

MORETON INVESTIGATOR ASSOCIATION.

TECHNICAL REPORT NO. 9.

TITLE:

SELF STEERING (SHEET TO TILLER).

1. Introduction:

The total commitment to steering our yacht can become a tedious operation on an extended cruise. The pleasure of being relieved of this task when conditions permit is great.

The writer has carried out considerable research into the subject of self steering for yachts prior to writing this report. Volumes have been written on the topic. This short report is not meant as a substitute for the excellent work covered by the authors of these books.

2. Purpose Of Report:

The reason for selecting sheet to tiller steering is explained against the alternative methods.

The basic concepts of sheet to tiller steering for the Investigator yacht are described. Hints for adjustment of the system are given. Some advice on safety is offered.

3. Wind Vane Steering:

The most accurate self steering system for a yacht is a wind vane system. Numerous combinations of vanes, servo rudders and trim tabs are available off the shelf or can be made by the enthusiast.

Complicated, expensive and bulky - these systems do not suit our type of sailing. An excellent treatise of the subject will be found in "Self Steering For Sailing Craft" - J. S. Letcher Jr., International Marine Publishing Co.

4. Sheet To Tiller Steering:

This system detailed below can be set up for approximately \$10.00. The results will be as good as wind vane steering if the skipper is prepared to spend the time fine tuning the rig. Without much bother at all (a bit of trial and error initially) a reasonably accurate course will be held under quite a wide range of wind speeds.

5. Self Steering Equipment List:

- (a) High quality ball bearing block - 50 mm. minimum diameter - (one or two required, see comments later).
- (b) Snap shackle to attach the block to the pushpit (or combing). Ensure that the snap shackle can be attached to the block or you may end up with quite an agricultural arrangement.
- (c) Surgical Tubing - 10 mm. outside diameter, approximately 1200 mm. long is required as a spring. (You can use shock cords but there are two problems - (i) the braided covering tends to give undesirable non-linear stretch characteristics to the cord. (ii) The outer braiding tends to chafe through rather quickly. This material will work.)
Light spear gun rubber is also good for the job.
- (d) You should have some suitable control line on board. You will need two metres of 6mm. plaited yachting line.

That completes the equipment list.

6. Setting Up The Equipment.

- (a) General Principle - Broadly speaking there are two separate forces to be fed to the tiller to enable a good course to be steered. The surgical tubing is used to provide lee helm and so is cleated on the lee side and attached to the tiller (see later for correct adjustment). The action of the surgical tube must be balanced by rudder forces and by sheet forces. A control line is rigged from the main sheet or jib sheet depending on the point of sailing (see later) and is passed through the ball bearing block, shackled to weather rail, and then to the tiller. This system may then be balanced to sail a good course to apparent wind direction.
- (b) Which Sheet To Use - The sheet selected as the controlling influence must be the one most sensitive to changes in wind speeds. It is fortunate that the choice is very simple.

Point Of Sailing	Controlling Sheet
Pointing - Shy Reach - Beam Reach	Main Sheet
Beam Reach - Broad Reach	Jib Sheet
Running Square	Twin Head Sails or Spinnaker (best with no main sail)

(c) Principle Of Operation - With the correct sails for the conditions (ie. not overpowered) and the sails correctly trimmed the system works as follows:

- (i) Changes Of Course - In steady winds the system compensates for a tendency to luff up by an increase in sheet tension due to the increase in apparent wind strength. The sheet tension increases weather helm slightly and corrects course. A slight bearing away decreases apparent wind and sheet tension allowing course correction to windward.
- (ii) Change In Wind Strength - Increased wind velocity results in the control line attached to the sheet increasing weather helm as demanded by the changed conditions and a resultant stable course. The converse applied to reduced wind velocities.
- (iii) Experimentation - It is not possible to detail settings because of the wide range of tuning of rigs, rudders and hulls. The secret is to experiment systematically and record successful settings.

7. Fine Tuning:

(a) Setting The Elastic - The best starting point is to cleat the surgical chord off to provide a very slight amount of lee helm when the chord is fully relaxed.

(b) Setting The Control Line -

- (i) Beating - The control line is rigged to bend one fall of the main sheet (refer fig. 1). The amount of bend is critical - with some trial and error success will come. If the yacht tends to luff with an increase in wind you need more bend and "stiffen" the elastic by moving it forward along the tiller. If she bears away with increasing wind the system is too strong so reduce the bend and move the elastic aft along the tiller.
- (ii) Beam Reaching - Here the control line is set up to take a more direct pull on the sheet. The control line must be bent to the main sheet with a rolling hitch onto the fall line of the main sheeting system and the jam cleat must be freed. Refer to fig. 2 for details.

7. (b) cont..

- (iii) Broad Reaching - The controlling sheet in this case is the jib sheet. A control line can be bent onto the sheet and the set up is then similar to the previous system. For reasons of convenience when moving around the cockpit a second sheave block on the lee rail will make the system tidier. Tacking downwind is recommended (refer to fig. 2 for details).

8. Safety:

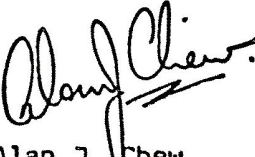
This is a critical aspect of using any self steering system. Two matters deserve your serious consideration.

- (a) A watch should be maintained at all times.
- (b) A life line or life jacket should be worn if you are on deck alone. Falling overboard under these circumstances without taking these precautions will probably cost your life.

9. Friction And Backlash:

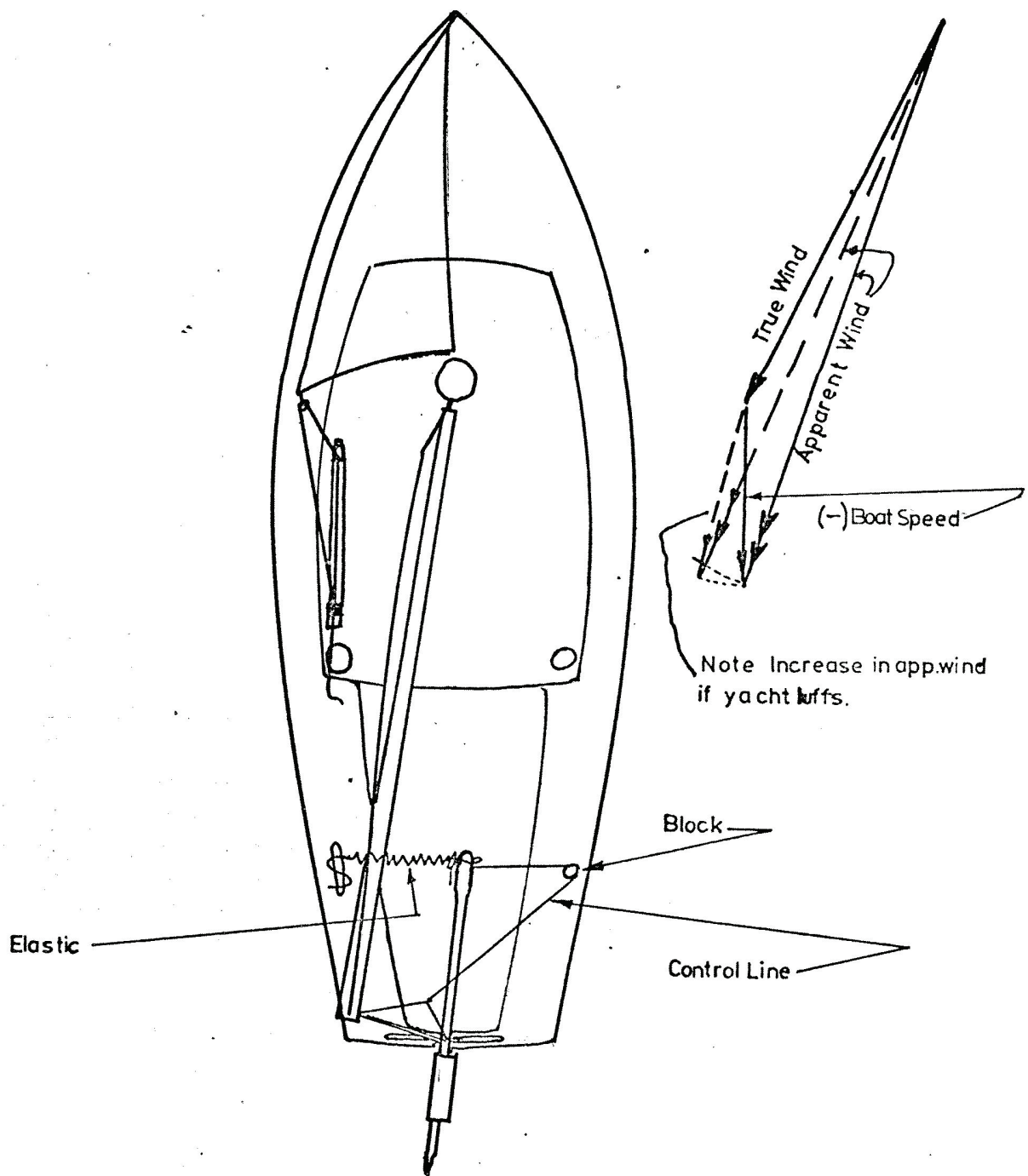
All control systems are plagued by these two problems. The effectiveness of the system depends greatly on the minimisation of friction and the elimination of backlash. The following steps are essential -

- (a) The tiller must fit tightly into the rudder with no sideplay. Use a wedge to eliminate free play.
- (b) Run the control line as directly as possible to the tiller and use good quality large diameter sheave blocks where they are required.



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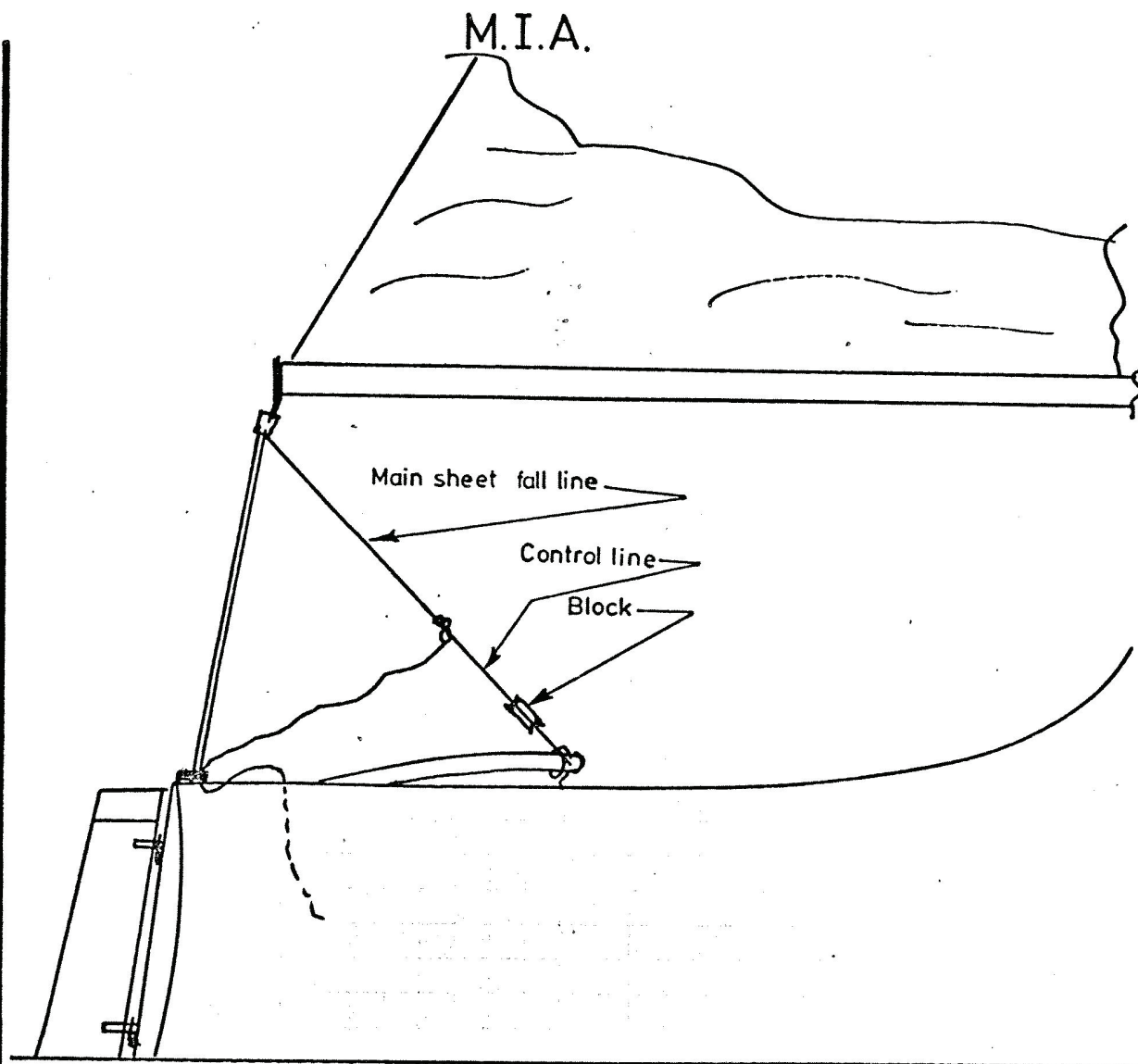


Sheet To Tiller Steering
Close Hauled

Alamy Chew

FIGURE 1

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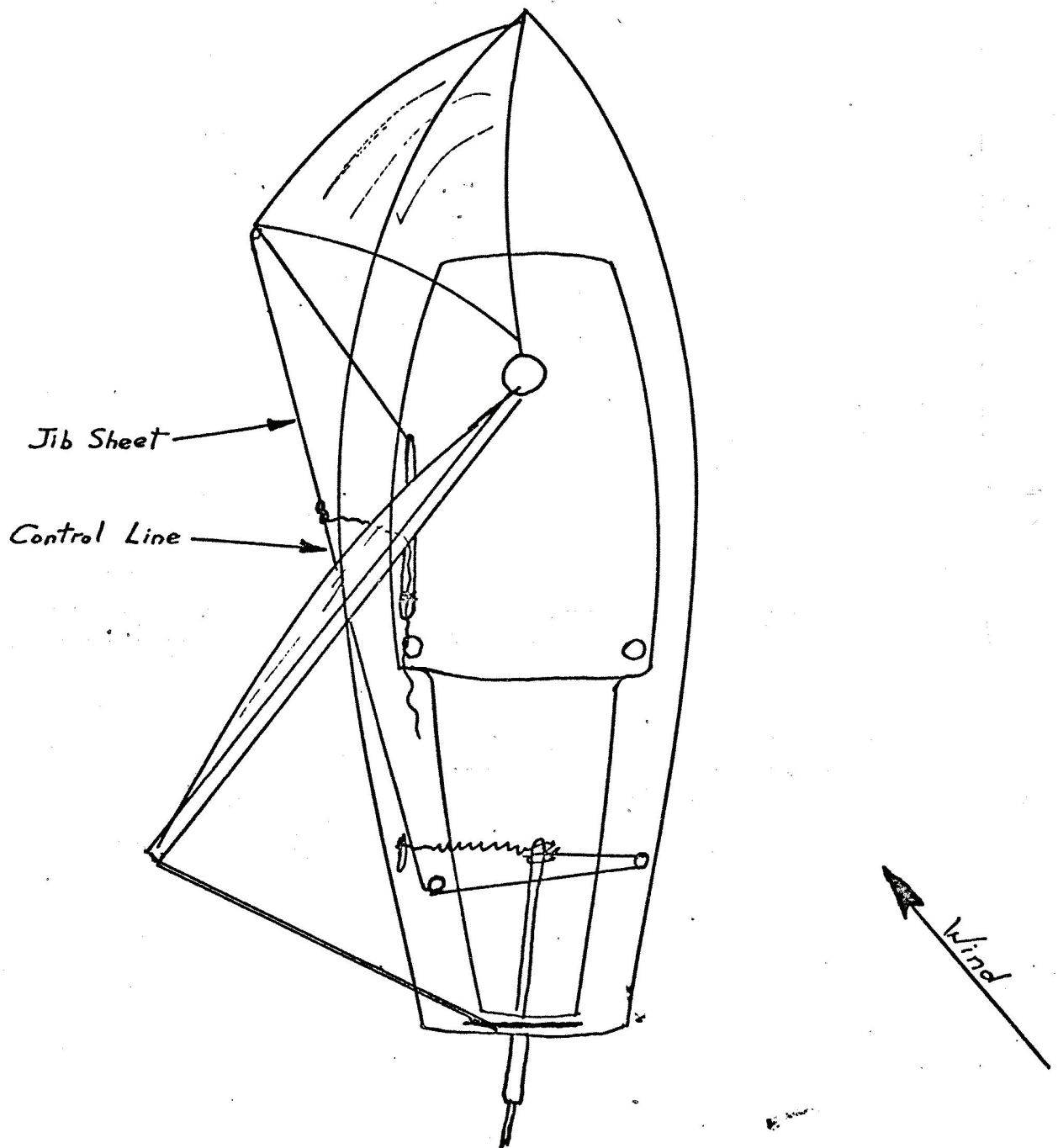
Sheet to Tiller Arrangement _
For Beam Reach.

Figure _2.

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Sheet To Tiller Steering
Broad Reach

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FIGURE - 3 - Report No 9.