ARIES VANE GEAR

Designed & Manufactured by

NICK FRANKLIN

in

NORTHWOOD · COWES · ISLE OF WIGHT

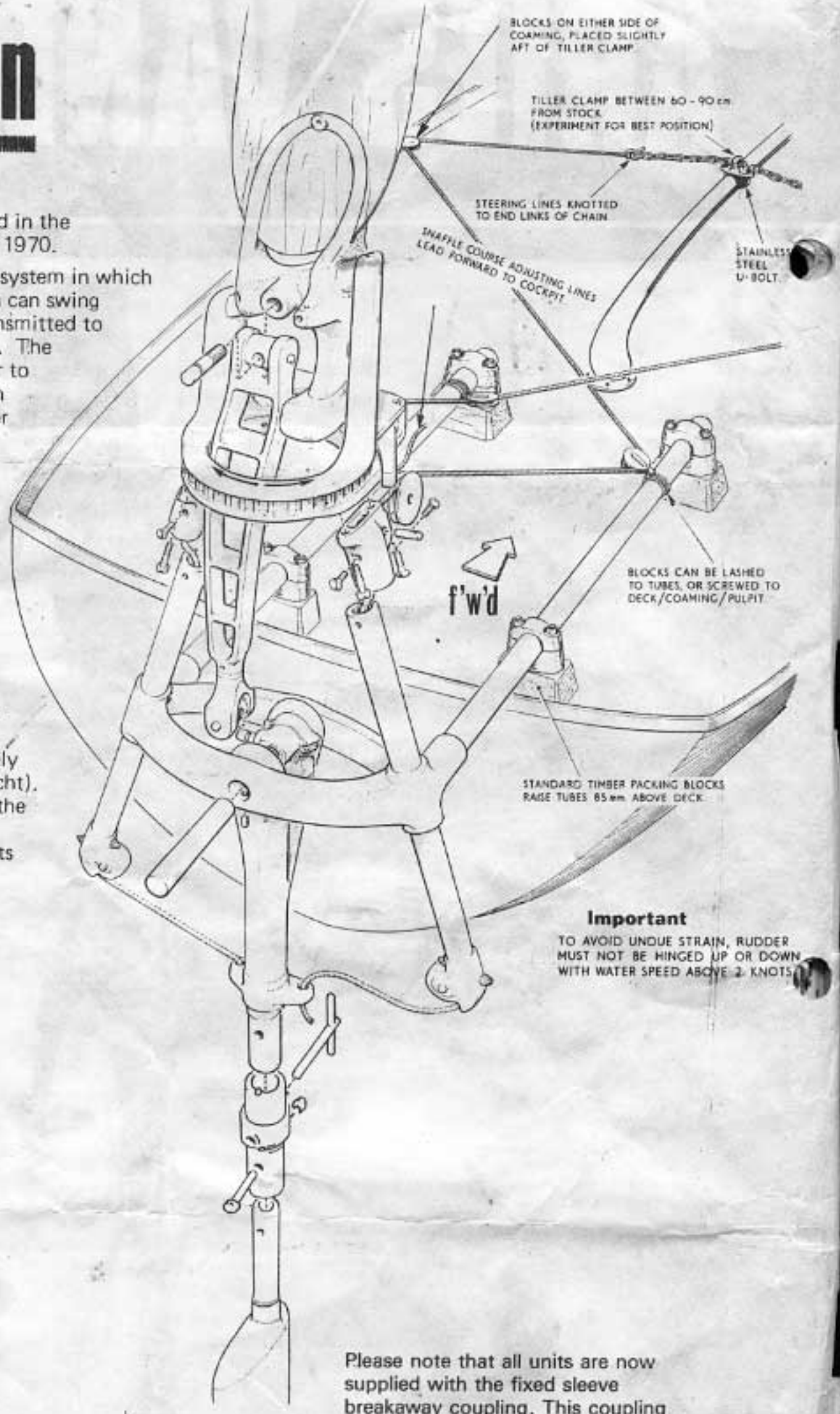
Introduction

The Aries Vane Gear as described in the brochure has been in production since 1970.

It works on the servo pendulum system in which the vane operates a servo rudder which can swing sideways. This sideways motion is transmitted to the tiller or wheel by ropes and blocks. The gear only has to develop enough power to move the tiller or wheel to steer, which is easily obtained from the servo rudder through its length and leverage in pulling the steering lines.

The gear is suitable for virtually every type of yacht up to 55 ft. L.O.A. The minimum size vessel is usually around 28 ft. L.O.A. due to the gear's mainframe weight of 50 lb. being unacceptable on smaller boats unless they have broad stern sections.

Fin keel/skeg rudder design yachts which have inherent quick helm response do not cause any oversteer problems with the gear. (Approximately 50% of customers have fin and skeg yacht). The two mounting tubes coming from the gear can be bolted to the aft deck or transom using the standard clamps, bolts and timber packing blocks.

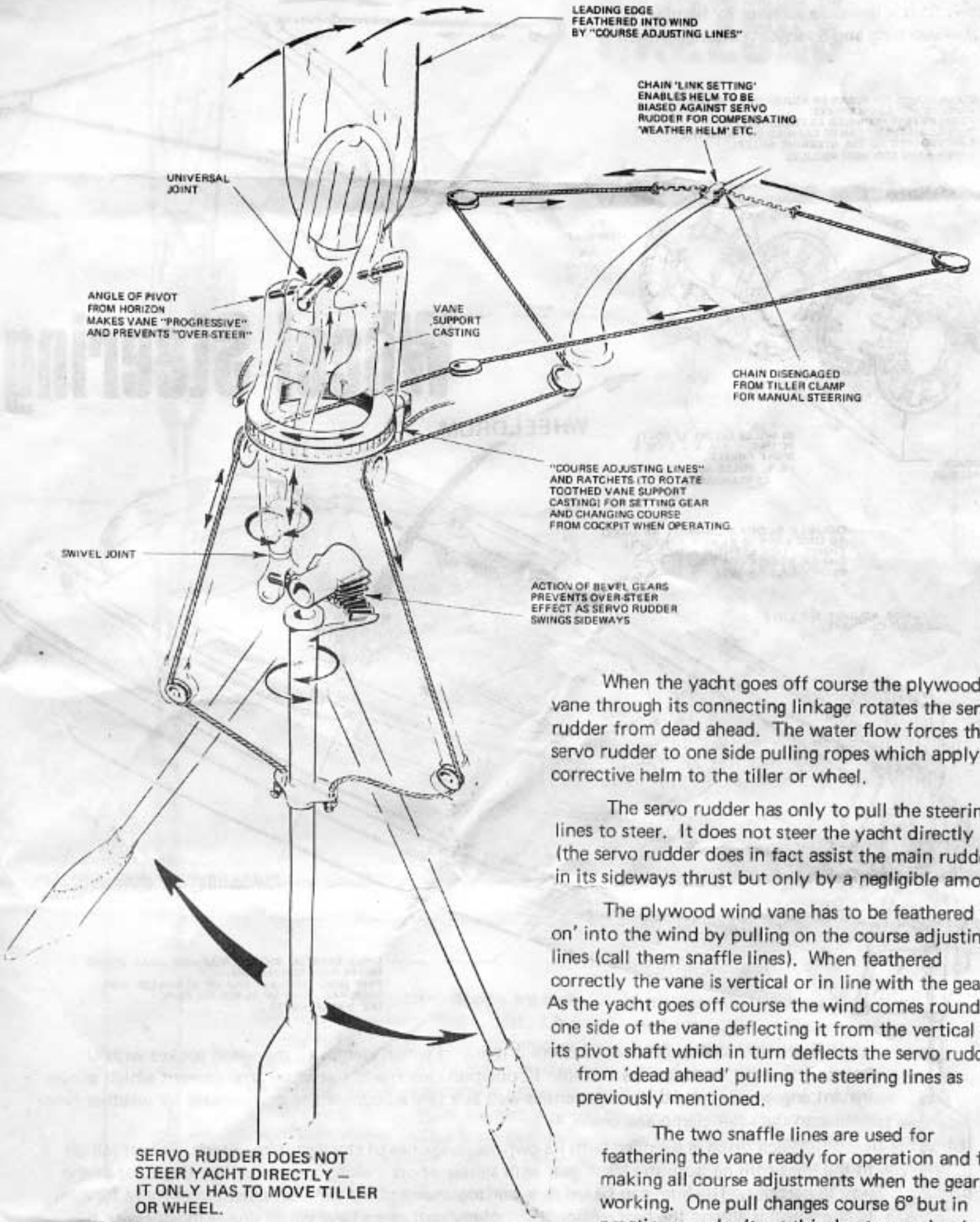


Important

TO AVOID UNDUE STRAIN, RUDDER MUST NOT BE HINGED UP OR DOWN WITH WATER SPEED ABOVE 2 KNOTS

Please note that all units are now supplied with the fixed sleeve breakaway coupling. This coupling does not allow the servo rudder to be hinged up but has the advantage of simplicity and durability.

How it Works



SERVO RUDDER DOES NOT STEER YACHT DIRECTLY – IT ONLY HAS TO MOVE TILLER OR WHEEL.

When the yacht goes off course the plywood vane through its connecting linkage rotates the servo rudder from dead ahead. The water flow forces the servo rudder to one side pulling ropes which apply corrective helm to the tiller or wheel.

The servo rudder has only to pull the steering lines to steer. It does not steer the yacht directly (the servo rudder does in fact assist the main rudder in its sideways thrust but only by a negligible amount).

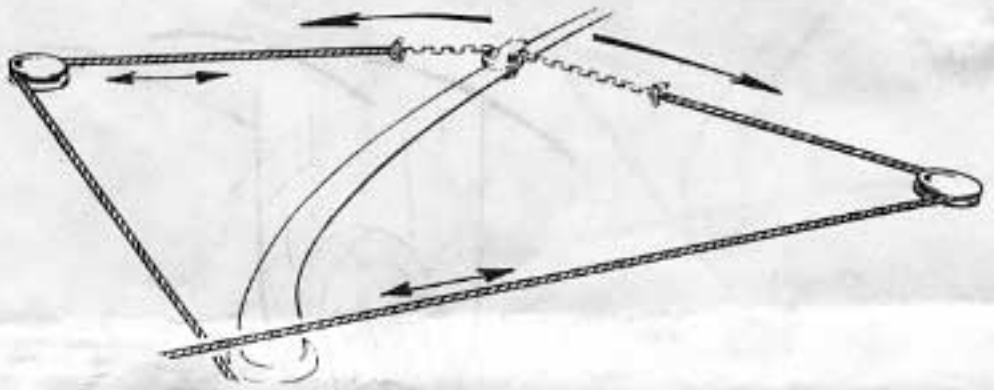
The plywood wind vane has to be feathered 'edge on' into the wind by pulling on the course adjusting lines (call them snaffle lines). When feathered correctly the vane is vertical or in line with the gear. As the yacht goes off course the wind comes round on one side of the vane deflecting it from the vertical on its pivot shaft which in turn deflects the servo rudder from 'dead ahead' pulling the steering lines as previously mentioned.

The two snaffle lines are used for feathering the vane ready for operation and for making all course adjustments when the gear is working. One pull changes course 6° but in practice you don't get this due to weather helm. Settings much smaller than 6° can be obtained by adjusting the tiller clamp and chain (or clutch in the wheel drum) but most owners don't bother doing this. The snaffles are especially useful at night as you can make any course adjustments by simply pulling once or twice etc. and have some idea of what you will get (unlike a wormwheel and endless cord).

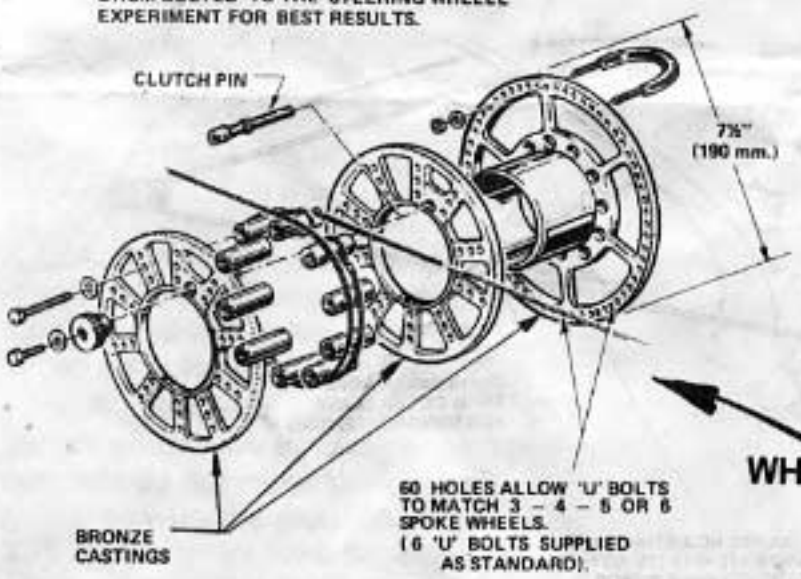
The snaffles can be led into the cockpit or cabin and should be secured port and starboard so you know which one to pull. The ratchet arms are spring return and the snaffle lines can be left slack.

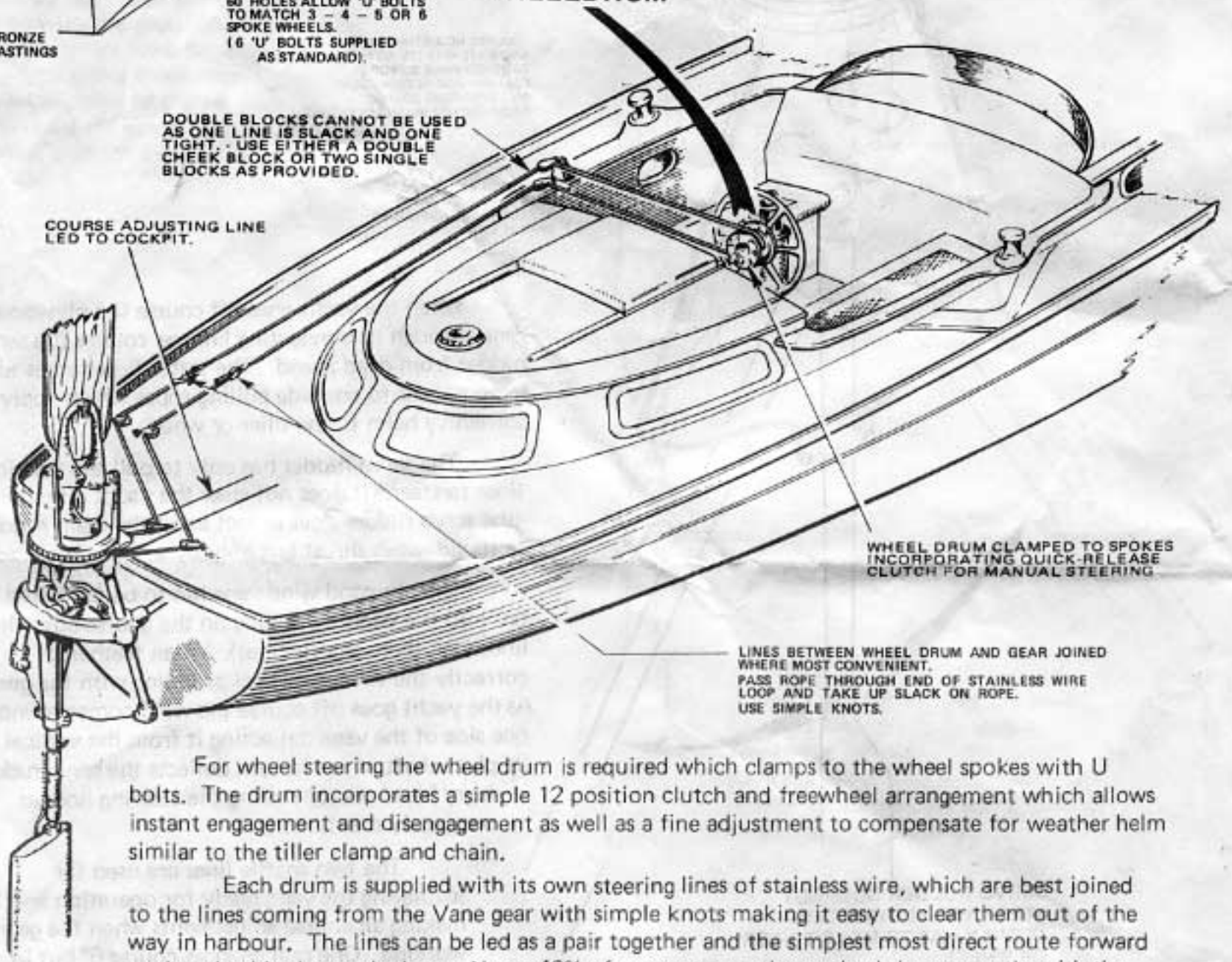
Tiller Steering

The movement of the steering lines is connected to the tiller by a simple clamp into which fits a length of chain. This arrangement allows an instant engagement or disengagement of the gear as well as having an adjustment to compensate for weather helm (don't use cleats screwed to the tiller – I think the chain is much better). It is impossible to steer by hand with the gear working and an instant disengagement is essential.



Wheel Steering





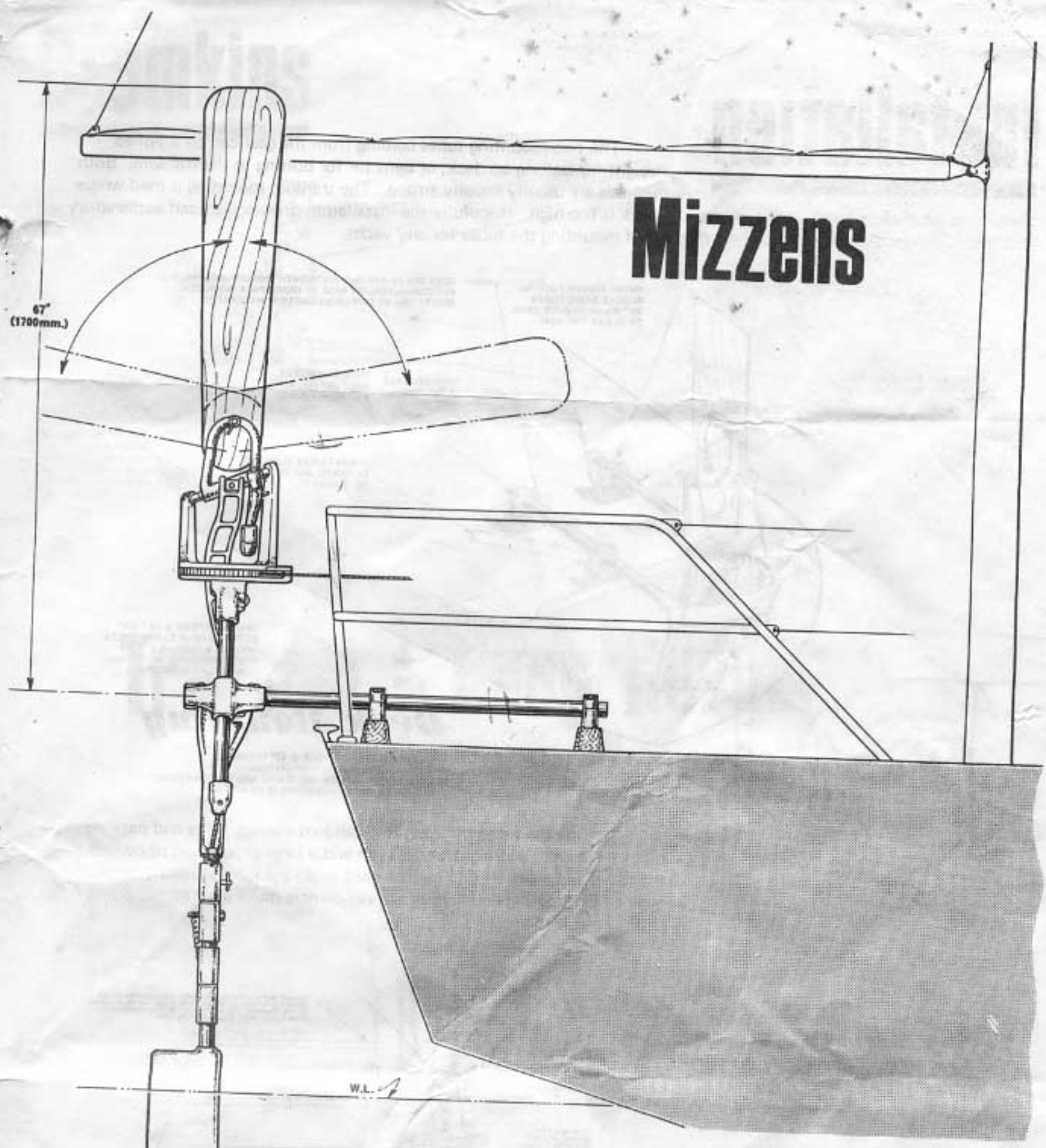
For wheel steering the wheel drum is required which clamps to the wheel spokes with U bolts. The drum incorporates a simple 12 position clutch and freewheel arrangement which allows instant engagement and disengagement as well as a fine adjustment to compensate for weather helm similar to the tiller clamp and chain.

Each drum is supplied with its own steering lines of stainless wire, which are best joined to the lines coming from the Vane gear with simple knots making it easy to clear them out of the way in harbour. The lines can be led as a pair together and the simplest most direct route forward to the wheel is always the best. About 40% of my customers have wheel drums mostly with the centre cockpit/aft cabin layout.

The drum gives almost one full turn hard over to hard over (½ a turn either side of 'dead ahead').

Yachts with wheel steering can also use the emergency tiller instead of the wheel drum leaving the wheel mechanism connected. However, it is important that the emergency tiller is reasonably easy to operate in this way and must be in an accessible position from the cockpit to adjust for weather helm etc.

Mizzens



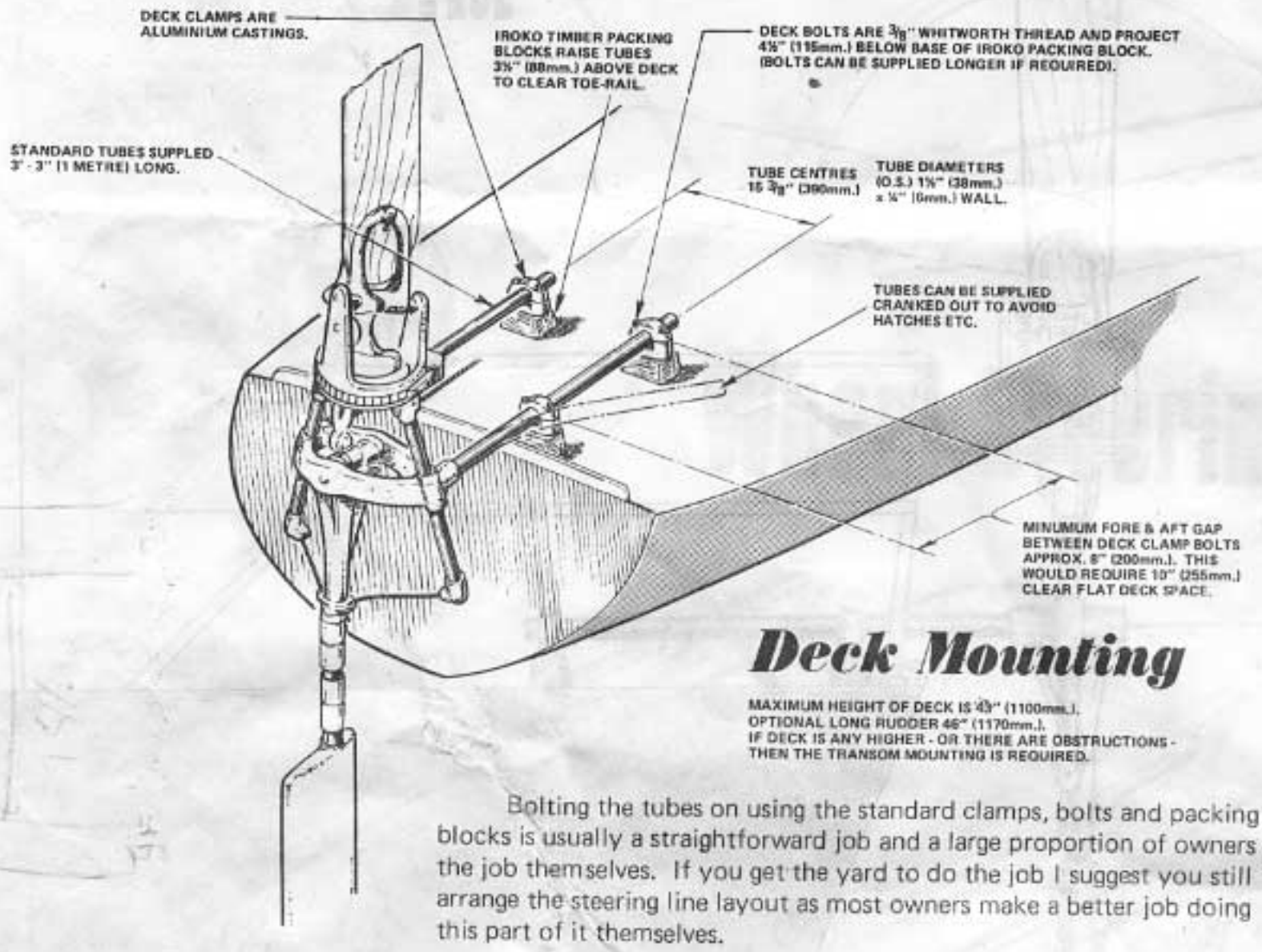
Very few mizzens booms are high enough to clear the plywood vane (5'6" 1640 mm above mounting tubes). I feel the worst (and only) problem is when closehauled with the mizzen boom sheeted in hard to the centreline. Under these conditions the vane is limited in its travel by hitting the boom. The remedy is to set the vane up to the weatherside using only half of its movement which is quite acceptable as most yachts are virtually self steering when on the wind. Slight easing of the mizzen sheets helps a great deal and you can also pivot the vane aft in its clamp to 45° off vertical without ill effect which will probably clear under the boom anyway.

The vane can be pushed down to horizontal in its clamp which is very useful when manoeuvring or gybing or tacking. No matter what you do to the plywood vane you cannot break its mounting casting, connecting linkage or any other part of the gear. A spare plywood vane is supplied as standard and you can easily make your own from 6 mm plywood.

Experience has shown that backwinding effects from the mizzen onto the vane when closehauled are unnoticeable (the yacht's inherent directional stability no doubt helps here.)

Installation

The two mounting tubes coming from the gear can be supplied straight for bolting on deck, or bent for for bolting to the transom. Both methods are usually equally strong. The transom mounting is used where there is no aft deck, a hatch in the way or the deck is too high. Hopefully the installation drawings are self explanatory and helpful in deciding what is the best method of mounting the tubes for any yacht.

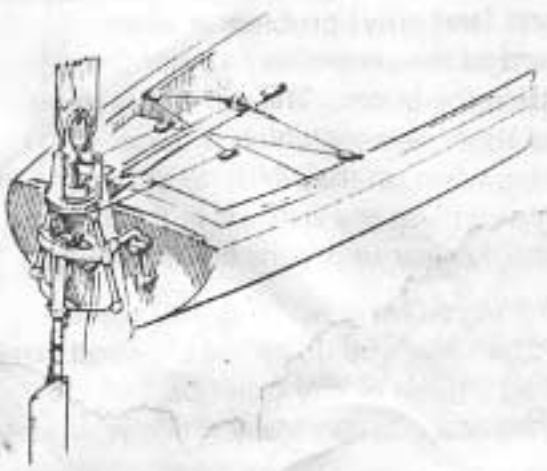


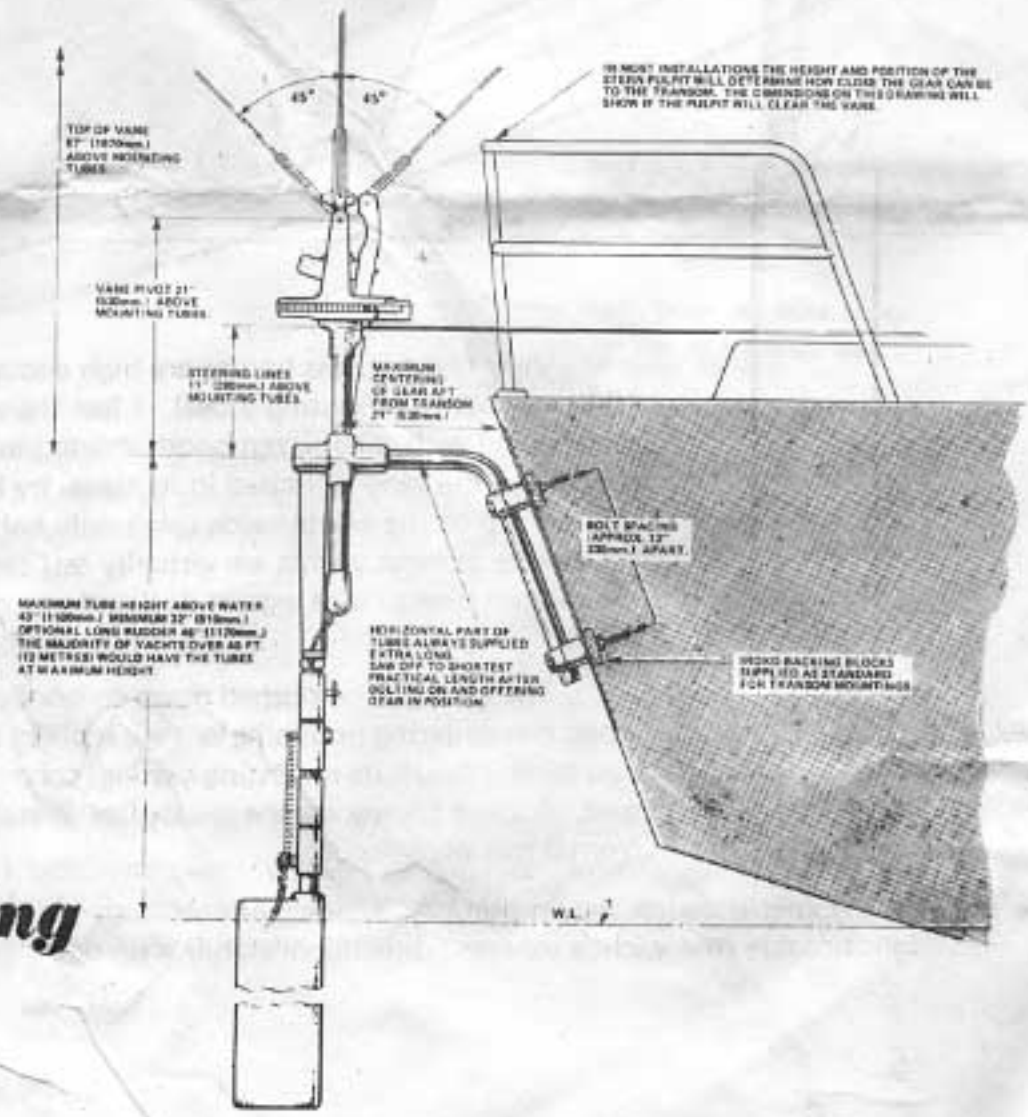
Deck Mounting

MAXIMUM HEIGHT OF DECK IS 43" (1100mm.).
OPTIONAL LONG RUDDER 46" (1170mm.).
IF DECK IS ANY HIGHER - OR THERE ARE OBSTRUCTIONS - THEN THE TRANSOM MOUNTING IS REQUIRED.

Bolting the tubes on using the standard clamps, bolts and packing blocks is usually a straightforward job and a large proportion of owners do the job themselves. If you get the yard to do the job I suggest you still arrange the steering line layout as most owners make a better job doing this part of it themselves.

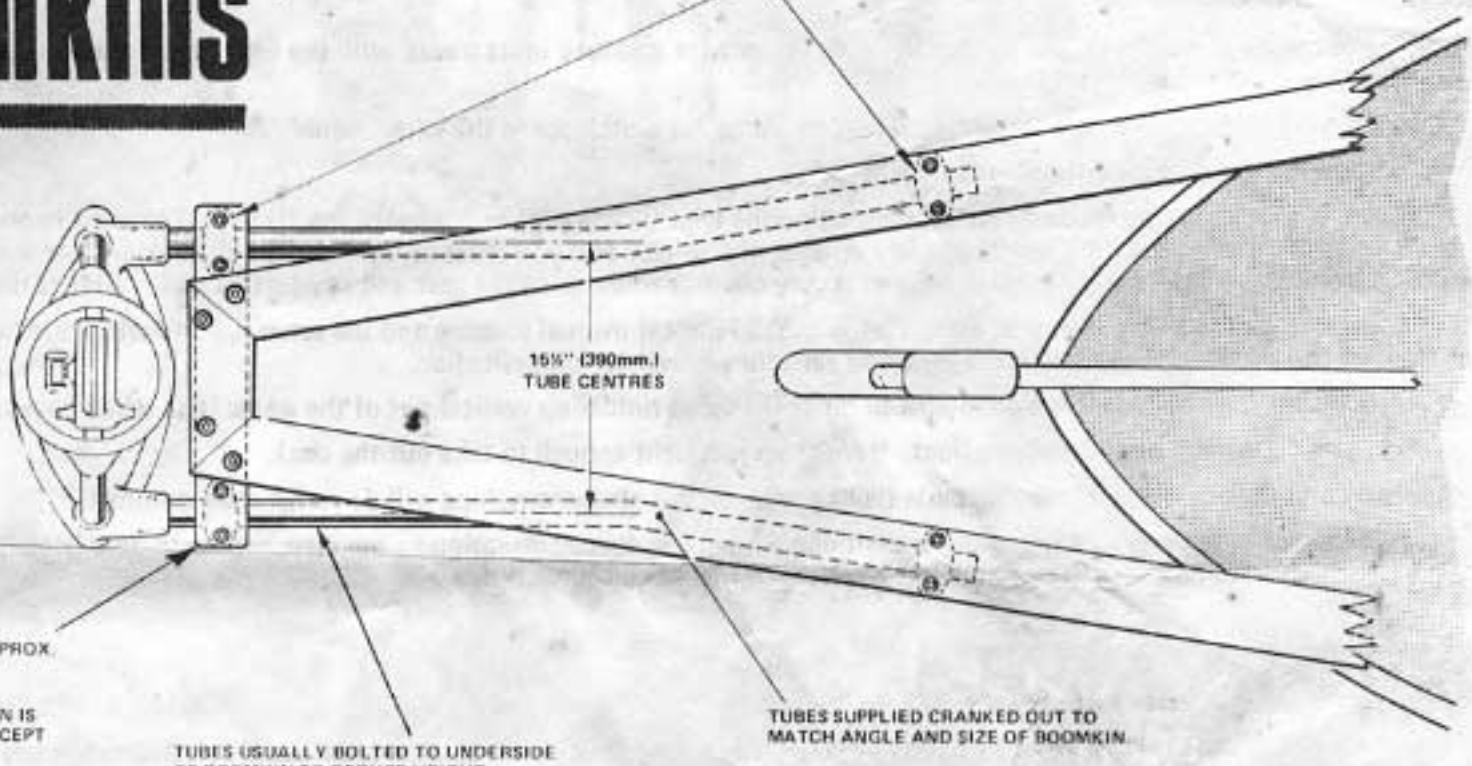
There are no modifications made on the Gear to suit a particular design of yacht and all Aries are exactly the same except for perhaps the mouting tubes.



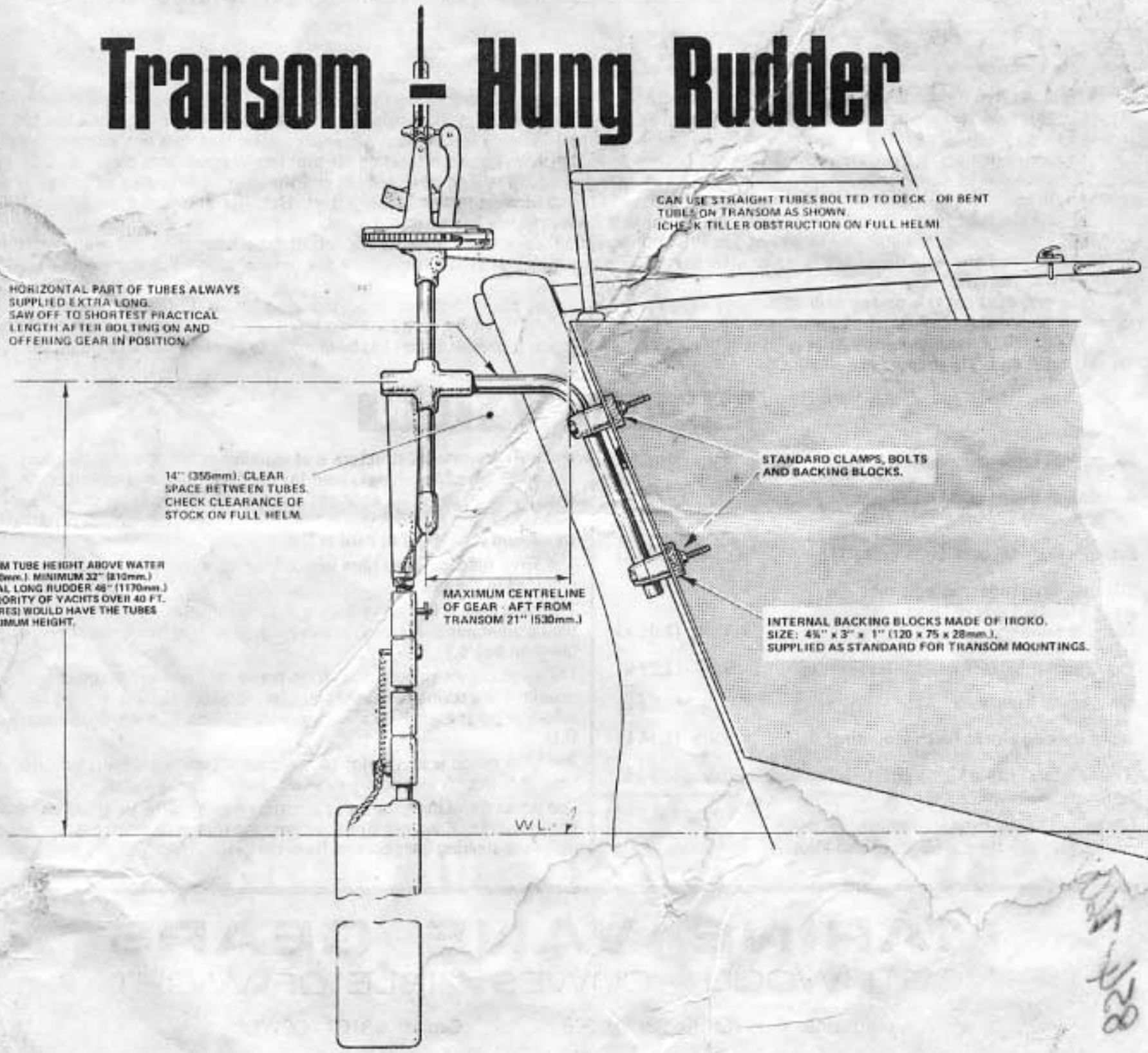


Transom Mounting

Boomkins



Transom Hung Rudder



OPERATION

To set the gear into use:

1. Pull the appropriate snaffle line to feather the vane upright (or mid-way in its travel) with the high side of the vane pivot (or lead weight end) facing into the wind.
2. When the vane is upright engage the chain in its tiller clamp (or clutch pin in the wheel drum).
3. The vane gear should now be steering the yacht.
4. Most course alterations are made by simply pulling on the appropriate port or starboard snaffle line. The most important thing to remember is to keep the vane working approximately upright or mid-way and you must adjust the tiller clamp chain (or wheel drum clutch) against the main helm to achieve this. I feel this point is very obvious when using the gear and any further elaboration is unnecessary.
5. Dis-engagement of the tiller clamp or drum clutch enables instant manual steering and the servo rudder trails quite happily in the water without steering the yacht at all even with the plywood vane blown over to full deflection.
6. If motoring for long periods it is a good idea to hinge the servo rudder up vertical out of the water (also when hove to).
7. Avoid extreme tension on the steering lines. Have them just tight enough to take out the slack.
8. Apply a good dose of oil to all moving parts (light engine oil but almost anything will do rather than nothing!)
9. I would suggest oiling every 24 hours under continuous use. Pay special attention to the main rudder spindle (stainless tube) running vertically from the lower bevel gear box its casting down to the second servo rudder.

PERFORMANCE

The Gear should steer the yacht on all points of sailing (including downwind) to a standard equal to a helmsman paying reasonable attention to his course steered. Under normal cruising rig I feel my customers should never have to steer by hand. The time when manual steering has to be resorted to entering harbour, flat calm/motoring etc.

The power developed by the servo rudder is proportional to the water speed and the gear's control of the helm increases as the wind and water speeds rise. In a strong wind the pull on the steering lines is very high and it is impossible to prevent them moving by hand.

In very light winds the vane and servo rudder develop low forces which of course is all that is required under these conditions.

DESIGN COMMENTS

I feel the servo rudder design such as the Aries (and other makes on the market) offers the best chance of achieving good self steering on all types and sizes of yachts under virtually all conditions. The main rudder on a yacht is remarkably efficient in that it only needs a low human effort applied to the tiller or wheel to control a vessel weighing perhaps 20 tons. I feel that any vane gear system that does not operate on the main rudder but attempts to steer the yacht directly (direct acting type – helm lashed) is tackling the problem in a very hard way.

The servo rudder design requires more engineering in that the servo has to swing sideways and pull the steering lines with an appropriate framework to accommodate the rope pulleys, and the ropes have to be led forward to the tiller or wheel. However, this aspect is very easily dealt with and the rope and pulleys are basic yacht equipment that is very reliable and easy to replace.

The basic design of the aries was established in 1966 using a little theory, common sense and lots of experimentation and prototype building. Repeated attempts since have failed to offer any performance gain (not even a trim tab on the servo rudder – but this was too complicated anyway).

The gear does not rely on any high technology design or materials and could have been produced using timber, leather and fashings since the earliest recorded times (if anybody wanted one)

The design philosophy of the Aries is "if it exists – the sea will smash it". No attempt has been made to calculate the stresses on the gear – It relies on brute strength and simplicity.

SPECIFICATION

Aluminium castings grade AC5 **(LM5)**	33lb	(15.08 k)
Aluminium tubing grade HT30 1½" x ¼" wall (38mm x 6mm wall)	18lb	(8.25 k)
Stainless shafting, deck bolts grade 316	7lb	(3.20 k)
Stainless servo rudder spindle tube grade 316. 1½" x 3/16" wall 38mm x 5mm	4½lb	(2.05 k)
Vane counter balance weight lead casting	6½lb	(2.97 k)
Bevel gears. Bronze	2 lb	(0.91 k)
Iroko packing blocks (deck mounting)	2½lb	(1.14 k)
Tiller clamp. Bronze clamp chain – galvanised	2lb	(0.91 k)
	75½lb	(34.51 k)

The weight of the main framework overhanging the stern is 50 lb. (22.85 kilos)

The main framework structure is of aluminium tubing and aluminium castings. The same tubing is used for the deck tubes and servo rudder stock. It is grade HT30, anodised and specially made in the hard drawn as possible condition which makes the tube tremendously strong (most aluminium tube is not as hard as this).

The servo rudder is glass fibre with a foam core, with the rudder stock moulded in the foam.

The wind vane is 6 mm marine ply – clear varnished (ply is much lighter than aluminium or plastics for this purpose and replacements are easily made on board.)

The servo rudder spindle (runs from the lower bevel to the rudder coupling) is a seamless stainless tube, grade 316, polished. It runs in pure teflon bearings each 1" (25mm) long 1½" (38mm) bore x 2" (50mm) O.D.

The tiller clamp is supplied with two sizes of stainless U bolts for differing sizes of tillers. A length of galvanised chain is also included.

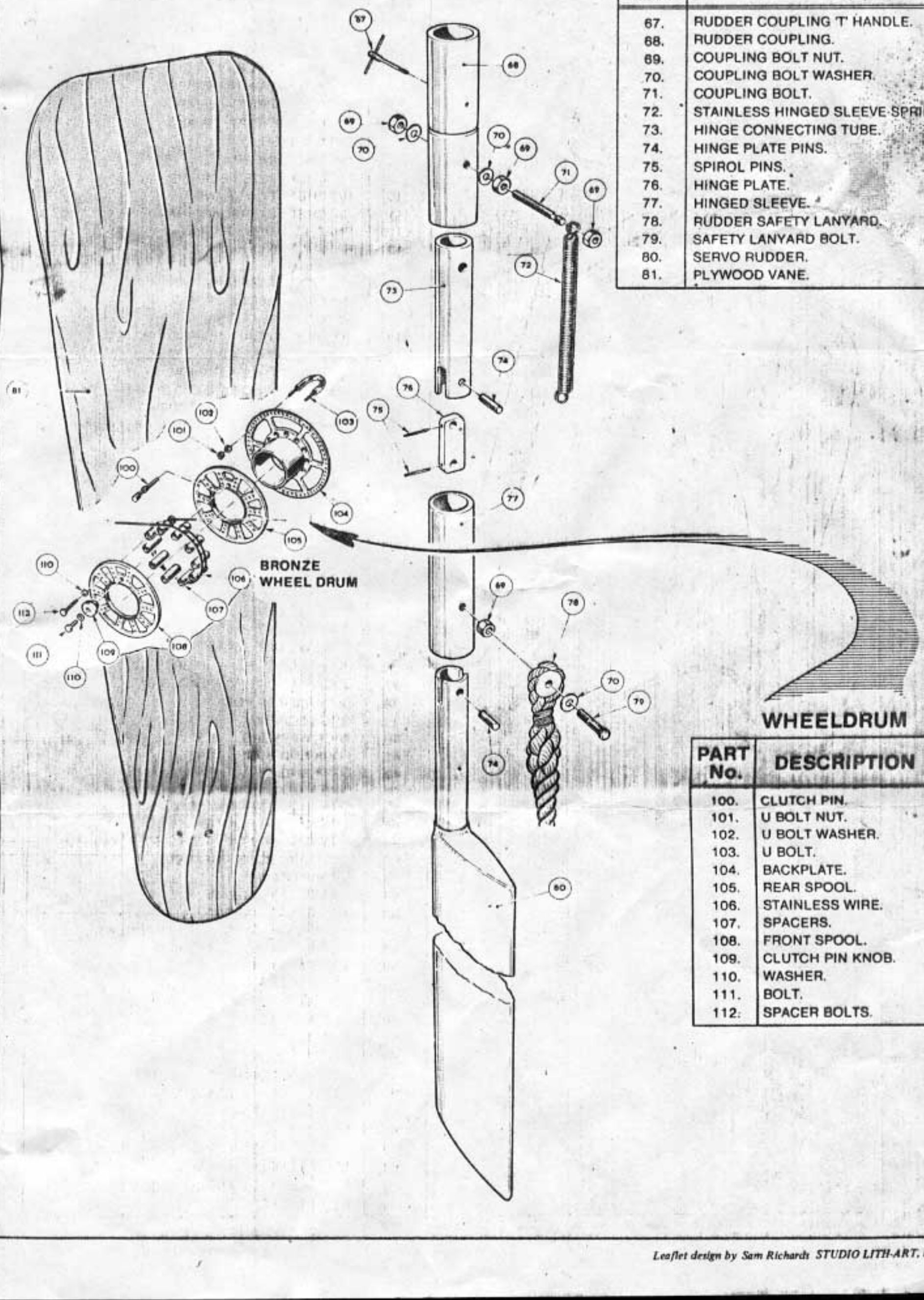
The wheel drum includes the appropriate number of U bolts for clamping to the spokes. 8mm pre-stretched terylene rope is also fitted which joins up to the steering lines coming from the gear.

MARINE VANE GEARS

NORTHWOOD COWES · ISLE OF WIGHT

Telephone: COWES (0983) 295266 Cables: ARIES - COWES

VANE · SERVO RUDDER · WHEELDRUM

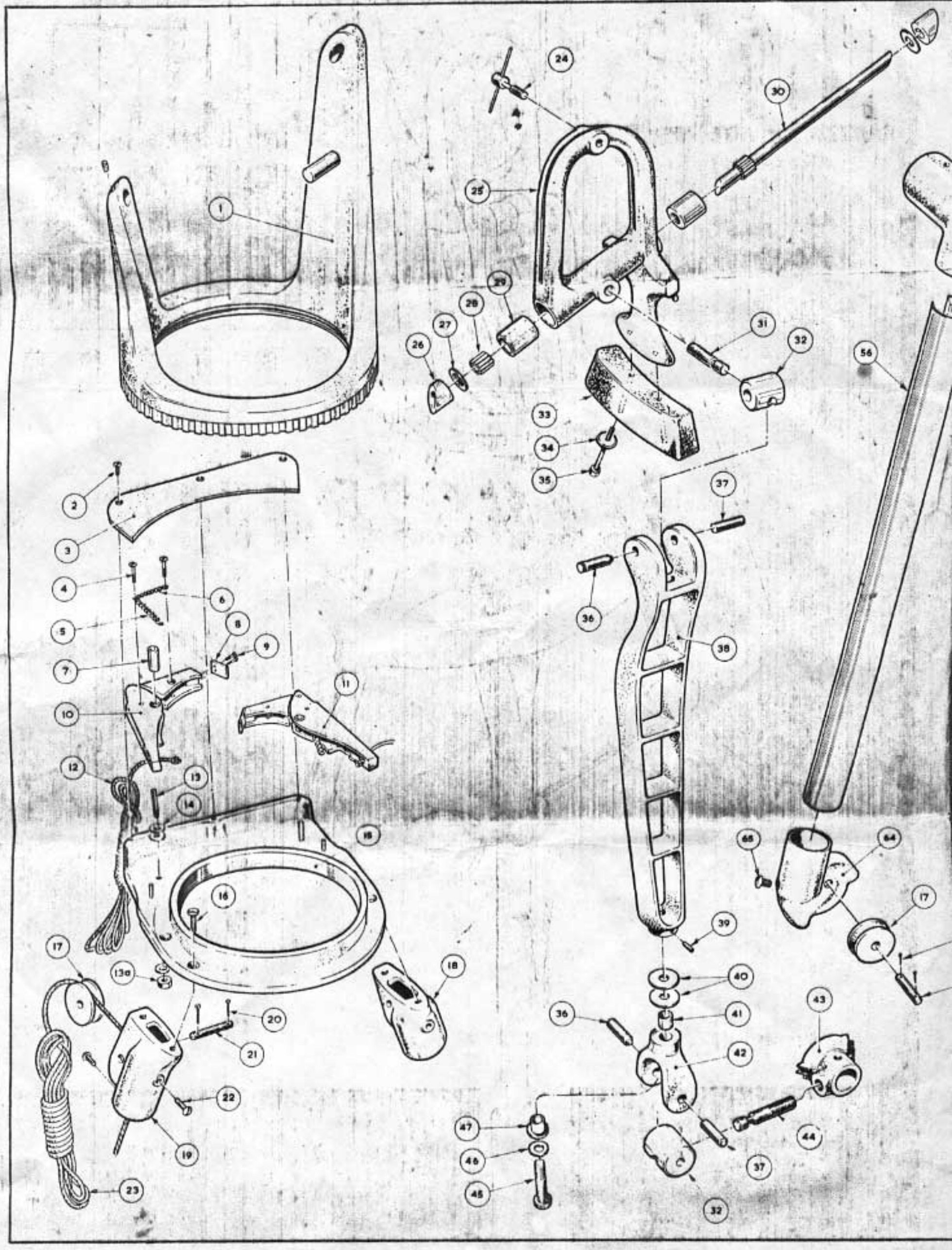


PART No.	DESCRIPTION
67.	RUDDER COUPLING 'T' HANDLE.
68.	RUDDER COUPLING.
69.	COUPLING BOLT NUT.
70.	COUPLING BOLT WASHER.
71.	COUPLING BOLT.
72.	STAINLESS HINGED SLEEVE SPRING.
73.	HINGE CONNECTING TUBE.
74.	HINGE PLATE PINS.
75.	SPIROL PINS.
76.	HINGE PLATE.
77.	HINGED SLEEVE.
78.	RUDDER SAFETY LANYARD.
79.	SAFETY LANYARD BOLT.
80.	SERVO RUDDER.
81.	PLYWOOD VANE.

WHEELDRUM

PART No.	DESCRIPTION
100.	CLUTCH PIN.
101.	U BOLT NUT.
102.	U BOLT WASHER.
103.	U BOLT.
104.	BACKPLATE.
105.	REAR SPOOL.
106.	STAINLESS WIRE.
107.	SPACERS.
108.	FRONT SPOOL.
109.	CLUTCH PIN KNOB.
110.	WASHER.
111.	BOLT.
112.	SPACER BOLTS.

Leaflet design by Sam Richards STUDIO LITH-ART, I.O.W.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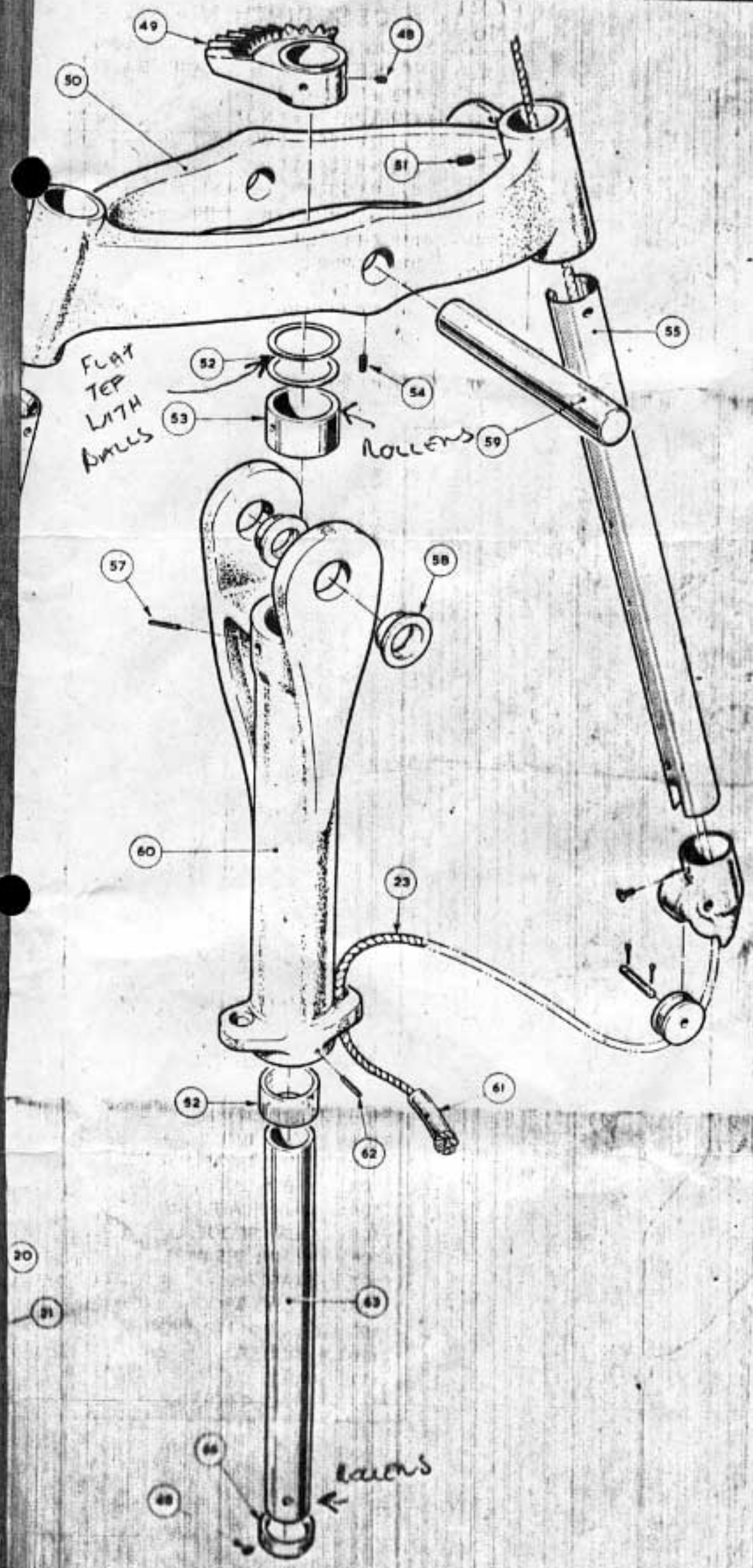

Part No.	DESCRIPTION
1.	TOOTHED VANE CARRIAGE.
2.	RATCHET COVER PLATE SCREW.
3.	RATCHET COVER.
4.	SPRING RETAINING SCREW.
5.	RATCHET SPRING – LARGE.
6.	RATCHET SPRING – SMALL.
7.	NYLON BUSH.
8.	RATCHET FINGER.
9.	RATCHET FINGER SCREWS.
10.	RATCHET – PORT HAND.
11.	RATCHET – STARBOARD HAND.
12.	SNAFFLE LINES – PAIR.
13.	RATCHET PIVOT.
14.	WASHERS 6mm.
15.	RATCHET BASE PLATE.
16.	BASE PLATE SCREWS.
17.	NYLON ROPE SHEAVE.
18.	TOP PULLEY CASTING – STARBOARD.
19.	TOP PULLEY CASTING – PORT.
20.	ROPE SHEAVE SPLIT PINS.
21.	ROPE SHEAVE STAINLESS SHAFT.
22.	TOP PULLEY CASTING SCREWS.
23.	8mm. PRESTRETCHED STEERING LINES (PAIR).
24.	VANE HOLDER 'T' HANDLE.
25.	VANE HOLDER CASTING.
26.	VANE PIVOT SHAFT SPACER.
27.	VANE SHAFT WASHER.
28.	NYLON ROLLERS.
29.	NYLON ROLLERS OUTER HOUSING.
30.	STAINLESS VANE PIVOT SHAFT.
31.	CONNECTING ROD ARM.
32.	SWIVEL JOINT BLOCK.
33.	LEAD WEIGHT.
34.	CUP WASHER.
35.	LEAD WEIGHT BOLT.
36.	JOINT BLOCK PIN – SPIGOT END.
37.	JOINT BLOCK PIN – PLAIN END.
38.	CONNECTING ROD.
39.	GRUB SCREW.
40.	FACE WASHERS.
41.	FORK END BUSH.
42.	FORK END.
43.	BEVEL GEAR PINION.
44.	CONNECTING ROD ARM.
45.	CONNECTING ROD SWIVEL BOLT.
46.	CONNECTING ROD SWIVEL BOLT WASHER.
47.	FORK END BUSH – HEADED.
48.	GRUB SCREW.
49.	LOWER BEVEL GEAR.
50.	MAINFRAME CASTING.
51.	MAINFRAME CASTING GRUB SCREWS.
52.	BEVEL ADJUSTING WASHERS.
53.	TEFLON BUSH.
54.	GRUB SCREW.
55.	'A' TUBE – STARBOARD.
56.	'A' TUBE – PORT.
57.	SPIROL PIN.
58.	HEADED BUSH.
59.	SERVO RUDDER SWIVEL SHAFT.
60.	SERVO RUDDER CASTING.
61.	PLASTIC SLEEVE.
62.	SPIROL PIN.
63.	STAINLESS SERVO RUDDER SPINDLE.
64.	LOWER SHELL CASTING.
65.	LOWER SHELL CASTING SCREWS.
66.	RETAINING COLLAR.

SEE OVER FOR PARTS LIST OF SERVO RUDDER & WHEELDRUM ▶▶▶▶