

Figure 13-3D. An exploded view of the steering pedestal from a rack-and-pinion steering system. 1. Pedestal tube. 2. Pedestal bowl. 3. Pedestal base. 4. Lower bearing housing. 5. Sealed ball bearing. 6. Output lever. 7. Down-tube assembly. 8. Output socket. 9. Sealed ball bearing. 10. Gear quadrant. 11. Pin. 12. Input pinion. 13. Sealed ball bearing. 14. Input socket. 15. Woodruff key. 16. Brake cover. 17. Brake clamp assembly. 18. Top cover bearing. 19. Top cover. (Whitlock Marine)

## Cobra 6R Deluxe/King Cobra MK6 Maintenance

Your Cobra steering system has been designed and manufactured to the highest standards to provide many years of trouble free service. To get the best from your system there are some simple maintenance hints.

- 1.1 Once a season unscrew the 4 countersunk stainless screws which retain the top cover. Clean and refit using Whitlock anti-seize.
- 1.2 Carry out the same procedure on the four stainless steel socket screws which retain the input assembly. Note it is necessary to remove the steering wheel and brake spinner to access these screws. Be careful not to lose the steering wheel key!
- 1.3 At least twice a season thoroughly clean the pedestal in fresh water and apply a coat of good quality car wax polish.
- 1.4 If any paint has been accidentally chipped, immediately rub down the area locally using a fine grade of wet and dry abrasive and touch in with yacht enamel designed for aluminium surfaces. International Yacht Paints have suitable products.
- 1.5 Periodically check that the tiller lever, draglink assembly and output lever nut are securely fastened.

- 1.6 Every two years remove the compass and top cover (see point 1.1 above) to inspect the gears and check the integrity of the quadrant to down tube fixing. Rotate the steering wheel until the system reaches the rudder stop and apply additional moderate turning effort to check there is no relative movement between quadrant and down tube assembly. Inspect for damage or wear to the seal ring which fits between the top cover and the head. Replace the top cover, compass wire grommet and compass fixing bolts on re-assembly.

## Reshimming pedestal to adjust gear mesh

It is possible after a period of time for a small amount of play to develop in the gear mesh. This will not exceed 10mm on the rim of a 1000mm diameter wheel and can be easily removed following the procedure set out below.

- 2.1 Remove steering wheel, brake spinner and steering wheel key.
- 2.2 Remove the 4 socket stainless steel screws which retain the input assembly.
- 2.3 Withdraw the input assembly.
- 2.4 Refit the steering wheel without the key and by pulling on the wheel withdraw the input socket assembly. If you are unable to apply sufficient force it is permissible to use a wooden bolster on the hub of the steering wheel and strike with a hammer.
- 2.5 Remove 1 plastic shim which is situated between the input socket and the face of the top bowl casting.
- 2.6 Re-assemble in the opposite order using anti-seize on the cap screws.

The Cobra system is an extremely robust unit and is unlikely to develop any major faults. If damage should occur, the equipment can be stripped down as follows:

- 3.1 Remove compass and top cover plate which is secured via 4 stainless steel countersunk screws.
- 3.2 Remove steering wheel and input assembly as described in section 2.1-2.4.

- 3.3 Disconnect draglink from output lever via aeronut.

3.4 Unship pedestal from cockpit floor by unscrewing four countersunk screws, washers and nuts.

3.5 Grind back weld that secures stainless steel output lever to down tube. Mark relative position of output lever to down tube and then top off output lever.

3.6 Remove 3 off M8 stainless steel bolts and spring washers that secure output socket to pedestal bowl. Withdraw quadrant, downshaft and output socket assembly taking care not to mislay plastic shims fitted between output socket and pedestal bowl.

3.7 Refit in reverse order — *Please note: It is essential to apply Loctite retainer grade 601 to the 3 off M8 bolts/spring washers that secure the output socket to the pedestal bowl. Also apply anti-seize to the input socket and top plate screws. Reseal the compass wire grommet, compass mounting screws and pedestal top plate on re-assembly to prevent ingress of water.*

3.8 If it has been necessary to replace the down tube/quadrant assembly, the output lever will have to be repositioned. Lock the pedestal brake with the quadrant in midship's. If the pedestal is mounted in the normal position, forward of the rudder stock, bias the output lever 15 degrees forward of athwartships on either starboard or portside to match tiller arm. Reweld using stainless steel welding rods.

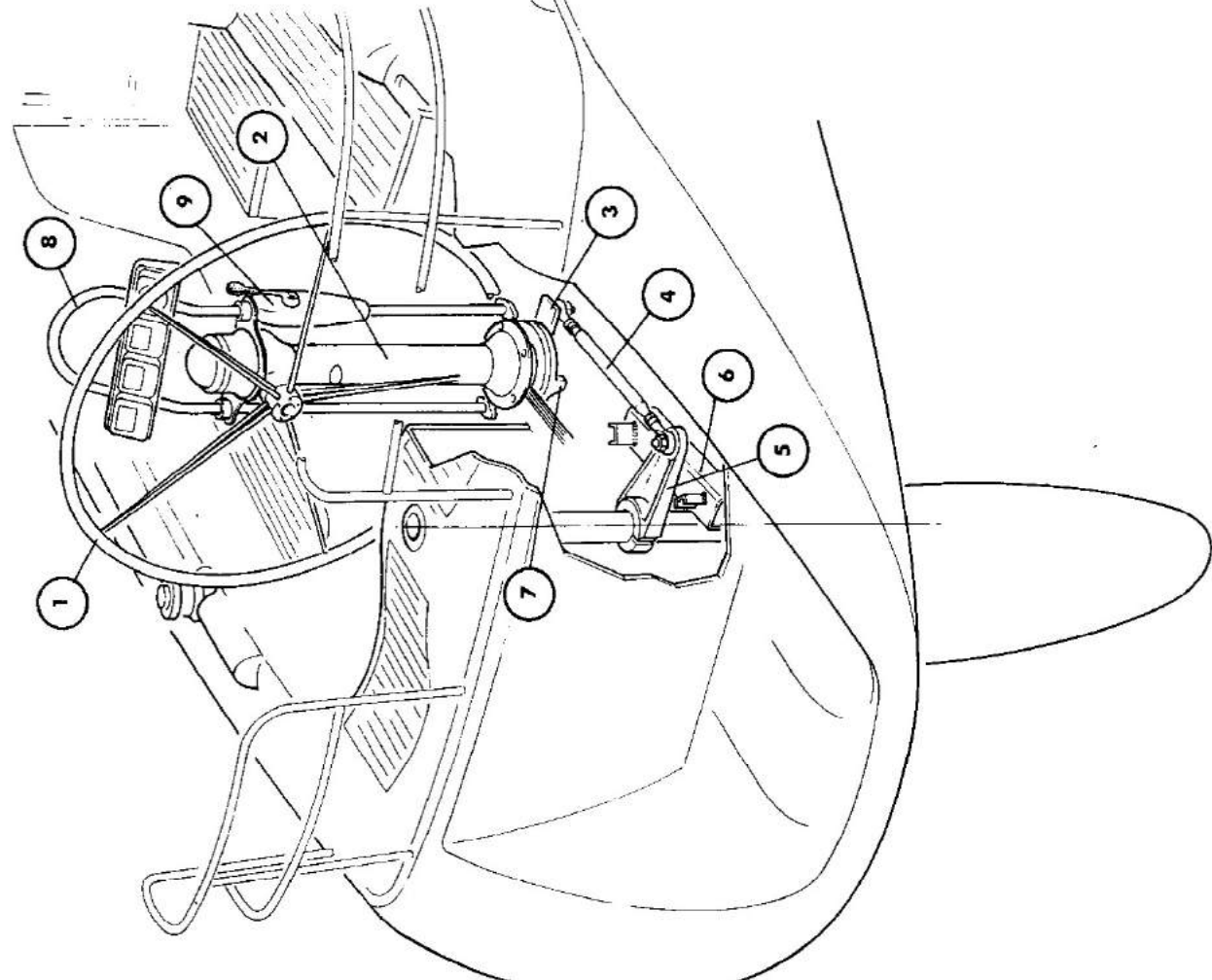
## CAUTION

**Please note that the most likely cause of damage is incorrectly set or missing rudder stops. It is essential the rudder stops operate before the travel limiter in the head of the pedestal. They must be sufficiently rigid to prevent the quadrant from reaching the travel limiter when moderate load is applied to the wheel rim and the tiller is on its stops. Rudder stops must be designed to withstand 150% of the rated load of the steering system. Please refer to the specification page.**

**If in any doubt regarding this point contact your boat builder or local Whitlock agent. No warranty is offered where rudder stops are incorrectly fitted.**

**It is bad seamanship to let go of the wheel whilst manoeuvring the boat astern. In addition, if this maltreatment of the equipment occurs at high speed and the wheel is left to run until the steering reaches its rudder stops, damage can occur to the key, the gearing or the pedestal structure.**

# INSTALLATION INSTRUCTIONS



## General Description

The Cobra system is the world's most popular steering for aft cockpit sailboats and has been continually refined since its inception to provide outstanding performance in 'feel' and reliability. The basic system comprises of five components.

The steering wheel, available in a range of stock sizes from 16" to 48" diameter and Mini Maxi style up to 60". The standard wheel is manufactured from stainless steel and is fully welded and polished. Racing wheels are also available in 6082T6 alloy and all wheels can be fitted with hide covers and spats.

The pedestal contains the rack and pinion gearing and is supplied as standard with friction brake, compass wiring and compass mounting plate.

The output lever is constructed from stainless steel and is normally prewelded to the pedestal down-shaft in the correct position for your installation.

An AHFT10 type stainless steel drag link with teflon lined stainless steel rosejoints is employed on the Cobra 6R Deluxe models, and the larger AHFT12 version is used on the King Cobra derivative. Both types have threaded fittings to allow some final adjustment to be made on site. In general, however, we supply the rod or tube section pre-finished to your specification.

Tiller arms are available to suit rudder stocks from 1"/25mmØ to 5"/125mmØ and can be finished bored and keyed to suit your rudder stock for a nominal charge. Special tiller arms are available for transom mount rudders, severely raked stocks and to accept linear type autopilots.

## Installation — basic steps

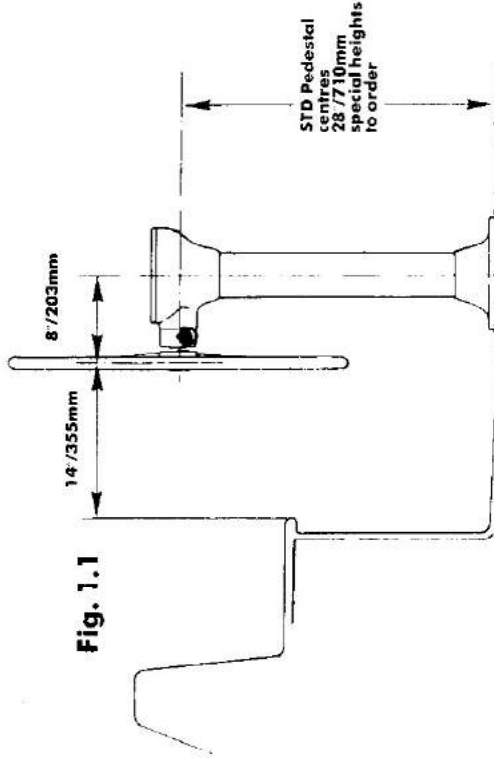
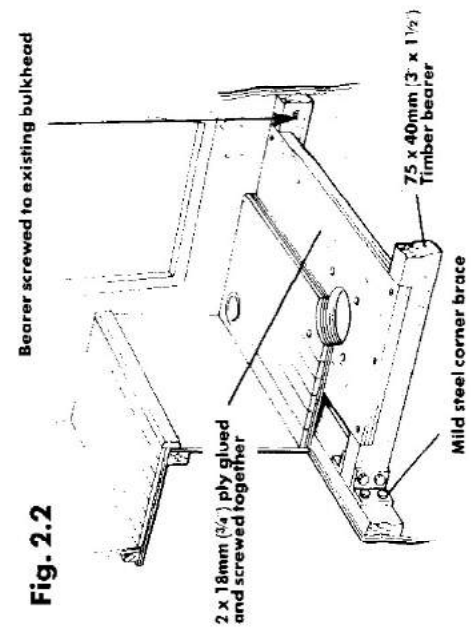
1. Sight pedestal
2. Reinforce cockpit floor if necessary
3. Drill cockpit floor and fit pedestal
4. Fit tiller arm
5. Fit rudder stops or Cobra stop ring
6. Install draglink
7. Test system

## 'Basic components of Cobra systems'

### KEY OF PARTS

1. Steering wheel
2. Pedestal assembly
3. Output lever integral with pedestal
4. Draglink assembly with rose joints
5. Tiller lever
6. (Boat builder supplied) rudder stops
7. Pedestal stop ring
8. Guard rail
9. Single lever engine control

Your Cobra system has been designed and manufactured to the highest standards to provide many years of trouble free service. To aid you with the installation we have prepared these simple guidelines, which are vital to follow if the systems full potential and reliability are to be achieved. The notes should be read carefully before installation is commenced. Should you encounter any problems not covered in these instructions or have any queries please contact your local Whitlock agent who will be pleased to provide technical guidance.

**Fig. 1.1****Fig. 2.2**

Typical application for Plywood cockpits

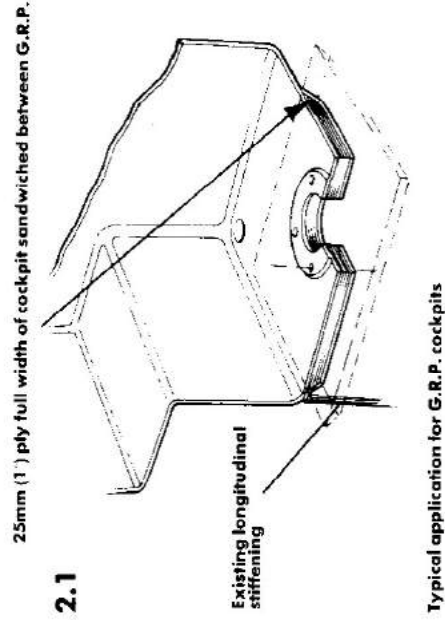
**Sighting the Pedestal**

1.1 The pedestal should be installed in a position where there is adequate space to fully control the craft at all times whilst providing sufficient shelter for the helmsman to brace himself in severe sea conditions. Care should be taken to ensure that it will not obstruct members of the crew from operating bilge pumps, sheet winches and cockpit locker lids, etc. Alternatively these items may require resighting. Where the pedestal is situated near the mainsheet a guard should always be fitted to help prevent the sheet snagging the pedestal in an inadvertent gybe.

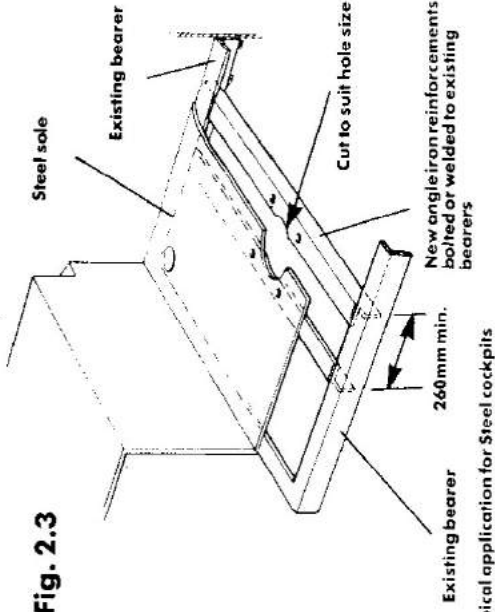
The optimum position for mounting the pedestal relative to a helmsman's seat is shown in Figure 1.1.

1.2 Next check that there is sufficient clearance below the cockpit floor to allow the output lever free movement and for the draglink to operate. In Figure 1.1 the standard output lever position is shown, but special depths are available.

The draglink should operate horizontally  $\pm 5^\circ$  and the rudder stock should next be examined to ensure that the tiller arm can be fitted at the correct height.

**Fig. 2.1**

Typical application for G.R.P. cockpits

**Fig. 2.3**

Typical application for Steel cockpits

**Reinforcement of cockpit floor**

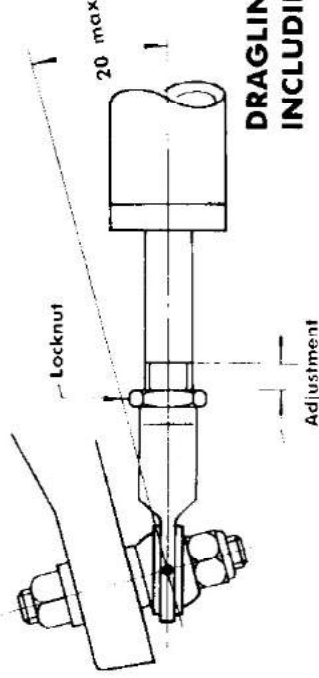
2.1 The cockpit sole must be sufficiently rigid to withstand the steering loads or the force of the helmsman thrown onto the wheel in severe sea conditions without deflecting significantly. As a guideline — for g.r.p. boats the cockpit floor should have a total thickness of at least 40mm. There are many ways of providing additional reinforcement for fibreglass construction and an example is shown in the following illustration, Figure 2.1.

2.2 Where a plywood sole is used, local reinforcing by the way of ply doublers, e.g. 2 x 18mm ply glued and screwed together between fore, aft and transverse bearers should be used. The minimum thickness for solid hardwood should be no less than 50mm (2"), see Figure 2.2.

2.3 Where a steel sole is used local stiffening with 75 x 60 x 6mm angle iron bolted directly to the pedestal mounting bolts and either athwartships or fore and aft existing bearers may be used, see Figure 2.3.

2.4 When finally bolting the pedestal to its reinforcement use either Whitlock pedestal bolt sets incorporating heavy stainless steel washers or supply 4 off 75 x 40 x 6 plates to spread the load.

2.5 We strongly recommend the use of Whitlock pedestal bolt sets which incorporate internal socket countersunk screws. This type of deck bolt has a perfectly smooth seat into the countersink of the deck flange and unlike conventional cross headed screws will not damage the paint finish when tightened.

**DRAGLINK ASSEMBLY INCLUDING ROSE JOINT**

## 6. Rudder Stops

The importance of the rudder stops cannot be over emphasised. They should be designed to operate on the side of the tiller arm, adjacent to the rose joint. They should be sufficiently rigid that at a load of 150% of the maximum rated rudder torque, no significant deflection occurs. It is recommended that a resilient facing is bonded to the rudder stop to absorb some impact loading. A typical example of a rudder stop can be seen in illustration Figure 3.2.

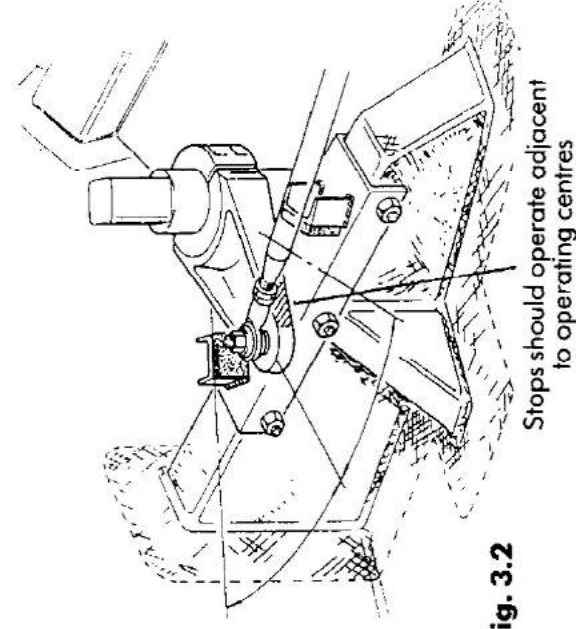


Fig. 3.2

Stops should operate adjacent to operating centres

Where it is not practical to fit stops operating on the rudder stock or tiller arm it may be possible to install the Whitlock stop ring — see section 3.2. It is totally forbidden to use the travel arrester in the head of the Cobra pedestals as a steering stop.

Conventionally rudder travel is set at  $\pm 36^\circ/72^\circ$  total movement. Should you require greater travel it is possible to adjust the lever lengths to accomplish this, but it must be specified in your order to the Whitlock agent, who will confirm the special features and new rudder travel.

3.2 On some boats there is no boat structure to mount rudder stops as above. An alternative system of steering stops is provided by the Cobra stop ring. This fits directly below the pedestal utilising the pedestal mounting bolts. It provides a neat, quick installation with the additional benefit of adding to the stiffness of the cockpit floor. It does not, however, protect the draglink assembly and in the event of a collision, this item could be damaged.

The stop ring is normally supplied predrilled to match the offset angle  $B^\circ$  of the levers. (Please see section 5 on Cobra geometry.)

It may be necessary to manufacture a spacer ring to obtain the correct height for the stop ring — see Figure 3.3. Distance 'x' needs to be adjusted to allow the full edge of the output lever to abut the lug on the stop ring.

Please also check that there is clearance between the underside of the lever and the pedestal bolt 'y'.

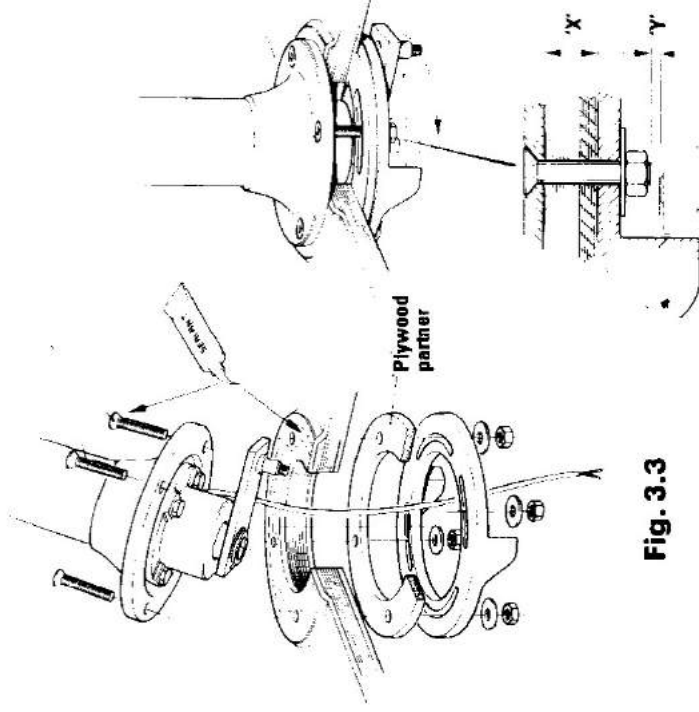


Fig. 3.3

## 4. Fitting Pedestal

4.1 Having checked carefully the correct sighting of the pedestal and reinforced the cockpit floor (if necessary) it is now time to install the pedestal. Mark the centre point of the pedestal and cut a  $6\frac{1}{2}$  153mm diameter hole in the cockpit sole. Offer the pedestal into position, fit the steering wheel and set the unit square to the fore and aft centre line.

4.2 When you have aligned the pedestal mark the 4 off 13mm/ $\frac{1}{2}$  diameter holes to be drilled on the cockpit sole. Remove the pedestal and drill holes. Using a non-setting mastic apply a bead of sealant around the underside edge of the pedestal base. Carefully set the pedestal back in position and insert the four pedestal mounting bolts. Put sealant under the head of the countersunk bolts and tighten using heavy washer and nuts. See Figure 3.3.

## 5. Cobra Geometry

5.1 Before commencing to fit the tiller arm it is important to understand about the offset angles used with the Cobra system. The Cobra system uses a principal known as 'wide angle geometry' which gives very direct steering near midships and an increasing mechanical advantage as the rudder approaches full travel. This results in the most direct, positive system available to a helmsman — a tiller cannot provide this variable ratio!

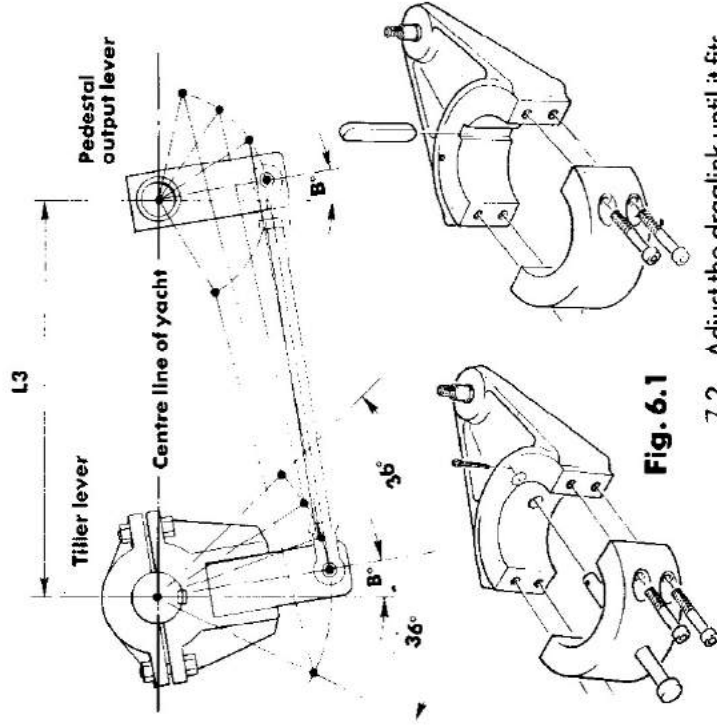
To accomplish this effect the pedestal output lever is shorter than the tiller lever in a ratio of 1.52:1. At midships therefore the tiller arm and output lever are **not** painting athwartships but instead are angled slightly forward. See Figure 4.1. This offset angle is known as  $B^\circ$  and **varies** dependent on the length of the draglink. The shorter the draglink the greater the offset angle  $B$ . In Figure 4.2 we give a table showing the pedestal to rudder stock distance L3 and the corresponding offset angle  $B^\circ$ . If you have instructed us to finish bore and key the tiller arm we will have checked the distance L3 and cut the keyway in the tiller arm to the correct offset angle. If you are finishing the tiller arm yourself please refer to the table in Figure 4.2. Should this be unclear please contact your local Whitlock agent, who will be pleased to 'guide' you through this procedure.

L3mm	$B^\circ$
(distance between pedestal centre and rudder stock)	(lever offset angle forward)
less than 200mm	refer to factory-custom
200-225	25°
226-250	23°
251-300	20°
301-350	17°
351-400	14°
401-500	12°
501-750	10°
751-1000	8°
1000	5°

**Fig. 4.2**

5.3 Please note the above assumes the pedestal is mounted forward of the rudder stock. If the pedestal is mounted behind the rudder stock the same offset angles apply but the levers are **offset aft**.

**Fig. 4.1**



**Fig. 6.1**

## 6. Fitting Tiller Arm

6.1 The tiller arm can be fitted to the rudder stock via a keyway or through bolt, see Figure 6.1.

Conventionally a key is used on a solid rudder stock and a through bolt on a tubular or pipe stock. The tiller arm should be mounted to keep the draglink as close as possible to horizontal — please refer to section 1.2. Please also ensure that the offset angle is correct as described in section 5.

6.2 When fitting the tiller arm ensure an even gap is maintained on either side of the cap and that the bolts are tightened gradually and sequentially.

Do not overtighten the clamp bolts — torque to tighten assembly is 40Nm.

6.3 For rudder stocks raked at an angle of greater than 15° a special tiller arm may be necessary. This information should have been requested when you placed your order and the arm modified for you. If in doubt consult your Whitlock agent before commencing installation.

## 7. Fitting Draglink

7.1 To complete the installation of the basic system it is only necessary to fit the draglink assembly. The tiller lever should already be set at the correct offset angle and the rudder fixed at midships. Check that the friction brake is released and rotate the output lever until it is parallel to the tiller arm.

7.2 Adjust the draglink until it fits over both lever pins and offer into position. There must be at least 1.6mm of draglink thread inserted in each rosejoint.

Refit and tighten aeronuts on lever pins and tighten locknuts on draglink.

Check that the 1/8"/3mm alloy spacer is fitted on lever pin between the rosejoint and face of the output lever.

## 8. Checking Steering Operation

8.1 Ask a colleague to slowly turn the wheel from lock to lock and check that

(a) the tiller reaches its rudder stops before the travel limiter in the head of the pedestal is met.

(b) that the draglink does not foul on the boat structure.

(c) that the rosejoints do not exceed their designed working angle and bind.

8.2 If the above points check out O.K. then ask your colleague to apply moderate load on the wheel with the tiller up against each rudder stop and check that the stops and the cockpit floor do not flex significantly.

The basic installation is now complete. The fitting of a pedestal has now opened up a range of possible accessories to add to your boating pleasure. These include binnacle compasses, guard rails, engine controls, cockpit tables, instrument pads and autopilots. Please refer to the Whitlock catalogue for details of these products and others. We hope you enjoy your Whitlock Cobra steering — the finest system afloat!