

# **Paper Tiger Catamaran Tuning Manual**

*a collection of articles by leading Paper Tiger skippers*

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## Paper Tiger Catamaran<sup>TM</sup> HANDBOOK

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A Guide to Sailing, Racing & Tuning a Paper Tiger Catamaran

**Publication of the Australian Paper Tiger Catamaran Association Inc. \$10.00**

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# Editor's Introduction

*by David Stumbles*

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Over the past few years, many people have been asking about the likelihood of a new Tuning Manual. Thankfully, the Victorian Paper Tiger Catamaran Association took up the challenge and started to assemble articles. When certain circumstances prevented progress with the manual, the APTCA took over the job of finishing it off. My personal thanks must go to Andrew Helmore and the other members of the VPTCA Committee for pulling most of it together. Andrew has also written an excellent guide to help you get the most out of this manual and your sailing.

The manual has been produced in such a way that it can be easily updated or added to. You can use it to keep all your Paper Tiger information together, including the addition of other articles you manage to obtain. I would recommend that if you do find an article that is beneficial, that you send a copy of it to the APTCA so that it can be included in future updates of the manual. It is hoped that these future updates, of two or three articles, could be made available each year.

The sharing of knowledge has become a feature of the Paper Tiger Catamaran class and this manual is just one example of that sharing during the history of the class. On behalf of the APTCA, and all the sailors who will read this manual, I would like to thank each of the authors who contributed their time, effort, enthusiasm and knowledge to this manual. They have produced high quality articles on various topics that are directly relevant to sailing and racing Paper Tiger Catamarans.

I hope you all get a lot out of this manual and that it increases your enjoyment of the class that is, for many reasons, the best small catamaran to own, sail and race.

## **David Stumbles**

President, APTCA, 1997.

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Catamaran™ Association

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International "A" Class Catamaran 1996 World and European Champion and 1997 European and German National Champion. Paper Tiger Catamaran 1995 International and National Champion. Victorian State Champion 1995 and 1997. 1996 Ronstan Australian Junior Yachtsman of the Year.

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# How to Use This Manual

*by Andrew Helmore*

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One of my golden rules of life is to ask questions when in doubt. When I am uncertain about solving a problem or I need to educate myself about an unfamiliar topic, I simply begin my own information gathering process. I obtain information from as many sources as possible, including the different opinions and methods from experts or experienced people in the relevant field. This enables me to build on my existing information base and then I am (hopefully) able to solve the problem myself.

I have used my golden rule extensively for sailing. For instance, when I joined the Paper Tiger fleet I spoke to many of the more experienced PT sailors, asking questions about why they used this brand of sail or why they chose to have their rudders set at a particular angle, what are the benefits of a certain system and so on. By talking to as many sailors as possible and asking an infinite number of relevant questions, I was able to solve problems, for instance, a lack of height when over 15 knots, or a lack of reaching speed in light airs.

Part of my ongoing process of developing Paper Tiger sailing skills involved reading the previous association tuning manual 'Tuning a Racing Catamaran'. I also attended Paper Tiger Training weekends. The training weekends provided a great opportunity to fire bundles of questions at the people who have the answers and the tuning manual provided a wealth of information that had been produced by the leading skippers of that era (even today this edition is still valuable reading).

In short, what I am proposing is that in order to improve your sailing, skippers should absorb as much relevant information as they possibly can from all available sources and then form their own opinions. In most cases there will be more than one opinion on how to accomplish a given task on a Paper Tiger. You must decide which is the most suitable for yourself and do not simply copy a skipper because that skipper happens to be winning at the time. Be critical and analytical about the changes you make to your methods, systems, rigging and so on. Use the methods that suit your style of sailing, your body weight, skill level, type of sail, what feels best and other relevant variables. We are all individuals and therefore our sailing development should be consistent with own views, characteristics and personality.

At times I have seen sailors making radical changes to their rigging as a result of a disastrous race during a major regatta (don't laugh - people still do this). Instead of hastily making major changes, establish why you had a terrible result. It may have nothing to do with your rigging. Take the time to test new methods or settings before the significant regattas. The majority of your testing and trialing of new systems should be well and truly complete by the time you sail at a major regatta. Use winter sailing and your club races to experiment with major changes and only make small alterations while at a major regatta, for instance, changes that are consistent with the regatta's prevailing conditions.

Use this manual as a source of information in order to seek out how other sailors go about certain tasks and combine this knowledge with your existing understanding. For example, what technique does a particular leading skipper use while reaching in twenty knots, how do I sail on those tricky inland lakes and so on. However, it is important to remember that what works for one sailor may not necessarily work for you. This manual will help you to build on your knowledge base. Read the manual, listen to others, ask questions, observe what others do and learn from all of this, but at the

end of the day you must make your own decisions. Finally, never forget which part of the boat is the most valuable piece of equipment. It is that grey matter in your head - use it constructively!

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# The History of the Paper Tiger Catamaran

*by Jack LeEVERS*

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In 1967 when Ron Given was discussing with friends how he planned to design a father and son training catamaran which he proposed to build on a simple mould by sticking plywood together with fibreglass tape, his friends began to comment that he may as well use sticky paper. Eventually, the word 'paper' and also the description of 'paper boat' kept coming to mind during talks about the new boat. As a result, 'paper' soon became part of the name, followed by 'tiger' because the tiger is an active member of the cat family. By the end of 1967 five Paper Tigers were built and one made its debut at Cat Week during January 1968 at Brown's Bay, New Zealand. By the end of 1968 the New Zealand Catamaran Owner's Association had been formed.

Following the publication of an article in 'New Zealand Seacraft', Nick Papas (an Australian) wrote to New Zealand for the plans. Nick also saw a New Zealand Paper Tiger while at the 1968 Melbourne boat show. This boat was owned by Wayne Thomas who was a New Zealander who had settled in Melbourne. Nick, Graeme McArthur, Bob Legg, Norm Regan, Dick Clarke, Geoff Braden, Ken Atkin and Kevin Carabott were among the first Australian owner builders. Ken Fay was the first commercial builder of the Paper Tiger in Australia.

The first meeting of the Victorian Paper Tiger Catamaran Association was held at the home of Nick Papas during July or August, 1969. The first general meeting was held at the Burwood Tennis Club on Friday 26 September, 1969. At this meeting there were 26 foundation members of the Victorian Paper Tiger Catamaran Association. By 1970 the number of members had grown to 58, in 1971 it was 102 and the association peaked at 329 members in 1973.

The first Victorian State Titles were in 1971 and attracted 37 competitors with the number of participants extending to 68 the following year and 83 in 1973. Due to the large number of boats wishing to compete in subsequent years, elimination rounds were held to limit the fleet size. For example in 1974 there were 86 PT's before elimination rounds reduced the fleet to 50 competitors, and in 1975 a fleet of 99 PT's was reduced to 50 boats. In 1980 the fleet size peaked with 109 entrants which was restricted to 100 competitors.

The National Title events have been held since 1971 and in 1975 the International Series commenced with a visit of an Australian team to New Zealand. Table 1 presents a list of current and past champions within the Paper Tiger class.

**Table 1 *Paper Tiger International and National Champions***



## The Paper Tiger Design

The original hull design of 5mm ply has stood the test of time. In fact some of the best Paper Tiger skippers of modern times have used self built ply hulls. The plans still support the original design in plywood. All other materials including fibreglass and foam sandwich are regarded as alternate materials.

By the early 1970's some fibreglass hulls were built but these were found to be too flexible and if they were built rigid enough they were too heavy. Composite designs were tried where fibreglass was used for the lower hull and plywood was used for the deck. There were many variations of combinations. For example, Terry Heron and John Clift built a composite Paper Tiger consisting of fibreglass up to the chines with plywood sides and decks. This design required less keel maintenance than a plywood hull.

The 1978 National Titles saw the appearance of the first foam sandwich Paper Tiger. This was owned by David Hart (Hartatack). This boat was built on a normal male mould and was finished externally by hand. The following year Dennis Etchells and Geoff Walker built foam sandwich hulls at 'P.T. Yachts' offering an off-the-mould finish from a female mould. By 1982 Derek Congerton of South Australia also had foam sandwich hulls in production.

Up to this time all fibreglass and foam sandwich Paper Tigers were built with the beams bolted through the deck to blocks attached to the gunwales in the same manner as the original design. In the mid 1980's a revision of the moulds allowed the beams to be bolted through the gunwales thereby removing one of the weaknesses in the design, that is, the lifting of the decks from too much force on the bolts.

While the Paper Tiger was designed as a training catamaran Ron Given, the designer, did not anticipate the competitive ability of those sailors who were attracted to the class. Through the ingenuity and determination of the sailors who have entered this class, the Paper Tiger has been turned into a smooth racing craft. Many items now approved were not in the original plans. These include a traveller which replaced a wire hawse, lower forestays which can now be adjusted and the introduction of adjustable downhaul and outhaul systems and a mast spanner. Fittings which are considerably different from those of the early Paper Tigers are a hinged gooseneck, a mast cup and pivot which replaced a pin through the main beam and a plastic washer, turnbuckles and stay adjusters which have replaced cord lashings, a multi-purchase boom-vang and swing-up rudder systems which have replaced dagger rudder boards. Also many fittings have been designed by Paper Tiger sailors especially for Paper Tigers.

Although the Paper Tiger is a New Zealand design, Victoria has the greatest concentration of boats. South Africa in the past did have a strong association and there once was a North American Paper Tiger Association. Additionally, there was a small fleet at Madang and a licence to manufacture Paper Tigers was sold to Japan. These days very little is heard about the Paper Tiger from overseas except, of course, New Zealand.

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# Tips for the Beginner Sailor

by Peter Anderson

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Learning to sail is fun, but remember the conditions of the sea are always changing, so be prepared. Conditions can change from no wind to extremely strong winds in a matter of minutes. It is best to learn to sail in light to moderate breezes (5 to 12 knots).

## Rigging your Paper Tiger

Place the boat on the beach with the bows (front) facing into the wind. Rest the mast on top of the boat with the mast top to the rear of the boat. Attach all of the stays to boat and mast except for the front upper stays. The adjustable front lowers must be left loose to allow the mast to fit into the mast base. Standing in between your hulls, lift and stand the mast upright. Step the mast into place on the front beam and tighten the adjustable front lower stays to support the mast (apply enough tension to these stays to allow the front upper stays to be connected).

Battens must be firmly tied into the sail before hoisting up the mast. Make sure the sail is attached to the halyard lock mechanism at the top as it is very difficult to re-hook a sail once on the water. Slide the boom onto the bottom (foot) of the sail and connect the boom vang to the mast spanner and the mainsheet to the traveller car (always leave the traveller and mainsheet uncleated and free to move). Make certain that the centre boards and rudders are secured to the boat just in case you do capsize.

Before leaving the beach put on some warm gear (wet suit or old clothing under a water resistant slicker). It will usually be colder out on the water than on the beach and it is better to be a little warm than a bit cold. An approved buoyancy vest or life jacket must be worn in all conditions while sailing. If you intend to race, sign on, otherwise let a friend know how long you intend to stay out on the water.

## Leaving the beach

Perform a final check of your boat and gear before leaving the beach making sure that the hatch covers are on tight, the ropes are not tangled and all the cleats and gear is operating smoothly. Ask for a hand to lift your boat into the water, always keeping the boat head to wind (bows into the breeze).

The wind will generally be blowing from one of three directions; along the beach, out to sea (off-shore) or straight onto the beach (on-shore). If the wind is along the beach, keep the sail nice and loose, your back to the wind and turn the boat to face out to sea. Put one rudder part way down, jump on board and pull in the sail a little and sail straight out into deeper water before lowering the centre boards and rudders completely.

If the wind is off shore and fairly light, put one of the rudders part way down and with the sail loose, turn the boat and sail out into deeper water. Be prepared for a gybe as often with off shore breezes the wind can be very shifty (changing direction constantly). If the wind strength is strong you will need a lot more room to manoeuvre the boat into a downwind position as the boat is often difficult to turn with the rudders only half way down. Additionally, beware of unsuspecting swimmers. It is sometimes easier to leave all boards and rudders up and drift out backwards by just sitting on one of the bows of your boat (you have no steerage, so make sure that the way out is clear).

If the wind is blowing onto the shore then the sea is likely to be rougher (a shore break may be evident). You will need to put a centre board part way down as well as a rudder because you will be pointing into the wind while trying to get out through the waves (the centre board will prevent some sideways slip). You may have to walk the boat through some of the waves in order to achieve a little more water depth in the troughs between the waves so that the centre board may be partially lowered. This will also reduce the chances of your boat being washed backwards into the shore and your rudders being broken. Don't try to point too high, just go for some speed to get you through the waves.

## Basic Sailing

### **Beating to windward (sailing into the wind)**

When beating to windward the traveller should be set about 15 to 20 centimetres from the centre of the boat and the main sheet (main rope to control boom angle) should be pulled in tight. The centre boards and rudders should be all the way down. The wind will feel like it is coming straight from the bow of the boat. If the bow is steered too high into the wind the sail will begin to luff (the wind hits the back of the sail and causes it to back wind or become distorted in shape near the mast). Generally, you will find that 45 degrees from the true wind (actual wind direction) will be the best angle of beating to windward.

### **Tacking (turning the boat through the eye of the wind)**

In order to tack the boat you need to keep it moving as smoothly as possible all the way through the tack. Start your tack going up a wave and finish it coming down the back of the same wave. The rudder is moved by pushing the tiller away from you smoothly. Sometimes it helps to tie a cord from the centre of the tiller crossbar to the centre of the boat's rear beam to restrict the rudder movement to about 45 degrees. This prevents excessive drag in the water by the rudders when turned too far.

The boat may get into 'irons' (stuck head to wind or pointing directly into the wind and not moving forwards) if the tack is not performed cleanly. That is, the boat is neither on a starboard tack or a port tack. To get out of irons push the tiller away from you and push the boom out in the same direction. The boat will reverse in an arc and at the end of this arc straighten up the rudders and pull the sail in using the mainsheet. This will get the boat moving again.

### **Reaching (sailing across the wind)**

Reaching is great fun. The boat travels at its fastest and you have a wide range of sail positions and directions in which to move. Reaching angles include a 'close reach' (just off the angle of beating or pointing- about 90 degrees to the wind) and a 'broad reach' (sailing side-on to away from the wind). The traveller must be let out towards the side of the boat (the further away from the beating position the further out the traveller should be set). Centre boards should be all the way up in most cases. The exception being a very close reach where the windward centre board should remain in the down position.

### **Running/dead run (sailing with the wind / the wind is coming from behind)**

When on a dead run the wind will feel lighter and the boat will be travelling slower. However, sailing down wind in heavy breezes will break more masts and 'bottle' (capsize) more boats than any other sailing angle. It is important to keep your lower front stays firm to support your mast and reduce the chances of a breakage.

Gybing is when the sail and boom go from one side of the boat to the other while travelling downwind. This manoeuvre occurs very quickly so be prepared to duck under the boom. The traveller will be right as far as it can possibly go and both centre boards will be fully up. It is best to control the gybe by pulling in the main sheet a little way first and then let it out as the boom swings across the boat. This will also cushion the shock load on the mast.

### **Capsizing or bottling (tipping the boat over)**

Capsizing is not uncommon in sailing and should be treated as part of learning to sail. A Paper Tiger is a very buoyant boat and will not sink even if full of water so always stay with your boat. The Paper Tiger is also a very easy boat to right.

### **Returning to the beach**

Returning to the beach is in the reverse order to leaving the beach. The centre boards and rudders need to be considered together with the angle of the wind to the shore. Leave rudders in the half down position so the boat can be manoeuvred but also sailed into shallow water at the same time. Keep an eye out for swimmers and leave plenty of room to turn the boat up into the wind to stop it before the hulls hit the bottom.

Always ask for the help of the more experienced Paper Tiger sailors at your club. Most Paper Tiger sailors are more than willing to pass on their knowledge to new comers.

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# Righting a Capsized Paper Tiger

*by David Stumbles*

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Capsizing is something that eventually happens to everyone who gets involved in small boat sailing. It is part of the sport, normally resulting from a mistake made by the skipper. Whilst it is to be avoided if you want success on the race course, it is not something you should be worried about, so long as you have some basic knowledge of how to right the boat.

The two most common ways to capsize a Tiger are:

- (1) getting overpowered and heeling too far while going upwind or on a tight reach. This is the most common amongst newcomers to the class, often the result of getting the mainsheet stuck in the cleat, and
- (2) involves a nosedive while on a broad reach, sometimes resulting in a complete cartwheel of the boat, which is more common among more experienced Tiger sailors.

If the boat simply tips over on its side, as in the first case, the most likely result is that the mast will sink and get stuck in the mud (in shallow lakes). Once this happens, climbing onto the hull, or worse still the centreboard, will do nothing at best or result in major damage at worst. Once the mast is in the mud, you need to turn the boat around so that the mast is pointing upwind. This enables the trampoline to catch the wind to help blow the boat along and pull the mast out, as well as aiding in righting the boat. Trying to swing the boat around so that the mast is pointing into the wind is no easy task if the correct technique is not used.

Once you have capsized, and the mast has started to sink, you should attempt to swing the boat as soon as possible. The method I use is to sit on the bow (the further out to the front the better), which lifts the sterns clear and (for some reason) starts the boat swinging around, pivoting about the mast top. This will be a slow process, but is quite effective. I have been assured that sitting right on the stern has the same effect, although I have not had an opportunity to test this method.

Once the boat has swung around and the mast is pointing upwind, you should stand on the bottom hull (preferably on a chine) around the centre of the boat. **DO NOT** stand on the centreboard as PT boards are not strong enough. Most boats should have a righting rope. Use the rope to hang off, using your weight to drag the boat upright. If no righting rope is fitted, grabbing the jumper strap will also work, although it requires more effort. When the boat starts to come up, get ready to throw your weight onto the hull on which you are standing. This will counteract the momentum that will try to launch this hull into the air and possibly capsize the boat the other way, which can be very disheartening and tiring.

If you capsize as a result of nosediving, the boat may end up in any number of different positions. The above technique will normally work whenever the mast gets stuck. If you have to get towed out of the mud, always tow away from the mast, ie. from the bottom of the boat, otherwise you may bend or break the mast. Never wrap a tow rope around the hull, always try to use the front beam. If you have to be towed into shore, wrap (don't tie) the rope around the front beam about 6 or 7 times and hold onto the end. This allows you to undo it quickly. Hopefully, you won't be involved in this process too often!

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# Common Paper Tiger Systems

by Ben Deed

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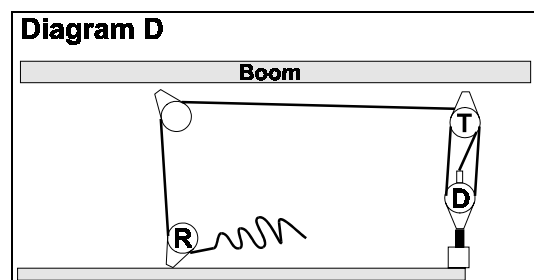
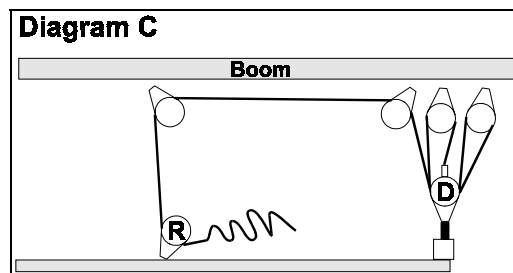
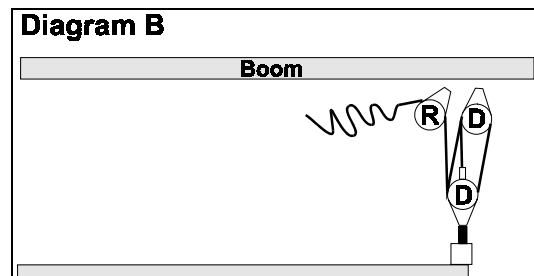
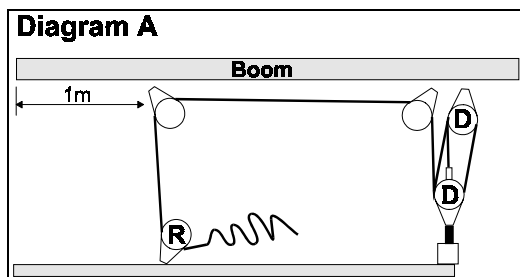
The systems of the Paper Tiger are an important part of the boat. Whether it be used for recreation or for racing, if the systems on the boat are hard to use when sailing, it is hard work and becomes frustrating. In my experience, when you update your systems, it is best to save your money up so that you can buy the best quality equipment.

## Main Sheet

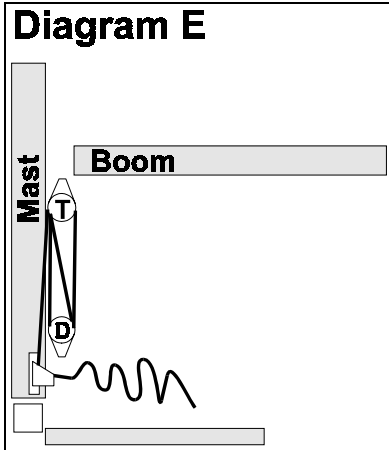
The main sheet is, without a doubt, the most used system and when made user friendly the boat will perform very well. The sheet (rope) sizes may vary. I would recommend no larger than 10mm diameter and no smaller than 8mm dia. The length will depend on where you position the boom hangers.

The best pulleys to use are roller bearing pulleys to rid unwanted friction. Diagram A shows a standard arrangement of pulleys, having a 6:1 ratio with the pulley on the traveller car being a double with a becket, with a double pulley and two single pulleys placed on the boom. The single pulley that leads the main sheet to the ratchet block is located approximately 1m from the front of the boom. The ratchet block, which is attached to the fore-aft beam, is located for the skipper's comfort. Diagram B shows that the ratchet can be located on the front boom hanger (giving a 5:1 ratio), but when sailing in heavy winds it may tend to pull the skipper towards the back of the boat. Diagrams C and D show alternate arrangements for the main sheet system.

(Note: The markings on the pulleys indicate **D**=Double, **T**=Triple, **R**=Ratchet)



**Diagram E**



**Downhaul**

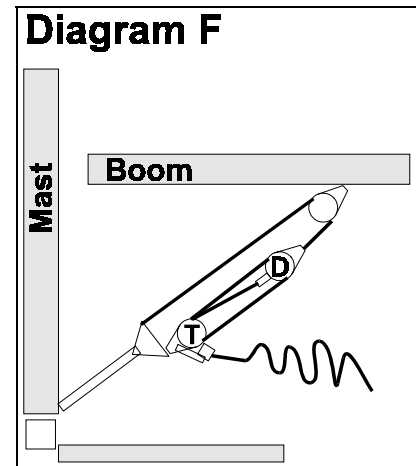
The downhaul systems are becoming more technical each year. Some people are using fixed goosenecks and setting up a cunningham system, which lets them adjust the luff without altering the vang setting. Diagram E shows the system that most people are using. It uses a sliding gooseneck with a triple roller bearing pulley, suiting a 6mm rope, shackled to the gooseneck. The bottom pulley is a double roller bearing pulley. Swivel cleats are mounted on both sides of the mast. The downhaul rope is tied off at the lower shroud so that it can be operated from the skipper's hiking position.

NOTE: If you are using an Australian section mast, make sure the gooseneck is a tight fit in the web of the sail track as the track is known to open out and crack.

**Vang**

The basic set up of the vang has not changed a great deal, but the quality of the pulleys and cleating arrangement has. The roller bearing and the use of 4mm dia. rope decreases the friction and makes for a user friendly system.

A 5:1 or 6:1 ratio system, doubled with a wire strop, usually works quite well. A cleat mounted on the bottom block will make the system easy to use.



If you change or alter any system, remember to make it easy to operate while sailing and try to make it as friction free as possible.

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# Using the Lower Forestays

*by David Godfrey*

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Primarily the lower forestays are designed to support the middle of the mast when sailing in heavy breezes on a broad reach or on a run. There are several methods of supporting the mast that are currently in use that all do basically the same thing. I suggest that if you do not have an adjustable system then you look around and find one that best meets your needs. The system should be simple and easily accessible while sailing. A method of calibration also needs to be incorporated so settings can be repeated throughout the race. Usually a 3:1 purchase is sufficient, however, many top skippers are presently using higher purchase systems (6:1). The extra purchase is used to alter sail shape which is a topic that will be covered later in this article.

## **Prevent that mast from breaking**

This is the most important use of the lower forestays. If the wind strength exceeds twenty knots then the lower forestays should be pulled on firmly to hold the centre of the mast straight when broad reaching and running. Take caution not to over tighten these front lower stays. Over tightening will excessively bend the mast which effectively lowers the upper hounds and loosens the upper stays. Consequently, the top of the mast is left without a lot of support and the risk of a breakage to the top portion of the mast is greatly increased. If the centre of the mast is held straight the top will tend to flick forward in response to the bigger gusts of wind. This can be controlled to some extent by using a great deal of vang tension and even mainsheet tension to support the top of the mast. Many skippers tighten their back upper stays when the wind is very strong as a precautionary measure to preserve the mast.

## **Using the lower forestays to change sail shape**

The tightening of the lower forestays primarily does three things. Firstly, it flattens the sail (less camber), secondly, it will cause the drive to move further aft, and thirdly, it will free up the leech.

While on the beach set up your sail with the lower forestays slack, then watch what happens to the camber and the leech as you tighten and loosen the front lowers. Generally the maximum draft (drive) for a Paper Tiger sail is around 40 - 45 percent from the luff for upwind sailing, while for shy reaching the drive needs to be around 30 percent. Therefore, it is possible to set up a slightly fuller sail ideal for reaching and then by using the lower forestays simply move the drive back for upwind.

As with all sail adjustments, a good set of telltales placed on the sail will help you determine the amount of adjustment required. I like them placed at 33 percent and 66 percent across the sail with a set in line with the lower hounds. This gives you the most information about the tension required on the lower forestay. If the windward telltale is not flowing and the leeward telltale is flowing, then the sail is too full. Conversely, if the leeward telltale is not flowing and the windward one is, then let the lowers off a bit.

The best way to learn how to use your lower forestays is to simply go out on the water and try fiddling. This can be done by yourself (ie. what feels best), however, more efficient methods of obtaining settings would involve either a two boat tuning session or a race. Remember to record the setting that appeared to be quick on that day and try these again the next time you sail.



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# Starting

*by David Stumbles*

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It is very important to get a good start. Blowing the start means that you are behind from the first moment of the race. This can be especially disappointing if you are new to the sport, as you will have nearly no opportunity to get back into the race. Therefore you have to try to be on the line when the gun goes.

The first thing to ensure is that you are aware of the "starting sequence", which means which flags go up or down, when they do and what each of these means. There is a fairly standard starting system that is used by most clubs for most events. This system is as listed:

- ☞ Course Flag..... Red (Port) or Green (Starboard) determines which side the buoys are to be taken. This flag will be raised with or before the 10min and without a sound signal.
- ☞ Warning Signal..... Normally the Paper Tiger Class flag at a Paper Tiger event, but can be anything at other events. This flag will be raised 10 minutes before the start with one sound signal.
- ☞ Preparatory Signal. The standard Code Flag "P" (white flag with thick blue border). This flag will be raised 5 minutes before the start with one sound signal.
- ☞ START..... Both the Class flag & "P" will be dropped with one sound signal.

It is important to note that the times are taken from the flags and NOT the sound signal.

Whilst you should go for a bit of a sail before the start to get yourself into the groove and to get a feel for the breeze and waves of the day, it is important not to stray too far from the starting area. Always try to be near the start boat when the 10 minute gun is due and be ready to start your watch countdown timer (if you have one) or your stopwatch. You can then use the 5 minute gun to check your watch.

Although the starting crew will try to position the start boat so that the start line is perpendicular to the direction of the wind, the line will nearly always be closer to the wind at one end. This is generally the "favoured end", as it is closer to the first mark. The most basic method of checking the line is by sailing your boat into "irons" (head to wind), roughly on the line somewhere, and then looking at each end to determine which looks further upwind. This method can be a bit crude, but it works most of the time. You should sit head to wind for a little while to allow for any small wind changes. This checking can be done while you are waiting for the ten minute gun and then again when waiting for the five minute. In the early stages of racing, you shouldn't worry if you get this wrong. It is much more important to actually be close to the line than to be at the right end.

You should always try to start a slow approach to the line with about two minutes to go. This can be practiced at the five minute gun as well (this is the best opportunity to check your approach as conditions should be nearly identical as at the start other than the number of boats on the line). If the wind is very light, you will need to start your approach earlier. Start sailing towards the line with the sails just sheeted enough to keep you moving. Keep an eye on your watch and the other boats around you.

At one minute to go, you should be on track for the position on the line at which you want to start. If you think you are not getting to the line quickly enough, you can sheet on more. Stay with the

boats around you but don't be tempted to race up to the line too soon, as you will have to bear away and will be at the mercy of the boats below you.

As a guide to starting, this is how I would approach a club start in a breeze of about 5 to 20 knots. In winds under about 5 knots, I adjust my start so that my approach starts sooner and in very strong winds I slow my approach down a bit and concentrate on staying away from other boats, some of whom may not be totally in control! So, my standard approach would be (times listed are amount of time to go before the start):

- ◆ 12 minutes. At this point I am thinking "Why did I sit around in the club house and talk for so long, I should have been out here earlier!" I head towards the start boat around this time, and sit near it checking the line to see which end is best.
- ☞ 10 minutes... Set my watch, then head off for a sail upwind, tacking a few times, looking at the rig and adjusting it as I see necessary. In very strong winds, I pay particular attention to the traveller position, so when I start I will be in the ballpark and not be over or under powered. I also check the compass readings as I'm sailing upwind.
- ◆ 7 minutes Head back towards the start boat (running).
- ◆ 5½ minutes... Sit by the start boat, checking the line and waiting for the gun.
- ☞ 5 minutes..... Check that I have the time set correctly. Then set off for another brief upwind sail.
- ◆ 4 minutes..... Head back towards the line (running). Decide which end to start.
- ◆ 3 minutes..... Check the line again if in doubt, then start heading out to beyond the starboard end of the line, 30 - 40 metres to leeward of the line. As I am on port tack here, I have to watch carefully for other boats.
- ◆ 2 minutes..... Turn around (generally gybe) and position myself for the final approach. At this stage I am generally 100 - 200 metres from the start line, still about 30 - 50 metres to leeward.
- ◆ 1¾ minutes.... Ensure boards are right down and forestay telltales are untangled.
- ◆ 1½ minutes.... Start the boat heading at the line, slowly, but ensuring forward movement (avoid stalling)
- ◆ 1 minute..... Assess distance from line and adjust speed of boat if necessary.
- ◆ 40 seconds.... Start asserting authority on the boats around so that they are not walking all over the top of me or hunting me up from below.
- ◆ 30 seconds.... Keep adjusting speed and ensure bow is in front of boat to windward.
- ◆ 20 seconds.... If approaching too quickly, start doing "esses" to wash off speed.
- ◆ 10 seconds.... Hopefully I am the right distance from the line. If so, I power up and start going for it (it's good to have full speed at the gun). If not, I try to wash off more speed or start bearing away if there are no boats to leeward.
- ☞ START..... GO FOR IT!!!

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# Upwind Sailing

*by David Stumbles*

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As most sailors would realise, the way in which the rig controls are adjusted and set is dependent on the wind strength at the time. This article is designed particularly for the new comers to the Paper Tiger class and it will consider firstly, the adjustments to each of the primary controls for the various conditions that a sailor might expect. Secondly, this article will consider other aspects of upwind sailing such as boat handling skills and some basic upwind tactics. Additional information will be necessary as the sailor's skill level increases.

## Settings and Controls

It is important for you to get your settings correct before the start of a race. The most obvious benefit to doing this is that your boat will be going as fast as possible right from the gun, leaving you to concentrate on sailing the boat rather than trimming the controls. Of course, conditions will often change during the race requiring further adjustments to the controls. However, conditions in the ten minutes prior to the start are generally quite similar to at least the first five minutes after the start.

### **Very light winds (less than 4 knots)**

I have heard some sailors recommending that lots of downhaul be used in very light winds to flatten out the sail and to open up the leech (back edge of the sail). The leech does tend to hook (curl to windward) in these conditions. I tend to use less mainsheet tension to avoid this problem. The method that you employ will depend on the type of sail that you use. It is always a good idea to discuss the settings of a given sail with someone in the class who is going well with that type of sail. I use very little downhaul, just enough to almost pull out any wrinkles along the luff (front edge of sail). I set my vang so that the vang spanner (rotation lever) is about 45 degrees to the centre line of the boat. This is fairly standard for me in most wind strengths. I leave the traveller set in the centre.

Mainsheet trim can be critical in these conditions. Too much tension will hook the leech and choke the sail. I believe it is better to use too little tension than too much in these conditions. The sail tell-tales are particularly useful when determining the sheet tension. If you get headed (where the wind swings so that you can not point quite as high) and the boat starts to stall a little, ease the mainsheet and bear away. Gradually pull the mainsheet back on to the original setting as your speed increases. I lie along the centre of the tramp, in a position that allows me to watch the telltales on the forestay, looking occasionally at the sail to ensure correct trim. I lie as far forward as is comfortable in order to get the transoms out of the water and I try to keep as still as possible.

### **Light winds (4 - 8 knots)**

Once there is enough wind to ruffle the water the mainsheet tension can be increased with the aim of getting the telltales on the sail flowing. A little more downhaul may be required to remove the luff wrinkles. This, combined with the added mainsheet tension, will mean that the vang will have to be tightened in order to maintain the 45 degree rotation (the boom is now lower). The traveller can remain in the centre.

I find that a sitting up position is more comfortable in these conditions, as you will need to watch the sail more carefully. Sitting up also allows you to shift your body weight quickly in response to a gust. Generally your body weight should be well forward, near the front beam.

### **Light to moderate winds (8 - 12 knots)**

When it is possible to start flying a hull in light to moderate winds, a little more mainsheet tension will be required. You should try to fly a hull whenever possible, so don't hike out when the windward hull is still in the water. Flying a hull greatly reduces the wetted surface area of the boat and therefore the drag. This is a highly desirable situation. You may have to move slightly further aft to avoid digging the nose in to the small waves (just behind the rear chainplate). This also allows you to hike in response to gusts without fouling the sidestays. Trim the downhaul to remove wrinkles and adjust the vang to maintain the 45 degree rotation. The traveller can remain in the centre.

### **Moderate winds (12 - 16 knots)**

When sailing in the moderate wind range the lighter skippers will be looking to depower. Newcomers to the Paper Tiger class will tend to ease the mainsheet as a method of depowering. Whilst this method of depowering is effective while you are learning to sail, it is a slow way of sailing which uses much of the skipper's valuable energy and is therefore inappropriate for racing. By this I don't mean that I never ease the mainsheet. The mainsheet should be eased in response to a gust to depower but not as a permanent method of depowering. The other controls are a more effective means of depowering. In fact mainsheet tension should be increased as we go up the wind range.

In moderate conditions before the downhaul and traveller are brought into play as methods of depowering, the use of hiking should be employed. Hiking is the act of hanging your weight over the side of the boat (gunwale) to counteract the forces of the wind using the footstraps to support your body weight. The footstraps should be positioned so as to allow you to have the gunwale located somewhere between the bottom of your backside and halfway down your thigh with your legs slightly bent. Again, you will need to trim the downhaul to remove luff wrinkles, adjust the vang to maintain the 45 degree rotation and leave the traveller set in the centre.

### **Moderate to strong winds (16 - 20 knots)**

Within this wind range nearly all skippers will be starting to depower. Remember, don't use the mainsheet to do this, except in response to gusts. In fact, more mainsheet tension will be required to avoid sail twist, to keep the leech straight and to keep the boat driving forward. The two major ways to depower involves the downhaul and the traveller. Increasing the downhaul tension will flatten the sail and open up the leech. You may also need to ease the traveller out depending on your body weight (anything between 100 and 200 mm from the centreline).

Some sailors depend on a cleat to hold their mainsheet in these conditions. This is a bad practice for two reasons. Firstly, you will not be trimming the sail in response to every gust and lull. Secondly, you are greatly increasing your chances of capsizing as you may not be able to quickly uncleat the mainsheet when a large gust hits you. You will also need to hike that bit harder in these conditions. If you find this tiring, don't worry. As you sail more in these conditions you will attain a certain level of 'sailing fitness' and it will become easier.

### **Strong winds (20 - 25 knots)**

Safe sailing and depowering will be the key to your survival in strong winds. More downhaul and mainsheet tension will be required. A good downhaul can really depower the sail and make the boat sailable in these conditions. You should have the traveller eased to around 200 - 300 mm. You will know if you have the traveller and downhaul correctly adjusted because you will be able to sail with the mainsheet on hard (virtually block to block) and just depower using the main for the big gusts. Of course you will have to hike very hard. To give yourself a break every now and again, just ease

the traveller and reduce the effort expended from hiking. You may have to hike a little further back to avoid the nose of the leeward hull digging into the waves too much (over the top of the centreboards is generally a good position). Adjust the vang to maintain a rotation angle of between 30 and 45 degrees.

### Rough guide to settings and controls for various conditions

Wind conditions	Wind strength (knots)	Mainsheet tension	Downhaul tension	Vang spanner rotation	Traveller from centre (mm)	Body position on boat
Very light	0-4	Eased	Pull the wrinkles out	45°	0	Lying/centre well forward
Light	5-8	More		45°	0	Sitting well forward
Light to moderate	8-12	Moderate		45°	0	Ready to hike
Moderate	12-16	Fair bit		45°	0-100	Hiking close to sidestay
Moderate to strong	16-20	Lots	Fair bit	45°	100-200	Hiking harder
Strong	20-25	Very hard	Heaps	30°-45°	200-300	Hiking further back

## Boat Handling Skills and Tactics

Not only is it very important for a sailor to have the primary controls set correctly (as outlined earlier in this article), but it is also critical that the skipper maintains good control of the boat in order to obtain maximum boat performance. Control of your boat is a skill that will ensure that you get upwind as quickly as possible.

### Boat control

I have already detailed where you should be positioned on the boat for various wind conditions, which is a major factor affecting the control of your boat. I have also stressed that you should avoid using a cleat for your mainsheet system. A good ratchet block is sufficient to ease the load in all conditions. Newcomers often ask how it is possible to pull in a lot of mainsheet without a cleat. This can be easily achieved by sailing with the tiller extension positioned across the front of you rather than beside you. This way the steering hand may be used as a cleat to hold the mainsheet while grabbing another handful of rope. Additionally, this method is also handy when you need a spare hand to adjust another control. You simply hold the mainsheet and tiller in the one hand and use the other to make adjustments. Whilst sailing upwind I wrap the mainsheet a few times around my hand to avoid it slipping out. Having it slip out accidentally will dump the sail and cause the boat to slow right down (you may also end up with a trailing boat climbing over your back beam).

### Using telltales upwind

Once you have your controls set, you should be able to sail using the forestay telltales. To position these correctly, they should be attached at about eye level when standing beside the boat on the shore. Always attach them to the upper front stays, not the lowers, as these lower stays are often slack and consequently flop around which makes it difficult to read the telltales. Use a piece of cassette tape that is long enough to be tied to the forestay (I use a round turn and two half hitches) and they must reach back almost to the mast. You can steer to these telltales by keeping them pointing back at the mast or slightly to windward of it, but not more than 100mm. This is a good

safe guide to your correct sailing angle upwind. If you are unsure as to your settings and your other controls, use the telltales on your sail as a further guide to correct boat trim. You should aim to always have the leeward sail telltales flowing and the windward ones flowing or just lifting slightly.

## **Steering**

You should aim to steer as smoothly and precisely as possible. Excessive movement of the rudders will only slow you down. It is better to make large adjustments with the mainsheet in response to a gust rather than alter course too much.

## **Other boats**

Always be on the lookout for other boats. Be aware of what tack you are on (port or starboard) and your rights in case a give way situation occurs. For instance, you must at least know the most basic right-of-way rule: a port tack boat must give way to a starboard tack boat. If this does not make sense to you, get someone to explain it to you as soon as possible. If you do look like having to avoid a starboard tack boat, you will generally have two options. (1) tack, or (2) bear away and go beneath the starboard tack boat. In most situations it is generally better to bear away and go beneath as tacking is slow and usually positions you in the starboard boat's dirty wind. If you go beneath, bear away early and move your body weight back on the boat as you will now be close reaching. Cut close to the stern of the other boat, but do not make the passing manoeuvre too fine in case the other boat stalls or hits a wave. If you allow plenty of time to pass beneath (so that severe rudder movement is avoided) then you should not lose too much ground at all. As you get more comfortable on the boat you will be able to look behind you and underneath the boom to check for other boats without wandering off course - you should practice doing this.

## **Tacking**

A lot of ground can be lost through poor tacking. Stalling the boat (getting stuck in irons/head to wind) is something to be avoided, as it will really lose you a lot of ground. A successful tack takes some skill and preparation, although it becomes very automatic after you have been sailing for a while. Firstly, you must have plenty of speed (relative to the conditions). You must check to ensure that you won't foul anyone during or immediately after your tack. Be definite with your steering. Once committed to the tack, go for it. Keep the tiller pushed across - don't let it come back to the centre, as this will definitely stall the boat. Ease the mainsheet as the boat goes through head to wind. Ensure that the mast spanner has moved across to the new side. Sheet on slowly as you start off on the new tack.

## **Stalling**

If you do get stuck in irons, you will have to reverse the boat out of it. Do this by positioning yourself on the side of the boat that you want to be on at the end of the tack. Ease the mainsheet right out and push the boom across to the opposite side to you. Push the tiller away from you. This will make the boat go backwards. As it reaches the point of being about 45° to the wind, straighten the tiller and pull in the mainsheet slowly.

## **Which way do I go?**

If you are new to Paper Tigers, your best bet is to try to stay with the faster boats, especially on the first beat. Most of the time they will be sailing in the best part of the course. You may occasionally get a wonderful lift by heading off by yourself, but you won't learn anything by it. By sticking with the bulk of the fleet you can easily gauge your speed relative to the other boats. If you are in the ball park, be content with this and just try to sail as best you can. If you appear to be slow, review your primary sail settings and compare them with those boats around you. Always be aware though that slow speed out of the start may be due more to bad positioning (being in dirty air from other boats) than from incorrect settings.

## Lifts and knocks

This is a very complex subject. If you don't believe me, try reading *Advanced Racing Tactics* by Stuart Walker. However, you can apply some very basic principles that will hold you in good stead most of the time. On coastal lakes, most breezes are oscillating, meaning they shift around about a mean direction. So they will vary slightly, most of the time, but they will maintain a general direction.

A lift is a clockwise shift when you are on starboard tack and an anticlockwise shift when you are on port tack. It allows you to point closer to your destination (when sailing upwind). In the early part of a beat, a lift is nearly always desirable. A lift becomes undesirable when you have reached the layline (see definition below) and wish to tack back to the mark. Ideally, you shouldn't be on the layline until you have sailed most of the upwind leg. A knock is the opposite to a lift. A knock will force you to bear away, meaning that you are losing ground to your desired destination, the windward mark of the course. Generally, it is best to tack when you get a significant knock. As I stated earlier, this is a very complex subject. Trying to explain it in detail would take many pages. Being aware of these simple guidelines will help you to understand why the sailors around you tack when they do.

## Laylines

If you sailed on a starboard tack from the start line, you would eventually reach a point where the windward mark was about 90° to the centreline of your boat. If you tacked at this point, you should be able to reach the windward mark. This is called the layline. If you kept going on the starboard tack, you would go past the layline and when you eventually tacked, you would have 'overlaid' the mark and would approach it on a tight reach, rather than beating. Of course, the opposite applies if you left the start line on port tack. Always be aware of where the mark is so that you don't overlay it, as this wastes valuable time.

## Dirty air

Dirty air is the common name for the disturbed air produced by a boat as it sails along. It is also known as a boat's wind shadow. It is of extreme importance to avoid another boat's dirty air, as it is slow to sail in this disturbed air. A lot of newcomers to sailing think that the wind shadow from a boat only occurs directly downwind from its sail. Whilst this area is part of it, the shadow also stretches back from here by a couple of boat lengths. The real trap though, is the wind shadow that extends straight back behind the boat about three to five boat lengths and slightly (a boat length or so) to windward of this line. This is a real trap. It can appear that you should be getting clean air, but you can be getting quite disturbed air, resulting in you dropping back away from the boat ahead. Be aware of this. It can often explain another boat's apparent burst of speed.

## Covering

Whilst classic covering involves trying to put another boat into your wind shadow to slow it down, the more common form of covering involves protecting your position from the boat or boats behind. If you round the last mark in front of a boat, the best way to ensure that you are still in front of it at the finish is to stay between that boat and the finish. Sounds basic, right. Well it is fairly basic, but most people don't do it effectively. If you are truly between the boat and the finish mark, you can protect your lead even if the other boat gets some advantageous windshifts. In fact, being in this position normally results in you getting much the same windshifts as the boat being covered. The difficulty comes when you are trying to cover two boats and they head off on different tacks. You should generally choose the boat you need to beat the most, or the better of the two boats as it may teach you some things. Whilst covering is another subject that could be dealt with in much more detail, these basic guides will help the newcomer.

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# Reaching

*by David Stumbles*

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By "reaching" I am referring to the four reaching legs of the course, which may vary from very tight to very broad. Some people seem to have trouble staying on the pace on reaches, but this is an area where improvement becomes obvious, because the complexities of "which side to go", like sailing upwind, are not there. So you have to be on the pace - there is nothing else to blame!

I have a basic set of rules that apply to the way I sail on reaches and the way I adjust my boat for the reach. In my view, reaches tend to fall into three categories:

- 1) Tight reaches: where you have to have the sail pulled in to a point where the boom is over the traveller in order to get the tell-tales on both sides of the sail to flow.
- 2) Broad reaches: from where the boom is just past the end of the traveller to well past the traveller, but to a point where the tell-tale on the windward stay is not pointing forward.
- 3) Very broad reaches: start to occur when the tell-tale on the windward stay starts to point more than about  $5^{\circ}$  to  $10^{\circ}$  forward. It is at this point that I reverse the mast, except in very strong winds. By reversing the mast, I mean easing the lower forestay and allowing the mast to pop back to windward in the centre. Some rig set ups will require a pulling of the windward lower rear stay to make the mast pop back, while others will pop back as soon as the forestay is eased.

Before I explain how I sail each of these three types of reaches, remember that a single reaching leg may vary between two or all three of these reaching types simply because of wind shifts. It is also very important to try to sail straight to the next mark when on a reach. Always avoid going high (sailing above the "rhumb line") as this may seem fast at first, but you will lose ground as you bear away to the mark towards the end of that leg.

## **Tight Reaches**

These are definitely my favourite, as in anything above 10 knots they are always a great ride. The instructions I have listed below are for sailing tight reaches when the wind is about 18 knots or less. Anything above this and I find it is too windy to come in to make adjustments and you already have more than enough power for reaching, so the upwind setting is still fast. However, the traveller should always be adjusted to a point where it is under the boom when the tell-tales are flowing on both sides of the sail.

While the boom is over the traveller, the vang is purely a "mast rotation" device, as it is when sailing upwind. I find it is better to have quite a bit of rotation on the tight reaches, somewhere around  $60^{\circ}$  -  $70^{\circ}$  (from the centreline of the boat). This allows for better flow on the leeward side of the sail. I also like to ease the downhaul right off, but normally this won't go up far unless the vang is eased. So I dump the downhaul, then the vang, then adjust the vang back in to give me the desired rotation. I then tighten the main and re-adjust the traveller to the correct position.

If the boom is out towards the end of the traveller, I lift both centreboards and possibly the windward rudder blade. As the reach tightens and the boom comes in towards the centre (around two thirds out), I have the windward centreboard down. This is for two reasons: 1) you need some



board to stop the boat sliding sideways as you get closer to the breeze and 2) you have to start moving forward as the reach tightens, and the windward board will be in your way if you leave it up. I always leave the boards till last as I believe incorrect sail trim is slower than having the boards down (assuming your boards are well shaped).

I find a lot of skippers tend not to use enough sheet tension on reaches. If it is a tight, windy reach, you can really give it a bootfull, keeping the boom right down and the leech tight. Of course, it must be eased in big gusts. Keeping the windward hull just out of the water should be your aim. Having the hull in the water increases the wetted surface area of the boat, creating drag. Having the hull too high out of the water reduces effective sail area and reduces rudder effectiveness.

My usual procedure for rounding the windward mark and going on to a tight reach would be as follows:

- ◆ Start easing the main and the traveller as I round the windward mark.
- ◆ Move in and dump the vang, then dump the downhaul.
- ◆ Tighten vang to achieve desired rotation.
- ◆ Start to tighten main and lift leeward centreboard.
- ◆ Move out if breezy and adjust traveller accordingly.
- ◆ Lift windward board if required.
- ◆ Pay utmost attention to mainsheet trim and traveller position while reaching in an attempt to keep the tell-tales flowing. If the upper windward tell-tales are not flowing, generally more sheet tension is required. I always pay most attention to the tell-tales at the middle level of the sail, as they are an average of the sail and often the bottom ones are wet.
- ◆ Stay low on the reach, try to be inside at the gybe mark and enjoy the ride!

### **Broad Reaches**

Once the boom is out past the traveller, the vang starts to behave like a monohull vang, ie. it is now used to control the twist in the sail by keeping the boom down to a position where you want it. On the tight reach, the mainsheet was doing this job. A lot of sailors tend to have the vang eased too much on broad reaches. I try to keep the boom nearly level with the deck, otherwise I find the sail twists off too much. Your mainsheet is now used to control lateral (in & out) position of the boom. So, in anything under about 18 knots, once I've eased the downhaul, I reef the vang back on hard.

Both centreboards should definitely be up and possibly the windward rudder. If it's windy, you'll have to sit back against the beam to prevent the boat from nosediving. If it's very windy, you'll probably need to have the end of the traveller between your legs and one cheek behind it. If it's really windy, get both cheeks behind the traveller and get ready to dump the main if it nose dives.

On these broad reaches, always aim to keep the tell-tales flowing and avoid the temptation to sail too high. Nine times out of ten, sailing too high will be a slower route down the reach. Aim to sail a straight line (especially if leading) or go a bit low at first to allow a better chance of getting on the inside at the gybe mark.

### **Very Broad Reaches**

These will be sailed very much like a run. Once that windward tell-tale on the forestay starts to point forward ( $5^{\circ}$  to  $10^{\circ}$  forward of perpendicular to the boat), it is time to start reversing the mast. The lower forestay must first be eased and, if the mast hasn't already popped back, the rear windward lower should be given a pull back to assist the mast reversing. You will generally require a fair bit of vang tension to keep the rig reversed, however this is not always the case. You will have to test yours to see what works best.

A lower forestay that is adjustable from your normal position on the boat is a necessity, as leaning over the front of the boat to adjust it wrecks the boat trim and is a sure fire way to nosedive. Above about 18-20 knots, I am reluctant to ease the lower forestay and reverse the mast, as there is a danger of bending or breaking the mast. What happens in strong winds is the pressure on the top of the reversed mast pushes the top forward and the lack of lower forestay tension allows the middle of the mast to move further back, resulting in excessive mast bend. This is accentuated if a nose dive occurs, as the top of the rig wants to keep going while the boat (and the bottom of the mast) are virtually stopped while buried in the water. I believe that if you are concerned about possible mast damage, don't reverse the mast. There is very little speed difference in strong winds between having it reversed or not. Remember, it's better to finish the race.

### **Light Wind General Rules**

When the breeze is really light (0-6 knots), less vang tension is required on the broader reaches so as to avoid "hooking" the leech. Generally, less mainsheet tension is required on the tight reaches for the same reason. You should stay up against the front beam to keep the transoms out of the water, as this stops the back of the boat "sticking". Keep low on the boat (lie along it) and keep closer to the centreline of the boat. Avoid moving around too much and remember to drink plenty of water! (Nothing puts a dry-mouthed competitor off more than watching you guzzle a drink!).

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# Running Downwind

*by Wayne Eager*

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Let us begin immediately after rounding the windward buoy. The first thing I do is set the sail for the appropriate wind conditions. In light winds, I try to fill the sail as much as I can by easing downhaul and outhaul. The front forestay should be loose to allow full reverse bend of the mast. I don't use much vang in light conditions because it tends to curl the leech to windward. Remember, the main aim when running downwind is to present as much sail at 90° to the wind direction as possible (except in strong winds).

In medium strength winds, the only difference to my sail setting is to tighten the vang to keep the leech straight. In strong winds, the downhaul, outhaul, vang and forestay remain tight. The last thing you want is reverse mast bend. If the wind is very strong, I sometimes pull some mainsheet in to reduce the effective sail area, but be careful not to run by the lee, or you may unexpectedly gybe.

Now that the sail is set, it's time to pull both centreboards up, but make sure you don't pull them up too far. The bottom of the centrecase (the slot) should be filled with some board. Use a marker pen to mark the correct height position. I usually lift one rudder blade in light and medium strength wind. In order to keep drag to a minimum, your position on the boat can make a significant difference. I try to sit in the middle of the boat and well forward so that the transoms are not dragging along and creating turbulence in the water. Of course in strong winds, you must sit as far back on the boat as possible to prevent nose diving.

At this point many skippers, including myself, tend to have a little sleep, taking advantage of the easy sailing position. But the facts are that the run is subject to the same wind shifts, gusts and tidal influences as the other legs of the course. Generally there is very little difference in boat speed when running downwind so, if you keep your eyes open, you can overtake other boats. A mast head tell-tale is the most effective way of determining any changes in wind direction when on the run. You can buy mast head wind vanes, however a piece of cassette tape on some galvanised wire is just as effective. Watch for wind lines (gusts along the water) coming from behind as well as to the sides of you. It may be prudent to gybe across or round up a little to get yourself into a wind line. Be aware of the relative speeds of other boats. They may be in stronger breeze or their sail may be set in a better configuration than yours.

When following other boats, you can slow them down by keeping them in your wind shadow. This is most effective in light winds. The fastest way downwind on a Paper Tiger is to run a few degrees off the wind direction, so don't get carried away in shadowing other boats and then find yourself broad reaching. All the other boats who are running close to the wind direction will generally overtake you.

In medium wind conditions, surfing the waves can also be a great advantage. Shifting your weight forward on the crest of a wave may be just enough to get the boat surfing.

## Conclusions:

- not everyone will agree with my sail settings, so experiment with your own rig.
- install a mast head tell-tale on your boat.
- watch out for changing wind conditions, wind shifts and what other skippers are doing.
- use shadowing to your advantage.
- practice surfing waves.
- don't fall asleep, and enjoy yourself

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# How to Achieve a Good Start

*by Cam Owen*

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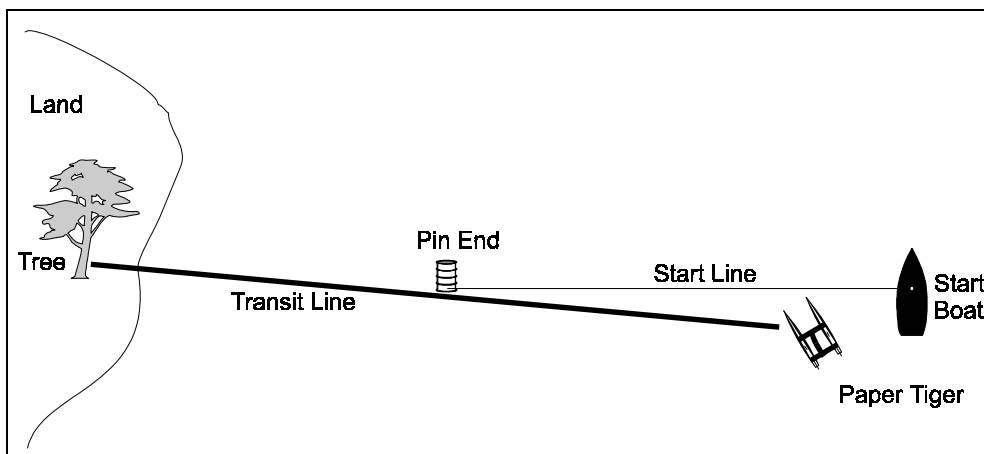
In order to achieve a good start it is imperative that the skipper has an understanding of the weather forecast and the sailing instructions before leaving the beach. It is also important that you know the rules associated with starting such as your luffing rights before and after the start. Knowledge concerning both of these issues may influence your starting tactics.

It is also important to get out on the water early and practice various manoeuvres such as tacking, gybing, time on distance and slow sailing as these are important when starting a race. For instance, you may need to manoeuvre into a favoured position on the start line within close proximity of other yachts and therefore clean and precise boat handling skills are necessary.

Use your time before the race constructively. That is, don't simply sit around on your boat waiting for signals. Go for a good warm up sail, noting pre-race wind direction, looking for the favoured side of the course, get an idea about how the wind is phasing and check the strength of the tide also. Additionally, it is important to know where the marks of the course are. Set the boat up making sure that the trim is fine. It is better to be slightly overpowered so when you blast off the line you are able to use the traveller to control how you point (speed vs height) depending on the positioning of your boat during the last few seconds before the start.

Once the start line has been set, get to know it. If it is possible, take some transits to the land. That is, orientate yourself with the start line by using a fixed object on the shore (distinctive house, big tree, radio tower and so on) These will give you an indication of where the line is when starting with the fleet (see Figure 1).

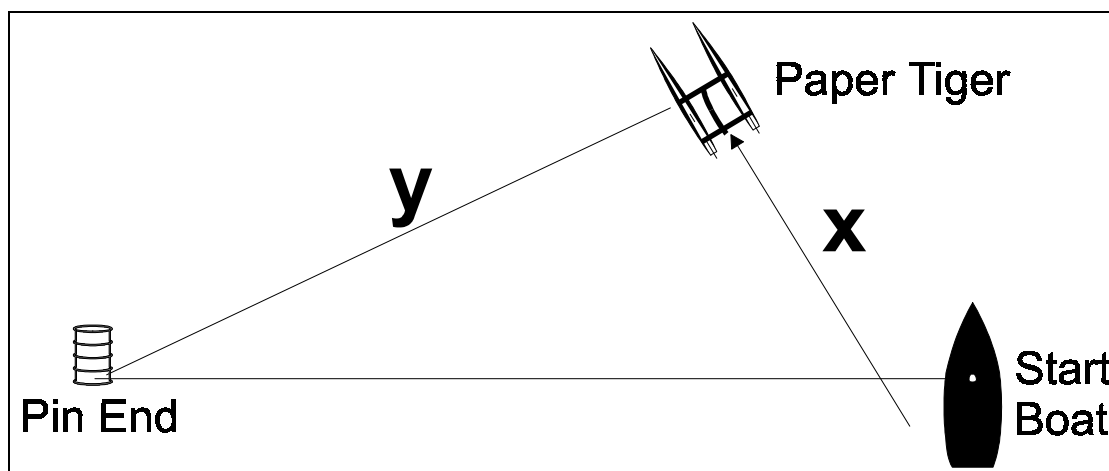
**Figure 1** *Taking transit lines*



The favoured end of the start line must be decided. One method of achieving this is to sail off from one end of the line close hauled. Sail until an imaginary line running along your front beam or an extension of your front beam, passes through the other end of the start line. The end to which you are closer to is the favoured end (see Figure 2). There are many other ways of doing this but I find that this method is easy and reliable. Checking the favoured side needs to be done several times which will help you get an idea of how the wind is shifting. Having established the favoured end, attempt to start in this area but also consider the fleet size and quality. Sometimes the favoured end

will get you into trouble such as being trapped at the port end of the fleet or problems with boats trying to barge the line at the start boat end.

**Figure 2** *Deciding on the favoured end of the start line*



It is evident from Figure 2 that this start line has a starboard bias. That is, the distance of 'y' is far greater than the distance of 'x'. Therefore, when sailing off the line a starboard tack boat will be advantaged.

It is important to know the boats around you. Different skippers sail in various ways and this will have an effect on your starting position. For instance, if you like to foot off for speed, then don't start to windward of a known pointer or pincher. Don't leave much of a gap to windward and at the same time try to develop a gap to leeward. This will enable you to bear off at the signal to get some speed off the line. Be on the front row and practice time on distance so when you hit the line on the gun (checking transits) you will be a full speed. Make sure you have considered the first leg during your starting plan. It is no good starting at the pin end of the line if you believe the right hand side of the course is favoured. Once you are off the line and sailing in clear air begin to put the remainder of your first leg plan into action- look for the shifts, work to the right, whatever it may be. Always think speed and one final note, don't forget to sign on!

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# Upwind Light Weather Rig Tuning

by *Tim Daddo*

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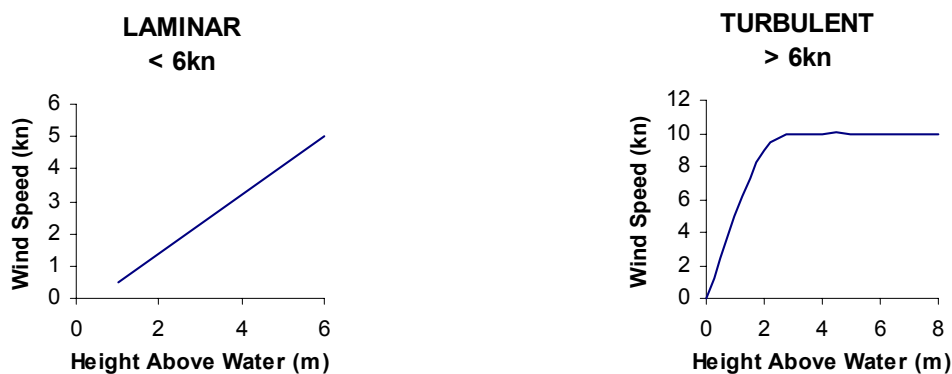
Racing your Paper Tiger in light “drifter” conditions can be fun, especially if you have a speed edge over the competition.

Gaining this speed edge however, requires a completely different rig set-up to that which many would feel appropriate. After all, logic suggests that to go faster, the rig should be set for the most power, ie. full.

This is, in fact, almost the opposite to what is required. A flat and twisted rig seems to work the best. To understand the reason behind this, we need to look at the characteristics of the wind in which we are working.

Theoretically, there are two distinct breeze types in operation. The one we are concerned with is the laminar type which exists when the wind is below about six knots. Above this, the wind becomes turbulent in nature and consequently requires a very different rig set-up.

Below is a graphical representation of wind speed variations against height, based on measurements taken during our speed sailing trials:

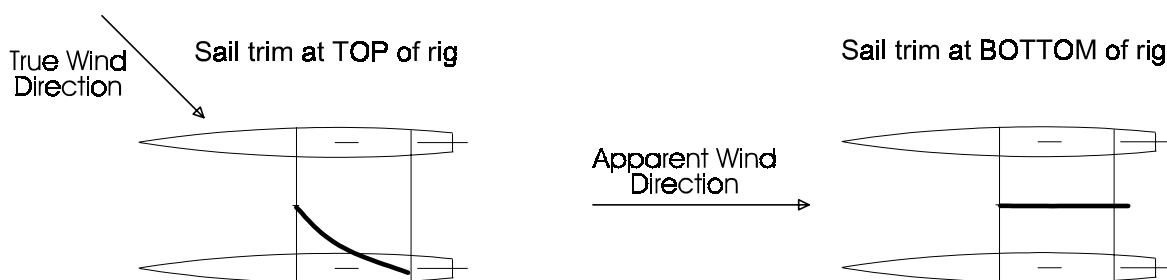


What becomes apparent is that when the wind is above six knots, the wind strength is basically the same all the way up the rig, eg. at 6m there is 10 knots and at 1m there is still 8 knots. However, below six knots it is noticeably less at the base of the rig compared with the top, eg. at 6m there is 5 knots and at 1m only about 0.5 knots.

Hence the fastest rig will be the one that makes the most use of the different wind speeds at different heights.

Firstly, we should concentrate on the top of the rig with the strongest airflow over it. This is where the greatest region of power is developed, even taking into account its relatively smaller area. The sail plan should have a narrow entry (ie. flat sail) in order to have a low drag profile. If you make the sail too full, the airflow will stall and not only will you suffer for power, but there will be a high degree of drag associated.

The next point is probably the most critical of all. As you move further down the sail plan, less wind strength is encountered and therefore less power is generated, until you reach the foot of the sail where practically no “true wind” exists. However, we are all aware that if we go for a run (jog) in no wind, we feel wind blowing straight onto us at the speed at which we are running - this is “apparent wind”. The same is felt by the base of the rig that is being driven by the by the higher speed air at the top of the rig. Consequently, it becomes important to have a very flat sail at the base, trimmed directly fore/aft so as not to create extra drag in the apparent wind. The top of the rig is trimmed to a wider angle to cope with the true wind direction. The figure below demonstrates the two wind directions and two different sail trims.



Combining the above diagrams results in a very flat rig at the foot, twisting off progressively to the top.

Enough of the theory, let’s look at how to achieve this type of rig. The first step is to tighten the front lowers; These are set to approximately the same tension as for 20kn. This will flatten the entry of the sail. The next step involves increasing the downhaul tension, again approximating the 20kn settings. This will serve to open the upper leech, allowing it to twist more easily. Pull the foot out as tight as possible, centre the traveller and ease the mainsheet for plenty of twist. It helps to let the mast rotate as much as 80<sup>0</sup> to 90<sup>0</sup> to assist the airflow at the top, although this stage appears the least critical. A mast-head wind indicator can then be used to ensure that the sail is trimmed appropriately. If in doubt, always ease the mainsheet for more twist, especially as the wind drops out.

Hopefully this provides an opportunity for an increase in light wind performance. Light weather racing is still incredibly frustrating, but if you have a speed edge over your competition, it is amazing what a calming effect this can have.

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# Upwind in Moderate to Heavy Conditions

*by Kim Fairhall*

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## Introduction

Upwind sailing in moderate to fresh conditions is an exhilarating and fundamental part of sailing a Paper Tiger. In these conditions, the Paper Tiger ranges between fully powered up to completely depowered. For optimum sailing performance it is not only critical that a suitable sail shape is obtained but that the boat is handled proficiently. It is also imperative that the skippers efforts be focused on the attainment of maximum velocity-made-good, often requiring the sacrifice of some apparent pointing ability for speed. The skipper must also have considerable confidence in the integrity of boat and rigging as it is in these conditions that the stresses placed upon the boat will be maximised. Suitable boat preparation is therefore essential. This article distils my understanding of achieving competitive upwind performance in breezes between 13 to 21 knots but it should be emphasised that this article is a guide only; suitable adaptations will need to be made to address individual requirements.

## Boat Handling

Boat handling is one of the most underrated areas of PT sailing. When mastered it can result in significant performance improvement. It is **fundamental** to upwind sailing excellence. Boat handling is a combination of skills that includes:

- controlling the angle of heel through hiking,
- determining the appropriate “attitude” of the boat in relation to sea surface conditions via judicious positioning of fore and aft hiking location and
- efficient and “instinctive” tacking.

Fortunately, boat handling is a skill that in comparison to other areas of upwind sailing, such as sail trim, is relatively easy to improve and is simply achieved through *practice*.

### Hiking

One of the fun parts of sailing a PT (and other catamarans for that matter) is the ability to fly a hull. While this in itself is fun and looks interesting to spectators it is extremely detrimental to boat speed. In stronger conditions it is imperative that the boat be sailed without significant heel to:

- permit maximum immersion of the windward centreboard and rudder,
- optimise the centre of effort of the mainsail and
- to prevent the bows from dipping under waves.

The optimum amount of heel is that which allows the entire centreboard to be almost constantly immersed whilst the rest of the hull just touches the water.

Apart from sheet tension and traveller position, heel is primarily controlled by hiking. The further one can suspend one’s weight outboard from the windward gunwale, the greater the righting force exerted. Obviously, if we were all extremely fit (and probably with washboard stomachs!) we could in theory hike from our toes with knees and torso straight. Unfortunately, hiking in this manner is extremely tiring, and realistically, can only be achieved for short bursts (in my observation this is generally seen just after the start or nearing the finish line when trying to discard a close checking



competitor!). For the majority of the upwind sailing, most top skippers adopt hiking positions that permit maximum hiking extension in gusts but return to a position that allows reasonable and sustained hiking force without being exhausting for the majority of the upwind legs. This position is with the buttocks edged over the hiking rail with the body at an angle of about 95 to 100° from the thighs and the knees slightly bent. The arm handling the sheet is placed across the chest and bent 90° at the elbow. This permits easy adjustment of mainsheet in both directions for fine tuning of sail trim. Note that the use of off the boom sheeting enhances this hiking style since the mainsheet can provide a small amount of additional support.

Another but less common hiking style which is claimed to conserve energy is to move the toe straps to about 20 to 30cm out from their conventional position, bend the knees over the gunwale and sit on the side of the boat. As I have never attempted this position I cannot verify its effectiveness but its proponents assure me that it does work. This type of hiking is commonly used on small keel boats such as Flying Fifteens or Stars. The problem I perceive with this hiking position, especially for single crew boats like the PT, is that it may be difficult to operate sail trim controls, possibly becomes difficult to see close proximity competitors (especially those on the leeward side), and is probably not as effective in marginal or gusty hull flying conditions when rapid adjustment of hiking extension is required. Nevertheless, for some skippers it is an effective and efficient alternative. It may also be suitable for those skippers with back problems (consult your doctor first!!).

Whatever hiking style you adopt, it is important that it is “comfortable”. Comfort, or at least the minimisation of fatigue associated with long stretches of static muscle contraction, leads to prolonged hiking extension. A comfortable yet effective hiking position frees concentration for tactical considerations rather than dwelling on fatigue. The use of padded shorts or thick wetsuit pants is effective because the hiking loads are spread over a greater area. Battened shorts have also been used to help with comfort and projection of body weight. Toe straps should be at least 5cm wide, seat belt webbing for example and suitably placed for maximum comfort and body weight extension. Obviously, taller or shorter skippers will need to locate toe straps further inboard or outboard respectively. Toe straps should be elevated off the trampoline to permit easy and fast positioning of toes and body and must be kept taught. This is commonly achieved by wrapping the toe strap over the top of the front beam and fixing to adjustable length U-bolts secured through the back beam.

As PT hiking is unsupported by trapeze, upwind hiking performance is also be enhanced by physical fitness. However, it is difficult to construct shore based activities which accurately model the static and dynamic loads and forces and other environmental variables experienced during actual hiking. For this reason it is my firm belief that the only way to develop sustained and efficient hiking fitness is to sail in these conditions as often as possible; for most of us this means practicing before weekend club races!

### **Boat Attitude**

One of the commonest mistakes made by newcomers to the class is incorrect placement of body weight in the fore and aft direction. It is important that hiking be done from a position that effectively controls how the bows pierce waves, that is, the attitude of the boat in relation to sea surface conditions. As a novice PT skipper, I remember one of my first races was plagued with extremely low boat speed. A fellow competitor observing my disappointment pointed out (after the race!) that my lateral hiking position was too far aft.

Hiking from a position too far forward will obviously result in the bows burying while too far back increases hull wetted area. Both are detrimental boat speed. Generally, as wind speed increases

from 15 to 21 knots, the hiking position should move from against the windward stays to a position behind the centreboard slot. However, the exact hiking location is also strongly influenced by the angle of heel and sea surface conditions. For flatter seas or where there are rolling waves, it is possible to hike further forward than in the same breeze in choppy conditions. Additionally, when the boat is being sailed with the minimum amount of heel it is also possible to move further forward since both hulls will contribute to forward buoyancy, consequently reducing the propensity for the leeward hull to “go mining”.

In general, boat attitude is optimised by keeping body weight as far forward as possible and is assisted by sailing the boat flat. In choppier conditions with higher wind strengths a location farther aft will be required.

### **Body Weight**

Skippers body weight is an upwind performance factor in strong breezes. Typically, skippers in excess of 80kg will perform better in the 16 knot and over range but below this wind speed these skippers will be disadvantaged simply because they cannot derive enough power from the sail despite its trim. However, such a disadvantage can be compensated for by minimising tactical errors and concentrating on maintenance of boat speed and boat handling. Interestingly, low mass skippers (that is those below 70kg), are not proportionately disadvantaged in higher wind strengths since sail shape may be sufficiently altered to reduce available power. Once again however, the performance of lower mass skippers in moderate to heavy breezes is also contingent on superb boat handling and sail trimming skills. An Interdominions heat sailed in the Tasman Sea off New Plymouth, NZ highlighted to me that light skippers can do exceptionally well in heavy conditions. In approximately 20 knots of breeze, in very big seas and on a course which took over 2 hours to complete, Greg Cann (65kg) finished second in a race which supposedly was a heavyweight’s dream. Through depowered sail trim, sustained and efficient hiking and excellent tactical decisions Greg was able to put some of the heavyweight flyers to shame. He eventually went on to win the Interdominion Title.

Consequently, what is important in maximising the performance of a PT in moderate to heavy conditions is not body mass but how a skipper matches sail trim, boat handling and hiking performance to the prevalent conditions. Body weight, while conferring some advantage for some skippers in some conditions is only a minor factor in overall regatta performance where typically a variety of conditions will be incurred. However, if you are a heavier skipper you should always aim to capitalise on stronger wind conditions whenever they prevail.

### **Tacking**

The ability to tack efficiently, especially in moderate to heavy breezes with choppy seas, takes significant mastering and even experienced skippers have lost major regattas because one bad tack. Conversely, those who can tack quickly, without hesitation and practically without thinking about **how** to tack saves considerable time on the race course.

Tacking a catamaran is slower than a mono-hull simply because the boat is not pivoting around a single axis. It is analogous to driving a car around a corner. A skipper should aim to steer a PT through a tack rather than a helm-down-hope-for-the-best approach. There is no single best way to achieve this as different skippers use different techniques, have varying tiller types (“rabbits ears” or single extensible tillers) and have differing locations from which to sheet. However, there are some general features which are common to promoting good tacking . These are:

- the tiller cross bar is tied off with a short piece of cord to a saddle on the centre of the aft face of the rear beam (typically where the traveller rope is tied to) to prevent the tiller from being

pushed too far down and creating “stall”<sup>1</sup>. Typically, the rudders can only move through a maximum angle of 70°,

- the tiller is initially pushed down slowly and as the boat begins to change direction the rate at which the tiller is pushed away is increased; this lessens the likelihood of stall,
- the skipper moves to the new windward side only after the PT has passed head to wind and then swaps sheet and tiller hands (akin to monohull “roll” tacking),
- the skipper moves underneath the boom on the aft side of the trampoline to help lift the bows out of the water during the tack, maintaining control of the tiller throughout the tack is imperative - it is far more important to have the boat completely reach the other tack heading and lose control of the sheet. Losing control of the tiller mid-way through a tack will inevitably lead to irons and subsequently a greater time to recover and
- tacking tasks are always performed in an identical manner in the same order for every tack.

As a junior PT coach, one of the first areas of boat handling that is addressed is tacking. Usually, short 500 metre windward courses are set and junior skippers are asked to perform multiple tacks in quick succession. During some tacking drills, a sound signal will be made and the skipper will be expected to tack immediately. All other things being equal, the skipper who can tack systematically, fastest and without lengthy preparation will reach the windward buoy first. These simple exercises are excellent for developing and optimising tacking for skippers of all ages and skill levels. Multiple tacks in quick succession are also recommended practise prior to sailing major regattas on unfamiliar waters with different wave patterns.

In heavier conditions, where waves are larger it becomes more difficult to tack. What is important is that sufficient speed, usually achieved by slightly bearing off just prior to the manoeuvre, is carried into the tack to ensure that the boat passes completely to the opposite tack despite the inhibitory effect of waves. Note that with proficient tacking in heavy conditions it should never be necessary to find a “flatter” patch of water. If “flat” water tacking is adopted it will inhibit the ability to tack at will and severely reduce tactical options, especially when in close proximity to other competitors

However, the principles as discussed previously remain identical and what I can only stress here is that mastery of tacking in such conditions comes with practice.

## Sail Shape Controls

The adoption of a suitable sail shape and being able to **constantly** and **easily** alter that shape as dictated by marginal changes in wind strength and wave conditions is of vast importance to maintaining and improving upwind boat speed. However, it is incredibly difficult to comprehend the number of variables that have an effect on sail shape and what the correct inter-relationship of each of those variables are for optimum upwind performance. Factors such as the main beam stiffness, hull twist, rig tension, rig stretch, mast pivot point location, are just a few whose bearing on sail shape is subtle yet significant and these are not even the main sail shape controls!! In some cases, when one skipper leaves the fleet just after the start with excessive levels of boat speed, it is probably because 10% of all possible sail shape variables that could be optimised are. What will be discussed here is the effect and use of the major sail shape controls that are available when on the water. Other variables, whilst important, are fixed either during construction of the boat or on-shore rigging and are discussed elsewhere in this tuning manual.

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<sup>1</sup> Stall is where flow over the back of the rudder blade becomes detached and leads to a “spongy” helm. The boat will not respond to any further movements in tiller position after stalling is initiated. It can only be rectified by returning the rudders to the center position to re-establish flow.

## **Mainsheet**

As wind strength increases from fifteen knots the ability to counter the heeling force with sufficient hiking force becomes impossible. Consequently, it becomes important to shed excessive power developed by the sail and restore the balance between hiking and heeling forces. Fortunately, the Paper Tiger with a relatively flexible rig conveniently permits the required change in sail shape and can be effectively sailed upwind even in wind speeds exceeding 25 knots (but you wouldn't want to bear off onto a reach!)

The coarsest control which permits rapid change in sail shape is obviously the mainsheet. As wind speeds increase from 13 knots it becomes more critical to remove the depth from the sail, that is, make the sail flatter. Flatter sails produce less power and permit better boat control in higher wind strengths. With increasing mainsheet tension, the Paper Tiger main will become progressively flatter, especially at the top of the sail. Removing the depth from the top of the sail is excellent for reducing heeling force. Increasing the amount of tension extends the region of "flatness" down into the body of the sail. It is not uncommon in heavy conditions (greater than 17 knots) for skippers to apply so much mainsheet tension that the traveller and boom mainsheet blocks touch each other and prevent any further mainsheet tension from being applied. This is the so called "block to block" position. It is at this point that the mast will have its greatest curvature which consequently draws the body of the sail into a flat shape. With high mainsheet tension, the leeward back shroud will be very loose (depending on rig tension) and may flap against the leeward side of the sail in choppy seas. If you reach a block to block position with only moderate sheet tension, this indicates that either your sail is not at its maximum hoist height (which may mean that your mast is too short or that you need to reposition your halyard lock) or that your sail has significantly stretched (which unfortunately means a new sail or at least a significant recut).

It is extremely important however that oversheeting is always avoided. Oversheeting can be instantly recognised when the bottom batten or bottom two battens begin to invert in shape from the leech into the sail. Oversheeting causes the boat to "feel" sluggish as the sail is now dragging through the air and not contributing to driving the boat through the water. If oversheeting is suspected then ease the mainsheet out two to three centimetres. Note that with some sails, some degree of flattening (but not inversion) of the bottom two battens inwards from the leech is normal in heavy conditions. This flat portion of the batten may extend into the sail by between 15 to 30 centimetres and is usually most obvious in the bottom batten. This is actually a fast sail shape because the small but significant force developed by the sail in this region in strong breezes is not acting in a reverse direction to the boats motion.

As the wind strength is never constant always be aware that sheet tension will need to be frequently adjusted, especially in gusty weather. Top skippers are constantly making minor sheet tension adjustments to optimise sail shape to ensure maximum upwind speed, allowing for both wind strength and sea conditions.

## **Traveller**

The traveller is second most important sail control. The traveller, in technical terms, coarsely controls the "angle of attack" of the leading edge of the sail, irrespective of the degree of rotation of the mast. The further the traveller is let out from the lateral centre of the boat, the less the boat will be able to point (due to the changing of the relationship between the centre of lateral resistance of the boat and the center of effort of the mast, sail and boom when considered as a single entity). However, the boat will go faster because the force developed by the sail will be acting in a more forward direction and, concomitantly, heeling force is reduced.. This in turn allows the centreboards to develop more lift. Leeway is thereby decreased and over a longer sailing distance the boat will

actually end up in a higher position than a boat which is pointing high but going nowhere. In moderate to heavy breeze, this is commonly seen at the start when pin end boats drive off for speed (Jon Pinkerton is an expert at this) while committee boat PT's point high but are unable to go low due to boats underneath them. At the all important first cross and without any major wind changes, those boats which drive away for speed but with a slightly lesser pointing angle tend to be in front in heavier conditions.

What is the correct traveller setting? This comes with experience. In moderate breezes up to 15 knots a traveller setting around 20 centimetres from centre is approximately right. As the wind strength increases the traveller setting is progressively extended out to a maximum of 40 to 50 centimetres or approximately adjacent to the toestrap fixtures. Beyond this the boat is effectively reaching and the upwind velocity made good will begin to fall irrespective of any further speed increases. The actual traveller position between these two extremes will be determined by balance between heeling and hiking force. If there is a struggle to keep the boat from heeling past optimum despite modification of sail shape, then the traveller needs to be eased further, typically in 5 centimetre steps until heeling force is sufficiently reduced. Sea state conditions will also influence the traveller position. In flatter seas or long, rolling waves less traveller is required however in choppy seas where speed is needed to punch through waves an extended traveller position is better.

The traveller is not altered as much as the mainsheet but should be adjusted whenever there is a sustained change in breeze strength. A setting which is suitable 90% of the time is desirable. Just after the start, a slightly shorter traveller position may be utilised in conjunction with maximum hiking to help point high and develop room away from close proximity boats, after which the traveller may be dropped to a more suitable position for improving velocity made good.

It should be emphasised that extending the traveller position and increasing mainsheet tension should happen in unison. The mainsheet will decrease the power developed by the sail shape while the traveller will point the reduced power in a more favourable direction. If the traveller is extended beyond 35 centimetres, maximum mainsheet tension should have been applied. Using extended traveller positions and less mainsheet tension negates the benefits because pointing will be worse as more sail shape returns.

A further tip is to tie off the traveller rope to the mainsheet and have the combined sheet and rope run through an adjustable locator running between the stays. This helps prevent losing the mainsheet and traveller overboard and permits easy location of the traveller rope for adjustment while hiking.

## **Vang**

This is the simplest control to trim correctly. The vang, when going upwind, simply functions as a mast rotation lever. To extract maximum leech tension, the mast needs to be rotated very slightly beyond the apparent wind direction. This orientates the majority of the widest dimension<sup>2</sup> of the mast into the breeze and as a consequence the mast bends less, applying more tension to the sail's leech. A leech without sufficient tension allows the deepest part of the sail to move backwards subsequently reducing speed and pointing ability. In heavier conditions where power is overwhelming, vang tension is increased to derotate the mast, reducing leech tension and permitting the top third of the leech to "fall off" and depower the rig. Normally, high vang tension is applied

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<sup>2</sup> The apparent breeze will be slightly different in direction at the top of the mast than at the bottom due to the increase in wind strength with altitude above the sea surface. This known as wind shear. To compensate for wind shear the mast has to be rotated slightly more at the bottom to ensure that most of the mast is orientated correctly with respect to apparent breeze direction.

only when wind strength exceeds more than 17 to 19 knots. A good rule of thumb is to only derotate the mast when the main sheet blocks go block to block. The vang will have to be readjusted if either downhaul or mainsheet tension are altered as these will change mast orientation. Its important that vang be tension be significantly eased when going onto a reach, except in very strong breezes, otherwise a broken boom could result (of which the author has personal experience).

### **Downhaul**

The downhaul or cunningham serves to control the position of maximum depth of the sail. As the wind strength increases from moderate to strong, progressively more downhaul is applied to maintain the lateral position of maximum depth, otherwise sail shape moves backwards and boat speed is reduced. Correct downhaul tension is different for different sail types. In general though it is important not to apply premature downhaul tension, especially in moderate conditions where maximum pointing ability and power is required. The tension applied should only be sufficient to counter drift back of sail shape as wind strength increases, except when additional depowering of the rig is desirable. The normal amount of tension in moderate breezes is just after the point when all lateral creases along the luff have been removed. As more downhaul is applied, luff tension is increased and consequently the mast will start to bend. An increase in mast bend has the effect of reducing leech tension in the top third of the sail. As a result, the rig is quickly depowered as the sail “opens up”. The downhaul is therefore an efficient deactivator of sail power and should be adjusted carefully. Note that if it becomes impossible to shift the sail’s draft forward with downhaul, then it is most likely that the sail has significantly stretched and requires recutting by your sailmaker.

To assist adjustment when hiking, it is recommended that the outhaul rope tails be tethered to the backstays or attached to some other system for permitting easy adjustment from a semi-hiking position. It should also be emphasised that a true cunningham adjustment rather than a downhaul attached only to the boom gooseneck will allow adjustment in both directions throughout the upwind leg. A downhaul may only be adjusted in the downwards direction once on the upwind leg and consequently it is important to apply less rather than more downhaul tension before commencing the upwind leg. Downhaul tension may then be increased later in the leg if required.

### **Outhaul**

The function of the outhaul is to adjust the sail shape in the bottom quarter of the sail, which is relatively unaffected by other controls except the mainsheet. While a “full” sail shape is desirable in moderate breeze, it is important that the sail does not have excessive depth in this region of the sail when going upwind as this will lead to increased drag and subsequently reduce boat speed. It is not uncommon to have to slightly flatten the sail with the outhaul (by two to three centimetres) when returning to an upwind leg from a reach. As breeze strength increases, the outhaul should be extended less to reduce available power. However, it is possible to use too much outhaul. In this situation the sail is extremely flat at the bottom and insufficient power is developed to drive the boat, especially in choppy water. It is always better to have slightly too much shape in the bottom of the sail and depower the rest of the rig with the other controls than have a “flat foot”. Tinkering with the outhaul settings can be a good way to fine tune upwind power levels. To this end it is worthwhile ensuring that your outhaul adjustment system is free of friction and has sufficient purchase to easily move the clew even when it is under block-to-block mainsheet tension.

As with the downhaul, the outhaul line should be easily adjustable from a semi-hiking position. This is commonly achieved by tying the outhaul tail to the movable locator through which the mainsheet and traveller pass (see traveller section).

### **Lower Forestay**

In extremely heavy conditions, where it is desirable to remove all but the last vestiges of sail shape, tension can be applied to the lower forestays to pull the middle of the mast forward. This results in sail shape being removed from the middle of the sail and allows the leech to fall off. However, in my experience, the difference that this control makes is relatively marginal in comparison to other sail shape controls. However, some skippers believe it has a significant impact. I'll leave the decision to you but remember sailing upwind with any tension applied to this control in wind strengths below 20 knots is slow!

### **Leech Line**

Never apply leech line going upwind in moderate to strong winds (you'll break it!). Remember to let it off before you start going upwind from a reach.

### **Lower Backstays**

While not a control that can be adjusted during the racing, the lower backstays are a key determinant of sail shape. However, there are different philosophies concerning their use, which is basically a function of whether you apply low or high tension to your backstays and your sail cut. My recommendation is to look at a competitive boat with your sail and ask the skipper how he sets up the lower backstay tension. I use high rig tension and have loose lower backstays that permit the mast to move forward with increases in mainsheet and downhaul tension. For heavier races sailed in breezes over 17 knots, these stays are marginally lengthened (by 0.5cm) to allow the mast to bend forward and remove more of the sail shape which aids power control. Some skippers may adjust these just prior to racing when on the water.

## Summary

This article has summarised what I consider the most important aspects of achieving competitive upwind performance in moderate to strong conditions. However, it must be emphasised that in these conditions, the best sail shape will not win without consummate boat handling skills. The combination of effective boat handling and the ability to easily and constantly manipulate sail shape is paramount to achieving results. Hopefully some of the thoughts expressed in this article can be adapted to develop your PT sailing skills and make racing what it is intended to be - FUN.

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# Reaching

by Garry Williams

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'Reaching, nautical' - A point of sailing where the wind is coming within a few points of abeam. Reaching can be broken into two components;

- the boat
- the skipper

## The Boat

To understand the boat and its requirements to reach successfully we need to understand some of the loads placed on the boat and how these loads effect the overall rig.

When a large load is exerted to the rig such as on a reach in moderate to heavy breeze the mast transfers the load to the front beam assembly. That assembly transfers the load to the hulls and depending on its strength the front beam assembly will sag in the middle and pull the outside of the hull upwards creating a consistent curve or if the dolphin striker strap is very strong a "W" effect. This has the effect of twisting the hull as the rear beam on a shy reach will be being forced upwards in the middle by the mainsheet block.

If the flexibility of the front beam assembly is too great then there is a real chance that the inside rear beam pad area may break or at least change the tune of the rig by allowing the mast step to drop in relation to the chainplates. Another concern is the amount of stretch that the rear upper stays will allow as this also needs to be considered for reaching.

For Tigers using the *loose rig* the two points about the front beam assembly strength and rear upper stay stretch as well as plenty of front lower stay purchase would be essential to prevent unwanted mast damage in the very heavy weather.

Back to reaching!

The sail needs to be cut with sufficient seam shape to lock the sail shape into place to gain maximum speed, or for the battens to be strong enough to keep the extra shape due to luff round in place. Some sailors have even been using leech cords to hold the leech up and combine that with battens that are firm on the rear section to give a similar effect.

A clean exit for the wind is important and it is advisable to install about three tell tails down the leech to show how the sail is set to allow a clean air flow over the leech of the sail. For maximum power the main sheet traveller should be positioned directly under the boom which will help hold the leech up. To depower the sail the mainsheet can be slightly released.

## The Skipper

It is the skippers job to trim and steer the boat and so in this section we will discuss some fundamental principles for reaching.

After the installation of the leech tell tails the skipper can set the main to allow the wind to flow off the leech and not to stall out which is now visible if the tell tails curl around the rear of the main.

Balance of the boat is another consideration. In light winds when the boat is not planing, the skipper needs to be foreword allowing the transom to be on or above water level but move back in heavier



conditions until the skipper is leaning out from behind the rear beam in very heavy conditions. In conditions heavier than those which will allow the boat to plane, it is important to consider the boat as a windsurfer, that is, to have the nose of the boat riding high in the water which will reduce drag (that is greatest at the point of entry).

Both centreboards should be raised as the extra skin friction will slow the boat down. When possible the windward rudder should also be raised for the same reason.

Sailing a course to the leeward mark is always a challenge, especially when in a large fleet, as the tendency is to sail high off the mark. This is generally not the fastest way to get there as the closer to the leeward mark you get, the broader the reach (and sometimes even to the point of a run).

That definitely is not fast. The best path is straight to the leeward mark or slightly low off the mark. Being slightly low in most conditions will allow you to be at top speed when you arrive at the mark and it is amazing how slow a boat that has gone high is going then. When the wind is very strong and there is real fear of putting the noses in and turning over, sailing low between the gusts is a good idea as you have the flexibility to turn up in the squalls and still retain speed.

Above all else, it is imperative to be in the clear air on a reach and if you are not at the front of the pack, it is generally not wise to duel with a lone competitor as the game is to get around the course in as fast a time as possible, not to win the battle and loose the war.

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# Reaching Faster / Sailing Faster

*by Bruce Rose*

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To put this into words is more difficult than first thought as I feel I now sail more instinctively than I used to. The first thing I would suggest is to pick as many brains as possible, as I did when I first joined the class. My first piece of reaching advice came from Mike Wold, out of my frustration after watching the fleet go by me after rounding the first mark in second position. One of my first highlights. This article is more about what I do rather than why I do it. My ongoing goal since starting in Paper Tigers has been to improve my position in the National and International fleet. I believe having a goal is the first step to improving in all areas of sailing. If you don't have a desire to improve, don't be disappointed with your position, rather just enjoy your sailing.

A "peak performance strategist" analyses the strengths and weaknesses of an individual or a team and then maximises the strengths to gain a desired result, while minimising the weaknesses. I have attempted to do this with the Paper Tiger fleet. I have watched, listened to, and learned from skippers who I have felt have been amongst the best, or very knowledgeable, in different areas, even down to how the tiller is held, for example, on a reach.

The way I sail my Paper Tiger is a result of taking a lot of knowledge and wisdom offered by others and then making it my own. Paper Tiger skippers, generally speaking, are very unselfish when it comes to passing on information and I would encourage anyone to seek it. One thing that is now very obvious to me is that nobody gets to the front of the fleet, or improves at all for that matter, without firstly thinking about their sailing and, more importantly, without spending plenty of time on the water. In other words, you must be committed to learning and improving.

Anyway, I think you get the idea. Now to reaching.

I would love to take all the credit for my recent success and good reaching speed, however a big part of it is a direct result of the sail I use, which was developed by Neil Williams and is now manufactured by Goodall Yacht Sails, as well as the help from Neil himself and also Graham Ince. They both looked at my sail many times after sometimes the smallest setting changes and answered the many questions I threw at them. Their combined knowledge has been invaluable to me and much appreciated. I believe the first thing to do if you want almost immediate results is to model someone's actions and this is what I have done. Every time something of use has become apparent to me, I have adopted it. If someone flies past you on a reach, use that as an opportunity to observe what they might be doing differently to you, ie. sail shape, traveller position, hiking position, etc. and then compare it with what you are doing. The next thing I would recommend is to have an expert look at your sail to see if the shape is acceptable and even check batten shapes and poundages. Then compare all this with what those who are doing better than yourself with the same sail. Check rig tension and again compare with others. Also check mast rake, while allowing for different foil shapes and sizes and rakes. Make sure you have all the right adjustments available, ie. adjustable outhaul, good downhaul system and of course a leech line, which I now wouldn't be without. You will find that most of the top boats have and use a leech line.

After that is all sorted out and your boat is at least potentially quick, the next thing to work on is yourself. It is important to be at least reasonably physically fit, if not very fit, and also mentally fit. You should become an observer of yourself and constructively criticise yourself, not punish yourself. Learning what not to do is just as valuable as learning what to do.

The most important thing to be in possession of after achieving good boat speed is a high level of concentration during a reach. Without it, good boat speed is wasted. In light to medium conditions, I spend 80% plus looking at the telltales and making sure they are flowing. Unless they are very shifty conditions, I have learned again from Graham Ince and others, you are better off steering the boat than constantly adjusting the traveller, especially in waves, ie. bear away as your speed increases down a wave to keep the flow over the sail and back up again as the apparent wind swings back

In light to medium breezes I use no downhaul, I ease the outhaul a little and let the vang off, which allows the mast to rotate and increases power. The leech line I use probably between 8 and 15 knots. I sheet on allowing a little twist in the leech. Basically I fiddle until it feels fast. The exception is a beam reach, where I use vang tension to provide leech tension and I also use the front adjustable lowers to induce some mast prebend, and if a very broad reach I sometimes invert the mast.

By moving to leeward and as far forward as possible (“The Wild Thing”) I attempt to get the windward hull out as early as possible and, by moving body weight constantly and working the sheet, I try to sail on one hull as much as possible. In one race in the 95/96 Nationals at Paynesville, I made up half a leg in one reaching leg by doing the above for most of it. By doing it, I left one boat behind and caught the three leading boats and I ended up winning the race.

Reaching, out of all points of sailing, is the one area where you can (apart from shifty upwind sailing) make up a lot of lost ground, or where wins can be set up from. So getting it right is definitely a big advantage over those who don't.

In heavy conditions, firstly I tighten my upper stays. Secondly, I increase downhaul tension and then outhaul if required. I sail by the power generated from the bottom of the sail, therefore reducing the ups and downs while maintaining maximum power and speed. I constantly work the main through gusts and avoid dropping the traveller too far. My centreboards are up, of course, unless I'm on a very tight reach, where I will lower the windward board. I steer the boat while holding the tiller extension over my shoulder, holding it like you would throw a dart.

In light weather, you should have your body weight as far forward as possible, while trying to remain comfortable. In hull flying conditions, keep moving back as is necessary to keep the bows from nose diving. In heavy conditions, I tend to sail fairly conservatively while still attempting to achieve a reasonable position, as opposed to being remembered for the spectacular cartwheel that cost me the race or the series.

In a series, consistency is the secret to a good result. I have learnt that it pays often to sail a reach on the low side of a line drawn from mark to mark. The best way to do this is to work your way down with the gusts and waves to keep good speed and come back up a bit during the lulls. The aim is to sail roughly two thirds or more of the leg heading low and fast and the last third you should be heading for the mark, as opposed to sailing high of the line and then running slowly to the mark. The advantage gained by doing this is often great over the boats that sail high. This works best in steady breezes, otherwise be on the lookout for and sail towards the breeze. In other words, if the whole fleet looks like sailing over the top of you in better breeze, get back up into it.

On a final note, read books on the subject. The same topic discussed with a different slant can sometimes help the penny to drop. Remember, we never stop learning. Plenty of time on the water just practising instead of racing is heaps of fun and it's a great way of learning what's fast and what

isn't. Sailing in the groove more often is what it's all about and good concentration will get you into it. Happy Sailing.

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# Lake Sailing

*by Garry Williams*

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This article has been written to enable a skipper to understand the variety of things that need to be considered when sailing a race or series of races on a lake. As my home club has always been an inland (small) lake there are many stories that could be told of experiences gained and each have tested my patience and determination.

Learning to sail well in lake conditions requires a sailor to be able to do three things:

- Understand the environment he/she is sailing in
- Set the boat up to cope with these conditions
- Tactically benefit from your knowledge

## **Understanding the environment**

The further inland you are, the less likely there is to be a coastal sea breeze influence. It would also be an obvious statement to say that away from the coast you would not be sailing on salt water.

As inland lakes do not have the benefit of a sea breeze, the wind that passes over a lake tends to oscillate although generally coming from the one quarter (or basic direction). Generally the stronger the wind, the smaller the oscillations.

Obstacles such as hills and channels such as valleys can also play a part in directing the wind. The closer you are to these land forms the greater the influence.

Most of the time wind will move across the water in gusts rather than in a steady manner like a good 15 knot sea breeze.

In very light conditions there is sometimes a benefit gained from sailing around the parameter of the lake as the hot still air rises from the edges and draws the cooler air from the water. Clouds in the sky will generally be a good sign of some wind (especially wisps cloud which is a sign of wind up high) but no clouds indicates little or no wind. A shelf of cloud or front indicates a change is on the way. The main of an expected weather pattern however is obtained in advance by the barometric weather chart that can be seen on the local TV station or the local paper. When the isobars are close together and cross the area being sailed, wind will be expected (the greater the concentration of the isobars, the stronger the wind). Conversely when a large high pressure is above you, there will be a distinct lack of wind, and if it is slow moving as well, than take your drink bottle because you may need it.

## **Setting up your boat**

If you are a coastal sailor, your boat would be set up to cope with chop (bigger waves) and you would be used to sailing in a more buoyant medium. To sail in a fresh water lake in most circumstances the sail will not have to be quite as full to push the boat through the water, due to the smaller waves. Achieving this could be just in the extra downhaul used or the greater forestay tension for a particular wind condition, or it may be a small adjustment of the intermediate stays, i.e. max. 5mm looser. Fittings and ropes need to be free and able to operate when you are in different locations on the boat. Balance of the boat becomes more critical as dragging the transom in sub planing conditions is as good as an anchor. The use of centreboards and even the second rudder should only be contemplated when necessary, ie. upwind for centreboards and two rudders

in difficult conditions such as, when tacking at short intervals or if it takes time to raise or lower a rudder.

### **Tactics**

In light gusty wind it is extremely important to gain the most advantage in each gust. To do this, you will have to decide how far and on which tack you should go, for example, if your option is to sail straight through the gust with the pack or go across (presuming the same distance to the next buoy either way) then the best option is across it, thus gaining the extra distance out of that gust.

For a skipper finding themselves in the middle of the fleet on a work you can also view the angle the boats in front are sailing at, as well as those behind you and use them as "field tell tails" to help plot your best course to the windward mark. Being able to identify a change in direction of a gust prior to receiving it can be a big advantage, i.e. a big knock on one tack will mean a big lift on the other and so you may elect to sail a lower course to reach the new wind (knock) faster, therefore sailing to a better position than if you had not been aware of the change to come.

In light winds ghosting between gusts or puffs should be done with little or no movement on the boat which impedes momentum and if you are pinching in the puffs it is generally best to bear away slightly in the lulls to be sure of having a full sail as soon as possible in the next puff.

Near some lakes such things as smoke stacks, wind socks, etc. will also aid those who are alert to different forms of wind indicators.

Above all else, when sailing inland you need to keep a good sense of humour and understand that 'when it is not fair to you now' it was not fair to someone else a minute ago!

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# The Williams/Goodall Sail - Rig Set Up

*by Neil Williams*

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Applies to Neil Williams/Hugo Ottoway & Goodall sails.

## About the Sail - How it Works

This sail has been designed and built using a special sailcloth which will deliver very good performance in all conditions, rather than excelling in only one wind condition. Rarely do you have a regatta where you sail in one set of conditions (how many times have you heard the locals say "It's never like this here!"). A big advantage with the sail is that it performs in all conditions and points of sailing with the same stay settings. This is the major reason for the sail's success. Once the sail and rig are set up correctly, all you should need to adjust is your mast rotation, mainsheet, outhaul and cunningham (downhaul).

Looking at windward performance, the sail is fairly flat in light weather, with an open leech (twisted) which makes the air flow cleanly over the sail and not stall, thus making it fast but also easy to sail with.

As the breeze fills in to medium (10-20 knots) conditions, the sail starts to become fuller, due to the specific cloth properties, to a point where it reaches optimum power.

In medium to heavy (20+ knots) conditions, a combination of "give" in the leech and mast bend, causes the leech to automatically open up towards the top of the sail, depowering it as needed, making the boat very easy to balance.

For reaching and running, the sail's ability to power up is the key to its downwind performance. This "powering up" is a result of the lower leech loads and the cloth properties. Also, different downwind mast bend actually aids powering up of the sail on the correct windward shroud settings.

## Tuning & Setting

Having discussed how the sail is made to perform and what you can expect to see on the water, we can now look at the best method of tuning and setting the sail. (I would recommend reading the article on mast stepping and rig tuning in the old VPTCA tuning manual for further information).

### **1. Mast Rake**

Mast rake (upper forestays) should be set to provide slight weather helm, ie. boat should round up over say 20m sailing to windward in medium conditions.

### **2. Stay Tension**

Shrouds should be loose by normal standards. The sail does not require artificial rig tension or mast reverse bending to provide performance. With all stays attached and the sail down the upper stays should be slightly firm, not tight. When sailing to windward in a fresh breeze the leeward shroud will be very slack. This is not a problem.

Unfortunately, due to the variation between boats with main beam sag and stay stretch, it is impossible to indicate any exact "on the beach" tension. Suffice to say that the correct setting is when windward and reaching / running performances are at peak.

Too loose:- windward performance will be slower.

Too tight:- will reduce reaching and running speed.

Increments of 2mm should be regarded as sensible steps for adjustments. The only concession I have ever made to the "one setting for all conditions" rule is to tighten shrouds an extra 3mm in 20 knots, essentially to protect the mast. (Windward speed will also increase marginally).

### **3. Rear Intermediates**

Rear intermediate stays control the fullness and do not need to be overly tight. The sail develops its own power in medium conditions. Once again the correct setting is highly dependant on the main beam sag, stay stretch and mast stiffness.

On the beach, without the sail, with front intermediates loose, the mast should be straight. If the front intermediates are then pulled on to take the slack out of the rear intermediates, the mast should be somewhere between 6mm and 50mm forward of straight at the lower hound. To determine this exactly is difficult.

If too full:- reaching performance will be excellent while the sail will stall (leech tell tales stalled), especially in medium conditions, and will be difficult to control to windward in a fresh breeze.

If too flat:- Pointing will be poor and there will be insufficient power in medium conditions.

On the water, sailing to windward with the sail fully trimmed and all tell tales streaming, draft (depth of the sail) should be around 8% in light and heavy conditions and up to 11% in medium conditions. Tighter intermediates increase draft.

The best way to judge sail fullness is to look at indicators placed at  $\frac{1}{4}$ ,  $\frac{1}{2}$ , and  $\frac{3}{4}$  up the sail about 300mm in from the leech. If, when sailing to windward, the leeward indicator of all three sets of indicators is stalling, this indicates that the sail is too full and that the wind is unable to fully run round the curvature of the leeward side of the sail. If the sail is too flat, all indicators will stream but either pointing will suffer or there will be a noticeable lack of power. If just one or two of these leech indicators do not stream equally, you should try changes to mainsheet tension, luff tension and shroud tension until equal streaming is achieved. When these indicators are not streaming equally, incorrect leech twist and/or fullness will definitely be reducing speed, compared to the fastest possible result if the problem is remedied.

### **4. Front Intermediates**

Front intermediate stays can be used as a "go fast" in light weather to windward to pull fullness out of the sail and open the leech. Flatten the sail till pointing is just beginning to drop off. This is then the optimum setting. Pull them on hard in heavy conditions for downwind to protect the mast.

### **5. Luff Tension**

Use just enough luff tension (cunningham) to pull out the wrinkles on all points of sailing, up to about 15 knots. Above 15 knots, use the cunningham to adjust the amount of power the sail has. The more cunningham, the less power. This works for two reasons. The first is; with more luff



tension, it tends to bend the mast, flattening the sail, making the top of the mast move aft, allowing the sail to twist and thus spill out. The second is due to the cloth used in the sail. As the luff is tensioned, it stretches, causing the draft to move forward a little. This stretching also twists open the leech. Too much luff tension will cause the boat to feel “free and easy” but speed will drop off.

## 6. Traveller Settings

Traveller settings for windward sailing should be as follows:

<u>Wind Speed</u>	<u>Traveller Distance from Centre</u>
0 - 2 knots	300mm
2 - 10 knots	250mm
10 - 15 knots	200mm
15 - 20 knots	250 - 300 mm
20 knots +	300mm+ as required

## 7. Outhaul

Outhaul adjustment has little effect on the sail. It has been designed to flatten off lower down with typical windward mainsheet tensions. It is thus just a little fuller (automatically) for reaching and running. A depth in the sail of approximately 300mm on the bottom batten is a good starting point. Fuller depths will tend to result in stalling, whilst a too flat setting will be most apparent with a lack of power when reaching in medium weather.

## 8. Leech Line

A leech line will provide additional speed on a 10 to 15 knot reach due to leech compression and thus fuller top battens. In other conditions, it is of no assistance.

## 9. One Setting

Remember, the key to the sail is one setting for all conditions. Tune it with this in mind. If a weakness is apparent in a particular condition, solving it should only lead you to the optimum setting. One of the excellent points I have found with the sail is its "wide groove". This basically means that as long as most settings are somewhere near right it develops virtually maximum performance. This also applies to sheeting and steering accuracy and allows the skipper to get on with racing and pick up an extra wind shift or two (hopefully every beat).

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# Tuning the Williams/Goodall Sail

by Glenn Ashby

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Over the past four years or so the Williams/Goodall Paper Tiger sail design has introduced a new era in sails for the Paper Tiger's. The sail was designed by long time and very successful Paper Tiger sailor Neil Williams, who believed he could design and develop a sail that would be the best all round sail for all conditions such as the Nationals when a wide variety of conditions can be experienced over the week of sailing. These sails are now produced by Goodall Yacht Sails of Bendigo in accordance to this standard pattern.

The feature of this design is the versatility and ease of operation which means that the rig is doing most of the hard work for you, unlike many earlier designs where rig set-up and trimming seemed much more critical. Having a sail and rig combination that is working for you means that you can get your head out of the boat and look around at the other boats, windshifts and marks. You do not need to spend as much time wondering which string to pull next and what turnbuckle to fiddle with back on shore. For instance, you can get height if you want it or you can go low and fast which is great for quickly getting out of the blocks at the start.

The sail shape can be changed dramatically and quickly just by using the basic controls (lowers, downhaul, outhaul, mast rotation, traveller and sheet tension). The following summary is what I have found to be the best set up for the nominated conditions:

## **Upwind 3-8 knots (flat water - slight chop)**

Lower forestays off  
No downhaul  
Outhaul pulled in so that the bottom of sail is flat  
Mast rotation set at about 45 degrees  
Traveller set about 100 mm from centre line  
Firm sheet tension but still allowing sail to breathe

## **Upwind 8-20 knots**

When overpowered use lower forestay tension instead of dropping traveller  
Downhaul pulled on as wind strength increases  
Outhaul pulled on as wind strength increases  
Mast rotation set at 20-25 degrees  
Spring some sheet tension in gusts so the sail twists off.  
Use traveller as a last resort to depower

## **Reaching 3-12 knots**

Lower forestays off  
No downhaul tension  
Outhaul should be fully out  
Mast rotation set at 90 degrees or beyond for an 'off the traveller reach'  
Use the vang as your mainsheet on a broader reach

## **Reaching 12-20 knots**

Lowers on if overpowered  
Downhaul on depending on level of power desired  
Outhaul on depending on level of power desired  
Reduce mast rotation to protect mast (boom pressure opening up mast track)  
Adjust traveller according to angle of reach

## **Downwind 3-12 knots**

Lowers off  
Downhaul on hard  
Outhaul out a little  
Mast in-line with boom - vang on very hard  
Traveller completely out - boom to touch side stay  
No mainsheet tension

## **Downwind 12-20 knots**

Lowers on to prevent mast from breaking  
Downhaul off a little  
Mast in-line with boom - vang on very hard  
Traveller completely out  
Centre boards up for all downwind legs

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# The Gale & Rimington Sail

*by Kim Fairhall*

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The Gale and Rimington sail has been designed with long life in mind. With both weekend and regatta sailing, at least 5 seasons should be easily obtainable without significant stretch. For this reason, the sail does not have a double reinforced leech or large amounts of reinforcing in other areas of high load. In areas where there is little to no loading, lighter cloth weight has been used. The sail was designed for durability for two reasons:

- to give the user a sail which varied little throughout its lifetime so that tuning would be easier and
- to help keep sailing costs down by negating the need to buy a new sail every 3 to 4 years.

The Gale and Rimington sail was the author's second sail in six years and throughout this period it remained as competitive as the first day it was used.

## **Batten Shape**

Fibreglass ("Blue Streak") battens should be used with this sail. Foam sandwich battens may also be used as these are lighter but are expensive and prone to breakage during cartwheels! Batten weights from top to bottom are 2.5, 1.2, 0.5, 0.5, 0.5, 0.8 and 1.2kg. Either tapered or untapered battens may be used but must be shaped to achieve a position of maximum draft at approximately 45% of the length of the batten. Battens should have even curve from start to finish without any straight runs. Battens should be tied in with enough tension to just remove all creases along the batten pockets. Batten end V-locks are useful for batten tension adjustment and easy tie off. To check that batten weights are correct, tie the head of the sail to a tree and stretch the luff with a rope and tie off to another tree. Attach a rope to the clew and pull diagonally away from the luff to simulate main sheet and outhaul tension. The leech should have an even curve from foot to head. If not, try adjusting batten tension or try reducing or increasing batten weight (you may need a stiffer batten if it appears too soft and higher batten tension cannot resolve the problem). Once you are satisfied with this curve mark the batten ties with a felt tipped pen and use these as a guide when rigging on the beach.

## **Sail Controls**

The only sail controls which appear to be useful with the G&R sail are the mainsheet(!), downhaul, vang, traveller and outhaul. The front intermediates should only be applied in very heavy weather to support the mast on reaches and downwind legs. No leech tensioning is required as the sail maintains plenty of power on reaches.

The G&R sail is extremely sensitive to downhaul tension on upwind legs and it is imperative to have it within 1cm of optimum for good performance. It may take some time to find the appropriate downhaul tension so it is worthwhile having an indicator on the mast against which the downhaul tension can be judged. More tension should be applied in very light or very heavy conditions to help prevent the leech hooking or to depower the sail respectively. The normal amount of tension in moderate breezes is just after the point when all lateral creases which radiate out from the mast have been removed. On reaches, the downhaul should be eased to increase the sail's depth while going downwind, the downhaul should be applied reasonably hard to help the mast invert and expose a greater sail surface area.

The G&R sail is equipped with a "pocket foot" so that with high outhaul tension, the lower third of the sail can be effectively flattened. Outhaul tension is important to have correctly set. Particularly note the importance of allowing the bottom of the sail to fill up by reducing outhaul tension when going onto a reach, except in very heavy conditions where a flat reaching sail is required. However, too full a sail will lead to increased drag and a detachment of air flow from the lee side of the sail. Allowing the clew to move in by two to three centimetres from an upwind leg should be about correct in most sailing conditions.

The G&R sail thrives on plenty of vang when on broad reaches (that is, when the boom extends out past the end of the traveller track). It is not uncommon, especially in moderate conditions to have a small amount of boom bend at the vang attachment point when on this point of sailing. In lighter breezes, vang tension should be less to ensure that the leech does not hook. On close reaches and upwind, the vang should be used to rotate the mast directly (or slightly more) into the apparent wind to ensure that the leech stands up and maximum power is derived. Mast angle can be judged from cassette tape attached to the front uppers.

Vang tension on a run should become progressively harder with increasing wind strength to expose maximum sail area and support the mast in very heavy conditions. Too much tension in lighter conditions will however, hook the leech, reducing exposed sail area.

Control of sail shape with mainsheet tension is conventional for the G&R sail. It is important not to oversheet the G&R when going upwind, especially in lighter conditions as the sail has a propensity to hook. This can be partially compensated for by using slightly more downhaul tension, centering the traveller and reducing mainsheet tension. Tell-tales and leech ribbons should always be flowing when going upwind.

The traveller should never be closer than 10 centimetres from the traveller centre in any condition. The G&R performs better upwind when the traveller is eased and higher mainsheet tension is used rather than the other way round. This allows better speed and promotes excellent velocity-made-good on upwind legs. On reaches always let the traveller as far out as possible but ensuring that both sets of tell-tales can flow. (Due to the good reaching performance of this sail, it is possible to sail very low angles on broad reaches and reach clear air away from competitors. The better reaching angle into the mark half way up the leg then gives increased speed and the potential for big gains).

## **Rig Tension**

The G&R sail has been designed to suit high rig tension, that is, the rear uppers go slack when the top two to three panels of the sail are flattened with mainsheet tension. This amount of tension is particularly useful when on a broad reach or run as it helps to invert the mast and expose greater sail area. Rear lowers are simply a power control and need to be adjusted to suit individual requirements. The leeward rear lower should have no tension on it when the boat is on the beach. For a 75kg skipper, the leeward lower can be held by thumb and forefinger against the leeward backstay to about 75cm above deck level when the boat is oriented in the upwind direction on the beach. For heavier skippers, this distance will be shorter (more power) or longer for lighter skippers (less power). In general, the other sail shape controls permit sufficient control of power so that race to race adjustment of rear intermediates should not be required (assuming that the intermediate length is on average, approximately correct).

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# Tuning the Irwin Sail

*by Ben Deed*

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Generally, when setting up the Irwin sail, you should aim at a consistent shape all the way down the sail, meaning that the depth should look to be in the same position. The batten drive position should be between 40% - 50% from the front of the batten. The drive positioning is critical for good performance.

Below is a list of comments that will help you to set your Irwin Paper Tiger sail for racing. At present, Irwin has two styles of sails available. The full radial cut and the horizontal cut are extremely similar to set up for racing.

## **0-5 knots** - Rig tension loose.

Normally on flat water you should try for a flat sail so that when the breeze travels over the sail it doesn't lose contact and stall. Be careful not to have the bottom (foot) too full when beating. Pulling on the outhaul will flatten the foot area. Also take care not to over sheet as the leech of the sail may hook and stall. You could also try pulling on the lower forestays to hold the shape in the sail. This will also help to hold the leech open (twist).

## **5-10 knots** - Rig tension loose.

Once the wind strength reaches 8 knots you should be sailing with a full sail. Decreasing the length of the lower backstays will increase the fullness of the sail. When sailing upwind, sheet tension is critical to control the twist in the leech. As a puff of breeze fills the sail, sheet on to stop the twist but be careful not to over sheet and hook the leech. You want the leech to stand up, not hook or twist off.

## **10-15 knots** - Rig tension firm.

Tightening the back upper stays will firm the rig. The sail still should be full. If overpowered, adjust (in order) outhaul, then drop traveller three inches. If still overpowered, use the downhaul. When sailing upwind, sheet tension should be tight to stop twist in the sail.

## **15-20 knots** - Rig tension firm to tight.

Flatten the sail by loosening the lower backstays, also tighten rig (back uppers) to place twist in the sail. If overpowered when sailing upwind and on reaches, pull on the outhaul as tight as you can and pull down the downhaul until you gain control of the boat. When sailing upwind, position the traveller 3-4 inches from centre and make sure you keep the sheet tension tight to reduce twist in the leech.

## **20 knots & above** - Rig tension tight.

If you weigh under 72kg, you could look at putting stiffer battens in number 2 and 3 batten positions. This will flatten the head of the sail. If still overpowered, flatten the sail by loosening the lower backstays as well as tightening the rig (back uppers) to place more twist in the sail. When sailing upwind, pull on the outhaul as hard as you can and drop the traveller 4-5 inches. The downhaul should be pulled on extremely tight and if still overpowered pull it on more! Be sure you keep the sheet tension tight to reduce twist. You should have the sheet pulleys almost block to

block. If you drop the mainsheet for any reason, the sail will fill up, which you don't want. To stop this from happening, pull on the lower forestays.