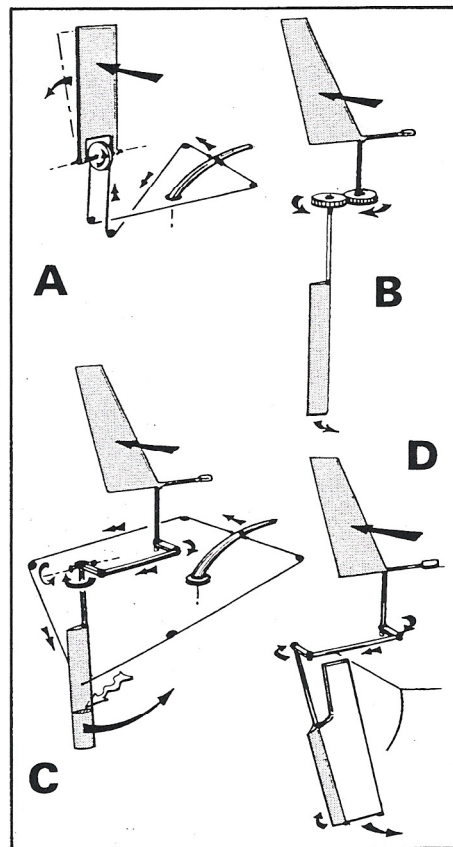
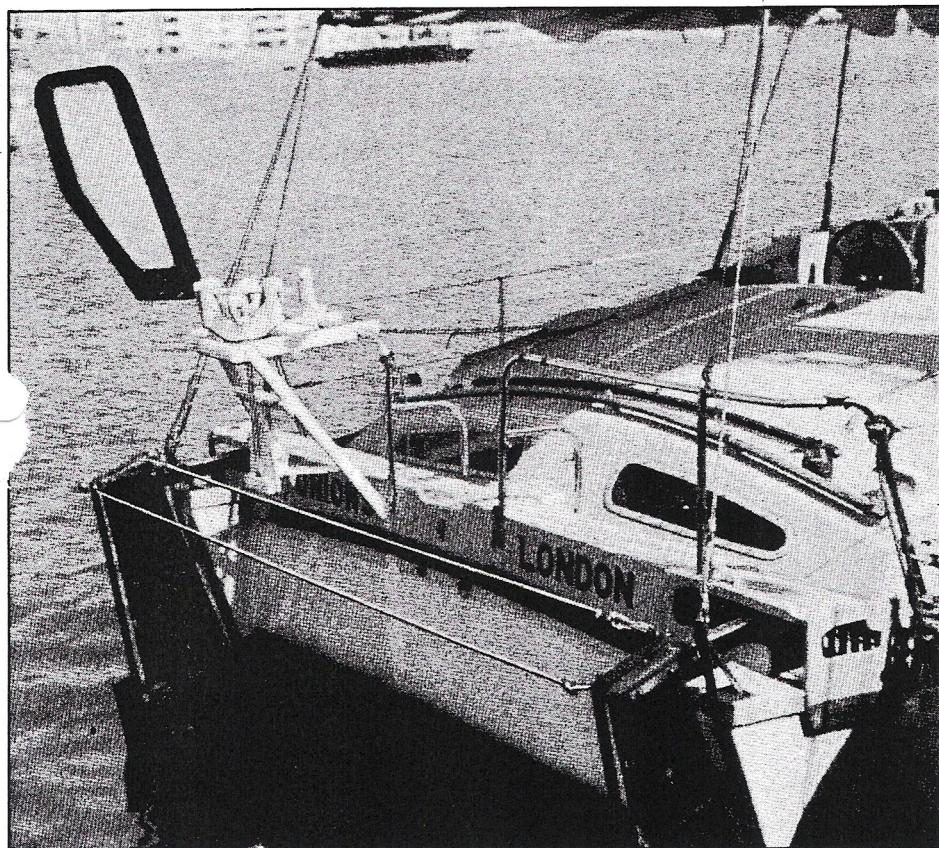


SELF SUFFICIENT SELF STEERING

Peter Dresser makes a simple wind-vane for his Heavenly Twins cat from odd bits and pieces



WHATEVER ROMANTICS say, steering, shared between two people, 24 hours a day, for two weeks, gets boring even if like us, you love sailing. I decided that any more long trips meant self-steering if at all possible.

I had plenty of time, but very little money, no power tools and no metal-working facilities, so it would have to be made mainly of wood, of which I had plenty of scraps. Although I fitted out the boat, I am not a carpenter; more a handyman.

I started with the AYRS book, *Self-Steering*. A superb book! It deals, in detail, with everything to do with self-steering, and is a must for anyone in my position. I studied it thoroughly, both to learn the principles of self-steering gears, and gradually to work out by elimination, which gear was best for me.

I decided against electrics primarily because of expense, and power consumption problems on a sailing boat. So wind-vane it was.

The two main things to decide were, what type of vane (vertical or horizontal axis), and how to use

its power to steer the boat.

Everything I read suggested that the horizontal axis vane was much more powerful in lighter winds, and as my boat sailed fairly quickly in relation to the wind speed, it seemed the obvious choice. In fact, I could see no disadvantage to that type. It looked easier to make both it and the corresponding framework out of wood. It also looked easier to make an 'infinitely variable' course adjuster, controllable by line from my central cockpit.

But how to harness the power. *How to use its power*. There were four possibilities:

(a) *Vane direct to wheel or tiller bar*; i.e. vane would move main rudders.

(b) *Vane to auxiliary rudder*; i.e. vane would move separate rudder while main rudders were tied amidships.

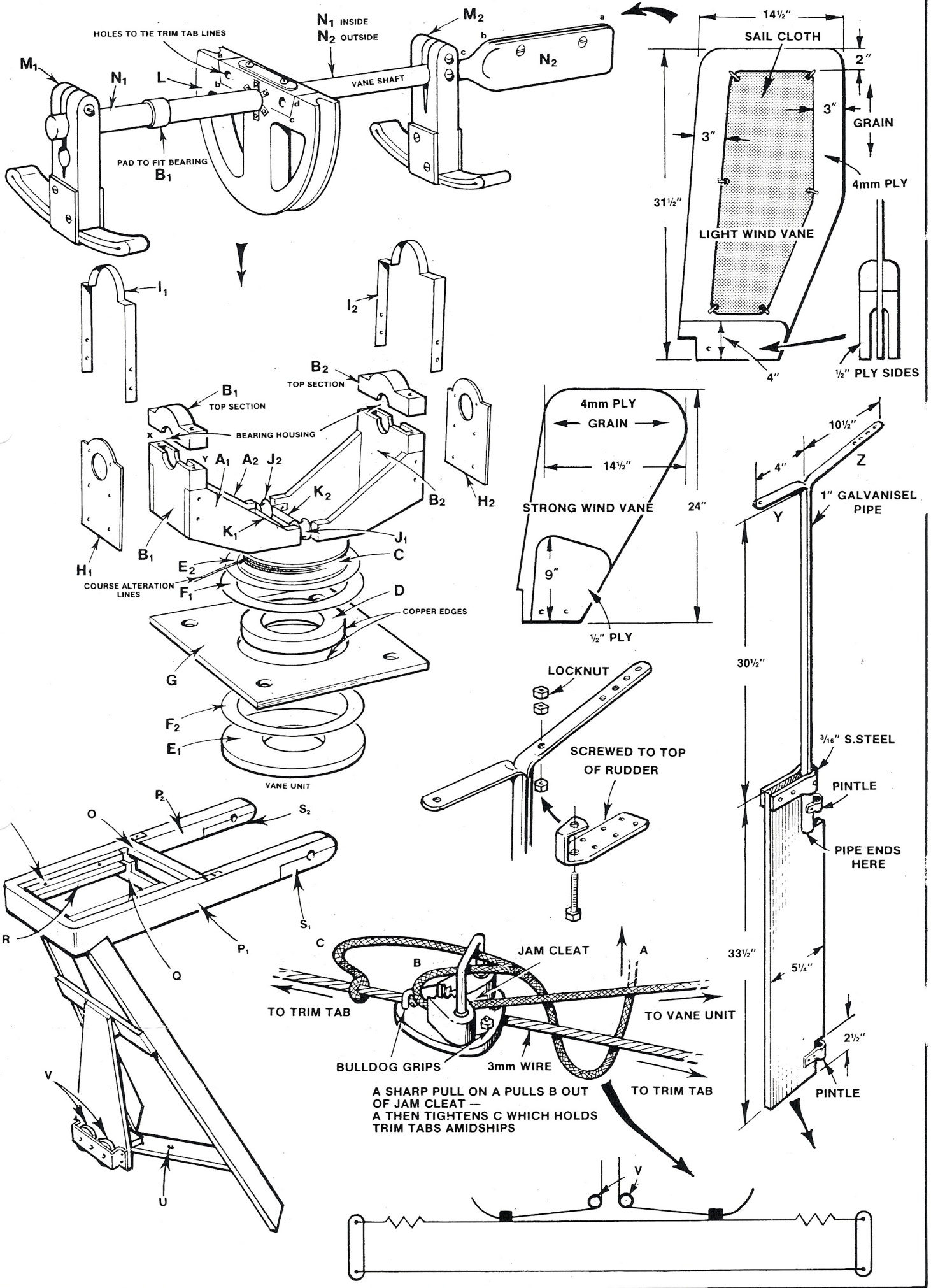
(c) *Vane to thin 'pendulum' blade*; i.e. vane would turn blade on vertical axis — water flow would then force it to move on a horizontal axis (swing like a pendulum) which movement would turn main rudders.

(d) *Vane to small trim tabs hung on the trailing edge of main rudders*; i.e. vane would move trim tabs — water flow would then force main rudders to move opposite way.

Type (a), I decided, would not be powerful enough because of friction in my steering lines (wire and sheaves).

Type (b) is popular with Do-it-Yourselfers. However, the auxiliary rudder must be very strong. It is always in the water and when in use, actually steers the boat, which means a lot of punishment. I felt I could not make a strong enough job without spending money.

Type (c), although the most popular for commercially-manufactured gear, looked difficult and complicated to make compared with Type (d). Our catamaran has stern-hung rudders with straight, almost vertical trailing edges; perfect for trim tabs. Other advantages of this type are (i) tabs are easy to turn, therefore not too large a vane needed; (ii) a tab drives the main rudder direct, therefore no lines to tiller or wheel; (iii) tabs trail behind main rudders and are protected by them.



A SHARP PULL ON A PULLS B OUT OF JAM CLEAT — A THEN TIGHTENS C WHICH HOLDS TRIM TABS AMIDSHIPS

This seemed an important point, as I remembered stories of long voyages when self-steering gears would break time and time again. They were usually types (b) or (c), of which the part in the water caused the trouble.

Next I sat for a long time working through all the possible ways of actually transmitting the vane power to the trim tabs. I decided in the end on the most simple method; Terylene line.

So, the final design was to be a horizontal axis vane mounted on the pushpit, transmitting power by lines and sheaves to two trim tabs (to be joined together to operate as one unit). I worked out crude but effective methods of altering course, disengaging in an emergency, and locking tabs amidships for going astern.

The idea; to make it as cheaply as possible, and if successful, add sophistications later.

All materials used I either already had, or found lying around in the yard, other than two ball races and some lead piping (given), dinghy rudder pintles, some stainless steel nuts and bolts, and some cleats.

Materials

I used 12mm ply for parts A1, A3, G, and the vane strengtheners; one-inch mahogany for B1, B2, C, M1, M2 and the main framework; 18mm ply for D, J1, J2, L and V; 4mm ply for H1, H2 and the vanes' Formica for E2, F1, F2 and the back and front of G; 9mm ply for E1 and parts of the framework; flattened copper tube for 11, 12, K1, K2, the outside of D and the inside of G.

Order of work

Having made parts A1 and A2, B1 and B2, I cut along the line XY, and after drilling a hole, gouged out the bearing housings until the two parts would close with the bearing a tight fit inside.

Parts A and B were then screwed and glued together, dead square, with the bearings in line.

Part C is the course wheel. I cut slots in it by placing the A/B assembly in position and marking from it.

Next came part D with the copper bearing surface outside (made from copper tube) then another plywood ring E1, and a Formica duplicate E2 stuck to the bottom of C, hard side down.

Formica was used again to make F1 and F2, and also stuck on both sides of the square base G, hard side outwards, with a copper bearing surface (flattened tube) round the inside of the hole. It was then a matter of clamping together C (with E2 attached), F1, D and G (D

inside G), F2 and E1, making sure the holes were in line, and bolting together F1, G and F2 loose.

The bearing cases were strengthened with components H1 and H2, flattened tube I1 and I2 shaped to fit over the top and sides.

Sheaves J1 and J2 were made by cutting a 1¼ inch circle in the ply, which had a drilled 4mm centre. I left the drill jammed tight in the hole, and put the drill handle in a vice, as a sort of makeshift lathe, then gouged a groove round the edge. The centre was then drilled to 6mm, and 6mm copper tube forced through.

Then, with that useful copper tube, I made the brackets K1 and K2, and assembled them, with the sheaves, screwing to the vane strengtheners (A1, A2). This unit (A/B) was then glued and screwed to the course wheel (C).

I moved on to the vane shaft and the quadrant (L) which was grooved deeply round the outer edge, and had a section (abcd) cut out of the straight side.

Shaped lead pipe fitted with a piece of galvanised steel (from flattened pipe) was used for rims (M1, M2) round the vane clamps, while the vane shaft itself was made from a deck brush handle, and mates with 25mm copper tube (N2). The top section of the tube (ab) was flattened to a U-shape, and there's a gradual change from round to flat between c and b. Sufficient metal was removed to grip N1 and fit tightly into the (B2) bearing.

I offered up the outside of the bearing case, fitted the bearing (B2) and quadrant (L) on the shaft, with the splayed end of the pipe (N2) at point d, and screwed to the quadrant L.

Positioning bearing B1 on the shaft, I removed the top sections of the bearing cases (B1, B2) and put the whole vane shaft in position (L in line with J1, J2). I screwed the top sections (B1, B2) into place, and fitted the rest of the bearing housing assembly (H1, H2, I1, I2, M1, M2). Incidentally, I put the vane at the end of the shaft, to get it away from deflected wind off the mainsail when close-hauled.

When making the wind vanes, I noted the grain direction, and removed wood from the 12mm ply strengtheners to fit over the pipe (N2) before fixing them to the vanes. The actual vane sizes were guesswork, but, in the event, worked well.

Before making the hardwood trim tabs, I split, opened and flattened the top of some galvanised water pipe to form Y and Z, with extra holes for adjustment, then securely bolted stainless steel strip to pipe and tab, fairing pipe and tab together with Plastic

Padding. The area of tabs in the water is about 20 per cent of the wetted area of the main rudders. A lock-nut on the top pintle prevents the tab lifting; the pintle holder was made from galvanised steel.

As for the framework (see diagrams) once thought out, it wasn't difficult to make, mainly out of scrap 2 by 1 mahogany and ply. Two more sheaves (S1, S2) clamp on to the pushpit.

To fit the vane unit, you first remove the cross-bar (O). The flat plate (G) drops between side pieces P1 and P2, moves over Q and into slots R. You then replace the cross-bar which holds the unit in position.

The holes at T lead the course adjuster lines (wound round the wheel C) to the cockpit. The holes at U lead the emergency lines together and to the cockpit. You then connect the lines as shown in the drawings.

Trials

A week before the Gibraltar trip, the gear was ready for testing. With a light beam wind we sailed from Poole to Yarmouth, IoW. I was almost too scared to fit the vane in case it didn't work. In the event, although we yawed a bit because of the low wind speed, we proudly sat on the front deck all the way to the Needles channel. Not once did we touch the wheel. It was a fantastic feeling.

What about rough weather? All I can say is that we were ten days in the Bay of Biscay; close hauled most of the way. We had three Force 9 gales that we knew of. The gear steered all the time, even up to Force 8, at which point we hove-to. On one long tack out of the bay, we didn't leave the cabin for two days as the small vane steered in winds of Force 5 to 8. Even hove-to, when the boat was being thrown all over the place with the rudders not travelling in their designed direction, the gear survived intact (thanks to the elasticity between the trim tabs).

Round the coasts of Portugal and Southern Spain, we had most other wind conditions. We found that the gear behaved best with the wind forward of the beam. It was worst with a light, unsteady wind from a stern quarter where our acceleration affected the apparent wind direction considerably. To work down wind I have to keep the sail area down so that there is enough wind over the vane.

Conclusion

Well worth the time and effort. I had great doubts about its strength, but no problems. I wouldn't like to make another long trip without it. ●