

# More power at the prop

When the skipper of a Nicholson 35 told Don Seddon about his boat's poor performance under power, they set about a detailed look at the whole installation – including the hydraulic drive...

**O**VER the years several Nic 35 owners have contacted the Association Newsletter reporting difficulties with their hydraulic drives. Indeed, there have been several instances of engines having to be rebuilt due to being run overloaded at low speeds. Although this hadn't happened to Francis Ball, he had never been satisfied with the performance under power of his own boat, *Albatross of Iona*.

The basic problem was that his Perkins 4108 engine was reaching maximum torque at less than 2100rpm, which meant it couldn't possibly achieve optimum hull speed with the original 16in x 8.5in propeller. The reason for the shortfall in engine speed was the displacement ratio between the pump and motor – 1.6 to 1.

## Making the change

Francis had decided to replace the propeller with a 16in variable pitch J Prop feathering propeller

which could be set to give five different pitch settings. Set at 7.7in pitch, the performance was improved with the engine now reaching maximum torque at 2500rpm.

A pressure gauge was then fitted to the output line from the pump and tests carried out to determine the working pressure at different engine speeds. As a result, it was decided to update the 28 year-old system, change the motor/pump displacement ratio to 1.95 to 1 and use a pump which would

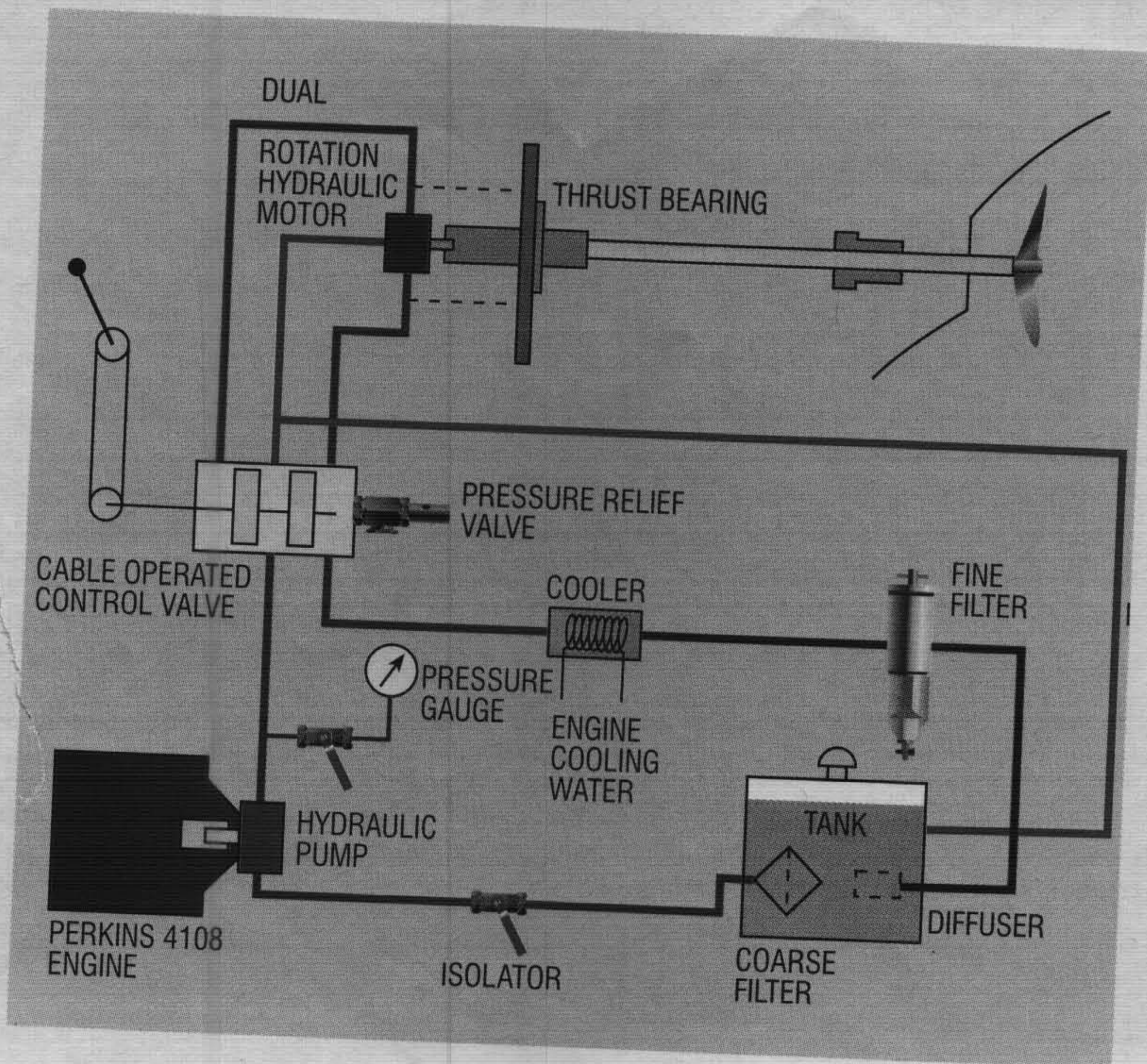


Because the Cassapa gear pump had no thrust bearing, we used an Aquadrive CV unit.



The Ultra gear pump yields 2100psi, but we had to modify the original mounting flange.

## ALBATROSS OF IONA - THE REVISED HYDRAULIC CIRCUIT



## How we got the best from the hydraulics

- 1 The engine should be capable of driving the boat at maximum hull speed with power in hand.
- 2 The pump input torque must be matched to the engine output torque. The pump torque is proportional to the output pressure and displacement.
- 3 The hydraulic motor displacement must be sized to provide an engine to prop speed in the order of 2 to 1 with a 16in propeller, and match the pump output pressure.
- 4 Modern pumps are capable of higher speeds and pressures. It was decided to keep to a maximum pressure of 2100psi; the original maximum pressure was 2000psi.
- 5 We used an industrial quality pump and motor. These will last a long time providing the oil filter elements are changed occasionally.
- 6 When the system was updated, the mild steel tank was replaced by a stainless steel unit and a return line diffuser fitted. Longer flexible hoses were needed to connect the new motor to the control valve.
- 7 The Husco control valve was in good condition so the unit was simply cleaned and all the seals replaced and repainted.
- 8 It's essential to have a pressure gauge fitted so you can monitor the pump system pressure.

absorb full engine torque at 3000rpm.

The pump was replaced with an Ultra gear pump of 31cm<sup>3</sup>/rev displacement and the motor with a Cassapa gear motor of 61cm<sup>3</sup>/rev displacement. The pump mounting flange matched the original but the coupling had to be modified to accommodate the different shaft length and key size. The new motor didn't incorporate a thrust bearing so it was decided to use a combined CV drive shaft and thrust bearing from Halyard. This

was fitted to the original thrust plate with an extra housing to mount the motor.

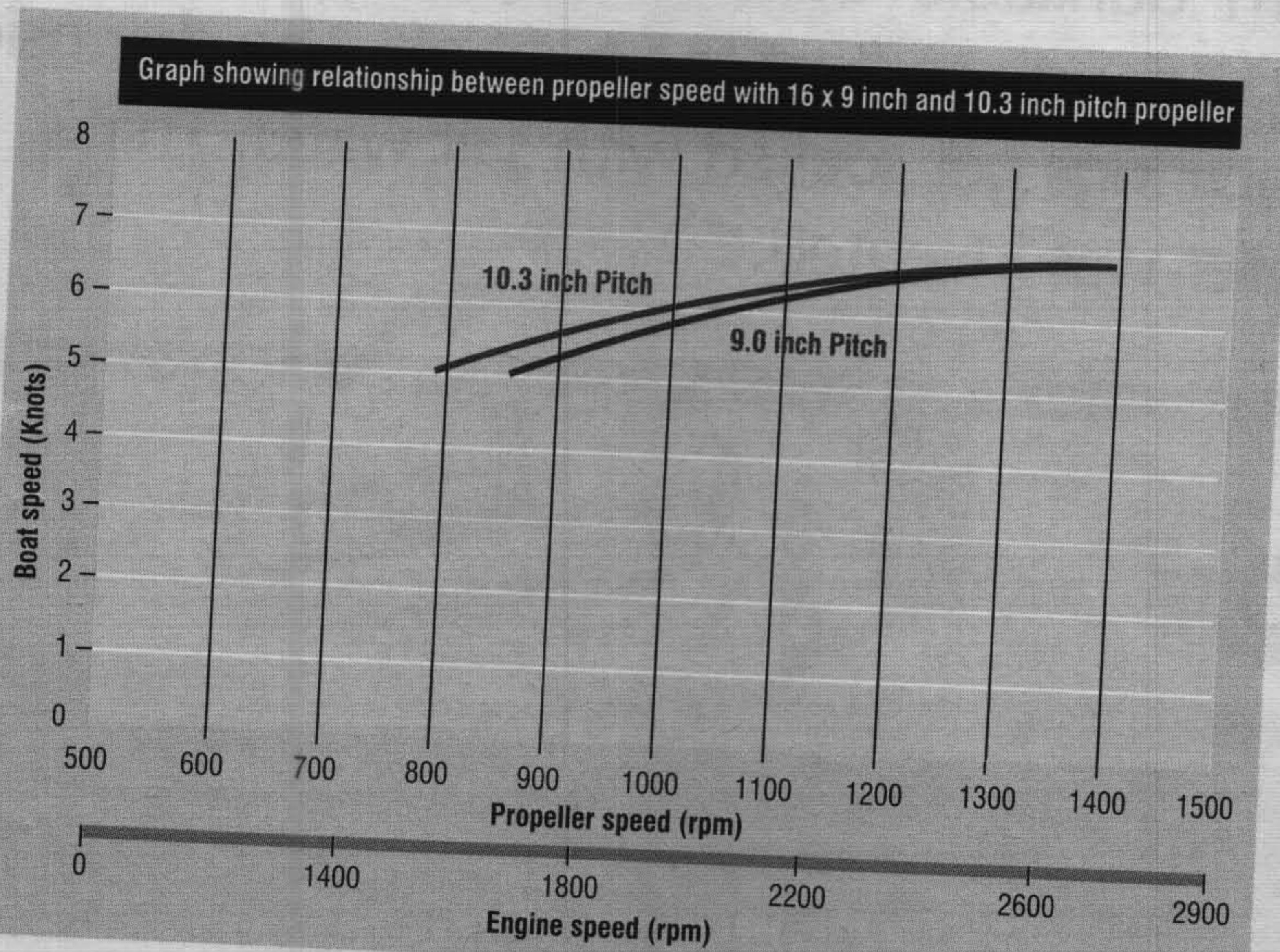
The 16in three-blade J Prop was set at 10.3in pitch. The boat design speed of 6.7 knots was achieved at an engine speed of 2400rpm without overload and the drive felt much more powerful than the previous set up.

### Final tweaks

Although these results were satisfactory, Francis decided to reduce the pitch to the next setting

which is 9in. After that, he could achieve maximum boat speed with an engine speed of 2600rpm, with a further 200rpm before maximum engine torque was reached. This, he decided, was the best combination as it gives a comfortable cruising speed of 6.5 knots at 2400rpm with the possibility of going up to 2800rpm if necessary.

Since the updating was carried out, *Albatross* has cruised to Normandy and South Brittany with no problems. **PBO**



Don Seddon has been in the fluid power industry all his working life and was the Chief Engineer of Denison Deri when they were supplying hydraulic drives in the late 60's and early 70's. He offers a hydraulic system design service for marine applications. Don currently sails a Hood 38, *Concordant*.



#### FURTHER READING

- *Boat Engines* by Dick Hewitt, 1994, Fernhurst Books. ISBN: 1-898660-04-2 £11.95
- *Diesel Troubleshooter* by Don Seddon, 1996, Fernhurst Books. ISBN: 1-898660-21-2 £9.95
- *Marine Inboard Engines* by Loris Goring, Adlard Coles Nautical. ISBN: 0-229-11842-9 £15.99
- *Propeller Handbook* by Dave Gerr, Adlard Coles Nautical ISBN: 0-7136-5751-0 £22

#### USEFUL CONTACTS

- Halyard (Marine and Industrial) Ltd: Tel: (01722) 710922 Email: [techhelp@halyard.co.uk](mailto:techhelp@halyard.co.uk) Website: [www.halyard.co.uk](http://www.halyard.co.uk)
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