



Both CJR and Veem have been at the forefront of propeller design and manufacture for many years.

### Two become one

The launch of the Interceptor Propeller System has seen a remarkable commercial tie-up between two former competitors — CJR and VEEM. Both of these companies have been at the forefront of developments in propeller design and manufacture for many years.

Initial contact between CJR and VEEM was prompted by CJR's interest in licensing the Interceptor Propeller System for its own use — but it soon transpired that the two companies had much to offer each other.

VEEM had Interceptor and an advantage in prop manufacturing processes, while CJR was ideally placed to give the Australian company access to the European market without the need to set up a subsidiary or distributor from scratch.

CJR could also produce the necessary shafts and sterngear components locally, eliminating shipping costs. A fortuitous bonus was that as part of an ongoing programme to move into the superyacht sector, CJR had just invested in a CNC lathe that allows them to machine shafts up to 180mm in diameter.

"It soon became clear that CJR were way ahead of anyone else in being able to help us to expand into Europe and the Middle East," says VEEM CEO Brad Miocevic. "They share our strong philosophy of exceptionally high standards across the board and an obsession with continual improvement. This partnership looks set to benefit both companies enormously, offering world class propulsion solutions throughout the developed world."

In Europe CJR can now offer boatbuilders complete packages with either VEEM-manufactured Interceptor propellers or home-grown non-Interceptor props from their existing range. Eventually, CJR will move over completely to VEEM's propeller design and manufacturing process while

continuing to develop the shaft and sterngear side of the business to the benefit of both companies.

It's a business axiom that as well as making all the right decisions and working really hard, success is dependent on being in the right place at the right time. For VEEM and CJR it looks as if synergy will produce a whole with the potential to greatly exceed the sum of the parts.

A major factor in increasing cost effectiveness has been the introduction of proprietary software to drive five-axis contouring CNC machines and other robotic systems in 'cyber cells' requiring minimal manual intervention. This combination results in much greater levels of accuracy than were previously achievable.

However, their latest development — the Interceptor Propeller System — has been seen by many in the propulsion world as almost too good, and too simple, to be true.



CJR managing director Mark Russell and VEEM CEO Brad Miocevic seal the deal.

# Speed strips

CJR Propellers of the UK has teamed up with former direct competitor VEEM of Australia to bring a remarkable new propulsion system to the European market — the Interceptor Propeller System. **TONY JONES** reports.

**T**he most extraordinary aspect of the new Interceptor Propeller System is that it appears to go against everything that major propeller manufacturers have been doing for the past several years.

The essential mission for any propeller manufacturer is to provide the boatbuilder with propellers for a new boat that will hit the 'sweet-spot' first time, every time. This 'sweet-spot' is when a vessel's hull, machinery

and propellers all come together to achieve the predicted and/or desired performance at the specified all-up weight the first time the throttles are fully opened on the initial sea trials.

It is, however, a remarkably rare event — even with today's sophisticated computerised design and manufacturing tools.

The key to this perfection is to have propellers that absorb just enough power to allow the engines to reach their maximum rated rpm at full throttle — no more and no less. And it requires having the correct diameter coupled to perfect pitch. This is, though, very difficult to achieve because the variables are so numerous.

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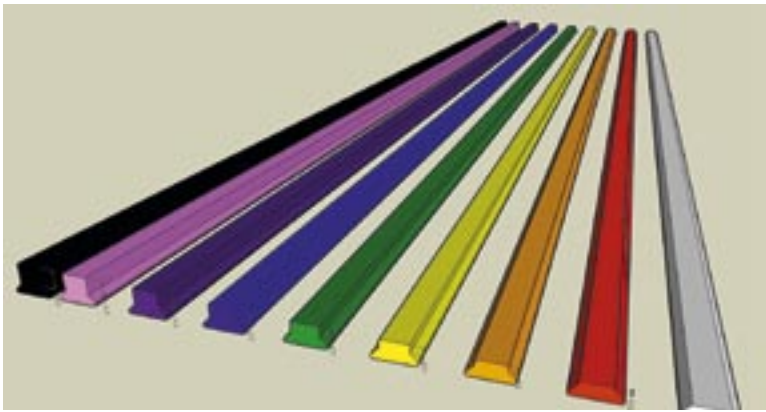
The traditional approach is to define those variables ever more closely through an ever finer grasp of hull hydrodynamics, control of weight and balance — but above all by greater understanding of the incredibly complicated fluid flow in, through and around the propeller: hence, the relatively new science

of CFD (computational fluid dynamics).

The big manufacturing challenges are to ensure the software accurately replicates real life and that the computer's 'virtual' propeller is reproduced exactly in the metal.

Even so, it's usual for the propeller pitch to be revised following the first sea trials. This means the props being returned to the manufacturer who — with time-honoured techniques that have more in common with blacksmithing than high technology — adjust or 'tweak' the trailing section of each blade to increase or decrease the pitch by the required — but actually approximated — amount.

This can happen more than once. And, of course, all that expensive CNC precision



Left: Colour-coded strips indicate the varying thicknesses. Above: The strips are inserted into machined grooves in each blade.

## Most boatbuilders' initial reaction to Interceptor is to doubt that such a 'crude' modification can work effectively.

and consistency can be rendered useless with time-consuming hand finishing and rebalancing being required each time.

The Interceptor concept seems to be based on acceptance that a propeller is so rarely going to be right first time that the sensible thing to do is actually build in 'tweakability' from the word go. The simplest, crudest and least expensive way of increasing the angle of incidence of any lifting surface is — as all

aerodynamicists know — by sticking bits under the trailing edge in the same way as trim tabs and wedges are used to increase lift at the rear of a planing hull.

And this is what VEEM has developed. The bits are in fact strips of plastic of varying thicknesses, and the 'sticking' is achieved by a dovetail groove machined into each blade's pressure (rear) surface less than an inch from the trailing edge.

The strips are essentially rectangular in cross section above the blade's surface and are colour-coded for easy identification. A specially designed entry point is provided at one end of the groove to make insertion easy.

Most boatbuilders' initial reaction to Interceptor is to doubt that such an apparently 'crude' modification can work effectively.

"That was exactly how I felt when I first learned of Interceptor," says CJR's Chris Feibusch. "But I've seen VEEM's data and been out on Interceptor-equipped boats and I'm totally convinced. A company like VEEM isn't going to launch a product without being totally confident that it works. But I still expect to experience serious scepticism from my customers for the first few months." ★

### CJR and VEEM histories

CJR first became involved in propeller manufacture in 1978 and then shafts and sterngears in 1991. In 1995 it purchased Power Propeller and shortly afterwards moved to its present site in Southampton. It surprised many of the industry's more established companies by refusing to accept long tried and tested conventions in propeller design and manufacture.

"We were sure that through a combination of computerised design — including CFD (computational fluid dynamics) — and more advanced manufacturing techniques, we could significantly improve propulsive efficiency for fast planing boats, particularly in the performance-conscious recreational sector," says CJR's sales director Chris Feibusch.

In addition to technological advances, Feibusch has sought closer cooperation with naval architects and early involvement in new projects to ensure that everything aft of the gearbox was performance optimised. Previously, propeller selection was based on a limited number of simple parameters such as vessel size and weight, basic hull form, installed power and desired maximum speed.

CJR's approach also involves intimate involvement at the project design stage — with information passing in both directions.

"One of our ambitions was to provide propellers that would do their job as required first time, every time. In the past that's been regarded as almost impossible, with sea trials usually resulting in at least some pitch adjustment, and sometimes requiring a quite drastic rethink. We wanted to eliminate that waste of time and money."

Another vital part of CJR's success has been its ability to meet the desire of boatbuilders to minimise the number of individual suppliers and favour those who supply complete sub systems guaranteed to work 'out of the box'. CJR's ability to manufacture shafts, support brackets and rudders enabled them to meet this demand for complete, integrated 'below the waterline' propulsion packages.

VEEM has followed an almost identical business strategy, investing heavily in CFD to maximise the scientific aspects — and minimise the artistic or intuitive aspects — of propeller design and developing ways of making manufacture more precise and more cost effective. It began manufacturing propellers in 1956 and has since expanded to become a major marine transmission systems supplier to the recreational, high-speed naval and commercial markets in the southern hemisphere and the US.

### The Gurney flap

The simplest, crudest and least expensive way to increase the angle of incidence of any lifting surface — as all aerodynamicists know — is by attaching a simple strip to the under surface right at the trailing edge. As long as the height of the strip isn't more than two per cent of the chord, increased lift is achieved without excess drag.

The device is known as a Gurney flap in honour of the American racing car driver and designer Dan Gurney who first used it to increase the downforce on the rear wing of one of his cars in 1971. He used a simple strip of angle aluminium alloy, riveted to the top surface of the rear wing. It was extraordinarily effective but so inconspicuous that for the rest of the season his rivals were mystified as to where Gurney had acquired his extra cornering ability and yet maintained his top speed on the straights. If asked, Gurney would say the strip was there to strengthen the trailing edge of the wing and protect mechanics' hands when pushing. Only when a rival added one to the underside of his wing and suffered vicious oversteer due to loss of rear wheel grip did the truth come out.