2.3.1 Function Selection

Our first example will be to select another function for one of the pages**.** The new function is Stored Log and since we want to place this function in the bottom display we will be using the **Scroll Down** Key.

(1) Press the **SPD/DEP** Key until the display is showing BOAT SPD in the upper display and DEPTH in the lower display.

(2) Press **Scroll Down**, the lower text now shows DEPTH flashing, the upper display is not affected.

(3) Press **Scroll Down** until the lower text shows LOG flashing, the upper display is not affected.

(4) Press **Enter**, the lower text now shows STD LOG flashing, the upper display not affected.

(5) Press **Enter** again, the lower display now shows required function, the upper display is not affected.

We are now able to view this function; press the **Page** Key, the configured pages will return and Stored Log will no longer be displayed**.** If you wish to keep Stored Log on a page, then you can configure the page.

2.3.2 Page Display Configuration

The **Page** Key allows the user to configure four pages per FFD depending on the required use at that position.

To store the setting in Paragraph 2.3.1 as a permanent new page, proceed as follows:

(1) Press **Scroll Up** or **Scroll Down** and scroll text to CNFG DSP.

Note
Scroll Up or **Scroll Down** can be used because we are configuring the whole page, both upper and lower displays.

(2) Press **Enter**, PAGE is shown in the appropriate display.

(3) Press **Enter**, the digital display is blanked and the two functions selected are displayed in the text.

Note
At this point, either of the two functions may be changed if required using the **Scroll Up** or **Scroll Down** Keys.

(4) Press **Enter** to accept the new page configuration and restore the digital display.

You will be able to set up each FFD on the boat for the people in the immediate vicinity, each crew member being able to develop their own pages for the information that is most needed on the FFD**.** All page displays are held in the display memory, independent of the power supply**.**

2.3.3 NAV Key Configuration

Our second example is configuring the NAV key. The NAV key allows the user to select either Rhumb Line or Great Circle navigation information to be displayed. To select the required mode, proceed as follows:

(1) Press the **Page** Key once.

(2) Press **Scroll Up** until the upper display shows CNFG DSP flashing.

(3) Press **Enter**, the upper text now shows PAGE flashing.

(4) Press **Scroll Up** to select either NAV MODE GC (Great Circle) or NAV MODE RH (Rhumb).

(5) Press **Enter** to select your desired choice. The display will stop flashing.

2.3.4 Damping Adjustment - Boat Speed

Our third example is the entry of a Damping Value**.** To find out if it is possible to damp a function you should refer to Table 1.2**.** We want to damp Boat Speed which is in the upper display we therefore use the **Scroll Down** Key.

(1) On the upper display select BOAT SPD.

(2) When BOAT SPD is shown in the upper display, press and hold **Scroll Down** to select DAMPING which flashes in the lower text.

(3) Press **Enter** and the current damping value is displayed on the lower display.

(4) Press **Enter** and DAMPING value flashes.

(5) Press **Scroll Up** or **Scroll Down** to increase/decrease the damping value as required.

(6) Press **Enter** to accept new value.

(7) Press **Page** to return to normal display.

Damping control for any of the other functions that can be damped is completed in a similar manner.

2.4 EXAMPLES OF CALIBRATION

The method of calibration for your Hercules 2000 System should be made clear by following the examples of calibration**.** The calibration process is described in detail in Part 3 - Calibration.

2.4.1 Manual Calibration Adjustment - Boat Speed

(1) Select BOAT SPD.

(2) If BOAT SPD is in the upper display, press and hold the **Scroll Down** Key to select CALIBRATE from the menu.

(3) Press **Enter** then press **Scroll Down** and the display shows MANL CAL, which is the choice that we require.

(4) Press **Enter** and the display shows SINGLE.

Notes

1. SINGLE is the choice required if a single paddle-wheel or sonic speed is fitted.
2. If two paddle-wheels are fitted, the **Scroll Up** or **Scroll Down** Keys should be used to select PORT CAL or STBD CAL, as required.

(5) Press **Enter** to reveal the current calibration value in Hertz/knot.

(6) To adjust the calibration value, press **Enter** and the value flashes.

(7) Use **Scroll Up** or **Scroll Down** to change the calibration value as required to the new calibration value.

(8) Press **Enter** to store the new value into the system.

(9) Press **Page** to return to full display.

2.4.2 Calibration Adjustment - Depth

(1) Select DEPTH.

(2) When DEPTH is shown in the upper display, press and hold the **Scroll Down** Key to select CALBRATE from the menu.

Note
Scroll Down is used because we are using an Operation Menu Choice relating to the function on the upper display**.** If DEPTH is in the lower display then **Scroll Up** must be used.

(3) Select **Enter** and the display shows DATUM which flashes.

(4) Press **Enter** again, DATUM stops flashing and the current datum value is displayed.

(5) Press **Enter** and the DATUM value flashes.

(6) Use **Scroll Up** or **Scroll Down** to select the new DATUM value.

Note
If DATUM is referenced to the water line, the value is positive**.** If DATUM is referenced to the keel line, the value is negative and this is indicated by a minus sign in the left digit.

(7) Press **Enter** to store the new DATUM value into the system.

(8) Press **Page** to return to full display.

2.4.3 Calibration Adjustment - Wind Angle

(1) Select APP W/A.

(2) If APP W/A is shown on the lower display press **Scroll Up** and scroll to CALBRATE which flashes. If APP W/A is on upper display, press **Scroll Down** and scroll to CALBRATE.

(3) Press **Enter** twice and the current alignment value is shown.

(4) Press **Enter**, MHU ANGL flashes, use **Scroll Up** or **Scroll Down** to select the new value.

(5) Press **Enter** to accept the new value.

(6) Press **Page** to return to the normal display.

2.5 ALARMS

2.5.1 Alarm Control

When a pre-set alarm parameter is reached, e.g. the depth reducing, the system raises an alarm automatically. In an alarm condition, the lower display changes to highlight the cause of the alarm, which flashes on and off continuously until **Enter** is pressed twice; at which point all the FFDs except the one on which **Enter** was pressed, return to normal. The audible alarm, if fitted, is also silenced by this key operation. After this, the lower display continues to monitor the alarm condition.

The alarm is still active and, if the alarm parameter is again exceeded, the alarm will flash/sound as necessary. The displayed alarm function remains on the lower display until **Page** is pressed.

2.5.2 Alarm Types

The system incorporates the following types of alarm:

HI ALARM - This is generated if the value of a function exceeds a pre-set level.

LO ALARM - This is generated if the value of a function drops below a pre-set level.

SECTOR ALARM - This is generated when the heading leaves the safe sector as shown in Fig 2.2. - Sector Alarm.

Example

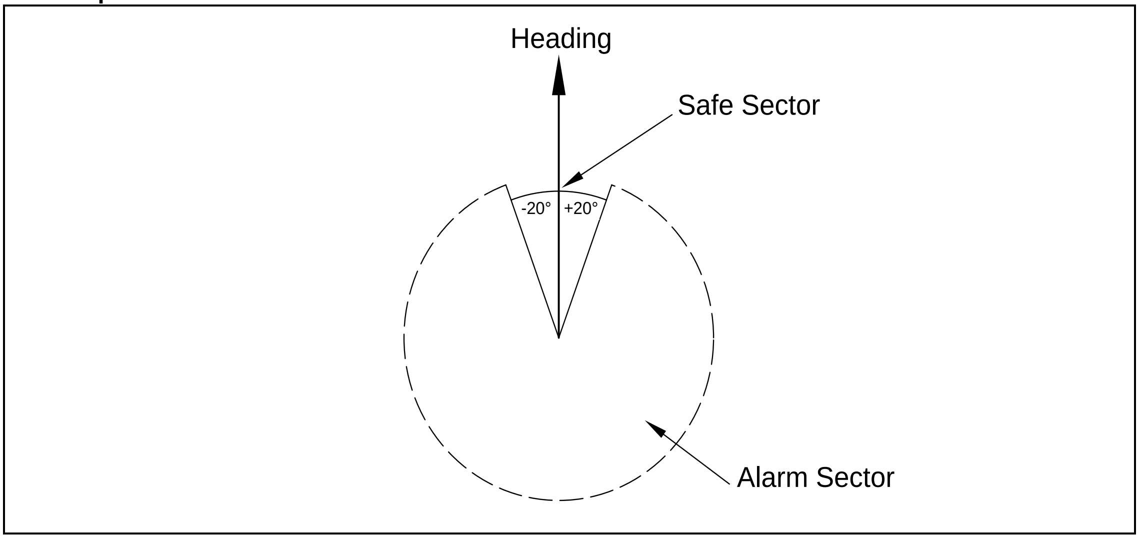

Fig 2.2 - Sector Alarm

For example, when the SECTOR alarm is turned on, the alarm reference heading is the current compass heading**.** If the SECTOR alarm is set at 40 degrees, the sector value is the compass heading +/- 20 degrees**.** It is therefore important to switch the SECTOR alarm OFF before carrying out a course alteration, switch the alarm ON again when settled on the new course heading.

Any alarm can be switched ON and OFF individually, or all alarms can be turned OFF collectively.

2.5.3 Set Lo Alarm - Depth

(1) Select DEPTH on the display.

(2) Press **Scroll Up** or **Scroll Down** to scroll text until ALARMS appears flashing.

(3) Press **Enter**, text shows ALL OFF flashing.

(4) Press **Scroll Up** until upper text shows LO ALARM flashing.

(5) Press **Enter**, the display shows current LO ALARM value.

(6) To change the LO value press **Enter**, the value flashes.

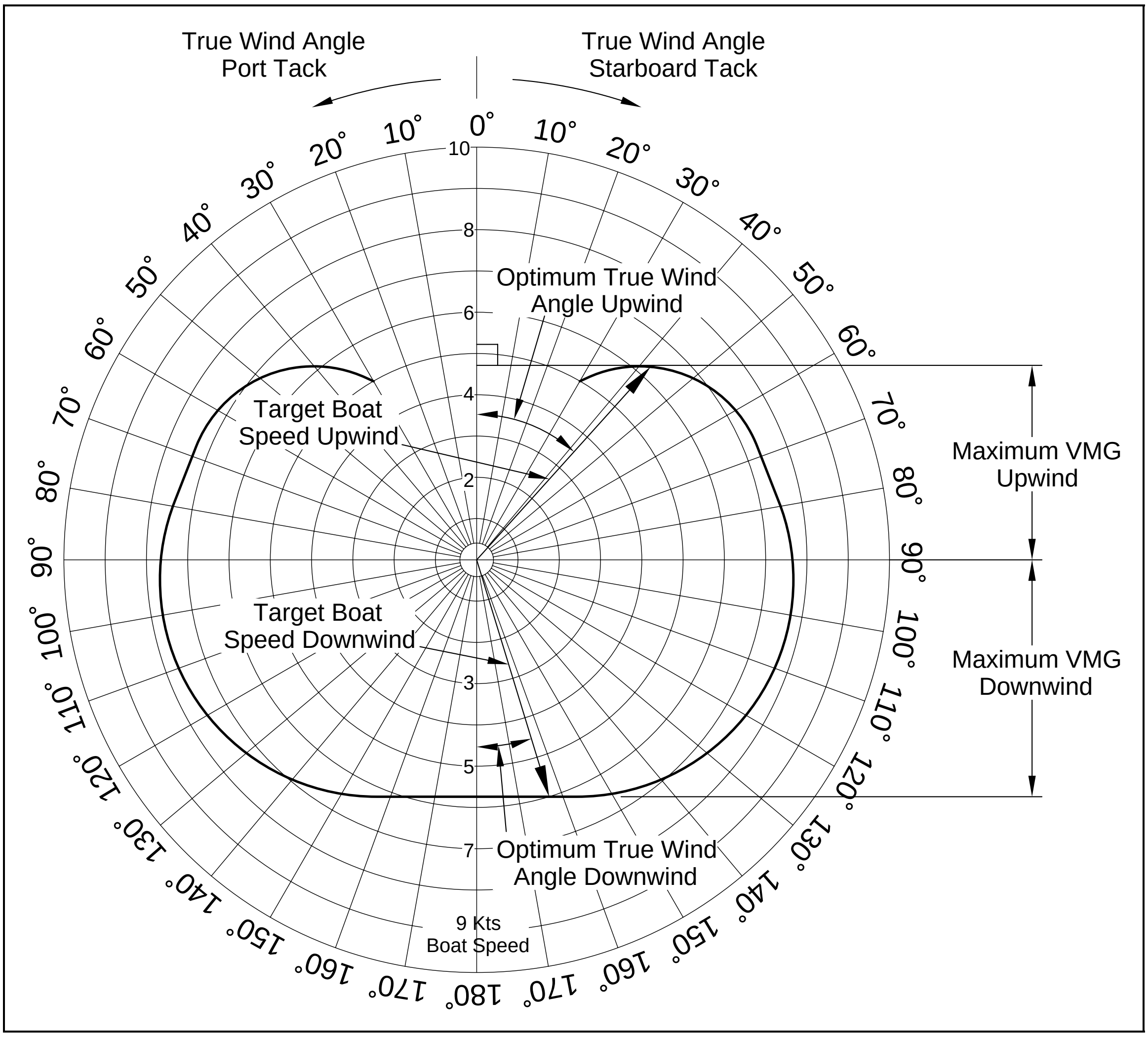

Fig 2.4 - Polar Performance Curve

The advantage of tacking performance over VMG is that it takes into account changes in windspeed. You should also be aware of the potential inaccuracies caused by your polar table being incorrect.

Tacking Performance has a CALBRATE option which allows you to choose a type of polar table which equates to your type of yacht**.** In the next Paragraph, Target Boat Speed, we discuss polar tables in general and the implications of this choice.

2.9.40 Target Boat Speed

Menu heading:	PERFORM
Function text:	TARG SPD
Update rate:	Once per second
Units:	Knots

Note
At optimum wind angle.

This is the boat speed at which the optimum VMG will be achieved, and can be measured from the polar table or obtained by careful analysis of both VMG and boat speed while you are sailing.

The polar table describes the performance of the boat in all conditions of true wind speed and angle. The boat speed is plotted radially against the true wind angle for each true wind speed in turn. The result is a diagram as shown in Fig 2.4 - Polar Wind Curve, which shows the boat speed plotted for just one value of true wind speed.

Polar tables can be derived either by theoretical predictions, the IMS certificate for instance, or by analysing the boat's actual performance. You may well use one of these techniques to obtain your polar table, however, if you do not, then the Hercules 2000 has one polar table already stored in its memory. A copy of this polar table is shown in Table 2.1 on page 2-47.

The polar table is located within the Hercules 2000 system under the following:

PERFORM → TACKING, **CALBRATE → CAL VAL1 (TAB TYPE)**

It can then be scaled to your rating using the RATING Menu choice, which is at the same level, and found by:

PERFORM → TACKING, **CALBRATE → CAL VAL2 (RATING**)

These values are entered in the normal manner.

Once you have understood and developed the polar table it will improve all the performance functions: reaching and tacking performance, optimum wind angle and target boat speed, as well as the predictions of next leg.

We can see from Fig. 2.4 how the target boat speed is obtained from the polar tables. It is the point at which a perpendicular drawn to the 0 degree true wind angle first touches the curve, hence optimising speed in a windward direction. The boat speed on the curve at this point becomes the target boat speed for that wind speed, and the true wind angle at that point becomes the optimum wind angle. The two combined give the optimum VMG and so allow us to calculate tacking performance.

2.9.41 Tidal Set and Drift

Menu heading:	NAVIGATE
Function text:	TIDE SET or TIDE RTE
Update rate:	Once per second
Units:	Degrees magnetic, knots

Notes
1. Damping 0-99 minutes.
2. Calibration: Magnetic variation.
3. Some position fixers output the current local magnetic variation on the NMEA 0183 port using either HVD, HVM, RMA or RMC sentences. As a result, CAL VAL1 on the TIDE SET function will be automatically set to the correct variation.

Your position fixer will either supply true or magnetic bearing to the Hercules 2000. If it supplies true bearing then you must enter the magnetic variation into the Hercules 2000. It is found in the menu under:

NAVIGATE → TIDE SET, **CALBRATE → CAL VAL 1 (MAG VAR)**

Note
If your position fixer sends magnetic bearing, check that the variation is correctly entered.

The calculation involves comparing the course and speed over the ground, from the position fixing system, to the course and speed of the boat through the water, from the dead reckoning. Any differences are due to the tidal set and drift, and can be displayed as such. To make this accurate the dead reckoning requires the leeway input which in turn, requires the clinometer to measure heel angle.

The damping on this function is adjustable and can be important. In rapidly changing tidal situations you need to lower the damping down as far as possible to be able to see the changes quickly. Conversely, in a steady tide or current the longer the period over which the calculation is averaged, the more accurate the results will be.

The lag in the position fixer's ability to adjust to rapid changes in direction, such as tacks, should also be borne in mind when considering the results of this function. Frequent tacking produces figures which are unreliable and should be treated with caution.

2.9.42 Timer

Menu heading:	TIME
Function text:	TIMER
Update rate:	Once per second
Units:	Hours, Minutes, Seconds

Note
Individually resettable.

Used for both the start and to record elapsed time during a handicap race. The timer will act as either a stopwatch or a countdown from 5, 10 or 15 minutes.

The **Enter** Key will toggle the display between minutes/seconds and hours/minutes. Paragraph 2.6.1 describes control of the timer.

2.9.43 Time to Layline

Menu heading:	TIME
Function text:	TIME L/L
Update rate:	Provide by the position fixer
Units:	Hours, minutes, seconds

Note
Requires NMEA 0183 interfaced position fixing system transmitting the ZDL sentence.

This function is linked to Layline Distance. The information displayed shows the time to go before reaching the appropriate layline. A value of zero indicates time to tack or gybe.

2.9.44 Time to Waypoint

Menu heading:	WAYPOINT
Function text:	ETA WPT
Update rate:	Provided by the position fixer
Units:	Hours, minutes

Note
Also gives ETA. Requires interfaced position fixing system.

This is calculated directly by the position fixer, and is based on your speed over the ground towards the mark, which is assumed to be constant.

2.9.45 Trip Log

Menu heading:	LOG
Function text:	TRIP LOG
Update rate:	Once per second
Units:	Nautical miles

Note
Individually resettable.

This is the resettable log for trip recording and reads from the time started in nautical miles. It must be remembered that this is the distance sailed through the water, not over the ground. It also forms part of the calculation for Average Speed. A particularly useful feature is that when reset prior to the start of the race, the Timer counts down to zero, the Trip Log (and any other trip functions that have been reset) start automatically.

The Trip Log display can be expanded to display 9999nm by pressing **Enter**. See Paragraph 2.6.2 for details of trip function control.

2.9.46 True Wind Angle

Menu heading:	WIND
Function text:	TRUE W/A
Update rate:	Once per second
Units:	Degrees

Notes
1. Relative to the boat's heading.
2. Corrected for masthead and other errors via the look-up table.
3. Variable damping 0-99 seconds.

The true wind is calculated from the vector triangle shown in Fig. 2.5. This uses the apparent wind speed, apparent wind angle and the boat speed in the calculation. The results are then corrected by the true wind correction tables, which are discussed in Part 3 - Calibration.

Note

The true wind is the wind relative to the water, not the land. The true wind is not the same as the ground wind, unless there is zero tide.

The true wind angle is the angle between the boat's heading and the true wind. It is probably used downwind more often than upwind, when it is easier to steer to a wind angle than to a boat speed. In addition, the Tactician will find it very useful for gybing angles downwind.

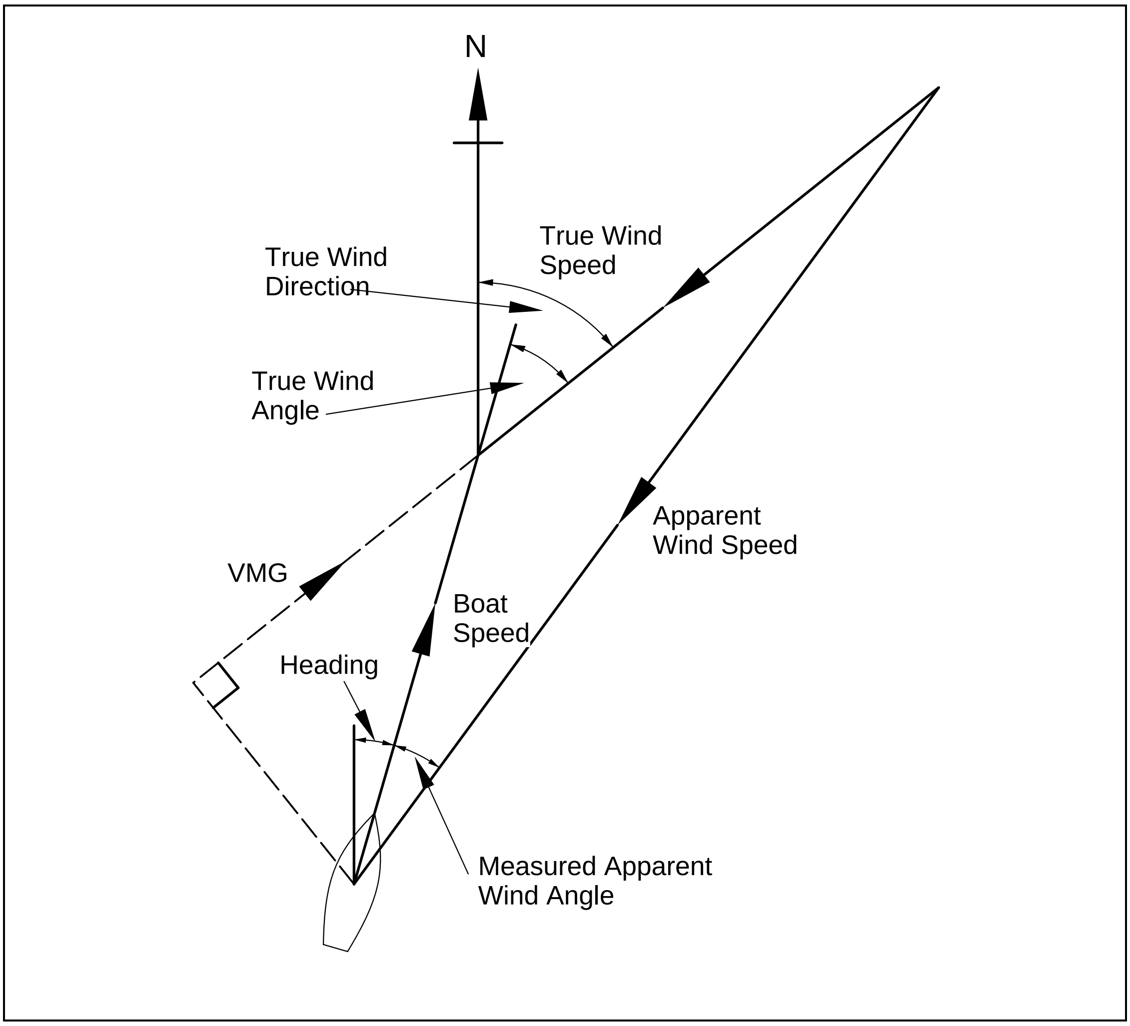

Fig 2.5 - True Wind Angle

2.9.47 True Wind Direction

Menu heading:	WIND
Function text:	TRUE DIR
Update rate:	Once per second
Units:	Degrees magnetic

Notes

1. Magnetic compass point
2. Corrected for Masthead and other errors via the look-up table, see Part 3 - Calibration.
3. Damping control via true wind angle and heading.

This is the Tactician's greatest ally in the search for the right wind shifts. It shows the compass direction that the wind is coming from regardless of the boat's heading. It is the easiest way to pick up changes in the wind direction that can be used to tactical advantage. It is calculated from the true wind angle and heading, and is corrected for calibration errors by the true wind look-up table. It is very important to understand the function of this, in order to have an accurate true wind direction. It is fully explained in Part 3 - Calibration.

2.9.48 True Wind Speed

Menu heading:	WIND
Function text:	TRUE W/S
Update rate:	Once per second
Units:	Knots, metres per second

Notes

1. Corrected for masthead and other errors via the look-up table, see Part 3 - Calibration.
2. Variable damping 0-99 seconds.

True wind speed is required by the trimmers for decisions on sails choice and as a check of sail trim when the wind changes. As the wind varies the helmsman will need to let the boat speed increase or decrease to bring it onto the new target boat speed. The true wind provides a good check of the intuitive results.

When the boat is sailing downwind, the air passing over the mast is accelerated, and in the past this has tended to make the true wind speed over-read. The Hercules 2000 has introduced a calibration for this which will allow you to correct out the error, it is explained in Section 3.6

2.9.49 VMG to Waypoint

Menu heading:	WAYPOINT
Function text:	VMG WPT
Update rate:	Provided by the position fixer
Units:	Knots

This is another function which is directly calculated by the position fixing system**.** This can be a very important function on free legs, particularly if you are a long way from the mark, since the greatest VMG to Waypoint is not necessarily obtained by sailing straight at the mark**.** In Fig 2.6 we can see how this works.

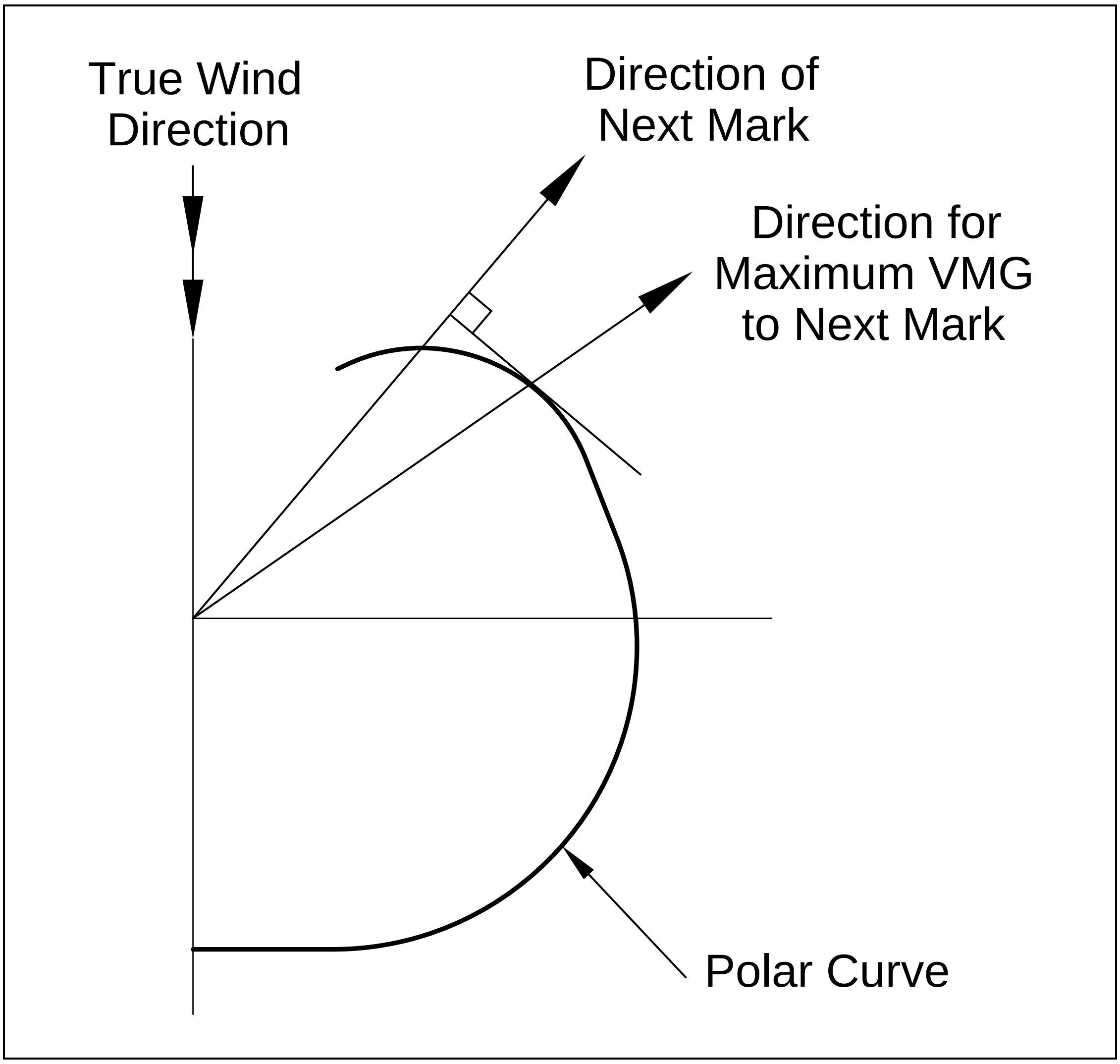

Fig 2.6 - Optimum VMG to a Mark

2.9.50 VMG

Menu heading:	SPEED
Function text:	VMG
Update rate:	Once per second
Units:	Knots

Note
Upwind/downwind.

As a measure of performance VMG has both advantages and disadvantages**.** It is calculated from the true wind angle and the boat speed.

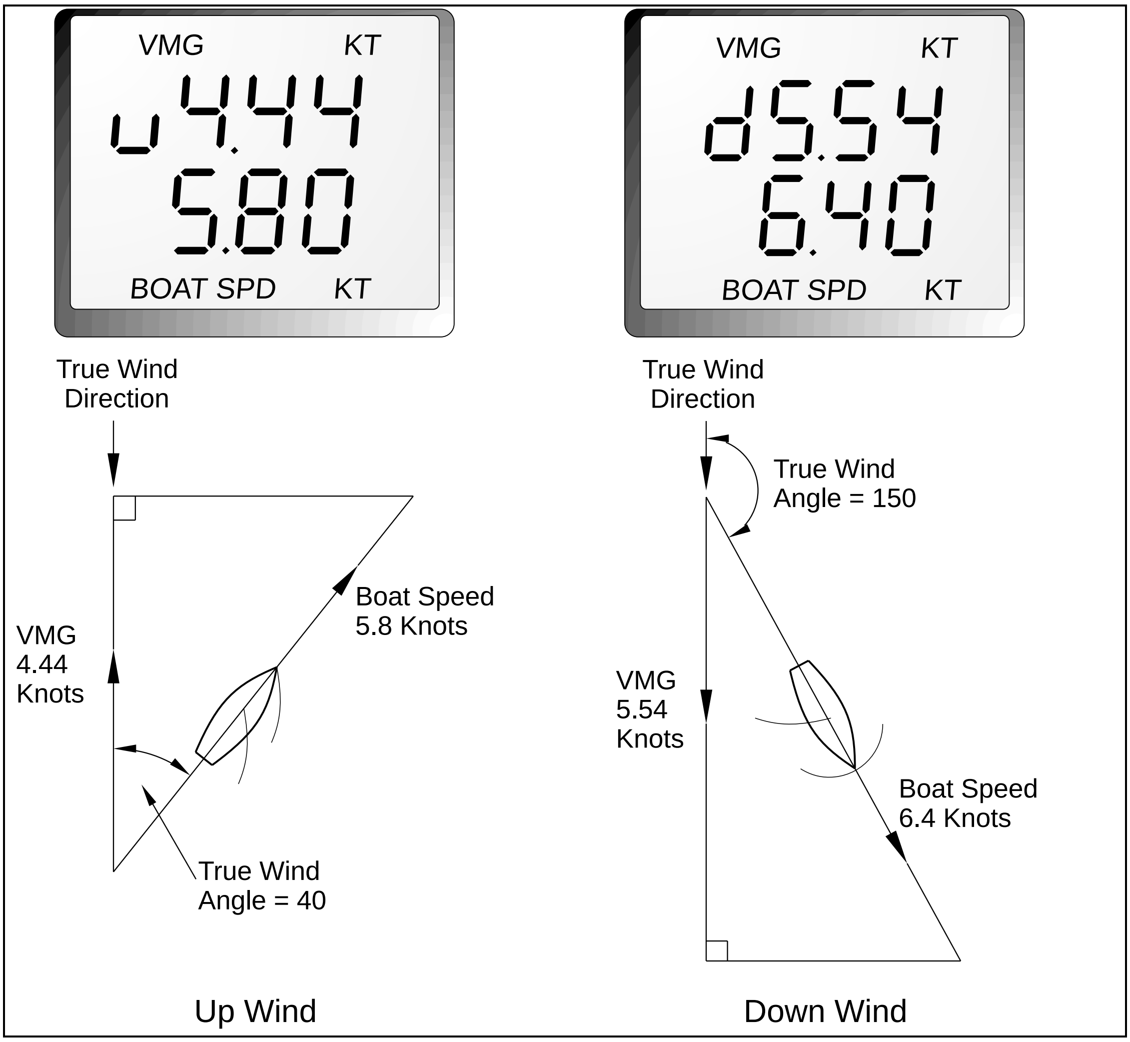

Fig 2.7 - Calculation of VMG

VMG can measure the performance upwind and downwind much more effectively than boat speed, since it takes into account how close the boat is sailing to the wind**.** However, it is not possible for the helmsman to sail to it directly because of the momentum of the boat. As the boat sails closer to the wind, the VMG will initially rise because the boat will hold its speed due to the energy contained in its momentum. VMG increases, and the helmsman, seeing this, would be encouraged to sail even closer to the wind thus increasing the VMG still further. Ultimately the boat will be head to wind and stop dead. VMG will then drop.

Because of this, the technique has been developed of analysing the boat's performance to find out at which speed the greatest VMG occurs.

Once this is known the helmsman steers to this target boat speed knowing that this is optimising their upwind or downwind performance.

Whilst VMG is an important part of sailing technique, it should be checked by someone other than the helmsman. This person should develop a feel for the boat speeds when the greatest VMG is attained and then communicate these to the helmsman.

2.9.51 Wind Angle to the Mast

Menu heading:	PERFORM
Function text:	W/A MAST
Update rate:	Once per second
Units:	degrees

Note
Requires mast rotation sensor

When the mast rotation sensor is fitted, this measures the apparent wind angle to the mast's centreline, thus giving the actual attack angle of the entry of the sail to the wind.

Table 2.1 - Polar Table 0

	TRUE WIND SPEED IN KNOTS									
TRUE WIND ANGLE	2.5	5.0	7.5	10.0	12.5	15	17.5	20	22.5	25
20	1.56	2.70	3.57	4.10	4.50	4.80	5.00	5.20	5.50	5.40
30	1.87	3.04	4.04	4.88	5.30	5.66	5.95	5.99	6.15	6.20
40	2.08	3.29	4.40	5.49	5.99	6.54	6.78	6.87	6.86	6.75
50	2.13	3.52	4.67	5.90	6.50	6.95	7.23	7.33	7.35	7.29
60	2.19	3.75	4.95	6.09	6.69	7.07	7.36	7.45	7.51	7.50
70	2.10	3.83	5.22	6.18	6.79	7.22	7.48	7.58	7.67	7.72
80	2.02	3.91	5.40	6.27	6.88	7.30	7.61	7.73	7.89	7.95
90	2.00	3.90	5.45	6.31	7.02	7.45	7.74	7.88	8.11	8.18
100	1.98	3.85	5.40	6.39	7.10	7.59	7.87	8.03	8.30	8.39
110	1.99	3.76	5.26	6.39	7.11	7.65	7.96	8.19	8.40	8.50
120	1.97	3.65	5.08	6.30	7.06	7.65	8.00	8.30	8.43	8.53
130	1.90	3.50	4.90	6.00	6.87	7.51	7.96	8.21	8.36	8.48
140	1.87	3.25	4.60	5.67	6.67	7.38	7.80	8.10	8.28	8.42
150	1.84	3.01	4.20	5.23	6.30	7.04	7.56	7.93	8.19	8.37
160	1.80	2.80	3.90	4.80	5.80	6.60	7.20	7.70	8.05	8.27
170	1.75	2.60	3.65	4.50	5.50	6.31	6.96	7.53	7.93	8.22
180	1.70	2.40	3.42	4.30	5.29	6.02	6.83	7.44	7.88	8.17
OPTIMUM VMG	1.80	2.85	3.79	4.34	4.69	5.00	5.23	5.33	5.37	5.32
OPT TWA U/W	40	39	38	37	36	35	34.5	34	34	33.5
OPTIMUM VMG	1.80	2.70	3.70	4.80	5.70	6.20	6.80	7.40	7.80	8.10
OPT TWA D/W	157	158	160	161	162	163	165	168	170	172