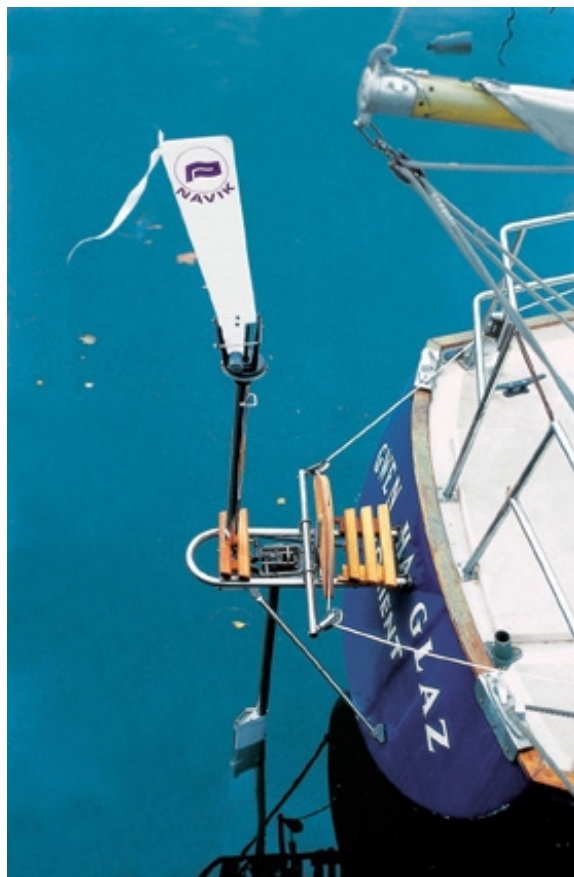




NAVIK SELF-STEERING GEAR



TECHNICAL GUIDE

WHAT IS REQUIRED OF A SELFSTEERING GEAR ?

That it can take the place of the helmsman on all types of sailing boats, at all points of sailing, under all weather conditions.

Reports from NAVIK owners, of North sea and Atlantic crossing, speak for the performance and reliability of the NAVIK.

In the 1976 Single-Handed Transatlantic Race (OSTAR) four entrants fitted NAVIK and, despite severe weather conditions, NAVIK operated perfectly and all four competitors crossed the finishing line at Newport, USA. In fact two of the competitors finished sixteenth and twentieth respectively. Proof again of NAVIK reliability.

NAVIK disproves the commonly held beliefs that:

- Self-steering gear have to be heavy, large, cumbersome and difficult to install.
- Self-steering gear can only steer a yacht at certain points of the wind.
- High performance self-steering gear is expensive.

NAVIK is extremely robust. Its patented trim tab system, derived from airplane controls, minimises the force acting on the transmission assembly. At 7 knots, the force required is only 50 g (less than 2 ounces). So all parts, although compact and light in appearance, are in fact oversize.

Produced by PLASTIMO, the largest suppliers of marine equipment in Europe, NAVIK has proved so popular, that it can be sold at a competitive price due to large scale production methods.

1. HOW NAVIK OPERATES

Like an helmsman, NAVIK acts on the tiller of the boat. It operates by means of a pivoting underwater paddle; controlled by a wind vane balanced in the apparent wind.

The movement of the boat through the water induces a pendulum movement on the paddle which is transmitted to the tiller by means of two lines.

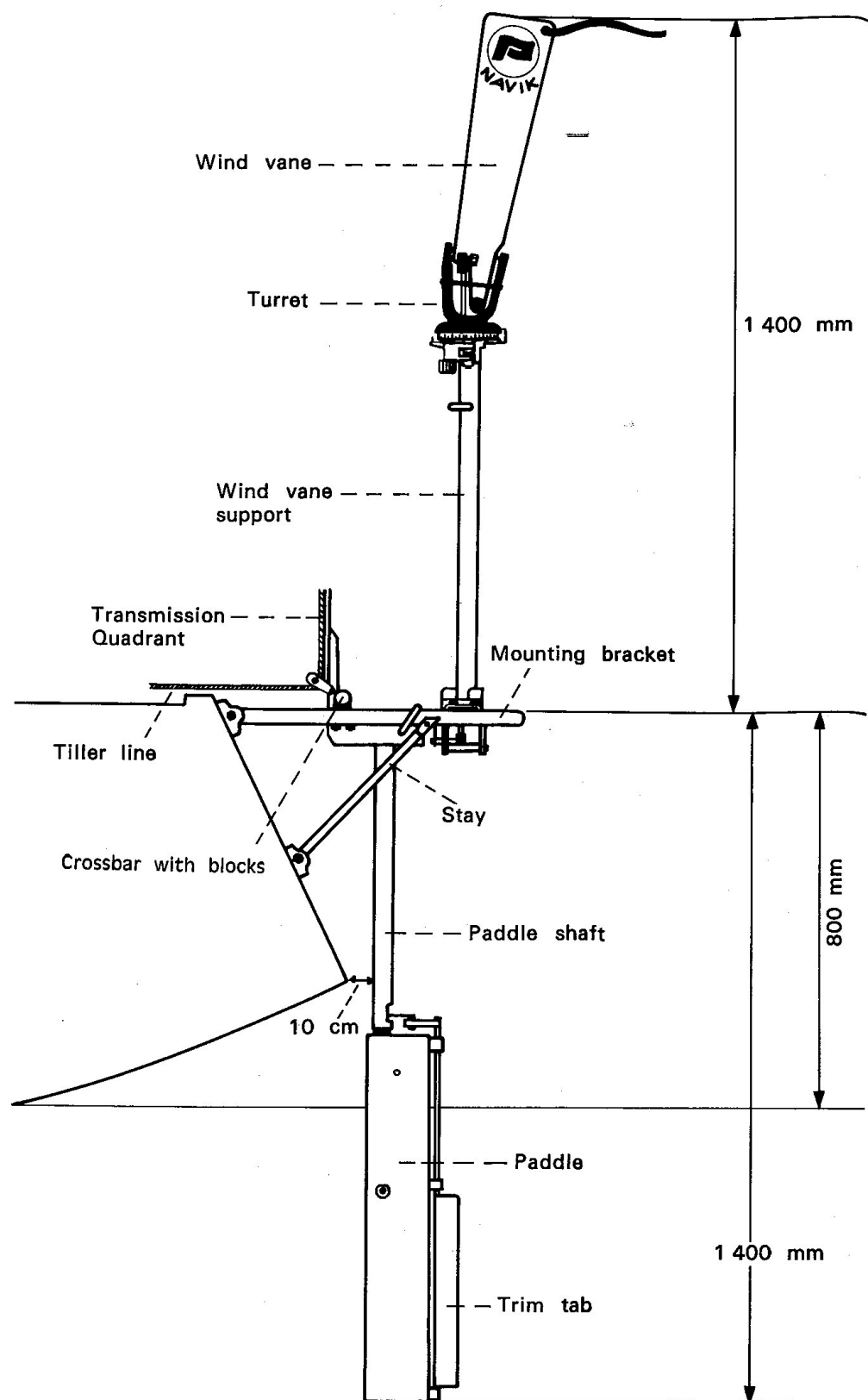
In order to minimise the force required to turn the paddle, the designers of the NAVIK have fitted a TRIM TAB (French patent nr. 692 2461, pending in other countries.)

The small wind vane directed into the apparent wind and balanced on an horizontal axis, swings at the slightest change in the course of the boat and moves the trim tab.

In addition, the efficient arrangement of the linkages between the wind vane and the trim tab has a compensating effect. When the paddle moves up on one side or the other the movement of the trim tab reverses to bring the paddle back in the axis of the boat, reducing the tendency to yaw, particularly when running or reaching.

Stages of operation

1. The boat changes its course.
2. The wind vane swings and
3. Moves the trim tab.
4. The trim tab drives the paddle connected to the tiller by means of two lines.
5. The boat comes back on its course.



2. HOW TO FIT NAVIK ON BOARD

NAVIK is supplied complete with all transom fitting parts and each component is well protected. Fastenings are fitted to each component on the unit and smaller parts are packed separately in a small bag.

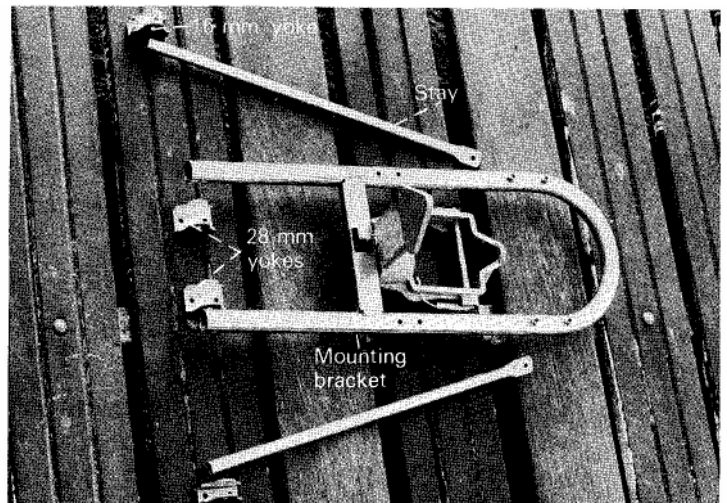
NAVIK is manufactured from the finest materials including 18/12 MO stainless steel, heavy anodized alloy, tropical hard timber and fibreglass re-inforced plastic.

N~AVIK can be fitted on any type of boat with tiller or wheel, of any length, of any type of transom or rigging. On ketches or yawls, the mizzen boom will generally require to be shortened or lifted to avoid fouling the wind vane when tacking.

NAVIK can be fitted to the boat on dry land or in the water. Fitting is simple, but the instructions should be followed in the right order.

Metric measures conversion

1 mm	1/32 "	10 cm/10 0 mm	4"
1,6 mm	1/16 "	12 cm	4" 3/4
2 mm	5/64 "	15 cm/15 0 mm	5" 7/8
3 mm	1/8" "	20 cm/20 0 mm	7" 7/8
6 mm	1/4"	48 cm	19-- lia
10 mm	13/32 2"	50 cm/50 0 mm	20"
16 mm	5/8"	63 cm	25" 1/4
20 mm	13/16 6"	80 cm	32"
28 mm	1" 1/16	90 cm	3'
30 mm	1" 3/16		
45	1" 3/4		



MOUNTING BRACKET

61.16,90.6 --r *Fitted mounting bracket,*

NIAVIK is delivered with a standard mounting bracket length 63 cm. This mounting bracket must be fixed to the transom of the boat, exactly along the centerline at 80/90 cm above the water. The paddle shaft must be easily accessible when in the sailing position. In case of a high freeboard, a longer paddle shaft (ref. 61.18.10.2) has to be ordered.

The paddle and paddle shaft assembly must be free to move laterally and must clear the transom (or, in case of a stern mounted rudder, the rudder) by 10 cm.

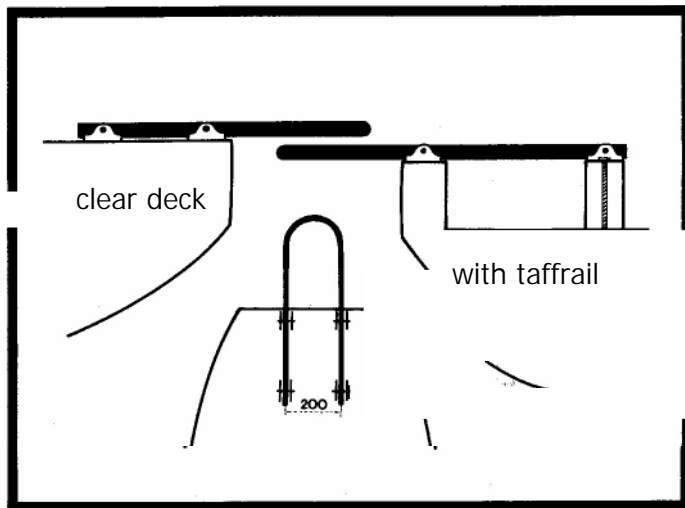
The mounting bracket must be horizontal

Fitting on reverse counter transom

1. Position the mounting bracket on the transom at 80/90 cm above the water. Determine the precise position of the 28 mm yokes, securing them to the transom with bolts and stiffening plates inside the boat. Fix the mounting bracket temporarily by supporting it horizontally with a rope.
2. Place paddle shaft vertically into the balancing unit. The shaft must be fitted to clear the outer edge of the boat by about 10 cm (4"). If necessary, shorten the two ends of the mounting bracket to minimise the space occupied by the assembly.
3. Drill 6 mm dia. holes in the end of the mounting bracket and fix permanently to the 28 mm yokes.
4. Bolt one end of each of the 600 mm (24") support stays to the mounting bracket and, while maintaining the latter in a horizontal position, locate the 16 mm yokes on the transom and attach with bolts. The two support stays may be cut to the required length and drilled (6 mm) to fit the yokes. When too short, have the necessary length of tube welded with an internal sleeve for rigidity.
5. Finally secure the mounting bracket and support stays assembly in the yokes.

Fitting on a vertical transom

Proceed as for an inclined transom, but the mounting bracket tubes will need to be shortened to within a few centimetres of the welded front crossbar, taking care that the clamping rod is accessible, that the transmission quadrant does not foul the stern pulpit or the gunwale and that the tiller lines can run freely.



Fitting on deck

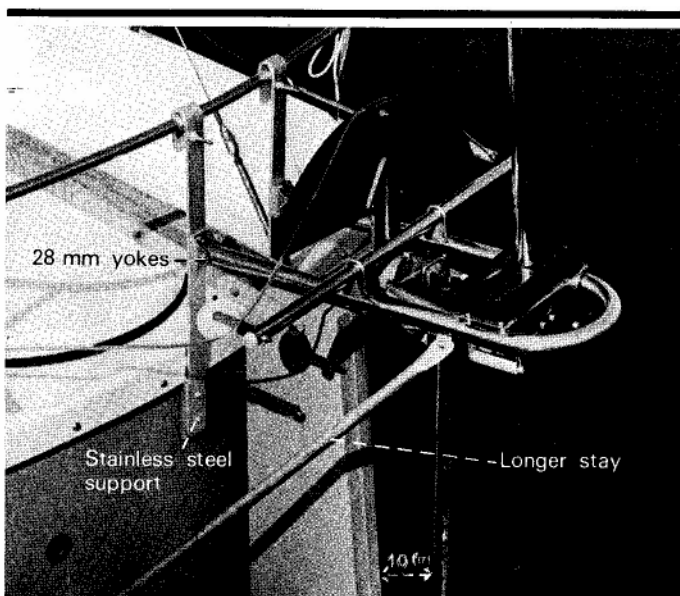
For yachts with a vertical or counter transom and a clear stern deck, the mounting bracket can be directly mounted on the deck provided the distance of the bracket from the water line is 80/90 cm (32/36 ins.).

To mount the bracket, fix the 28 mm yokes side by side, at least 150 mm (5 7/8") apart on the stern deck. If the yacht has a taffrail, fit two yokes to the rail and the two other yokes at the same level to a wooden block bolted through the stern deck (see drawing above).

Drill the mounting bracket and bolt it to the four yokes. On yachts with a steel deck, a sheet of perspex must be laid between the yokes and the deck.

If the standard tube is too short, it may be extended with a further length of 28 mm dia., 2 mm thick 18/12 MO stainless steel tubing, which may be attached either by employing a 100 mm long internal force-fitted sleeve or by argon welding.

Fitting on boats with transom mounted rudder



Remember, the mounting bracket must always be 80/90 cm (32/36") above the waterline and the paddle and shaft at least 10 cm (4") behind the rudder.

First method

If the yacht is fitted with a stern pulpit, bolt or weld two stainless steel supports vertically between transom and stern pulpit, 200 mm apart, making sure that the tiller is clear.

Attach the 28 mm yokes at such a height that the mounting bracket will clear the top of the rudder. Position the mounting bracket so that the NAVIK paddle will clear the end of the boat's rudder by 10 cm. Longer stays will normally be necessary.

Second method

Bend a piece of stainless steel tube of a diameter at least equal to that of the mounting bracket in a semi-circle around the rudder, ensuring that the rudder has full freedom of movement and fasten to the transom with bolts. Fix the mounting bracket to this piece, cutting off the end of the mounting bracket tube so that the paddle shaft is 10 cm behind the rudder.

Fitting on a Norwegian stern

Yachts with a Norwegian stern - may be dealt with in the same way, by fitting the mounting bracket on the stern pulpit or on a fabricated bracket around the rudder bolted on the hull. Longer stays will normally be necessary and the assembly has to be rigid.

INSTALLATION OF NAVIK

The mounting bracket is fitted to the stern of the boat. The components have now to be brought together in the right order. All screws, nuts and washers are stainless 18/12 MO steel, however it is advisable to grease each screw before assembly.

Wind vane

61.17.40.7 - Wind vane support crossbar

61.17.15.6 - Mk 2 black turret with fixed wind vane

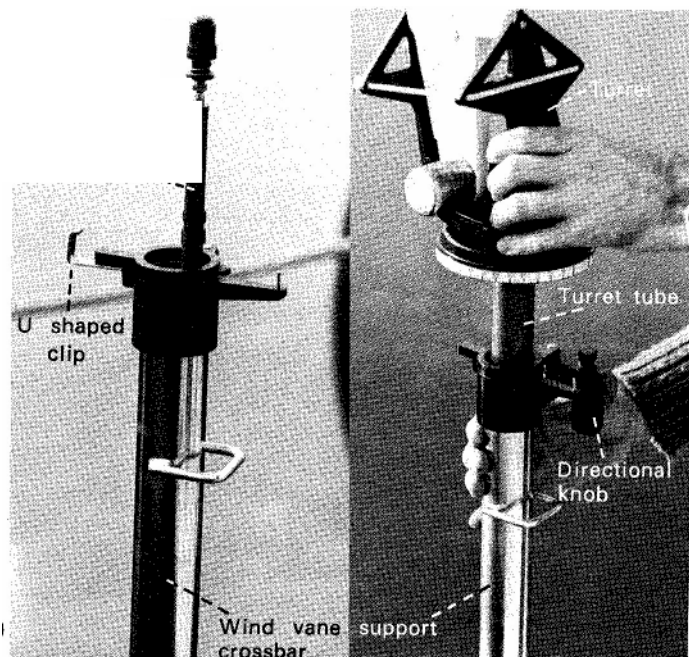
61.17.50.4 - Long connecting rod

The wind vane assembly is supplied in two separate parts:

- the wind vane support crossbar with long connecting rod inside the mast,
- the Mk 2 turret assembly with the fixed wind vane.

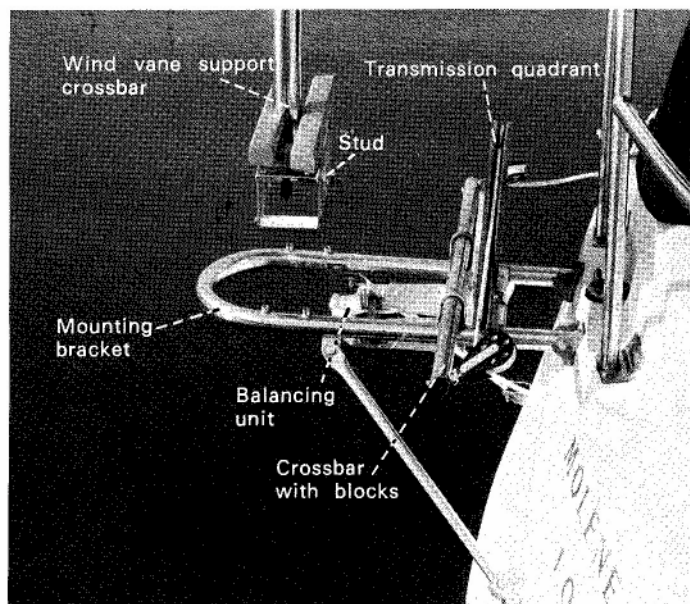
To mount the turret on the mast

1. First mount the lead counterweight to the bottom of the wind vane
 - Fit the black nylon tongue to the half-counterweight with a bolt.
 - Fit this half-counterweight to the side of the wind vane which is recessed.
 - Slide the second half of the counterweight on to the bolt and fasten with the washer and locknut provided.



- Tighten the locknut sufficiently, so that the lead counterweight can be turned to lock the wind vane in a vertical position, when the tongue engages with the built-in recess on the wind vane turret.
- Lock the wind vane in the vertical position.

2. Remove a "U" shaped clip, fitted opposite the pointer, by unscrewing the screw from the top of the mast and insert the turret tube into the mast ensuring that the adjusting wind vane directional knob engages with the gearing inside of the turret and is spring loaded.
3. Replace the "U" shaped clip and connect the long connecting rod to the bail joint on the wind vane.



Now, carefully position the wind vane support crossbar onto the rear of the mounting bracket taking care to engage the stainless steel stud on the crossbar into the black nylon bearing at the rear of the cast alloy balancing unit. Tighten the four 6 X 10 mm bolts which hold the crossbar unit to the mounting bracket.

Screw the small 2-step grating to the crossbar and check that the wind vane is still locked by way of the lead counterweight in the vertical position.

The wind vane is fixed to its support cradle and the rotating turret crown.

61.17.00.9 - Transmission quadrant

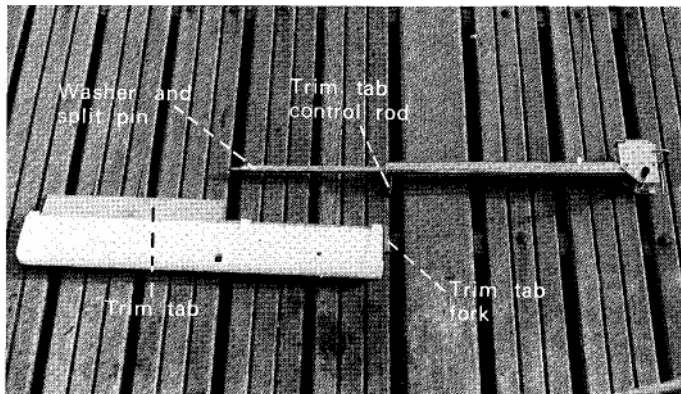
61.17.30.0 - Tiller line

Position the quadrant on the forepart of the balancing unit and secure it with the three 6X30 nuts, washers and bolts.

Pass the lines through the tiller lines blocks.

61.17.60.6 - Crossbar with blocks.

Place the crossbar with blocks (blocks facing forwards) on the mounting racket (not forgetting the two cradles) and maintain in place with the two stirrup bolts. Do not tighten so that the angle of the blocks may be adjusted later.



Paddle

61.18.00.5 - Paddle shaft. 61.16.70.2 - Complete underwater paddle.

Take the paddle shaft assembly, remove washer and split pin from the lower end. Assemble paddle onto shaft and replace washer and split pin, through the access hole in the paddle. The paddle must turn freely on the shaft.

The trim tab control rod is held in place by means of a spring. Engage it in the fork at the top of the paddle by lifting. Make sure that the roller turns freely with no excessive looseness.

Lower the pin clip on the left side of the balancing unit, remove the transverse pin and secure the security spring with the clamping rod in a forward position.

Position the assembly above the balancing unit, taking care to fold back the trim tab. Once the trim tab is introduced, raise the trim tab control rod (on the shaft) and engage it into the fork at the top of the trim tab.

Insert the transverse pin connected to the mounting bracket by rope. It acts as a pivoting point for the paddle when the security spring is released. Put the clip back in the groove of the pin.

Locate the paddle shaft assembly vertically in the balancing unit and loosen the rod. The clamping stud locates itself into the hole situated at the top of the paddle shaft.

61.16.20.7 - Jointed connector.

Connect the jointed connector with the trim tab control rod and the stainless steel bail-link. Attach it with a 0 2 mm rope to the paddle ring, to avoid, losing it.

61.16.40.1 - Removable grating.

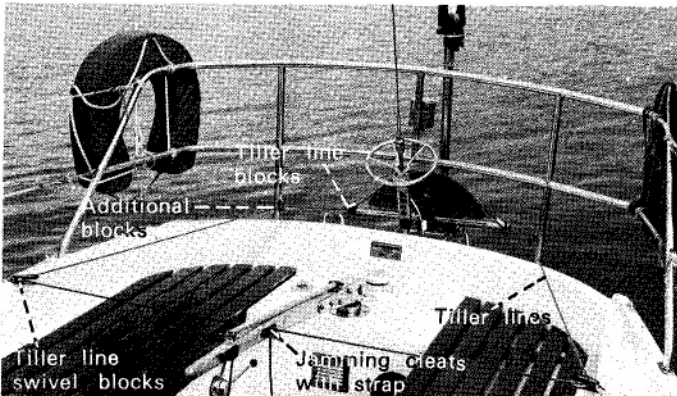
Position the grating on the bracket to protect the transmission unit.

LAYOUT OF UNES

Only general guidance can be given on the layout of the lines. The arrangement must be adapted to suit individual yachts during trials to establish performance under practical conditions.

The layout must be as direct as possible. The lines must run freely and it must be possible to free them from the tiller in a second.

If the crossbar blocks lay under the deck surface, blocks have to be fitted on the capping rail or on the pulpit to prevent chafing.



With tiller

Attach the tiller line swivel blocks to the cockpit coaming or inside the bulwark rail level with the forward end of the tiller. The tiller lines are made of 6 mm braided nylon and are 3 metres (10') in length.

Attachment to the tiller may be effected as follows:-

By means of a racing dinghy track.

Lines are attached to the runner, Continuous fine adjustment can be made to suit all sailing conditions.

By means of an open ring.

The open ring is fastened through the tiller. A perforated stainless steel strip connects the right-hand line to the left-hand line and is fitted to the ring.

By means of jamming cleats with strap

With 3 sets of cleats with strap at different levels on the tiller, tiller angle can be altered to correspond wind and sea conditions.

By means of a rope stop with two thimbles.

This 6 mm dia. rope stop with a spliced thimble at each end is lashed to the tiller. This solution enables continuous fine adjustment.

Having fixed the lines to the tiller, turn the blocks to the position in which the lines run freely.

The lines assembly must be well stretched.

With steering wheel

Whenever possible, it is easier to attach the lines to the spare or emergency tiller if transmission is not too hard.

Where the lines are required to act directly on the wheel, a drum must be fitted to the latter. However, since the number of revolutions of the wheel required to deflect the rudder to a given angle will vary from case to case, standard dimensions for the drum cannot be quoted.

Nevertheless, the average deflection of the paddle displaces the line by 12 cm and, if the gear ratio of the wheel is known, the drum diameter may be readily calculated.

Example

If it takes 1/4 turn of the wheel to deflect the rudder 10° (an angle sufficient for steering the yacht), 1/4 turn of the drum must constantly represent 12 cm. Its circumference must therefore be $4 \times 12 = 48$ cm and its diameter 15 cm.

The greater the ratio of the wheel, the smaller will be the required diameter of the drum.

The lines should be easily removable and, since the wheel moves in the opposite direction to the tiller, they should be wound on to the drum from the bottom.

3. A NEW HELMSMAN FOR YOUR YACHT

Your NAVIK is now fitted to the yacht. We are now going to explain in chronological order the sequence for operation. The process is simple; but all phases have to be accomplished in the right order.

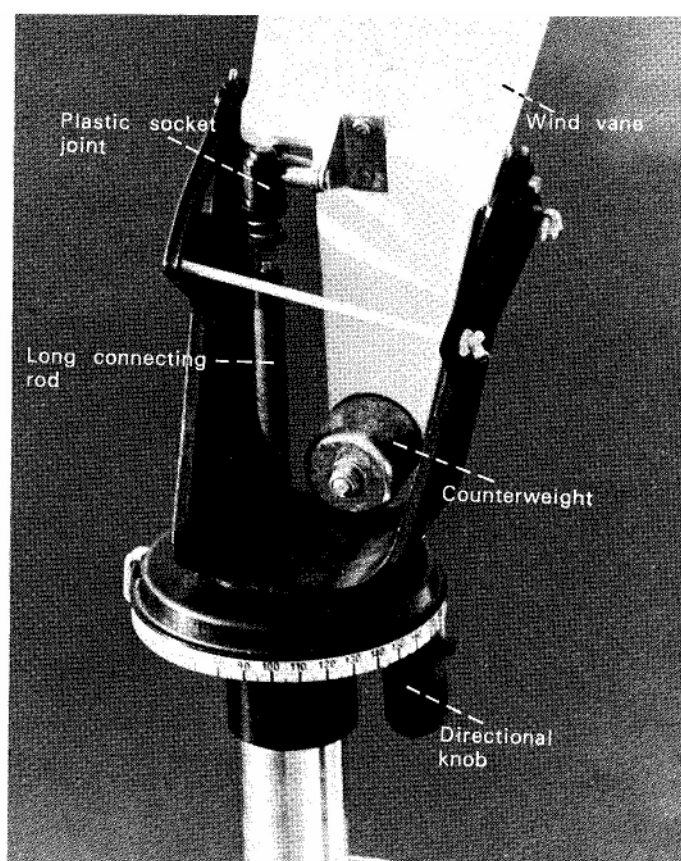
Basis adjustments have to be well understood to enable you to "feel" your NAVIK as you feel your boat. This will bring you greatest satisfaction when finding a peculiar adjustment applying to your boat only.

Your NAVIK will then become . the companion of all your cruises.

YOUR FIRST TRIP WITH YOUR NAVIK

Before sailing out

Adjustment of the long connecting rod



Lock the wind vane. The stainless steel ball-link at the lower part of the wind vane support must be in a vertical position.

If not, disconnect the top of the long connecting rod and screw or unscrew the plastic socket joint so that, when assembled, the stainless steel ball-link will be exactly vertical. Lock plastic joint with lock nut.

Put the paddle shaft assembly into place (page 12) Connect the jointed connector without adjusting it.

Sail out

Sail away under sail or power.

Adjustment of the jointed connector

The boat is underway, wind vane is locked. Paddle shaft must be in a vertical position.

If it goes up on one side or the other, disconnect the jointed connector from the stainless steel bail-link. Adjust position of the trim tab control rod manually so that it lays at 90° to the transom. Adjust the length of the jointed connector as required by screwing or unscrewing. Replace on stainless steel bail-link.

Wind vane locked-Paddle in the axis of the yacht, your NAVIK is properly adjusted.

Sail under NAVIK

Choose an area of open water to sail easily on different courses. The purpose of the NAVIK is to maintain a constant course in relation to the apparent wind.

Close hauled

- Sail yacht onto close hauled course and trim sails accordingly.
- Stand to leeward of wind vane. Rotate turret with the serrated knob until vane is in line with the apparent wind (direction of spinnaker strip). The knob "turns hard". Do not grease it, as it acts as a locking device for the turret.
- Tiller along the axis of the boat, connect lines to tiller tightening them correctly in relation with the required course.
- Unbolt the wind vane by rotating the counterweight.
- The boat sails under **NAVIK**.
-

Complete fine adjustment depending on peculiarities of your boat -by:

- Slightly altering orientation of the turret to achieve the exact compass course required.
- Adjusting leeward the tiller angle.
- Adjusting line attachments to the tiller.
- Tightening the layout of lines.

Boat underway = Wind vane in a vertical position

Reaching

Sail yacht close hauled. To bear away 30°, it is unnecessary to revert to manual steering, but: - Turn the turret 30° to leeward on the graduated turret. - Trim the sails accordingly. - Eventually ease out windward line if tiller angle is too wide. - Adjust turret on exact course. - The boat sails under NAVIK, wind abeam.

Wind free

- Continue bearing away turning the turret and trimming the sails.
- The boat alters her course by herself and keeps to it without touching the tiller.

Running downwind

- Set the wind vane along the centerline of the boat, spinnaker stree aft. - Lines slightly loosened. - Main sail boom lashed. - Jib boomed. - Adjust attachment of Unes to tiller to limit the tendency to yaw.

Wind vane in a vertical position tiller in the axis of the boat

Under normal conditions for spinnaker use, your NAVIK will steer your boat as well as a good helmsman.

Tacking

The boat sails on a close hauled course, turret 300 to leeward.

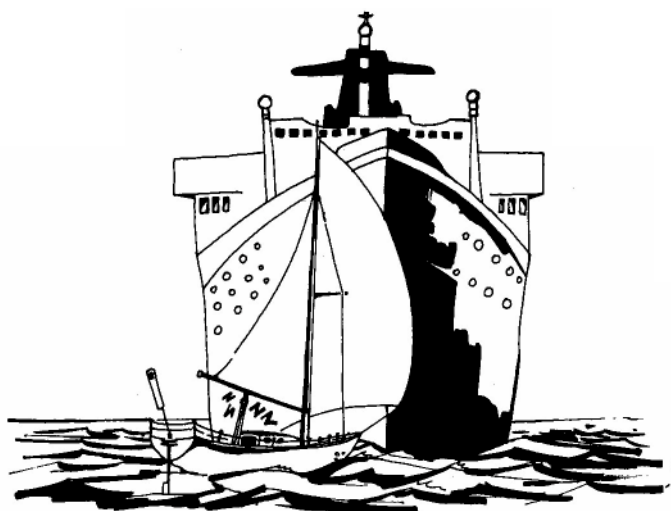
- Tacking does not require any manual steering.
- Rotate the turret at 300 on the cher side of the axis of the boat.
- The wind inclines the wind vane.
- The boat luffs up.
- Back the jib to help the boat tack.
- The main sali changes side.
- Ease out the jib's windward sheet.
- Haul in the leeward sheet.
- Adjust the turret.

Gybing

As for tacking, gybe by changing the side of the turret only.

Beware !

Your NAVIK operates perfectly; it really is the new helmsman of your boat, but do not forget:
= that no self-steering gear can clear an obstacle by itself.



YOU MUST BE ON THE WATCH

MAKE THE BEST OF YOUR NAVIK

As we have seen, the purpose of the NAVIK is to maintain a constant course in relation to the apparent wind. It will follow all changes in direction. So it is important to check regularly the compass course to notice al-I changes and make necessary adjustments.

On a gripping boat, in an unsteady wind, the yacht will luff up in gusts, but will be immediately brought back to its course.

Like a good helmsman, NAVIK will of course have to cope with the effect of the swell, mainly when running downwind. But a fine adjustment of lines on the tiller will greatly counteract yawing.

In the worst conditions, the .course will be wi.nding but NAVIK will steer as well as a good helmsnian for hour after hour.

AN IMMEDIATE SOLUTION

TO MOST PROBLEMS

<i>Probl em</i>	<i>Solution</i>
The wind vane is not sensitive enough.	<ul style="list-style-type: none"> - It is .off balance. - The bearings are dirty. - Check that it can swing freely. -Lines are badly adjusted on the tiller. -Check that the transmission as-sembly works freely.
NAVIK ,brings the boat back on its course too slowly.	<ul style="list-style-type: none"> - Lines are badly adjusted on the tiller. - Check that the transmission assembly works freely.
Operation is good on one tack and bad on the other.	- Long connecting rod or jointed connector are badly adjusted.
NAVIK no longer controls the boat.	<ul style="list-style-type: none"> - The paddle has run against an obstacle and the security spring has released. Resecure. - A bail of long connecting rod or jointed connector has gone off its socket.
Close hauled, the jib shivers or is aback.	- Wind vane is too close to the wind.
The yachts reactions are reverse.	<ul style="list-style-type: none"> - Wind vane orientation is 180` reversed (spinnaker strip always leeward). - Lines are reversed on the tiller.
The paddle releases frequently.	<ul style="list-style-type: none"> - Check lash at the back of the balancing unit. The nylon bearing must be worn away. Change it or replace it by a washer after taking off the wind vane support crossbar. - Insert a stop.bolt in the clamping ho.le if the speed of the boat is too high.
Roller of trim tab control rod does not turn.	<ul style="list-style-type: none"> - It sticks to its axis with dirt. - Unlock it.
Wind vane cannot be locked in a vertical position.	- Block the counterweight locking nut.
The counterweight is chafing against the turret or on the long connecting rod.	It has loosened. Tighten the nut finger tight. If the screw is damaged, the whole counterweight assembly has to be changed.

The paddle runs against an obstacle

When the paddle runs into a creelline for instance, the paddle shaft, which is held in place by a strong spring releases and swivels on its pin.

As the force of the water is considerable, all operations underway have to be made stopped or at little speed.

To set back the paddie:

- Put the clamping rod forward.
- Set the paddle shaft in a vertical position with the ring.
- Release the clamping rod for the stud to come in its hole. - Connect the jointed connector.
- Eventually use the help of a vang on the paddle shaft.

When NAVIK is not in use

A t sea

If the paddle stays in the water, you have to lock the wind vane in a vertical position.

So the paddle will remain along the axis of the boat. Boiting the wind vane locks the trim tab and, as a result of the counterreaction, the paddle will remain in the axis of the boat.

When using the engine, it is desirable to raise the paddle. To do this:

- Disconnect the jointed connector. - Put the clamping rod forward.
- Grasp paddle shaft by means of welded ring. - Withdraw the transverse pin.
- -Raise the assembly by rotating it through 180°.
- Hook the paddle to the welded ring on the wind vane support. - Replace the transverse pin.

If underway the stern sinks into the water and the paddle lays in the water even in an upward position, take it off completely to avoid damaging the trim tab.

In harbour or for wintering

During a, prolonged stay in harbour, it is recommended that the paddle and wind vane assemblies be removed completely and stored on board.

NAVIK is supplied with a 3 mm (1/8") Allen key. To remove the wind vane assembly, it is simpler to unlock the hexagonhead screw with this wrench, rather than removing the clip which is hard to put back in place.

- Unscrew the hexagon-head screw.
- Disconnect the long connecting rod.
- Remove the locking unit and turret assembly from the st. steel mast.

For wintering in harbour or on dry land, it is advisable to completely remove the NAVIK to avoid any risk of damage. The mounting bracket with its four yokes can be taken off in a few minutes.

Rinsing with soft water and overall greasing will ensure a good operation for the next season. Wood pieces will have to be maintained.

IN SOME CASES, OPERATION OF THE NAVIK WILL BE IMPOSSIBLE...

It should be borne in mind that, as a rule, the operating limits of a self-steering gear of any type are not set by the size or the weight of the yacht, but by the shape of the hull and the way she behaves at sea.

On a 15 to 20 metres (50 to 65') yacht with a prominent counter transom, no self-steering gear with an underwater paddle will work, as when the yacht passes over a wave, the stern lifts up, the paddle comes out of the water and there is a great risk that it breaks when the yacht falls back down.

On the contrary NAVIK can be very satisfactory on a yacht with the same length, but with a straight or reverse transom and with a stern which accordingly does not lift up so much.

Above a length of 15 metres (50'), behaviour of the yacht at sea has to be carefully examined before installing a selfsteering gear.

There will be no problem in operating the **NAVIK** self-steering gear when it is fitted on a boat which can be steered manually on any **course without** abnormal effort if the sails are correctly set.

On the other hand, on a yacht even of modest size and weight, which requires 30° of tiller into an average wind and strenuous efforts on the part of the helmsman to keep the boat on course, it is possible that no self-steering gear, however elaborate, would function.

It is also important to realise that when the force of the wind is such, taking the course in account; that a helmsman cannot control yawing, no self-steering gear will be capable of doing so. But it will do it for a longer time.

APPENDIX

61.16.10.0 - Standard NAVIKK self-steering gear.

61.16.00.3 - NAVIK self-steering gear with. long paddle shaft-

List of spare parts

Ref.	Qty.	Description	Use
61.16.90.6	1	Mounting bracket	
2.26.53.70.6	2	28 mm yokes	Fitting mounting bracket on transom.
	2	6 X 45 screws with bolts and washers	Fitting bracket on yokes.
61.17.80.5	2	-Bracket stays length 600 mm	
2.26.53.60.9	2	16 mm yokes	Fitting of stays on transom.
	2	6 X 20 screws. with washers and bolts	Fitting of stays on mounting bracket.
	2	6 X 30 screws with washers and bolts	Fitting of stays on 16 mm yokes.
61.17.40.7	1	Wind vane support	
61.17.15.6	1	Turret with fixed wind vane	
61.17.50.4	1	Long connecting rod.	Fitted on wind vane support.
	4	6 X 10 screws with fan-shaped washers.	Fitting of wind vane support on bracket.
61.17.60.1	1	Crossbar with blocks.	
4 6	2	Stirrup bolts with nuts.	Fitting of crossbar on bracket.
	2	Cradles for crossbar.	
61.17.00.9	1	Transmission quadrant.	
	3	6 X 30 screws with nuts and washers.	Fitting quadrant on balancing unit.
61.17.30.0	1	Quadrant line	Fitted on quadrant.
61.18.00.5	1	Paddle shaft.	With washer and split-pin.
61.16.70.2	1	Complete underwater paddle.	
61.16.20.7	2	Jointed connector.	One spare.
61.16.40.1	1	Removable grating.	To be fitted on coaming in layout of lines.
42.15.10.2	2	Tiller line swivel blocks.	
	1	Fitting instructions NAVIK self-steering gear.	
2.51.03.30.2	1	Quarantee file.	
61.18.30.6	1	Complete transverse pin	
61.18.10.2	1	Long paddle shaft.	
61.16.35.4		Counter weight	
1.17.15.40.5	1	Directional Knob	
61.18.40.3	1	Plastic bearings	
61.16.55.8	1	Wind vane alone	

Parts to be bought before installation

Stainless steel screws, nuts and washers to fit the 4 yokes on transom.
Attachment- on tiller.