PACIFIC PLUS

WELCOME

WELCOME …

… to the world of silent self-steering!

Prepare to be pleasantly surprised by your new windvane steering system: life aboard will never be the same again!

Learn to trust your new live-aboard guest. Enjoy the moment you realise it can steer with the kind of stamina and prolonged precision we can only dream of. Hand over to your tireless new mate and make the most of all the time it leaves you for other things. Life aboard will become much more relaxed; time at sea will be generally more restful. And those long trips that were once all but inconceivable are now very much within your grasp.

We at WINDPILOT are almost as single-minded as our windvane gears. We have been continuously developing and refining our systems for more than 30 years now - and all that experience comes free with every system sold. You will notice the difference: we have left no stone unturned!

KISS (keep it simple, stupid) - that's the motto we live by at WINDPILOT. We realise that manuals are probably well down your list of reading priorities, but there are mistakes to be made and they can be avoided. Good advice is particularly valuable at sea, especially if you have it there on board with you, so take a deep breath and read on…

You expect good steering from your WINDPILOT and it, in turn, has certain expectations of you:
- DON'T NEGLECT YOUR SAIL TRIM
Poor trim amplifies weather helm, which means more pressure on the rudder and less boat speed. Don't sail with the handbrake on! A well trimmed boat heels less and requires less pressure on the rudder. That means it sails faster. Adjust the mast, trim the sails: try it, you have plenty of time!
- BE AWARE OF THE CONDITIONS
Some combinations of wind and sea conditions will be too much for your windvane gear: imagine trying to steer around breaking waves with your eyes closed, for example.
- MAKE SURE YOUR WINDPILOT IS PROPERLY INSTALLED
Install it with care, treat it well and be prepared to give it a little attention now and again.
- TALK TO US, PREFERABLY RIGHT FROM THE START
If you would like confirmation that your system is properly installed and that everything is just right, send us a few photos of your WINDPILOT set up and ready for action. Pictures tell it like it is and make it easier for us to help you.

You have our word on it - lazy days at sea await… at least as far as steering is concerned…

Peter Förthmann

PACIFIC PLUS

1.0 INSTALLATION

1.1 TOOLS

- rule
- pencil
- 2.5 mm, 5 mm, 6 mm, 8 mm and 10 mm Allen keys (included in delivery package)
- 9 mm and 10.5 mm drill bits
- 10 mm, 17 mm and 19 mm ring/fork wrench/spanner
- Sikaflex sealing compound
- rubber mallet
- drill

1.2 INSTALLATION OPTIONS

MP 0 standard bracket left/right 900/910
MP 1 standard bracket with extension left/right 920
MP 2 standard bracket with tubular extension left/right 930
MP 3 standard bracket with tubular extension and cross brace 940/941/955

Where two digits are given, the first refers to the UPPER mounting bracket type and the second to the LOWER mounting bracket type.

EXAMPLES OF DESIGNATIONS USED

MP 10 upper mounting bracket type 1, lower type 0
MP 01 upper mounting bracket type 0, lower type 1
MP 12 upper mounting bracket type 1, lower type 2
MP 31 upper mounting bracket type 3, lower type 1
MP 30 upper mounting bracket type 3, lower type 0
MP 13 upper mounting bracket type 1, lower type 3

1.3 POINTS TO CONSIDER BEFORE INSTALLATION

1.3.1 ASSEMBLING THE SYSTEM AFTER DELIVERY

PENDULUM RUDDER MODULE

- The pendulum rudder module was partially assembled before leaving our premises.
- Place the base of the windvane assembly 130 on windvane shaft 140 and fasten with the Allen key (5 mm) such that bolt 132 engages in the hole in the windvane shaft 140.
- Guide push rod 150 through ring 152 from below.
- Set washer 153 and nut 154 on the top of the push rod and tighten.
- Now unscrew nut 154 very slightly (1/8 of a turn).
- The windvane assembly should now be able to rotate freely about the push rod 150.

AUXILIARY RUDDER MODULE

- The auxiliary rudder module was fully assembled before leaving our premises.

- Take care when unpacking the system that clamp 810 does not scrape against the auxiliary rudder blade (fix with tape). This can leave a horrible gouge on the blade otherwise.
- The mounting components for the transom have not been assembled.

1.3.2 POSITIONING THE SYSTEM
- Your WINDPILOT should be installed at the centre of the transom.
- Off-centre installation is possible (max. 10 cm/4 in) but not ideal.
- If your boat has a centrally mounted bathing ladder, it should be relocated to one side.
- TIP: install the PACIFIC PLUS first, then sort out the bathing ladder.
- Tie safety lines to all components before you start.
- Secure clamps 860 on the mounting bracket with tape.
- Coat the mounting bolts with lanolin or Duralac.
- Should I use a spirit level? No, boats are never perfectly level; it is better to trust your eye.

1.3.3 BAD AIR AND THE WINDVANE
- The windvane should not be subject to disturbed airflows in its working position.

NO PROBLEM
- Bad air from a sprayhood: the sprayhood is normally far enough from the stern not to be a problem.
- Bad air around davits - provided the dinghy is not still hanging from them!
- Bad air from the superstructure
- Bad air off the mainsail (sloop/cutter)
- Bad air caused by people in the cockpit

PROBLEM
- Bad air off the mizzen sail
- Bad air caused by an outboard motor on the pushpit
- Bad air caused by fenders/liferaft on the pushpit
- Bad air caused by a dinghy on the davits

1.3.4 AUXILIARY RUDDER AND MAIN RUDDER
- Turbulence from the main rudder can reduce the effectiveness of the auxiliary rudder. The auxiliary rudder should therefore ideally be at least 35 cm/14 in behind the main rudder (see 2.0 Sailing with Your WINDPILOT).

1.3.5 ON LAND OR IN THE WATER?
- You can fit your WINDPILOT with the boat ashore or afloat: it doesn't really matter, as all the holes are above the waterline.
- But you may be able to find the height above the waterline for installation more easily with the boat in the water.

1.4 INSTALLATION: QUICK GUIDE

1.4.1 THE FIVE CRITERIA

1 - Installation height: the top of the auxiliary rudder blade should be about 10 cm/4 in above the static waterline.

THE FIRST AUXILIARY RUDDER BRACKET

2 - Fit the UPPER bracket first on canoe, traditional overhanging and exactly vertical sterns; fit the LOWER bracket first on forward-raked and sugar scoop sterns.
3 - Fit the pendulum rudder module onto the auxiliary rudder module.
4 - Align the system: the windvane shaft 140 must be vertical!

THE SECOND AUXILIARY RUDDER BRACKET

5 - Fit the remaining auxiliary rudder bracket.

1.5 INSTALLATION: COMPREHENSIVE GUIDE

– Remember the five criteria.

1.5.1 HEIGHT ABOVE THE WATERLINE

– The rudder shaft has been manufactured to the correct length for your boat.
– The dynamic waterline should cover the auxiliary rudder blade.
– The rudder will project some distance above the static waterline.
– Ideal installation height: the top of the auxiliary rudder blade should be about 10-20 cm/4-8 in above the static waterline.

1.5.2 VERTICAL, CANOE AND TRADITIONAL OVERHANGING STERNS

1.5.2.1 MAKING THE FIRST CONNECTION

– Install the UPPER bracket first.
– Is the toe rail likely to be useful or get in the way?
– Decide whether to fit the upper bracket to the toe rail at deck height or through the transom below deck level (see 1.5.1 Height above the Waterline).

1.5.2.2 THE MOUNTING BLOCK

– We have prepared a wooden block to help you with the installation process. The block shows the precise clearance between the mounting faces on crown 500.
– On the block we have mounted either two brackets 900/910 or brackets 900/910 plus extension 920.
– Locate the block with the bracket/extensions and clamps 860 on the transom at the appropriate installation height for the UPPER bracket.
– CAUTION: is everything ready on the inside of the transom?
– Rotate the four clamps 860 into place against the transom (use the mallet if required).
– Start by drilling a single hole (predrill with the 9 mm bit then complete with the 10.5 mm bit).
– CAUTION: is everything still ok on the inside of the transom?
– Pass a bolt through the hole just drilled to hold the bracket in place.
– Align the bracket (level).
– Predrill three holes through the clamps (9 mm bit).
– Remove the bracket.
– Drill out all the holes with the 10.5 mm bit.
– Place sealing compound (Sikaflex) around each hole.
– Set the 60 mm diameter plastic discs on the Sikaflex compound.
– Fasten the bracket with all four bolts.
– Working inside the hull, set the washers on the bolt ends and tighten the nuts/locknuts.

- SEQUENCE: bolt head/stainless washer/plastic washer/clamp/60 mm plastic disc/Sikaflex/transom/stainless washer/nut/nut

REMOVE THE WOODEN BLOCK AND FIT THE AUXILIARY RUDDER MODULE

- Pass the bolts through the crown 500 and tighten until it is almost impossible to move auxiliary rudder shaft 600 fore and aft.
- CAUTION: check that coupling lever 520 and ring 540 can move freely without hitting the transom.
- If extension 920 has been fitted, the whole system can be adjusted up or down around the transverse bolts.
- CAUTION: check the installation height.

1.5.2.3 MOUNTING THE PENDULUM RUDDER MODULE

- Release two bolts 504.
- Insert the pendulum rudder module into crown 500.
- Fasten the two bolts 504 in crown 500.

1.5.2.4 ALIGNMENT

- Check the alignment of the system.
- The PACIFIC PLUS may be adjusted fore and aft while it is only connected at the UPPER mounting bracket.
- Windvane shaft 140 must be vertical!
- If the windvane shaft is vertical, the pendulum rudder shaft 420 will automatically be at the correct 10 degree angle and the auxiliary rudder shaft 600 will automatically be at the correct 5 degree angle. It is tough to distinguish a 5 or 10 degree angle by eye, but most people can recognise vertical without help. Make sure the windvane shaft is vertical and the rest will look after itself!

FIX THE AUXILIARY RUDDER MODULE IN POSITION

- Once you are happy with the alignment, snug the transverse bolts in the crown 500 down tight.
- Tie the windvane shaft to the pushpit in the correctly aligned position using the safety line.
- Check the alignment regularly until the lower bracket is fully installed.

1.5.2.5 FITTING THE CROSS BRACE

- The cross brace 940/945/955 is required only if the lower tubular aluminium struts 950 are longer than 50 cm/20 in.
- All units with lower struts 950 longer than 50 cm/20 in are delivered complete with a cross brace.
- Fit the cross brace before fixing the lower mounting components to the transom.
- Bolt the cross brace firmly to the struts 950.
- Tighten bolts …, … and … so that the whole lower assembly remains in this position.

1.5.2.6 MAKING THE SECOND CONNECTION

- CAUTION: before fixing the second bracket to the transom stand behind the boat and check that the system is parallel with the mast.

- Lateral corrections may be made by moving the bracket cheek 900/920 in the clamps 860: loosen the bolts through the transom and align the system using the rubber mallet.
- Loosely fasten the mounting components for the second/lower mounting point to collar 610.
- Slide the collar along shaft 600 until the clamps are resting against the transom.
- Tighten bolts …, … and … so that the entire lower bracket is held in this position.
- Position the four clamps flush against the transom by hand or with the rubber mallet.
- Predrill holes through the clamps using the 9 mm bit.
- Loosen the lower bracket without removing it.
- Rotate the bracket up/down as required.
- CAUTION: is everything ok on the inside of the transom?
- Drill out all the holes using the 10.5 mm bit.
- Place sealing compound (Sikaflex) around each hole.
- Set the 60 mm diameter plastic discs on the Sikaflex compound.
- Fasten the bracket with all four bolts.
- Working inside the hull, set the washers on the bolt ends and tighten the nuts/locknuts.
- SEQUENCE: bolt head/stainless washer/plastic washer/clamp/60 mm plastic disc/Sikaflex/transom/stainless washer/nut/nut

1.5.2.7 FORE AND AFT CORRECTION

- There is some scope for minor corrections to the position of the auxiliary rudder shaft.
- Slacken off bolts …, … and ….
- Slide collar 610 up or down as required.
- Retighten all the bolts.
- It is acceptable for the system to be slightly (up to about 3 degrees) out of vertical.

1.5.2.8 LATERAL CORRECTION

- The lateral alignment of the system may be adjusted.
- Secure the whole system with a safety line at the top.
- Make sure the safety line is pulled tight.
- Slacken off all eight through-transom mounting bolts.
- Adjust the position of the brackets 900/910 in the clamps with the rubber mallet.
- Check the position and alignment of the system.
- If everything is lined up properly, retighten all the bolts.
- The position of the windvane shaft 140 can be corrected once screw 251 has been slackened off.
- Retighten screw 251 when you have finished.

1.5.3 FORWARD-RAKED STERNS AND BATHING PLATFORMS

MAKING THE FIRST CONNECTION

THE MOUNTING BLOCK

- We have prepared a wooden block to help you with the installation process. The block shows the precise clearance between the mounting faces on the collar 610.

- On the block we have mounted either two brackets 900/910 or brackets 900/910 plus extension 920.
- Locate the block with the bracket/extensions and clamps 860 on the transom at the appropriate installation height for the LOWER bracket.
- CAUTION: is everything ready on the inside of the transom?
- Rotate the four clamps 860 into place against the transom (use the mallet if required).
- Start by drilling a single hole (predrill with the 9 mm bit then complete with the 10.5 mm bit).
- CAUTION: is everything still ok on the inside of the transom?
- Pass a bolt through the hole just drilled to hold the bracket in place.
- Align the bracket (level).
- Predrill three holes through the clamps (9 mm bit).
- Remove the bracket.
- Drill out all the holes with the 10.5 mm bit.
- Place sealing compound (Sikaflex) around each hole.
- Set the 60 mm diameter plastic discs on the Sikaflex compound.
- Fasten the bracket with all four bolts.
- Working inside the hull, set the washers on the bolt ends and tighten the nuts/locknuts.
- SEQUENCE: bolt head/stainless washer/plastic washer/clamp/60 mm plastic disc/Sikaflex/transom/stainless washer/nut/nut

REMOVE THE WOODEN BLOCK AND FIT THE AUXILIARY RUDDER MODULE

- Tighten collar 610 and bolt … until it is almost impossible to move the auxiliary rudder module fore and aft.
- CAUTION: check that the auxiliary rudder shaft 600 is clear of the transom.
- If extension components 910 have been fitted, the whole system can be adjusted up or down around bolts … and ….
- CAUTION: check the installation height. Do not finish tightening bolt … until you are satisfied that the auxiliary rudder is at the correct height.

MOUNTING THE PENDULUM RUDDER MODULE

- Release two bolts 501.
- Insert the pendulum rudder module into crown 500.
- Fasten the two bolts in the crown.

ALIGNMENT

- Check the alignment of the system.
- The PACIFIC PLUS may be adjusted fore and aft while it is only connected at the LOWER mounting bracket.
- Windvane shaft 140 must be vertical!
- If the windvane shaft is vertical, the pendulum rudder shaft 400 will automatically be at the correct 10 degree angle and the auxiliary rudder shaft 600 will automatically be at the correct 5 degree angle. It is tough to distinguish a 5 or 10 degree angle by eye, but most people can recognise vertical without help. Make sure the windvane shaft is vertical and the rest will look after itself!

FIX THE AUXILIARY RUDDER MODULE POSITION

- Once you are happy with the alignment, snug bolts … down tight.
- Tie the windvane shaft to the pushpit in the correctly aligned position using the safety line.
- Check the alignment regularly until the upper bracket is fully installed.

FITTING THE CROSS BRACE

- The cross brace is required only if the upper tubular aluminium struts 950 are longer than 50 cm/20 in.
- All units with upper struts 950 longer than 50 cm/20 in are delivered complete with a cross brace.
- Fit the cross brace 940/945/955 before fixing the upper mounting components to the transom.
- Bolt the cross brace firmly to the struts.
- Tighten bolts …, … and … so that the whole upper assembly remains in this position.

MAKING THE SECOND CONNECTION

- CAUTION: before fixing the second bracket to the transom stand behind the boat and check that the system is parallel with the mast.
- Lateral corrections may be made by moving the bracket cheek 900/910 in the clamps 860: loosen the bolts through the transom and align the system using the rubber mallet.
- Loosely fasten the mounting components for the second/upper mounting point to crown 500.
- Place the whole mounting assembly including the crown against the stern until the clamps are resting against the transom.
- Tighten bolts …, … and … so that the entire upper bracket is held in this position.
- Position the four clamps flush against the transom by hand or with the rubber mallet.
- Predrill holes through the clamps using the 9 mm bit.
- Loosen the lower bracket without removing it.
- Rotate the bracket up/down as required.
- CAUTION: is everything ok on the inside of the transom?
- Drill out all the holes using the 10.5 mm bit.
- Place sealing compound (Sikaflex) around each hole.
- Set the 60 mm diameter plastic discs on the Sikaflex compound.
- Fasten the bracket with all four bolts.
- Working inside the hull, set the washers on the bolt ends and tighten the nuts/locknuts.
- SEQUENCE: bolt head/stainless washer/plastic washer/clamp/60 mm plastic disc/Sikaflex/transom/stainless washer/nut/nut

1.5.3.1 FORE AND AFT CORRECTION

- There is some scope for minor corrections to the position of the auxiliary rudder shaft 600.
- Slacken off bolts …, … and ….
- Slide the auxiliary rudder shaft up or down in the collar 610 as required.
- Retighten all the bolts.
- It is acceptable for the system to be slightly (up to about 3 degrees) out of vertical.

1.5.3.2 LATERAL CORRECTION
- The lateral alignment of the system may be adjusted.
- Secure the whole system with a safety line at the top.
- Make sure the safety line is pulled tight.
- Loosen all eight through-transom mounting bolts.
- Adjust the position of the brackets 900/910 in the clamps 860 with the rubber mallet.
- Check the position and alignment of the system.
- If everything is lined up properly, retighten all the bolts.

1.5.4 BE AWARE
- The bolts must be properly seated and tightened. If the bolts work loose, the whole system could be lost.
- The vibrations from regular motoring can loosen screwed and bolted connections.
- Locknuts are not absolutely infallible.
- Your PACIFIC PLUS is supplied with two nuts for each bolt. They should both be kept tight.
- If blocks or plates are used inside the transom, make sure that they rest flat against the inside surface of the transom. If they are not flat, the bolt will continuously work against the joint and loosen it.
- Check the mounting bolts regularly!
- Attach a safety line to your PACIFIC PLUS just in case.
- Do you have a composite sandwich transom? If so, check it carefully.

1.5.5 DO I NEED TO REINFORCE THE TRANSOM?
- No, as the forces on the transom are distributed over eight M10 bolts and the overall contact surface of the eight clamps is more than adequate.
- The washers supplied provide sufficient load distribution for steel, aluminium, wooden and composite (solid laminate) hulls.
- Composite hulls built in sandwich laminate: cut the sandwich out from the inside and replace with wood. The wooden sections should be glued into place with synthetic filler (load distribution).
- CAUTION: If you decide you want to fit steel/stainless/aluminium transom reinforcement plates anyway, just in case, be sure to pack them in with filler so that the loads are properly distributed!

1.5.6 WHAT IF THE SYSTEM IS ALIGNED INCORRECTLY?
- No problem: release the mounting bolts and use the rubber mallet to move the clamps along the bracket cheeks 900/910 until the alignment is satisfactory (see 1.5.2.4 Alignment).

1.5.7 REMOTE CONTROL
- Lead the thin red line supplied through the slot in windvane shaft 250 and around the knurled red knob 270.
- Knot the two ends of the line together and secure the line in the cockpit with bungee cord.
- To operate the remote control, take the line in both hands and pull on one side of the loop with one hand while paying the other side out without tension with the other hand. Never pull on one side with both hands!

1.5.8 THE PENDULUM RUDDER

1.5.8.1 MOUNTING THE RUDDER BLADE

- The blade should be mounted with the rounded edge facing forward and the sharp edge facing aft.

1.5.8.2 POSITIONING THE RUDDER BLADE

- The pendulum rudder blade must be angled down and aft exactly in line with the rudder shaft, otherwise the balance will be off.
- Adjusting the rudder blade aft reduces the force generated (by reducing the balance proportion).
- Adjusting the rudder blade forward increases the balance proportion excessively, with the result that the rudder controls the windvane instead of the other way around.
- Both the adjustments described impair the performance of the system and make steering problems inevitable.

1.5.8.3 OVERLOAD PROTECTION

- Mounting bolt 435 for the rudder blade 440 should be tightened gently so that the rudder blade can still swing up if it strikes something below the water.
- The rudder blade is retained in the shaft fork by friction only.

1.5.8.4 PENDULUM RUDDER LIFT-UP

- Tie one end of the red lift-up line through ring 431 and secure the other end to the pushpit.
- Raise the pendulum rudder, take the red line once around the windvane shaft 140 and rudder shaft 420 and tie it back to the pushpit.
- It is not possible to raise the pendulum rudder out of the water while the boat is moving as the resistance is generally too high. The boat must be almost stationary before lift-up becomes possible.
- The pendulum rudder may be dropped back into the operating position at any time.

1.5.9 SETTING THE MAIN RUDDER

- You must have a reliable method of locking the main rudder in position if the PACIFIC PLUS is to perform properly. The lever fitted on many wheel steering systems is often insufficient, being designed to hold the rudder still when the boat is on its moorings rather than to resist the dynamic forces encountered at sea. If the lock allows the main rudder to wander while the PACIFIC PLUS is steering, the boat will veer unpredictably and effective self-steering will be lost.

1.5.9.1 MECHANICAL WHEEL STEERING

- Modern wheel steering systems (e.g. Whitlock) often have a disc brake type locking system, which secures the rudder much more reliably than a simple clamping device.
- Whatever method you use to lock the main rudder, it should be easily accessible and easy to adjust - as conditions change you will need to fine trim the rudder position to maintain optimal self-steering.
- CAUTION: make sure your rudder lock can be disengaged quickly in an emergency!

LOCKING THE WHEEL
- Lock the wheel in place with lines running to Curry or clamcleats on either side of the wheel. Ideally the cleats should be positioned between the binnacle and the cockpit seats.
- Alternatively lock the wheel in place with a blocking device mounted on the rim. This option is particularly good on boats with a bulkhead-mounted wheel.

1.5.9.2 HYDRAULIC WHEEL STEERING
- You must be able reliably to lock the main rudder in position.
- Check to see if the system has a locking device. Does the main rudder stay locked in place when you let go of the wheel?
- Does the centre spoke stay centred?
- Does the hydraulic cylinder give to allow movement at the wheel?
- Is the system free of leaks?
- Turn the wheel all the way to one side until it reaches the end stop and hold it there for a short while. Can you now turn the wheel a little further to that side?
- If the boat is ashore, try turning the main rudder by hand. Does it move?

LOCKING THE WHEEL
- Fit a new locking device.
- Replace the seals on the hydraulic cylinder.
- If the centre spoke does stay centred, lash it in place with lines (see 1.5.9.1 Mechanical Wheel Steering).
- If nothing else works, fit the emergency tiller and lash that in place with lines.
- CAUTION: the PACIFIC PLUS will only function properly on a boat with hydraulic wheel steering if the main rudder can be reliably locked in place. The same is true of boats with multiple wheels (e.g. inside and outside steering).

1.5.10 WINDPILOT AND AUTOPILOT

1.5.10.1 CONFIGURATION
- A pin suitable for connecting an Autohelm or Navico push rod autopilot is included as standard on the windvane hanger 110 of every WINDPILOT system.
- Find a good spot to attach the cockpit autopilot to the pushpit. The autopilot should be at approximately the same height as the pin on the windvane hanger.
- Rotate the windvane shaft into a position where the autopilot push rod can move through its full travel from stop to stop unimpeded as it moves the windvane hanger from side to side. Mark this position on the windvane shaft.
- Fit the mount for the autopilot to the pushpit (e.g. on a wooden block on the railing).
- The autopilot/windvane combination should only be used to steer compass courses.
- The autopilot/windvane combination will not perform well motoring in calm conditions as turbulence from the propeller interferes with the proper operation of the pendulum rudder. The autopilot should be connected directly to the tiller or wheel in these conditions; since the engine is running, there is no need to save power by using the windvane anyway.
- See 2.0 Sailing with Your WINDPILOT for operating instructions.
- CAUTION: always secure the autopilot with a safety line!

2.0 SAILING WITH YOUR WINDPILOT

2.1 WINDPILOT SYSTEM REQUIREMENTS

- The pendulum rudder shaft is long enough to provide plenty of leverage for the pendulum rudder.
- The bevel gear linkage on the pendulum rudder module is working properly to provide automatic yaw damping.
- The system is sensitive in light airs but powerful in stronger wind conditions.
- The pendulum rudder and auxiliary rudder modules are properly matched.
- The effective angular range of the auxiliary rudder from side to side is sufficient to handle the course corrections required.
- The PACIFIC PLUS is correctly positioned on the transom.
- The system has adequate leverage (i.e. is sufficiently far from the boat's centre of lateral resistance).
- Weather helm and any other consistent imbalances in the boat's trim are compensated for by the position of the main rudder and the PACIFIC PLUS is free to concentrate on transient course corrections.

2.2 SAILING WITH YOUR WINDPILOT: QUICK GUIDE

- Bring the boat onto course.
- Lock the main rudder in position.
- Lower the pendulum rudder blade into the water.
- Fix the windvane hanger on centre with catch 133.
- Loosen coupling 523 and pivot it aft until it is fully engaged.
- Retighten the coupling.
- CAUTION: check that the indicators on the two gear segments are aligned correctly.
- Release the windvane catch.
- Fit the windvane.
- Set the windvane into the wind (it should stand upright).
- Fine trim the course by adjusting the position of the main rudder.
- Make large course adjustments either by hand or using the remote control.

2.3 SAILING WITH YOUR WINDPILOT: COMPREHENSIVE GUIDE

2.3.1 SYSTEM NOT IN USE

- Keep the pendulum rudder blade in the lift-up position.
- Remove the windvane.
- Centre the windvane hanger with catch 133.
- Pivot coupling lever 523 forward (towards the boat) and tighten it down to lock the auxiliary rudder on centre.

2.3.2 PREPARING FOR USE

- Bring the boat onto course and check your sail trim.
- Lock the main rudder in position (see 1.5.9 Setting the Main Rudder).
- NOTE: ensure that the boat sails straight once the main rudder is locked in position. It will normally be necessary to lock the rudder slightly off-centre to counter the persistent effects of weather helm etc.

- Lower the pendulum rudder into the water.
- Fix the windvane hanger 110 on centre with catch 133. This will also hold the pendulum rudder on centre and prevent it moving while the rest of the system is being set up.
- Loosen coupling 523 by three turns and pivot it aft until it is full engaged.
- NOTE: if the coupling lever is not loosened sufficiently, it will not pivot aft and engage with the pendulum rudder.
- CAUTION: check that the indicators on the two gear segments 380/530 are aligned correctly.
- Retighten the coupling.
- Fit the windvane (the counterweight 120 should now be pointing into the wind).
- Release the windvane catch.
- Turn the windvane by hand or using the remote control until it is standing upright in its centred position.
- NOTE: the windvane is only properly centred if it is standing absolutely upright It is important to centre the windvane correctly as any errors here reduce the effective steering range of the system on one side.

2.3.3 KEEP AN EYE ON THE COURSE

- Minor course adjustments can be made by tweaking the position of the main rudder (at the wheel).
- Larger course adjustments should be made at the windvane either by hand or using the remote control (at worm gear 270).

2.3.4 ALTERING COURSE/TURNING

- First set the windvane shaft to the new course (rotate the shaft as quickly as possible). The windvane may be adjusted either by hand or using the remote control; the degree scale on the windvane shaft will help you find the correct position.
- Release the main rudder and turn it onto the new course as well. Using both rudders speeds up the turn considerably.
- Once the boat is on the new course, lock the main rudder in position again.
- Adjust the position of the main rudder until the trim is satisfactory.

2.3.5 FINE TRIM

- Weather helm grows more pronounced as the wind strength increases. Adjust the main rudder position appropriately as conditions change.
- The windvane should work evenly around the upright position most of the time. If it is permanently off to one side, adjust your sail trim or reef down.
- NOTE: weather helm slows you down. Sailing with too much weather helm is like driving with the handbrake on. You can tell if your trim could/should be improved just by looking at the wake. If there is substantial turbulence below the surface (wash from the keel), <u>something needs to be done</u>!
- CAUTION: larger, heavier boats may need to reach a relatively high boat speed before the pendulum arm starts to move through its full lateral range.
- The force generated by the servo system is always dependent on <u>leverage, rudder area and speed</u>. These factors are the product of physical laws, the consequences of which are inescapable!

2.3.6 OVERLOAD PROTECTION IN HEAVY WEATHER

- The maximum working range of the pendulum arm from side to side in normal operation is approximately 25-28 degrees.
- The 2:1 bevel gear linkage ensures that the pendulum rudder is always reset back to its neutral position (although the pendulum arm may still appear to be off-centre).
- If the pendulum arm swings outside its normal working range (only possible as a result of external influences), the bevel gear linkage works even harder to reset the pendulum rudder to the neutral position.
- The windvane alone can never displace the pendulum rudder arm more than 25-28 degrees to one side. The Aries and Monitor servo-pendulum systems both have a framework for the steering line transmission blocks that extends down alongside the pendulum arm and would prevent the arm from moving to one side by more than the normal working range. The bevel gear linkage brings the pendulum rudder back into the centre before it has a chance to exceed the normal working range. If such extreme lateral excursions were possible, we would expect to see Aries and Monitor systems with bent pendulum arms and/or bent transmission block frames. This simply does not happen!
- Although the normal working range of the pendulum rudder amounts to no more than 25-28 degrees to each side (i.e. a total angular range of 56 degrees), the nature of the design means that it is actually free to swing through 270 degrees (for lift-up etc.).
- The pendulum arm may be driven beyond its normal working range in certain extreme conditions. Confused seas and a pitching, slow-moving boat can conspire to push the pendulum rudder so far to one side that it all but leaves the water; with no steady flow of water across the rudder blade the system effectively ceases to function.
- The system is designed such that gear segment 380, which attaches to the pendulum arm, disengages from segment 530, which attaches to the auxiliary rudder, if the pendulum arm swings more than 45 degrees to one side. This position corresponds to an auxiliary rudder angle of attack of 38 degrees. Since the flow of water begins to separate from the auxiliary rudder at an angle of attack of around 18 degrees, the auxiliary rudder (and hence the PACIFIC PLUS) will be completely ineffective long before the two segments disengage anyway.
- The system will only resume operating once the pendulum arm has returned to centre and the two segments have re-engaged.
- CAUTION: since the auxiliary rudder will normally return to centre faster than the pendulum arm after such an extreme excursion, it is likely that the segments will not be properly aligned (typically they will be two or three teeth out) when they reengage. This means that the windvane and the auxiliary rudder will not be centred with respect to each other and the system will not maintain the desired heading.

2.3.6.1 RECENTRING THE WINDVANE AND AUXILIARY RUDDER

- Steer the boat by hand.
- Disengage the coupling and bring the two segments back into alignment.

2.3.6.2 DISABLING THE OVERLOAD PROTECTION

- If you wish for safety reasons to prevent the two segments from disengaging, secure the pendulum arm with a thin line (2 mm should be sufficient) so that it stops just before the gears would otherwise separate.

- Tie the thin line through the ring on the pendulum rudder.
- Lead it through ring … on the bronze bearing on the auxiliary rudder shaft 630 and fasten it on deck in the position required.
- Mark the maximum permissible pendulum arm travel before you set sail and tie a wooden or plastic ball into the thin line so that the ball reaches the ring on the auxiliary rudder shaft and stops the line running just before the arm reaches the maximum permissible travel.

2.3.6.3 PREPARING FOR USE - ALTERNATIVE PROCEDURE

- Start with the system out of use and the pendulum rudder in the lift-up position.
- Loosely fasten the new thin line to the pushpit.
- Lower the pendulum rudder into the water.
- Tie the new thin line into the desired position. Check that the line limits the pendulum arm travel as desired.
- You may also like to tie a wooden or plastic ball into the line as described above (see 2.3.6.2 Disabling the Overload Protection) to ensure that the line functions as intended.
- The lateral travel of the pendulum arm should be limited to around 40 degrees. This should stop the coupling just before the last two teeth would otherwise disengage.
- A thin line is sufficient for this purpose, as there is no hydrodynamic force acting on the pendulum rudder in the position at which the line comes into play.

2.3.7 SETTING THE WINDVANE FOR DIFFERENT WIND STRENGTHS

LIGHT WINDS

- Set the windvane absolutely vertical for maximum sensitivity.
- The upright setting also provides maximum steering force with the wind from astern.
- A strip of spinnaker cloth (‘windvane telltale’) on the upper trailing edge of the vane further improves sensitivity.
- CAUTION: you should not need to use a larger windvane in light airs. If you do use a larger vane, it must be exactly the same weight as the standard vane.
- This setting is particularly suitable for sailing with the wind aft of the beam, when the apparent wind strength is always relatively low.

MODERATE WINDS

- Set the windvane angled back 20 degrees away from the wind.
- This position is the general setting for sailing with the wind forward of the beam (relatively high apparent winds).

STRONG WINDS

- Angle the windvane further back from the wind (more damping).
- If the windvane begins to vibrate in very strong winds, try angling it back even further. The vane can go as far as about 70 degrees back, which should improve damping and give smoother steering impulses (and hence better steering).
- This position is the general heavy air setting.

2.3.8 THE IDEAL WINDVANE POSITION

- The windvane should always be working evenly around the upright position.

- If all the movement is occurring on one side, i.e. between the upright position and one of the end stops, adjust the wheel position until the movement is more evenly distributed.
- If the windvane is permanently well over to one side, correct the course setting at the windvane shaft either manually or using the remote control (check the degree scale).
- NOTE: the reading on the scale at the windvane shaft 140 may differ slightly from the reading on your wind instrument. This is because wind conditions at deck level tend to be different from those at the top of the mast.

2.3.9 EMERGENCY RUDDER
- The PACIFIC PLUS makes an effective emergency rudder if the main rudder is damaged or disabled.
- Remove windvane 100.
- Rotate windvane shaft 140 until the windvane hanger is perpendicular to the centreline of the boat. You should now be able to steer the boat by moving the hanger backwards and forwards with the boat hook.
- NOTE: you are now steering through a servo-assisted system, so you should not have to apply much force to the windvane hanger.
- CAUTION: the arrangement described will only work while the boat is moving forwards and will not work at all for manoeuvring in harbour. The pendulum rudder is useless without a flow of water across its surface.
- CAUTION: the auxiliary rudder is considerably smaller than the main rudder and is consequently considerably less powerful.
- TIP: pay particular attention to sail trim and reef early if need be to reduce the loads on the emergency rudder.

2.3.10 WINDPILOT AND AUTOPILOT

PREPARING FOR USE
- Remove the windvane.
- Turn the windvane shaft to the marked position.
- Fit and secure the cockpit autopilot.
- Connect the power supply.
- Switch the cockpit autopilot from standby to on.
- CAUTION: check the polarity at the autopilot. If it turns to starboard when you request port, you need to reverse the polarity.
- Reversing the polarity should be a simple two button function on most of today's cockpit autopilots (check the manual).
- TIP: the PACIFIC PLUS/autopilot combination only makes sense on a larger boat (9 metric tons or heavier) with wheel steering if the boat has no conventional cockpit wheel autopilot. It is normally advisable to use the boat's inboard autopilot when motoring, as turbulence from the propeller can easily set up vibrations in the PACIFIC PLUS.

2.3.11 SWITCHING BACK TO MANUAL STEERING

2.3.11.1 EMERGENCY
- There is no need to disengage the PACIFIC PLUS.
- Release the wheel lock and begin to steer by hand.

- NOTE: the main rudder is large enough to overcome the efforts of the PACIFIC PLUS, so you can leave it engaged during emergency manoeuvres if necessary.

2.3.11.2 NORMAL USE

- Release the wheel lock and begin to steer by hand.
- Remove the windvane.
- Close the windvane hanger catch 133.
- Closing the windvane hanger catch locks the pendulum rudder on centre, so the PACIFIC PLUS is now effectively disabled. You can now steer the boat as normal with no interference whatsoever from the PACIFIC PLUS.
- Lift up the pendulum rudder using the line.
- CAUTION: slow down before attempting to lift up the pendulum rudder. If the boat is moving too fast, there will be too much resistance to raise the pendulum rudder.
- The pendulum rudder may actually be left in the water without doing any harm, but don't forget to lift it up out of the way before entering harbour/manoeuvring under engine.

2.3.12 REMOVING THE SYSTEM TO USE A TENDER/IN HARBOUR/FOR WINTER STORAGE

- Remove the windvane.
- Remove the pendulum rudder blade.
- Secure the pendulum rudder module with a safety line.
- Release bolt 504, remove the pendulum rudder module completely and stow it below deck.
- CAUTION: When fitting/removing the pendulum rudder module be sure never to handle/lift it by the windvane shaft 140 alone. The shaft is retained on the worm gear 260 by just two bolts (M4) and is not designed to bear the weight of the whole unit.
- The system is best handled/lifted using the casting 250 at the base of the windvane shaft.
- The auxiliary rudder module can safely be left on the transom. If you do wish to remove the auxiliary rudder as well, undo and remove transverse bolts … and …, secure the module with a safety line and then carefully remove it from the mounting brackets.

3.0 CAUTION

- The WINDPILOT PACIFIC PLUS is a servo-dynamic system.
- Keep hands well away from the pendulum arm when the system is in operation (trap hazard).
- Take care when adjusting the windvane shaft manually (e.g. changing course) while the vane is in operation: moving parts can be dangerous.
- Take care when engaging and disengaging the system to ensure that hands, lines and other objects do not become trapped between the two coupling gears.
- Close catch 133 to stop the pendulum rudder moving.
- The pendulum rudder can only be raised into the lift-up position at boat speeds of less than 2 knots.
- The pendulum rudder may be dropped back into the operating position at any time.

- Always secure the system with a safety line before attempting to fit or remove it.
- Check the mounting nuts and bolts on the transom regularly.
- CAUTION: the system may be lost if the mounting bolts work loose. Never use the system if the bolts are known to be loose.

4.0 MAINTENANCE

- The system is largely maintenance free. It is, however, as susceptible to the effects of sun, salt and dirt as anything else onboard and will reward you for a little attention. Please take note of the care guidelines below. Follow them, and your WINDPILOT system should keep going indefinitely.

4.1 BEARINGS

- The bearings are made from Teflon, POM and Delrin. These materials must not be oiled or greased.
- Grease or oil in contact with seawater quickly solidifies, causing bearings to stick or seize.
- WD-40 and Teflon spray may be used on the bearings.

4.2 CLEANING

- Clean the system with fresh water and rinse thoroughly.
- TIP: thoroughly soak your PACIFIC in salt water (15 minutes should be long enough) at twilight on a damp evening and then rinse with fresh water.
- This applies equally to the rest of the boat. Salt crystals and sunlight soon take the gloss off any shiny surface.

4.3 PENDULUM RUDDER BEVEL GEAR LINKAGE

- Clean the bevel gear linkage twice a year.
- Clean any salt or oil from bearing 328.
- Make sure the gears are in the right position when reassembling the linkage (see 5.0 Troubleshooting).
- Never grease bearing 328!
- Axle 334 may be treated with WD-40 or Teflon spray.
- TIP: try to avoid leaving the pendulum rudder module exposed for long periods without use (remove or cover it). When the pendulum rudder is in the lift-up position, dew and rain wash accumulated dirt and grime off the rudder and rudder shaft down into the bearings, causing them to seize. <u>The bearings can only become blocked with salt/dirt in this way in the lift-up position</u>; the same can never happen in the operating position!

4.4 PENDULUM RUDDER - AUXILIARY RUDDER COUPLING

- The thread for wheel 523, the spacer 522 and the washer 521 should be lubricated regularly (WD-40 or lanolin).
- Spray axles 513 with WD-40/Teflon.
- The jaws in crown 500 that receive the projection on the moveable gear segment 530 and hold it on centre when the coupling is disengaged should be lubricated regularly with lanolin, Teflon or similar.
- CAUTION: check regularly to ensure that the two axles 513 are properly seated. Vibrations caused by the engine can affect these components.

4.5 PUSH ROD
- The top and bottom universal joints should always turn smoothly on the push rod. If they stick at all, try loosening the connections.
- The position of the push rod can be corrected by adjusting nuts 151/154.
- Ideal position: windvane vertical, pendulum arm 360 vertical, pendulum rudder 440 in line with keel, arm of small bevel gear 305 in the 'quarter past twelve' position

4.6 WORM GEAR 270
- The worm gear will appreciate a drop of washing up liquid or a squirt of silicone/Teflon/WD-40 spray every so often.
- If the worm gear is sticking, release bolt 273 and nut 271, remove the worm 270 and clean it.

4.7 CAST AND TUBULAR COMPONENTS
- All the cast and tubular components in the system have been treated with lanolin before assembly and will come apart again readily even after prolonged operation.
- Wax the tubular components occasionally.

4.8 LANOLIN
- Lanolin has been applied to all screwed or bolted joints to prevent electrolytic reactions.
- Lanolin works equally well on all the other screws and bolts on the boat (and also makes a good hand creme!).

4.9 ANTIFOULING
- Never antifoul the pendulum rudder blade. It should only be in the water when the system is in use, so there should never be any growth on it anyway.
- The pendulum rudder blade can be cleaned in the lift-up position.
- Antifouling may clog the bearing if liquid paint runs up the blade in the lift-up position.
- TIP: treat the blade with varnish only.
- The auxiliary rudder remains in the water and should therefore be antifouled regularly.

4.10 WINDVANE
- A spare or replacement windvane must weigh exactly the same as the original windvane. If it does not, adjust the dimensions until it does.
- CAUTION: even a coat of paint can significantly add to the weight of your windvane. The painted windvane must weigh exactly the same as the original it is to replace.
- The counterweight is matched to the weight of the original windvane. Using a windvane of a different weight will reduce the sensitivity of the system and impair steering quality, especially in lighter airs.
- The windvane may be no more than 50 g/1¾ oz lighter than the counterweight. It must never be heavier than the counterweight!

4.11 WINDVANE TELLTALE
- There comes a point where there is just too little wind to move the windvane. The fluttering of the windvane telltale, a strip of spinnaker cloth attached towards the

upper trailing edge of the vane, provides that little extra steering impulse and extends the range of conditions over which the system can sensibly be used. It can really make a difference on a long passage.

5.0 TROUBLESHOOTING

5.1 SYSTEM PERFORMANCE IS NOT SATISFACTORY

- Is the pendulum rudder positioned correctly? See 1.5.8 The Pendulum Rudder.
- Is the auxiliary rudder too close to the back of the main rudder? There should be at least 35 cm of separation (see 1.3 Points to Consider Before Installation).
- Do you need to improve sail trim/balance the boat better?
- Is there excessive weather helm at the main rudder? Is the boat snaking through the water? Try reducing sail area or balancing the boat better.
- Is the oil pressure in the hydraulic cylinder falling and allowing the main rudder to wander? See 1.5.9.2 Hydraulic Wheel Steering.
- Is the windvane working off to one side all the time? Try improving trim/balance.
- Is the windvane twitching or vibrating? Try moving the windvane forwards or aft (see 2.3.7 Setting the Windvane for Different Wind Strengths).
- Does the pendulum rudder keep swinging so far to one side that the two gear segments in the coupling disengage? If so you will have to steer by hand (see 2.3.6.2 Disabling the Overload Protection.

5.1.1 POSITION OF PENDULUM RUDDER BLADE

- If the pendulum rudder blade is too far aft, the balance proportion will be too small and the system will only be able to steer at relatively low speeds. No effective steering impulse will be generated at higher speeds.
- If the pendulum rudder blade is too far forward, the balance proportion will be too large. The pendulum rudder will be moving the windvane instead of the other way around, leaving the system completely unable to steer.
- Lower the pendulum arm into the water. If it immediately starts swinging around and seems unable to settle on centre, the pendulum rudder is too far forward.

5.1.2 THE PENDULUM RUDDER IS NOT MOVING 25 DEGREES TO EACH SIDE

- See 1.5.8 The Pendulum Rudder.
- Check to see if there is anything fouling or wrapped around the pendulum rudder.

5.2 SYSTEM IS STICKING

5.2.1 AT THE WINDVANE

- Does the windvane hanger 110 turn easily on axle 113?
- Check screw connection 113/116 and adjust if required.
- Are the screw connections on the push rod 150 and the top and bottom universal joints 156/160 properly adjusted? The universal joints must turn freely on the push rod.
- The upper screw 301 on the pendulum arm 360 must not be too tight otherwise bearing 328 will stick.

5.2.2 AT THE PENDULUM RUDDER AXLE

- If there is friction at the rudder axle, the system will have to be disassembled and cleaned.

DISASSEMBLY PROCEDURE
- Remove the pendulum rudder module from the transom.
- Remove red cap 320.
- Remove screw 326.
- Push shaft 327 down out of the bevel gear 325.
- Mark the relative positions of the two gears in the bevel gear linkage.
- Clean the bearing.

ASSEMBLY PROCEDURE
- Check the position of the two gears. The lever on the small gear should be in the 'quarter past twelve' position.
- Check that the pendulum arm is vertical.
- Check that the pendulum rudder blade is in line with the keel.
- Check that the hole in bevel gear 326 is flush with the hole in shaft 327.

5.2.3 AT THE AUXILIARY RUDDER
- Is bearing 507 encrusted with salt? Soak well, preferably with seawater, and then rinse the whole bearing thoroughly with fresh water. Engage the coupling to connect the pendulum rudder and auxiliary rudder and slowly swing the pendulum rudder from side to side while rinsing the bearing. Continue until the auxiliary rudder moves smoothly as you swing the pendulum rudder. Never use a hammer to loosen the bearing!

5.2.3.1 RESETTING THE COUPLING
- If the auxiliary rudder vibrates heavily in its centred position when the boat is under engine, you may find that you need to reset the coupling.
- Resetting the coupling is a job for two pairs of hands!
- Release the coupling. Do not tighten the coupling lever.
- Loosen bronze bearing … on the auxiliary rudder shaft (Allen key).
- One person pushes upwards (by hand) against the coupling component while making sure that the rudder shaft 630 itself does not move upwards.
- The other person knocks the bronze bearing … up until it rests flush against rudder bearing … with a small hammer or rubber mallet.
- Tighten bronze bearing ….
- The contact surface between gear segment 530 and crown 500 should be treated regularly with a little lanolin or wax.

5.3 THE PUSH ROD IS BENT
- Check the balance proportion of pendulum rudder blade 440 (see 1.5.8 The Pendulum Rudder).
- The push rod can be straightened easily.

5.4 THE WINDVANE SHAFT IS LOOSE
- Tighten bolts 251 and 504.

5.5 THE PENDULUM RUDDER BLADE IS VIBRATING
- Adjust the position of the pendulum rudder blade 440 in rudder fork 430.

- The vibrations should die down if you move the rudder blade aft very slightly.

6.0 REPAIRS

6.1 REMOVING THE GEAR SEGMENT FROM THE AUXILIARY RUDDER

- If the auxiliary rudder seizes in the crown 500, follow the procedure described in 5.0 Maintenance (soaking, rinsing) rather than disassembling the system.
- If the entire auxiliary rudder including shaft has to be removed from the crown 500 and shaft 600, proceed as follows:
- Remove the auxiliary rudder system from the boat.
- Loosen bolt 501 in the crown 500.
- Slide the crown downwards on tube 600 until the gear segment and its mounting are fully exposed. Retighten bolt 501.
- Release bolts 512 (Allen key).
- Unscrew retaining screw 511.
- Remove the gear segment assembly from the rudder shaft (use a rubber mallet if necessary).

6.2 FITTING THE GEAR SEGMENT ON THE AUXILIARY RUDDER

- This is a two person job!
- Carefully place bush 507 into crown 500 and spray with WD-40 or Teflon.
- CAUTION: if the bush is damaged, it must be replaced. It may be possible to cut a new bush out of 1 mm PTFE in an emergency. The bush must be an exact fit.
- First person: carefully insert the auxiliary rudder and shaft from below.
- Second person: carefully guide the shaft through bush 507 being sure not to damage the bush.
- Slide bearing ring 506 down the shaft (use lubricant spray).
- Open clamp bracket 510 up a little using a screwdriver or hammer.
- Place the clamp bracket on the rudder shaft 630 and keep it opened up.
- Screw retaining screw 511 back in again.
- Allow the clamp bracket to close up.
- Snug bolts 512 down very tight.
- Loosen bolt 501 in crown 500.
- Fix the coupling in the working position.
- Slide the crown up into its end position.
- Tighten bolt 501.
- Check for play in the coupling - see 5.2.3.1 Resetting the Coupling.

6.3 MISCELLANEOUS

- The system may be disassembled and reassembled using the component drawings.

- If cast components suffer collision damage and replacements cannot easily be obtained, it may be possible to repair them. Cast aluminium components can be welded back together quite easily if the faces to be joined are first heated thoroughly for a few minutes with an open welding torch flame. The actual welding procedure should only be attempted with proper aluminium welding equipment.

- 6 mm marine plywood is ideal for making replacement windvanes (see 2.3.7 Setting the Windvane for Different Wind Strengths).

- Some bearing play may develop in pendulum axle bolt 370. This is not a problem and will not impair the steering performance of the system.

6.4 THE PENDULUM RUDDER BLADE

- The pendulum rudder blade may be replaced with a simple wooden plank (approx. 120 x 900 x 20 mm). Even a completely unprofiled piece of wood will work on a temporary basis.
- CAUTION: the pendulum rudder needs a balance proportion of around 21%, which means that 21% of the rudder area most be located in front of the rudder shaft. If necessary try turning the blade around. The windvane should always control the pendulum rudder blade and not the other way around. Check this by lowering the pendulum arm 360 into the water. If it immediately swings out to one side and forces the windvane to do the same, there is too much rudder blade in front of the shaft.

6.5 THE AUXILIARY RUDDER BLADE

- The auxiliary rudder blade is finished in GRP and is very simple to repair. Filler, epoxy, polyester and some glass mat are all you will need.
- CAUTION: The auxiliary rudder has a rigid closed cell foam core. A certain amount of water always manages to get into the core around the rudder shaft because the stainless steel shaft is so much more rigid than the laminate. If it becomes necessary to repair the auxiliary rudder, remove it and allow it to dry out first.
- If the boat is to be left in the water when freezing temperatures are likely, remove the PACIFIC PLUS to avoid frost damage.

If you have any questions, please do not hesitate to contact us at

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and we'll do everything we can to help!