feathering prop may even work better in reverse than in forward gear, since there is no shaft or strut in the way of water flow to the prop.

Our last boat had a feathering prop installed when an engine was added in 1937, and 45 years later, it was still feathering and unfeathering with precision. Certainly, play had developed in the blades over the years, but it still worked with minimal vibration. The prop had, in fact, outlived three different engines. That prop is a Hyde feathering prop, now made by Paul Luke. Aside from cost, the only disadvantage to the Hyde prop is that the relatively large hub creates far more drag than the Max-Prop, a modern feathering prop built in Italy. But for pure reliability and a simplicity in a feathering prop, the Hyde is hard to beat.

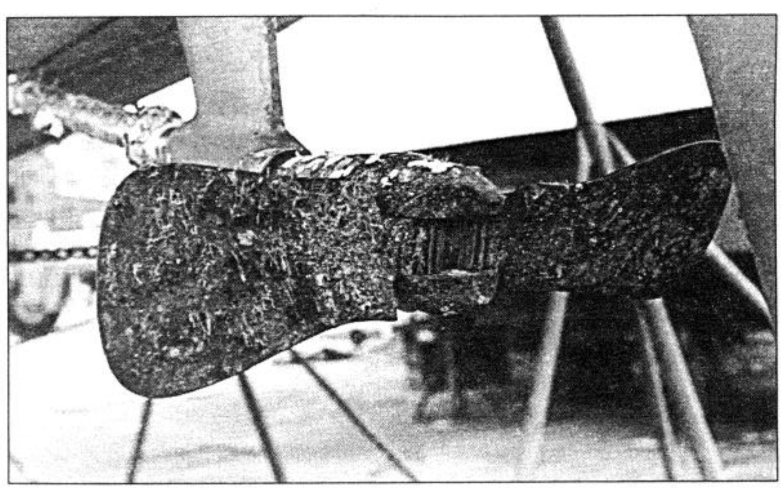
The Max-Prop is another story. It has a streamlined hub and elliptical blades, typical of the blade shape found in minimal-drag racing props such as the Martec Elliptic. It is installed on the shaft by being disassembled, unlike the Luke-Hyde prop, which is simply slipped on and secured with an external nut like a fixed prop.

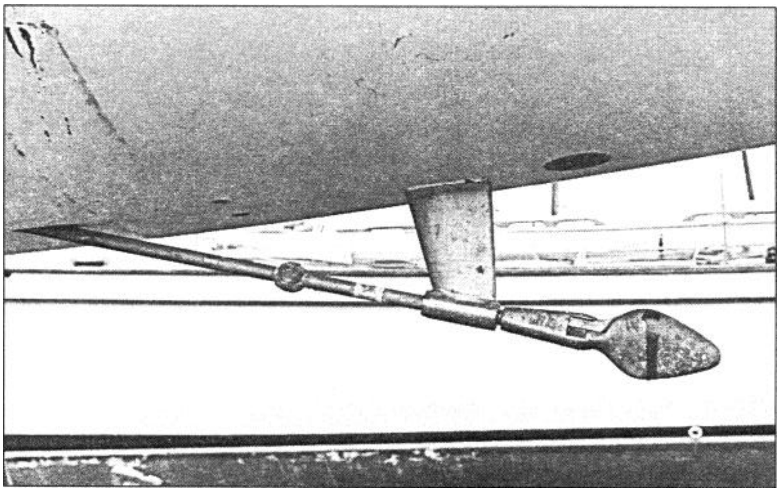
The pitch of the prop is adjusted internally by the positioning of the pinion. This means that assembling the prop is a little tricky, and the thought of disassembling one underwater in order to remove the prop in event of damage is enough to give you the fantods. Imagine watching pieces of your expensive prop glitter off into the deep if you make a mistake.

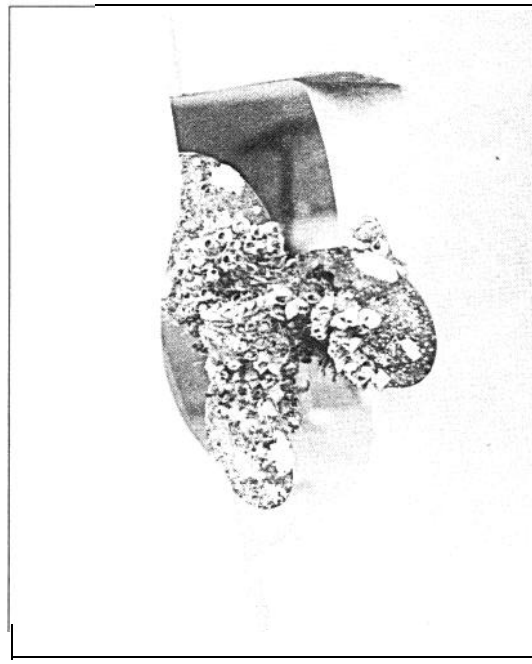
However, this disadvantage is more than offset by the possibility of



Left: *Even a boat with a propeller aperture can benefit* from the *installation* of *a low-dray* prop. Below: *This Nautor* folding *prop,* on *a Swan 38, is one* of *the* few *folding props with blades that are geared to reduce wear on the pivot pins.*







***Above:** An optimum exposed prop installation, with a low-drag propeller combined with a streamlined strut and a shaft of minimum length. **Right:** The ultimate in inefficiency (even without the barnacles); a fixed three-blade prop in a poorly faired aperture.*

adjusting the pitch minutely to suit the engine. This adjustability is particularly important if the boat is repowered, or the transmission changed.

Granted, the pitch of the Luke-Hyde prop can be changed by regrinding the external prop stops, but this is a factory job, not something for your local machine shop. The only good way to adjust the pitch of a folding prop is to change the blades, which constitutes half the cost of a new prop.

Apertures

If you have been gloating because the prop on your boat is in an aperture, rather than mounted behind a strut, you can stop right now. The aperture itself creates a significant amount of drag, and only if the blades of the prop are perfectly aligned with the aperture when under sail, will drag be reduced. This usually means crawling down a hatch somewhere to line up a mark on the shaft coupling, something that you are rarely going to do.

While folding props are not usually suitable for use in an aperture (since the blades fold aft, they would be likely to strike the back of the aperture), feathering props can be used to advantage in an aperture installation. As a rule, most apertures are large enough to accommodate a feathering prop of the same diameter as the fixed prop. The Max-Prop, with its streamlined, tapered hub projecting aft of the feathered blades, could be a problem in some installations.

The Luke-Hyde prop, with its shorter hub, can usually be installed in an aperture without problems, and the relatively greater diameter of the hub is less of a problem when it is hidden behind the deadwood of a boat with a propeller aperture.

At the extreme, swapping a three-blade fixed prop for a three-blade feathering prop pays enormous dividends. On a friend's 42-foot motorsailer, the 30-inch-diameter, three-blade fixed prop was replaced with a three-blade Luke-Hyde of the same diameter. While the new prop is not quite as smooth as the old fixed prop, the improvement in light-air performance made the $2700 list price of the prop less painful.

One disadvantage of the Luke-Hyde prop is that the shaft taper is different from the taper used for a conventional prop. If the Luke-Hyde prop is installed, you may need a new shaft. The Max-Prop uses the conventional SAE taper used for fixed props.

Conclusions

Whether you have an exposed propeller installation, or a prop mounted in aperture, you can probably improve your boat's light-air performance under sail. Low-drag folding props made their reputation with racing sailors, but they are in many cases just as suited to cruisers.

This is particularly true for the long-distance cruiser. Much of the sailing on the high seas is done in winds of less than 10 knots, despite the impressions given by the cruising sailor's preoccupation with heavy weather.

Suppose, for the sake of analysis, that a folding or feathering prop is worth half a knot of boat speed in winds under 10 knots. On a trip of 600 miles, you might encounter light winds 50 percent of the time. If your boat averages six knots, the trip will take you 100 hours. If a low-drag prop adds a half knot for half the distance, you have just cut four hours off your trip. On a 3,000-mile trip across the Atlantic in the same conditions, the trip would become almost two full days shorter.

In practice, the result is likely to be even greater, since boat speed may drop precipitously in very light winds, so that a small increase in speed is a greater proportion of boat speed in light air.

Just how important can two days, or even four hours be to a cruiser? In the worst case, it can be the difference between making port in good weather, or being trapped in a gale offshore. Even in the best situation, it puts you that much closer to a hot shower and a cold drink, which can be almost as important as getting in early enough to miss a gale. ■