JUNK RIG
and Advanced Cruising Rig Association

Newsletter 54 January 2010

Newsletter 54

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Cover photo:

PEREGRINE Apparently taken near the island of Hitra, which is west of Trondheim

From the Hon Secretary

Well that was another wet and windy summer in the UK, but at least it was warm so it paid to have a trailer sailer with no antifouling or berth charges. However a 26' MacGregor, although of light weight is not small to tow even with a 4x4, so I have now got my eye on a Swallow Boats 20' Bay Cruiser, an epoxy ply water ballasted boat that does not need a braked trailer, ideal for attending the rallies for another ten years.

Our rallies in Europe for 2010 are:

May 22/23	Summer Rally and AGM Mayflower S.C. Plymouth
June 26/27	East Coast Rally at Bradwell Quay Y.C. Essex
July 10/11	Scottish Rally, Holy Loch S.C.
August 7/8	Norwegian Rally, at Lundsvage Batforeng, Stavanger
September 11/12	North Wales Rally, Royal Welsh Y.C. Caernarfon

Worth a visit:

April 25th	Beaulieu Boat Jumble at Beaulieu Nr. Southampton, visit the JRA stand it is the biggest Boat Jumble in the world.

Annual subscriptions:
Due January 1st 2010

UK	£20 cash or cheque
Europe	€30 cheque or €25 Cash
Rest of world	US$50 check or $40 cash

New members including first year of membership add £5 value to annual subscription.

Robin Blain
Hon. Sec.
From the Secretary

R&D Editorial

by Slieve McGalliard

It may seem funny to start with a portrait photo, but this photo shows not just the person but also the world we live in. The person in the photo is Robert (Bob) Groves who wrote '*Sailing a Junk Schooner*' on page 12. The point is that I pressed the button to take the photo while sitting in my study in Surrey, England and Bob was sitting in the library in Lunenburg, Nova Scotia. The resultant photo was stored on my computer. Bob and I were chatting on a video phone link at the time and I just pressed the button. Magic.

Bob was stroking his beard and joking about having to do one day's work on the 25th December. We had a couple of very interesting chats about EASY GO and sailing without an engine. It was all very useful and Bob patiently answered all my many questions. I hope you find his article and the information at the end as interesting as I do. We need more members to share their knowledge in this way.

Robin Blain told me he quite often gets enquiries about yulohs, and when I said that I've written a few pages on the subject he asked me to put it in the newsletter. Some readers may have seen it before and to them I apologise. I hope some find it interesting. Bob on EASY GO has been using a straight yuloh since setting sail, but during the last year built a new one with the bend above the fulcrum and the camber on the bottom of the blade, and has enjoyed much better performance since. I hope we will be able to print more details in due course.

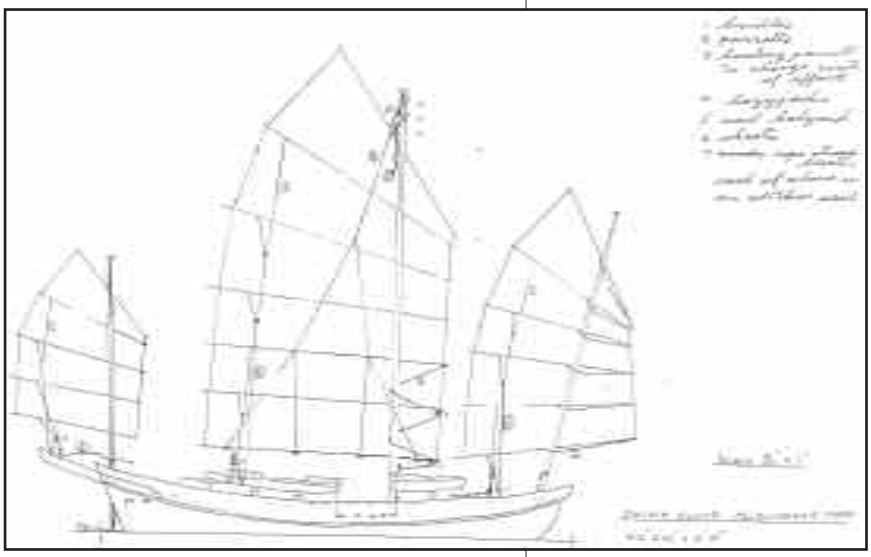
Paul Fay, in Greece, has been doing quite a few cambered rig tests and is cutting and sewing over this winter, so it will be interesting to see how his boat performs.

Although not quite R & D, but more re-pro/ traditional, many readers may have heard of Allen and Sharie Farrell and their boat CHINA CLOUD. This is a back to basics Chinese style junk, built on the beach and possibly even using drift wood. The book '*Sailing Back in Time*' by Maria Coffey & Dag Goering is a very good read about cruising in company with CHINA CLOUD. The diagram shows the hull and sail rig that CHINA CLOUD was built from. It may not be a 'round the cans racer' but it is an attractive cruising home.

So there are things to write about, there are a number of rigs coming along in the background. ***Please let us have your contibutions for future issues.***

Left: Bob Groves, with beard.

China Cloud hull and sail plan.

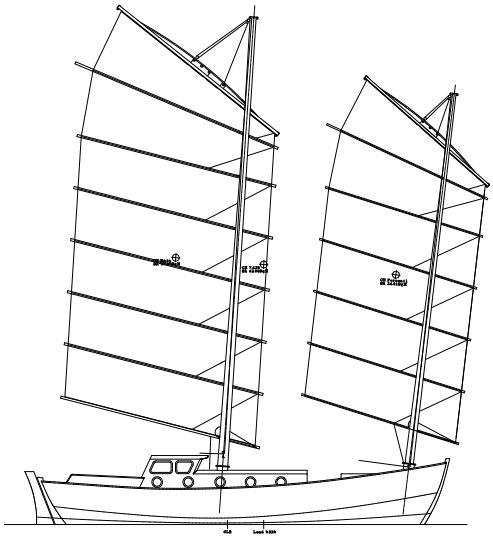


A new winch for POPPY

Some may be interested to hear that I have replaced the winch on POPPY. I've sailed all my life in bare hands, only wearing (ski-) gloves for cold night watches. When others have pulled on finger-less sailing gloves I have called them sissy names, but last year I watched some friends wearing them on POPPY to great advantage. I weakened and bought a pair, and haven't looked back. Since getting them I haven't used the winch and may have lost the winch handle. I can hoist full sail (with a break after 5 panels) and can let the halyard run through my hands for a controlled crash drop without getting a rope burn. Magic. Perhaps I have been too dogmatic. Now I have a lot of people to apologise to.

POPPY's new winch

Right: La Chica – Trystie Style Rig.



Annie's new boat shows the hull before work starts on the rig.

Late news from New Zealand

After writing about David Tyler and his latest ideas and about Paul Thompson and the new rig he is planning for his schooner La Chica with an Arne type sail on the aft mast and a split junk rig on the fore mast I suddenly got a mail telling me that Paul and David had actually got together and things were moving along quickly.

Paul wrote: .....

As for what is happening on the sailing front, quite a lot! As you know, David Tyler is here and he is using what humble facilities I have to make the changes that he wants to make on Tystie's rig. We have had extensive discussions and as a result of that David offered me all Tystie's old gear. I had in mind to play with it in two or three year's time. Then we got talking again and David mentioned that if I were really going to experiment with soft wings, I'd be better off if I built a rig that incorporated all his hard won experience.

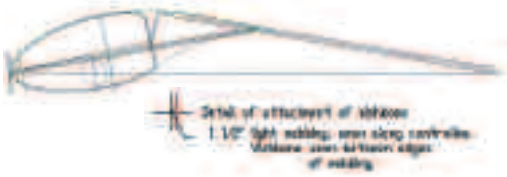
David's new battens are all aluminium alloy and we have made jigs for bending the aluminium tube and templates for the various plastic and aluminium parts that need to be made. Anyway, as we had all this stuff setup and David is here now it seemed a pity to waste the opportunity.

La Chica's new soft wing rig

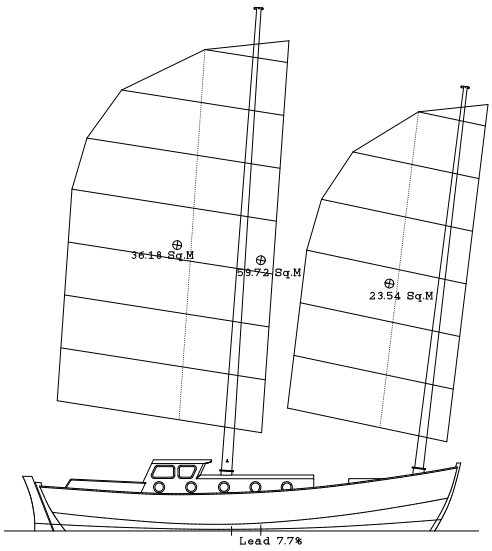
So the upshot of all this is that I am now building a soft wing junk rig for La Chica, It is essentially just Tystie's rig reversed as Tystie is a ketch and La Chica is a schooner. On the two main, the chords are identical but my batten spacing is slightly greater due to me having a taller mast. My foresail is also slightly bigger in that the chord is 300mm greater and the batten spacing also a little greater. Both rigs will use the same wishbone shapes for the main and likewise for the mizzen/foresail (note: the wishbones for the main and the foresail/mizzen are not identical as the chords are different). However the movable aft section (flap?) is longer in La Chica's foresail and I am also using 38mm tube versus the 32mm tube that David has in his mizzen. A copy of the new sail plan is shown below.

David is designing a junk sail for Annie's (Annie Hill of Badger) new (to her) that is of the same type that Tystie formally had. I will donate the yards, battens (brand new ex La Chica) and a roll of Odyssey III (enough to make the sail and some over for a dodger and lee cloths and so the work which I have already done will not be wasted. A photo (too small but all I have) of Annie's boat is shown left as well."

The pictures tell a little more about the work they are doing. 'One of David's latest drawings' shows the type of wing section they are working on.



This drawing shows Paul's boat with the planned new rig.



Bottom right: La Chica – Proposed final sail plan.

There is a lot going on over there, but I suppose the weather is better than it is in Europe or North America. It will be interesting to get progress reports from NZ.

And finally,

Arne sent me these photos of PEREGRINE he received from Sebastian. Apparently they were taken near the island of Hitra, which is west of Trondheim. How do people get such wonderful photos?

Some thoughts

by Slieve McGalliard

A Chinese lady with child or grandchild slung on her back can propel a 2 to 3 tonne sampan at up to 3 knots for prolonged periods.

Get a group of technically minded sailing enthusiasts together for an evening and the probability is that the Chinese Yuloh will get a mention. Where they all will be interested, probably none will have practical experience but will have heard that a Chinese lady with child or grandchild slung on her back can propel a 2 to 3 tonne sampan at up to 3 knots for prolonged periods. A quick search of the web will show that a few westerners have tried to use home made yulohs but have not achieved such significant performance, and have found it very tiring to use. The question is – could the quoted performance be realistic and if so, is it possible for a westerner to build and use a Yuloh and achieves this performance?

Many are aware that the Yuloh from China and the similar Ro from Japan have been used through out the south and eastern coasts of Asia as the basic form of manual propulsion for small to medium sized vessels. In its basic form the yuloh is an oar used for sculling over the stern of a vessel. By making a bend in the loom and attaching it to the boat with a lanyard from the end of the loom it seems to have developed into a remarkably efficient device.

The yuloh generates forward thrust by slicing through the water from side to side, like an oscillating propeller which changes pitch as it rotates each way. The operator only providing the energy to overcome the drag of the foil, the inertia of the yuloh and the effort required to twist the blade to the required angle. The thrust or lift produced by the blade is transferred to the boat through the fulcrum and the lanyard and does not stress the operator. Each stroke, left to right and right to left is a power stroke and no energy is wasted on a recovery stroke, and therefore the thrust is effectively continuous.

On the other hand, in rowing the stroke is made by dragging the stalled blade through the water. The total force of the drag is supplied by the operator as he uses his lower arm muscles to grip the loom with his fingers, pulls with his arms, and using his back and legs the boat is propelled by the reaction at the rowlocks and the foot stretcher, with all the propulsive force going through the rower's body. The stroke is followed by lifting the blade out of the water for the recovery to the start position which although it requires less energy it imparts no drive to the boat, and may even suffer from air drag if the rower does not feather the blade.

Comparing the hydrodynamic performance of the oar to the yuloh is similar to comparing the paddle steamer to a propeller driven vessel, and it is well documented that the propeller is more efficient than the paddle wheel. This would suggest that the basic action of using the yuloh should require significantly less effort than using oars to produce the same work.

The yuloh seems to have other advantages, in that not only does the operator face forward but he can work in waters little wider than the beam of the vessel.

The picture is of a model displayed in the most interesting collection of 24 model junks in the Naval History Museum at the Arsenale in Venice. This would seem to be an extreme example of the use of the yuloh. The other photographs are also from the museum.

A search on the web on the subject shows one or two references to the writings of G.R.G. Worcester book, Junks and Sampans of the Yangtze, or drawings of the Japanese Ro, however the majority of the available information tends to be based on western sculling or attempts to make bent sculling oars which produce relatively low performance, and which tire the operator very quickly. None of the western experiments seem to be able to reproduce the performance reputed to be achieved in the eastern world.

So how can the mythical little old lady with the child on her back produce significant work output over long periods with a low calorie input? Having a child on her back may help

on the Yuloh...

with domestic responsibilities, but it may even be that the extra weight assists in the work of propelling the boat. It would seem that the yuloh is a very refined tool and the operating technique must make the most efficient use of its properties. It would seem that the reported western efforts have missed the finer points of design and operation.

Perhaps the best starting point to make an efficient yuloh would seem to be to go back to the original reports by G.R.G. Worcester. In his book he initially shows one yuloh in detail which has a downwards curve above the fulcrum and an upwards curve below. This is the only drawing showing the upwards curve and at a guess this could be to allow it to be used in shallow water. The other yulohs he draws are either straight or with a bend/ angle positioned above the fulcrum, and these latter would appear to be the most likely to produce the efficiency which it is desirable to achieve.

To aim for maximum efficiency it would seem reasonable to tailor the physical properties (length, balance, bend position and angle and blade profile) to suit the vessel and the operator, and even consider adapting the vessel to assist the operator perform the work with the minimum of effort.

The bend.

Although westerners have sculled with straight oars through out the ages, it is the bend that is unique to the eastern system. If there is no bend the operator will have to use his or her wrists to twist the blade to the desired angle for each stroke, reversing it at the end of each sweep. This will use the lower arm muscles which are not the most powerful in the body and which will tire the operator. By including a downwards bend the yuloh will automatically twist in the correct direction for the blade to produce drive. The position of the bend seems to have a big effect on the overall performance.

If the bend is centred on the fulcrum the tip of the loom will use a large proportion of the stroke while the blade swings round to change angle. This could waste up to half the stroke and produce negligible drive.

If the bend is placed just above the waterline less of the stroke will still be wasted in changing pitch. Although apparently more efficient than at the fulcrum, there is still waste effort, and the blade will always try to turn to the same angle on every stroke. The yuloher will have to use his grip and lower arm muscles to vary the pitch angle for differing conditions.

By placing the bend above the fulcrum and just below the hand on the loom the effort used to push the loom will all be used for drive, assuming the initial effort is with the hand on the lanyard is applied first to twist the blade. This position also allows the yuloher to control the pitch angle of the blade by varying the ratio and timing of effort with each arm. With a good technique and experience the yuloher can easily match the blade angle/ pitch to the requirements, eg. Light lanyard effort for fine pitch to acceleration from rest or into strong wind/ waves or by leading heavily with the lanyard, coarse pitch for cruise speed after the acceleration stage.

The actual position of the bend would seem to depend on the size of vessel and the size of the yuloher. For a large vessel is appears that the yuloher has the aft hand just above the bend about shoulder height and aft of his/ her body with the forward hand on the lanyard across the chest and forward of the body. The tip of the loom will probably be level with the top of the head or slightly higher. With the bend just aft of the aft hand then by only using the aft hand the blade would receive a slight twist and give the minimum drive liable to be required, and to keep the blade pressing down into the water and unto the fulcrum.

The angle of the bend will depend on two features. The maximum speed will dictate the maximum blade angel, and the way the lanyard is attached to the loom combined with the bend will dictate the amount of twist imparted. If the lanyard is tied round the loom then the bend angle will control the twist, but if the lanyard is tied to an eye which is screwed into the underside of the loom then the effective angle will be from the bend to the eye where the lanyard is tied. This would suggest that to use an adjustable length eye under the loom would be a good way to experiment with or tune the yuloh for efficiency. Could it be that by using 3 pieces of wood lashed together to form the angle that the Chinese did adjust each yuloh to the usual yuloher on each vessel?

The lanyard would seem to be attached close to the tip of the loom, and to slope forward at an angle of about 14º to the vertical from top to bottom. The lower end seems to be attached to the vessel at about the level of the yuloher's feet.

The yuloh seems to have other advantages, in that not only does the operator face forward but he can work in waters little wider than the beam of the vessel.

The overall length of each yuloh would seem to be tied to the length and design of the vessel.

The photographs of the harbour sampans show the elevated position of the yuloher and the raised transom to support the fulcrum. It is not a large heavy vessel, so the yuloh does not extend to above head height.

Length.

The overall length of each yuloh would seem to be tied to the length and design of the vessel. All indications seem to suggest the length of a traditional yuloh is normally over 50% of the length of the vessel, and as the vessel gets smaller the percentage increases to up to about 90% for vessels 3 metres long. Yuloh propelled harbour sampans seem to have a raised after deck for the yuloher to stand on and also a raised transom to mount the fulcrum on.

Worcester suggests a stroke rate of about 41 per minute to be reasonable for a sampan, therefore to get effective drive the yuloh needs to be quite long with the yuloher raised above water level. We generally accept that a larger diameter slower revving propeller is more efficient than a smaller one.
This would suggest that for efficiency a westerner should raise the operator and fulcrum to accommodate the desired length of yuloh, and not just accept the low level cockpit sole.

Fulcrum.

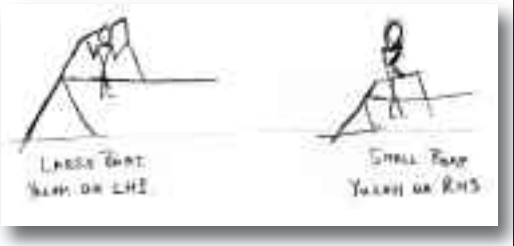
As a fulcrum Worcester reported that the Chinese used an iron pin with a small ball end attached to the transom, and inlay a hardwood block with a cut out into the lower surface of the yuloh as a socket. When worn the hardwood block could be changed. On larger load carrying vessels the hardwood block can be quite long with a number of sockets distributed along the length. Worcester suggested that this would allow the yuloh to be adjusted for different heights of cargo and different waterline levels. This suggests that the trim of the vessel and the yuloh have to be right to gain best efficiency.

Many westerners seem to use a towing ball as a fulcrum, though the standard 25 mm ball is quite large and a hole of that size would weaken the shaft significantly. It may be possible to find an adequately strong towing ball from a bicycle shop nearer 15mm diameter.

From Worcester's diagrams it seem that on large heavy vessels the fulcrum is placed to the left of the centre line, and on small punts on the right hand side of the centreline. This may be that as the majority of Chinese are right handed they use the left hand on the loom and the right hand across the chest on the lanyard when propelling a heavy vessel, but for a small light one the yuloh is not high enough so they possibly only use one hand, the right hand, below waist level and move the hand fore or aft on the loom to vary the blade pitch from fine to coarse.

A couple of simple experiments to try now.

Stand up, and imagine a line on the floor to be the centre line of your vessel. Place your feet on either side of the line just over shoulder width apart and with the right foot forward such that the line joining the feet is at 45 degrees to the centre line. (If you are left handed reverse all lefts and rights). Imagine the yuloh to be on



your left hand side and raise your left hand to hook it over the yuloh at shoulder level. Raise your right hand to a high waist level and grasp the imaginary lanyard in front of you. Remember that the lanyard is tensioned between a point at your foot level and the tip of the loom above your head. Using a relaxed upright stance, start to sway from side to side across the centre line at a stroke rate of about 40 per minute, which is a sway from left to right and back again in 1.5 seconds. Lead the change of direction with the lanyard hand.

If you imagine you are trying to propel a heavy vessel, but trying to use minimum effort you should realise that you can effectively lean on the yuloh and use it as a support. Adjust your stance to get the most relaxed position. You should notice that you will be using the larger muscle groups in a fairly relaxed way, and that the main effort going into the stroke will be coming from your weight swaying from side to side. It should become evident that, once you are used to the action that it should be possible to continue for long periods without getting overly tired. It would seem ideal to place the bend about 30 cm behind your left hand.

Now repeat the experiment, but with the yuloh much lower, so that the left hand is at waist level and the lanyard hand lower. By not standing upright the action will become tiring very quickly. This seems to be the situation with most of the existing western experiments where the yuloh is shorter and does not extend above the yuloher's head.

As a second experiment, imagine you are in a 3 metre light weight punt. Stand astride with you feet at right angles to the centre line. Let you right arm hang down by your side, and start to swing it out and in to the side as if you are 'swinging' the yuloh from side to side. This should be the 'fine pitch' position, with the bend just a short distance behind the hand. As speed increased and you want more twist, move your hand forward and upward on your imaginary yuloh and continue to stroke from side to side. Again you should see that this is a simple relaxed way to propel you vessel.

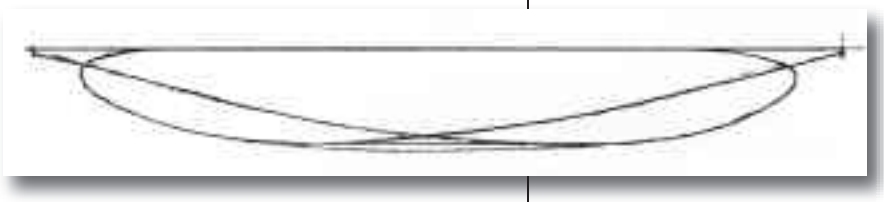
These simple experiments should help to give an idea of how to use a well proportioned yuloh with minimum exertion.

Blade profile.

As the yuloher is pushing the blade from side to side he is only overcoming the drag of the blade. The lift, or forward thrust is generated by the shape of the blade. Therefore it is important to use a blade shape to which gives the best lift/ drag ratio.

Western attempts to make sculling oars seem to be based on the oars used in the Bahamas, where the underside of the blade is generally flat and the top of the blade curved. With a straight oar this blade shape naturally wants to twist in the required direction for forward thrust, and reducing the wrist effort required from the oarsman. If cambered on the bottom and flat on top the blade will try to twist the wrong way, and will require additional effort from the oarsman.

As shown above, the bend in the yuloh takes care of the twisting of the blade for each stroke allowing the blade profile to be optimised for maximum forward thrust for minimum drag on the yuloher. For best lift/ drag an asymmetric cross section with the camber on the lower/ forward face would seem best. A Lift/Drag ratio of 6:1 should have 50% more drive force than a L/D of 4:1 for the same effort and although these figures are a pure guess they do show that getting the optimum section would seem to be the key to getting the remarkable performance mentioned earlier. The problem is that at the end of each stroke the trailing edge becomes the leading edge for the return stroke, so the section has to be symmetrical end to end.



The diagram above is simply the Clark Y section and mirror image superimposed in an effort to draw a two way section to give a downward force. (The only lifting foil that requires a leading edge at both ends that easily comes to mind is the Frisbee, which might be a good starting point). A compromise would have to be reached to combine hydrodynamic efficiency and mechanical strength. Ease of manufacture must also be considered.

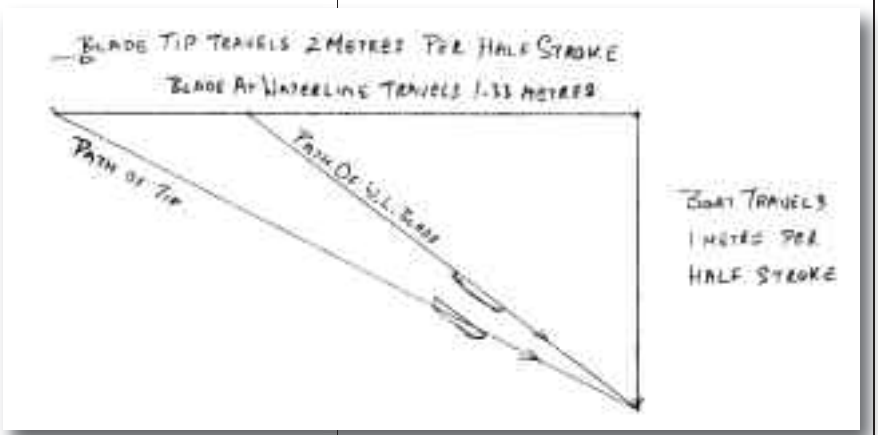
If you imagine you are trying to propel a heavy vessel, but trying to use minimum effort you should realise that you can effectively lean on the yuloh and use it as a support.

It may be possible for a westerner to compete with the little lady with the (grand) child slung on her back to produce good performance for long periods.

Clearly putting the camber on the top surface is similar to flying an aircraft with a Clark Y section inverted which is well known to be so inefficient that some such aircraft cannot maintain level flight when inverted.

As the blade is operating as a foil and not as a stalled surface, it would seem that the blade could be quite wide near the tip, possibly at about 4 – 5% of the length, but the following paragraph may suggest a rethink of these figures.

A further 'refinement' which may be worth considering, and possibly improve the performance would be to vary the section along the length of the immersed blade. A propeller blade has a twist built in along its length to optimise the pitch angle. As the yuloh sweeps in both directions the blade cannot be twisted, but it may be possible to adjust the cross section along the length in an effort to optimise the angle of attack of the leading edge. The diagram below is based on best guess for a 5 metre yuloh at 41 strokes per minute (82 half strokes / min) (Worcester) and a vessel speed of 2.5 kts.



This would seem to suggest that the section near the tip could benefit from being flat closer to the leading edges (or even slightly under cambered on the top surface) than the section near the waterline. At the quoted speeds the angle of attack would seem to differ by about 12° over the length of the immersed blade. The section near the waterline would naturally tend to be thicker and possibly narrower for practical mechanical reasons. This is one area which would benefit from a more detailed study.

All the above would seem to suggest that with a well designed set up, as seems to have evolved in the eastern world, that the yuloh can be a very efficient device. The following is a suggested list of actions which should result in a well proportioned yuloh.

Recipe for a Yuloh for a large vessel.

The following is one suggested way to design a yuloh.

Make a scale drawing of the side elevation of the hull.

Draw a line at 45° clear astern of the hull. T – W – F – L.

Make the line 60% of the hull length, such that the bottom mark (T) is 30% of the length below the waterline, and L is 70% of the length above W.

Mark point F (fulcrum) 66% up from the bottom.

Transfer the line forward to the hull to position F1 over the transom. This should be the desired position of the fulcrum.

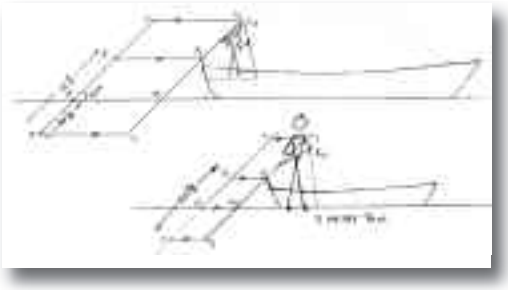
Draw in the yuloher to scale, and adjust his/her position so that the tip of the loom (unbent) is above their head. This should indicate the level of the platform they should ideally stand on, and may be at cockpit seat level rather than at the cockpit sole level.

Mark the bend point a short distance below the yuloher's aft hand and just below the level of his shoulder, and draw in the upper section of the loom bent forward some 9 to 10° to get L2.

Draw in the lanyard from the tip of the loom sloping forward some 14° to the level of the yuloher's feet.

You now have the general setup, and have to decide on the blade width and cross section which may vary from near the tip to near the waterline.

A reasonable starting width for the blade of a large vessel would be about 4% of the yuloh length at the tip, tapering in a straight line to 3% of the length at the waterline, and 0.4% of the length thick at the tip increasing to about 0.8%L thick at the waterline.
Make sure the blade is cambered with well rounded edges on the lower surface, and flat on the top surface if not slightly concaved near the tip.



Recipe of a Yuloh for a small vessel.

Similarly draw a diagram for short light weight dinghies or punts, but this time draw in the yuloher using an under arm action, and adjust the proportions to a length of about 90% of the boat length, and place the fulcrum about 60% up from the tip. As you will only be using one hand and not be working the lanyard with your other hand, then it would seem advisable to increase the bend angle to almost 20º when drawing L1 to L2, so that you can control the twist simply by moving the hand forward or aft on the loom. You may find it desirable to raise the fulcrum slightly above the edge of the transom on a normal western dinghy/ punt.

Worcester reports that the Chinese sometimes strengthen the tip with an iron band, which also helps to keep the tip under water when not in use.

Conclusion.

It would appear that western attempts at making yulohs with the bend designed to stow neatly around the gunwale and not designed for easiest use are not ideal, and by not placing the camber on the lower surface cannot achieve high efficiency. They do not encourage good use of the lanyard and good technique. It would appear to be pointless to make the shorter length yulohs used in most western attempts which do not encourage a relaxed stance. If the design can be optimised and the technique learnt then it may be possible for a westerner to compete with the little lady with the (grand) child slung on her back to produce good performance for long periods.

The author would like to receive constructive comments on the above, and any reports of recent experience on the use of yulohs at ***slieve@onetel.com*** (but he does not want to receive anymore 'junk mail').

A note from Bob Groves

Bob wrote - "Finally built the yuloh for EASY GO using your "Yuloh Recipe" It is very powerful and well balanced. It is built of Nova Scotia black spruce that I bought from a farmer. He had cut it for barn board siding but felt it was too good for that as it was virtually clear. This made the weight of a twenty foot oar manageable. I find that it floats a bit so will add some weight to the tip to get it too stay down."

And later he wrote

"First the yuloh news. We have it all figured out now. It propels the boat very powerfully and one needs to resist the desire to push too hard as it only makes it expends more effort with little result. My standing position is under the arch and as it is mounted on the port side I am using the rope in my right hand with the left providing minimal assistance. Following the "recipe" has provided a unit that I don't think can be improved on. We are building some chocks to support the yuloh on deck and with a new set of stanchions on the boat we made one removable so that there are no obstructions to the yulohs use.

The blade floats a bit as did our original sculling oar. When I start sculling I support the yuloh with my left hand and within two strokes of gradually increasing pressure the yuloh stays down and goes into propulsion mode. When one stops sculling it rises to the surface where it rides or can be lifted clear of the water and remain on the pin until one puts it back on deck.

We can scull against a ten knot wind and run over the anchor and chain without difficulty. We are heading north to Cape Breton Island and Newfoundland over the next couple of months and will have much more experience by the time we get back. I should have more pictures and plan to write an article on its construction and use. I'll send it along to you for review before submission."

We can scull against a ten knot wind and run over the anchor and chain without difficulty.

Sailing a Junk

by Bob Groves

Top right: Easy Go in Port Antonio, Jamaica.

Bottom right: One of many Dorado.

We are often asked why we choose to sail a junk rigged schooner for offshore sailing when more technologically improved sailing rigs are available today. Up until recently the response would be that we always were intrigued by the rig and simply wanted to sail one. Having been aboard a Colvin Gazelle at Marina Hemingway outside of Havana Cuba, only increased the desire to build and sail a junk rigged boat. We built a Benford Badger design and have sailed it from Canada and back on the Atlantic circuit with stops in the Azores, Portugal, Morocco, Canaries, Cape Verdes, and Caribbean before returning home to Canada directly from Jamaica. Easy Go, the name of our boat, is a junk rigged dory schooner, engineless, with auxiliary power in the form of a Chinese yuloh. Kathy and I built this boat in Canada close to Lake Erie. Previous to this boat we had sailed a Grampian 26 on the Great Lakes and as far afield as the Caribbean. The Grampian, also named Easy Go was a conventional sloop rigged boat. The best reason for sailing a junk rig became apparent during the 3200 NM nonstop 37 day passage from Port Antonio, Jamaica to Lunenburg, Nova Scotia, Canada. Port Antonio is located on the north shore of Jamaica. A choice of beating through the Windward Passage and then a downwind run in the Old Bahamas Channel or taking the old sailing route through the Yucatan Channel and riding the Gulf Stream is the decision to make. We chose the traditional downwind/current riding route along the south shore of Cuba and on north. Leaving on April 29, 2009 gave us a pleasant overnight passage to the first landfall off Cabo Cruz, Cuba where we not only passed by the great anchorage we had stayed at previously under the watchful eye of the light-house but were visited by a blue whale that dove under the keel at the very last moment giving us a little anxiety. Our next landfall was off Isla de Juventud, another one of our favourite places when sailing the south coast of Cuba. Our final view of Cuba was the light-house at Cabo San Antonio, the western most point of Cuba. Fishing was excellent with good catches of tuna.

Heading north east

Turning the corner inside of the major ship-ping lanes off this cape we headed north east in the general direction of the Dry Tortugas. While the current was in our favour it was very weak and we had an easterly wind during our

passage of the Florida Straits all the way from Cabo San Antonio until we were off Key Largo in the Florida Keys. While we have experienced beating to windward for short periods of time during our last two years we had not come on a time where we would be beating day and night for the better part of a week. The strength of the junk rig in beating to windward became rapidly apparent and appreciated for its steady pull and comfortable ride as we tacked across to the Dry Tortugas on a star-board tack then switched over to a port tack until we saw the lights of Havana then back to starboard tack to head us towards Miami. On this portion of the passage we picked up our first Dorado (dolphin fish) and started our time proven salting and drying. Without a motor, electricity is not possible to provide

Rig Schooner

refrigeration. We have researched and successfully utilized traditional methods of food preservation for some time and no longer desire refrigeration in any form.

Problems with sails

The tabling on our sails was not up to par and had been giving us some problems with the seams failing on the trailing edge as a result of flutter. This was part of the design when Kathy sewed the sails. We didn't know how much tabling would be required so put on the minimum amount of only about one inch. Off Key Largo we hove to for the night and in the morning put a few stitches on a couple of panels to secure the tabling and headed north with the wind on the starboard quarter. We picked up the full force of the Gulf Stream over the next few days and rolled off 170 mile days three days running and came close for a number more. Then we experienced a North Easter in the Gulf Stream! We've been in big blows before but nothing with the intensity and longevity of this one. It started with a strong line of thunder storms out of the south west that went on for about twelve hours then the wind swung quickly to the north east and increased in strength to a F7-8 and stayed there for three days. We sailed as long as we could. The seas became very high and breaking due to the wind over current affect so we hove to on a starboard tack to take us out of the Gulf Stream towards the mainland USA. The whole

affair started when we about 150 NM east of Cape Fear North Carolina and ended five days later with EASY GO off Savannah Georgia after a number of changes of tacks and damaged sails. The last two days of the blow had subsided quite a bit but it was still too rough to work on the deck to effect repairs and get under way.

Buried by breaking seas

During the storm we were buried by the breaking seas three times where the water came through the closed hatches and overwhelmed

Top left: Drying Salt Fish.

Bottom left: Head Sail With Ropes Securing Battens

Right: Blown Out Mainsail With Ropes Securing Battens

Top:
Lunenburg, Nova Scotia, Canada.

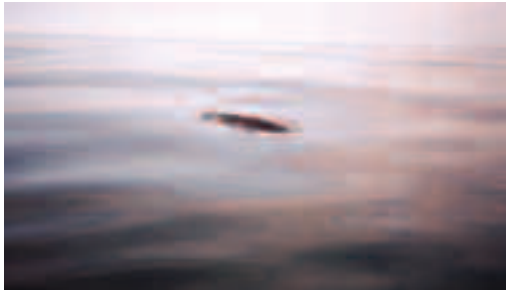
the boat. We were not knocked down but simply at the mercy of nature. The hove to main sail kept us far reaching although we did lose about 80 NM during the five days. On day two of the storm, while hove to under the two top panels of the mail sail we had a tear in the top panel that eventually shredded and took way about 30 percent of that panel. The next one down also tore but did not shred. The head sail was furled but the wind did damage the portions of the sail that were exposed to flapping in the strongest part of the storm. Long tears were evident.

When the storm ended we thought it might be prudent to go into Charleston, South Carolina and make repairs but after a long assessment we decided to jury rig the sails and head to Lunenburg, Canada where we could make the necessary repairs and possibly build a new suit of sails if required.

The strength of the junk sail

This is the time where we really appreciated the design and strength of the junk sail. Using light rope we tied the battens together in their original configuration leaving the holes and tears as they were. Cutting out any flapping fabric was about the only thing we did to the sail cloth. With the sails up and pulling we didn't really notice much difference in the boats handling or pulling ability. None the less, it is heart breaking to look up and the tattered sails but at the same time knowing that they will keep you going for the next 1000 NM or more is satisfying.

The rest of the trip was relatively uneventful. We had a few windy days, many calmer ones. More great fishing and visits from many inhabitants of the deep. Killer whales, a minke that stayed with us for three days, seals and not far out of Nova Scotia a basking shark very near as big as EASY GO decided to follow our rudder by about three feet giving us a tremendous opportunity to see this fantastic plankton eating shark up close.



Right:
Minke Whale

We arrived in Lunenburg, Nova Scotia on the rainy morning of June 6. Tired but happy that EASY GO, the junk rigged dory schooner we had built ourselves had completed the circuit of the Atlantic and brought us home safely although she was suffering a little. Three weeks later the Kathy had rebuilt the sails, strengthening the weak parts and after another month of improvements and upgrades we are ready to head out again for more sailing adventures.

After writing the above Bob was asked a number of questions about his rig and from his replies we get the following -

The rig is the standard Hasler/Mcleod rig as drawn for BADGER. The masts are aluminium flagpoles. The yards are 3 inch x 1/4 inch aluminium tubing with machined ends for securing the sail. The battens are 1 inch x1/8 inch wall aluminium tubing. The battens were fitted with end stoppers that we had a machine shop produce on a lathe. These are solid aluminium stock with a groove cut in the end and a hole drilled through the side similar to the ends of wooden battens. These ends allow for lashing the sails in the same fashion as a wooden batten.

The sails are cut flat with no camber. As the sails have aged they have bagged out a little in the middle giving a little camber. We have not felt we needed a more complicated rig for inshore or offshore sailing. I have considered the cambered panels but until I get a chance to sail someone else's will stay with what we have. We have been satisfied with the performance as the open ocean is not as demanding as inshore sailing when tacking or running down the wind. We try to live with the philosophy that 'Gentlemen Don't Sail To Windward' as much as we can.

We are able to sail almost as close to the wind as the traditional schooners in Nova Scotia and they are pretty good. I think the Badger design

with multiple masts and the sails set at different angles to the wind is the secret. We get a great deal of lift this way. The design of the keel and how it interacts with the sails is vital as well. We sail more often with reefs in than at full sail so I don't know if a different sail would help.

The sails are 5.5 oz US Polyester from a sail making loft. I took these weights as those recommended in the *Practical Junk Rig*. We started sailing this suit of sails in the spring of 2006. They are usually covered with a Sunbrella sail cover when we are in port after about two to three days. We leave them uncovered until we are sure the anchor is set and we don't have to move. They have between 20,000 and 25,000 sea miles on them

In the sail repair/rebuild Kathy replaced the original 1 inch edge binding tape with a multiple layer tabling. The way she designed this was similar to the way she built the corners. Taking a piece of sailcloth about 18 inches wide she folded it so that on one side of the sail there was eight inches and on the other ten. This allowed a step build on the tabling going from one layer to two layers to three layers virtually eliminating all flutter from the sail. The sailcloth itself had not deteriorated from sunlight at all to this point, and have many more years left in them.

We have a SailRite walking foot sail-maker's sewing machine. Our sewing machine has the large flywheel and hand crank option for use where electricity is not available or slow work is required. Kathy uses the hand crank most of the time.

All damage was from the inadequate tabling and some chafe. An important part of the rebuild was a total redesign of the lazy jacks. Now we can lower the sail bundle to the deck in any weather to effect emergency repairs and slow further damage. While Kathy sews on patches when we get to a port we find that contact cement (note 1) gives good patching at sea and they last for about six months to a year. Using 5200 (note 2) while in port gives an excellent patch but requires a long drying time so is not suitable for an at sea repair. In the future we are considering making the two top triangular panels of heavier cloth as we use these panels in heavier conditions and they wear more quickly. This has been a very interesting learning exercise and getting home with the damaged sails only confirmed that the junk rig is the best for short handed long term cruising.

Note 1. Contact cement is an adhesive frequently used for attaching plastic counter surfaces, such as Formica and Arborite to the underlay. We have purchased Contact Cement, LePage is a brand name, in Canada, Morocco and the Caribbean.

Note 2. 3M™ Marine 5200 Adhesive Sealant is a high-performance polyurethane adhesive sealant that stays flexible and waterproof, yet resists weathering and salt water. It bonds and seals woods and fibreglass of boat hulls. 3M™ Marine Fast Cure 5200 Adhesive Sealant is a faster curing version of 3M™ Marine 4200 Adhesive Sealant. The high performance polyurethane becomes tack free in one hour and fully cures in approximately 24 hours. The seal is extremely strong, retains its strength above or below the water line. Stays flexible and allows for structural movement. Has excellent resistance to weathering and salt water. It is easy to apply with manual caulking gun.

Note 3 from Slieve. In the UK I used to use 'Bostik Number 1' to repair my racing dinghy's buoyancy bags. This has been replaced with 'Bostik All Purpose, Extra Strong Clear Adhesive' (not the 'Bostik All Purpose, Solvent Free Adhesive' which seems to be a 'Health & Safety' product for kids). I have used this to stick the seam in my mast boot and seal the boot to the mast and it has been fully watertight for 4 years with no attention. I have coating 2 new pieces of polyester sail cloth and leaving to dry for 5 – 7 minutes before pressing together. 12 hours later it still seemed to be well bonded, but then I tested it to destruction by peeling if off. It took a lot of force so seems to be quite a useful repair, if the material is dry.

Straight to

by Austin Farrar

REVELATION, a windmill powered catamaran developed by Jim Wilkinson, chairman of Industrial Control Services Ltd of Maldon, Essex.

This article originally appeared in the magazine Small Craft

Top: Making way straight into the wind with fine pitch.

Below: Running before the wind with course pitch.

Many people are still convinced that it is not possible for a wind-powered vessel to go straight into the wind's eye: our remote ancestors were probably just as disbelieving when the first lateen-rigged sailors claimed to be able to go to windward at all. At least two models have proved that it can be done - one about 45 years ago - but it is only in recent years that man-carrying craft have been made to perform the feat; and there are now four in Britain, one in New Zealand, and at least one in U.S.A. All of them use a horizontal axis wind turbine - a windmill - as a prime mover (though vertical axis designs have been produced) and all of them have a vertical shaft drive geared between the rotor axis and the propeller.

Having shown that they can go straight to windward they can proceed in any other direction at will by altering course with the rudder, and turning the column which supports the windmill so that it faces the apparent wind as drawn ahead by the moving vessel.

The latest and perhaps most advanced "Windmill Boat" to appear is converted from a 26 foot Prout Sirrocco catamaran powered by a six-bladed 24 foot diameter rotor mounted on a rotatable "mast" 14 feet above the coach roof and extending in its bearings down to the centre of the bridge deck. The installation has been done by Mr Jim Wilkinson, chairman of Industrial Control Services Ltd of Maldon, Essex: partly as an exercise for his firm's products, and partly to get himself a novel form of cruising yacht which Revelation certainly is.

Rotation of the mast and pitch adjustment of the rotor blades are done by small hydraulic motors controlled by push buttons on either side of the steering console. They get their power from a hydraulic pump driven electrically from a· 12 volt car battery, which is kept charged when sailing by an alternator which is belt driven from the vertical shaft - no external power is needed.

The rotor axis is canted upwards slightly as on a conventional windmill to keep the blades clear of the mast. There are bevel gearboxes at the top and bottom of the mast with a gear ratio of I : 1.6 from the rotor to the 3 foot diameter propeller. This final propulsor is positioned at the rear of an appendage which grows down from the bridgedeck and houses the lower bevel gear box. The propeller pitch can be changed but is not adjustable while sailing. Rotor pitch needs adjustment to suit the relative wind angle and the course, and of course one has to remember that the terms "fine pitch" and "coarse pitch" normally applied to a propeller have opposite meanings when referring to a wind-driven airscrew. Thus when going to windward in a true wind of 20 knots the yacht makes 4 knots through the water so the apparent wind is 24 knots. A fine pitch is put on the airscrew which revolves at 100 rpm to turn the propeller against the drag of the hull plus their air drag of the superstructure and the resistance of the airscrew to the airstream which it is augmenting.

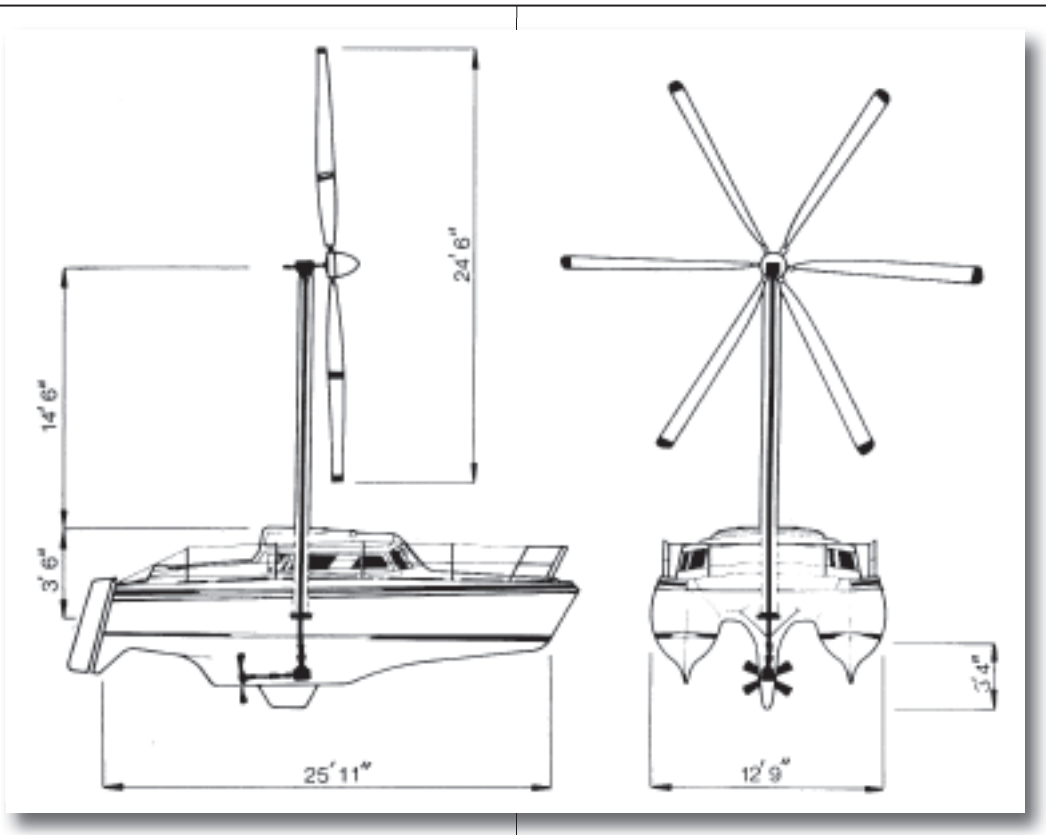
Conversely when running before the wind air drag is helping so a relatively coarse pitch is put on the airscrew. In the same 20 knot wind the yacht makes 7 knots downwind, reducing the apparent wind to 13 knots. But in 30 knots of wind she makes 9 knots: probably about the displacement limit for the hulls. When reaching the effect is somewhere between the two extremes.

In theory it is possible to run before the wind, reach, and even tack to windward with the airscrew free-turning like an Autogiro; and this was tried with some success by Lord Brabazon on a Bembridge Redwing in 1933; but although there is a clutch which will uncouple the propeller shaft from the drive, Jim Wilkinson explained that he had not yet tried the Autogiro mode as he had been mainly concerned since commissioning with getting used to the unusual craft and going out to demonstrate it.

The cockpit is quite a safe place when going to windward with the airscrew revolving forward of the mast, but it would be dangerous to try and go forward without first stopping it by feathering the pitch. However when running before the wind it is disconcerting to have the blade tips swish past a foot above one's head and getting up on the cockpit seat to have a better view is not advisable. Jim Wilkinson assures the nervous that one soon gets used to the swish of the airscrew; but he is going to fit a crescent shaped guard mounted on the mast and turning with it and extending to about the beam of the yacht.

The effective driving force of a windmill-type wind turbine is roughly equivalent to a sailor

windward



sails the same area as the airscrew's swept circle: actual blade area has little effect and some experimenters have settled for two blades only; so it is difficult to crowd on enough power to get a really sparkling performance on all points of sailing. Nevertheless Revelalion's windward performance will beat any yacht of her own size and many . larger ones tacking under normal sails.

Plans have been produced in the past for putting large wind turbines on commercial ships; but to get the equivalent driving force of the rig of a conventional square rigged merchantman would entail two airscrews each about 150 feet diameter - a daunting prospect - but still leaving the rig short of area.

However Jim Wilkinson now has a very pleasant cruising yacht requiring no winch winding or sail changing, which has been proved in North Sea conditions up to Force 7. Some modifications are in the pipeline: the mast rotation needs to be speeded up as at present the yacht can alter course quicker than the rig can be adjusted.

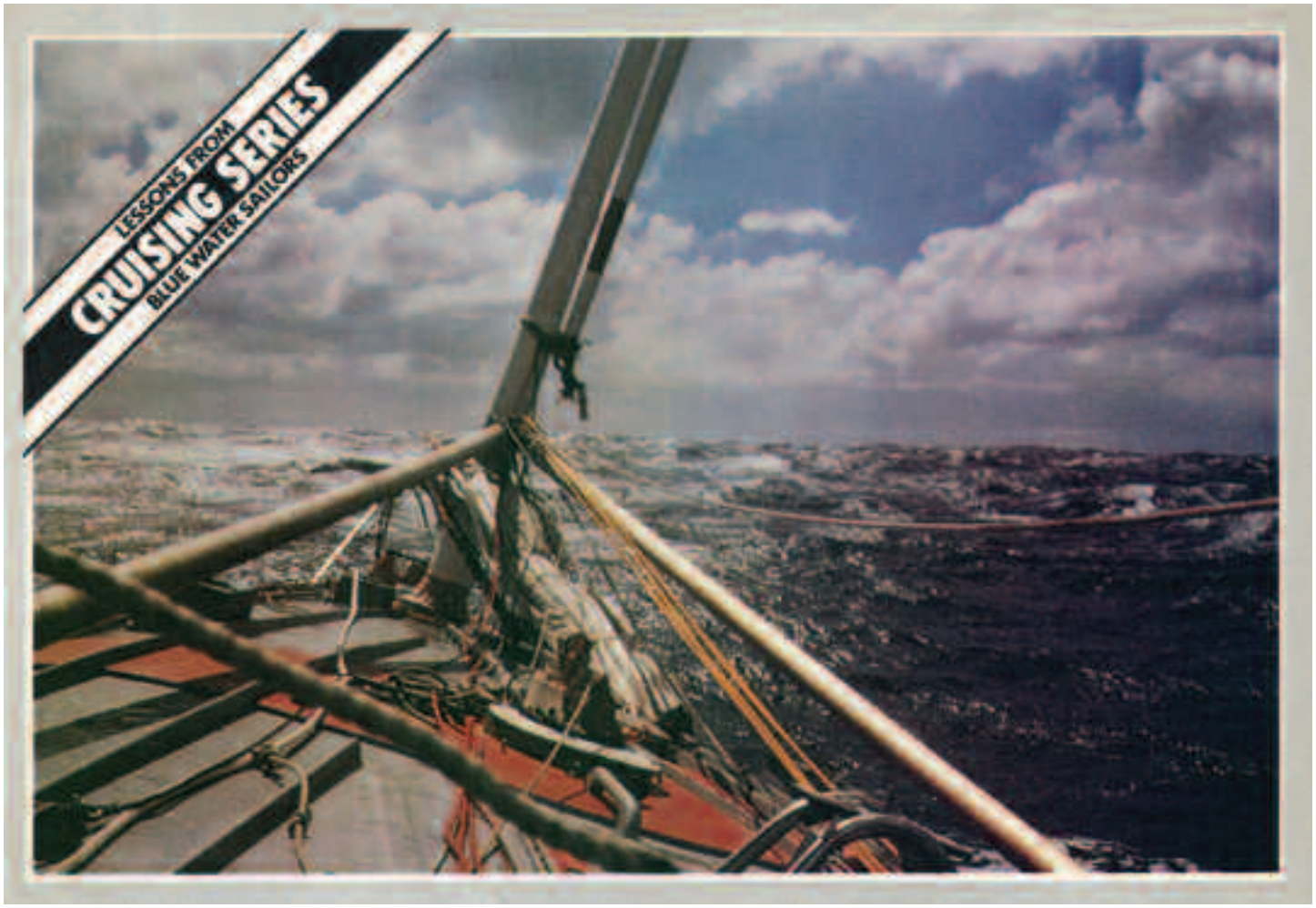
At present the hydraulic controls are operated manually; but an exciting possibility well within the capability oflndustrial Control Services Ltd would be to feed the output from a wind speed and direction instrument to a microcomputer which would compare the apparent wind angle to the yacht's course, turn the mast so that the airscrew faces the apparent wind and adjust the pitch for optimum performance. With the addition of an autopilot there will be little left for the crew to do apart from keeping a good lookout for other yachtsmen who cannot believe their eyes.

Top:
Rotation of the mast is by hydraulic motor.

Centre:
An alternator is constantly driven to ensure control power from a 12V battery.

Bottom:
Not the most efficient looking water screw.

Dismasted –



Peter Crowther describes his jury-rig for a junk

Practical Boat Owner magazine are planning a feature on the Junk Rig by David Harding (see box on page 33).

In order to remind members of PBO's support for the Junk Rig. We are reproducing some examples. This article was originally published in PBO, April 1980.

After her third roll-over in less than twenty-four hours GALWAY BLAZER OF DART lost both her masts. We were in the Roaring Forties in the Southern Ocean, and over 800 miles from the nearest land. But even in this dour predicament we were luckier than many other boats for Galway is probably unique in that she carries jury rig. The rig consists of two eighteen foot aluminium poles bolted together at their head and running on two tracks down each side of the boat. The following photographs show how we managed ...

Shortly after the dismasting and waiting for the wind and sea to subside. The poles can be seen still in their stowed position at the top of the track. To get them in position I had to undo them and slide each pole back down the track until they were behind the foremast.

but prepared

The poles in their upright position. This is done after the halyards and stays have been fixed. There are four stays each with a handy-billy for setting up. The siting of the bi-pod jury-mast is about 12 inches in front of the mast stump, thus making it possible to use the deck-fittings around the main-mast. To raise the jury mast I attached a triple-purchase tackle running from the transom of the boat to the top of the frame and found that it came up very easily. Once it was up it was then comparatively simple to manoeuvre the frame to the required position - though I found a tap with a six-pound hammer helped ...

Looking forward with a reefed foresail set in the 'A-frame' jury mast (below). This gave me a sail area of 150 square feet, and I also set a small staysail of some 80 square feet.

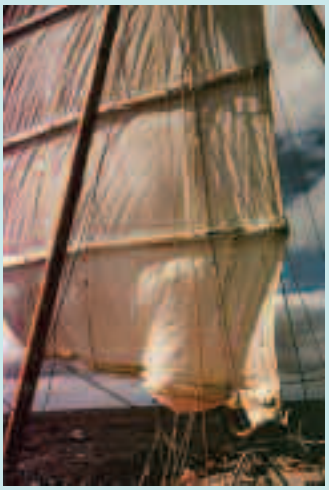
Looking aft; (above) the sail pivotted on a fixed wire coming down the centre of the frame.

This shows the yard and top-battens coming through the A-frame. When running before the wind I found it better to put the yard and battens outside the frame. In fact the yard was often hard against the poles.

Using this jury rig the only faults I encountered was that it was virtually iIhpossible to tack and I had to gybe. There was also a lot of chafe from the leeward backstay flapping against the sail. In future I will put baggy-wrinkle on both stays. Otherwise the rig worked very well. My best day's run was nearly 80 miles, though it was impossible to beat - especially in the seas off Cape Agulhas.

Originally known as Galway Blazer II

The author's junk-rigged schooner is seen just after her launch. Sailed by Cmdr. Bill King she was designed by Angus Primrose as a 'Cape Horner' and after more than his share of set-backs Bill King was the first single-hander to circumnavigate the globe via the five southernmost capes and return home again to his port of departure. Cold moulded, she is 42 feet LOA, 10.5 feet on the beam with a draft of 6 feet. Displacement is only 4.5 tons. (Photo: Beken, Cowes).



Pleasant sailing even under jury rig. I found that I could leave the foresail up in almost all conditions.

Galway Blazer II.

Fresh from

by Richard Peel

This article was originally published in PBO, April 1982.

It all started when I first met Miss Piggy. She was lying on her back, partly covered with dead leaves, and a large hole in her side showed where a tractor had backed into her. The owners wanted to convert her into a henhouse, and the chickens could have entered three abreast through that hole.

Otherwise she was quite sound

It wasn't love at first sight, for her generous 5-foot beam made her look more like a pregnant porpoise than a 12foot sailing dinghy. I tried to turn her over and the rubbing strip, more pulp than wood, came a way in my hands. When I finally managed to lift her, a thwart fell out, enlarging the already generous hole in her side. The daggerboard case was beyond repair, and what was left of the paint was already peeling off. "Otherwise she's Quite sound."

After some haggling with the owners, they generously donated her in exchange for some work on one of their other boats. Her rig comprised a short aluminium pole, some overgrown broomsticks and a pink mildewed bedsheet, which had been re-paired with large patches of tan canvas, stuck on with liberal applications of contact glue. The rig explained her name because, as the owners bluntly put it: "She sails like a pig".

The list of things to be done was long enough: side and aft decks to stiffen the hull, as she liked to adapt herself to the shape of the waves instead of the other way round, new daggerboard and case, drop rudder, side thwarts, mast thwart, floorboards and a thousand other details. As I was suffering from an overdose of enthusiasm, I grossly underestimated the amount. But I only realised by how much later, when the boat was half completed and it was too late to turn back.

Helped along by the sceptical remarks of friends and neighbours, I started to rebuild Miss Piggy in a corner of our island boatyard, Osea Island Boats. Her maiden name had been Sweedlepipe, as I discovered after unpeeling the rest ofthe paint, but I saw no harm in re-naming her Jetsam.

None of this kiln-dried trash for Jetsam ...

Especially as, apart from the resorcinol glue, the barbed ring nails ('grip fasteners') and some paint, all materials were supplied free of charge by the shores of the Blackwater: waste and offcuts from the local boatyards, pieces of old wrecks, complete with bronze screws and assorted fittings and fastenings, all types of wood from yellow deal to teak and mahogany - in short, driftwood. As one passerby remarked: "At least y'know the wood is well seasoned!" None of this kiln-dried trash for Jetsam ...

When it seemed that the hull would be finished in the near future, I started to think about a rig. A friend mentioned junk rigs: no stays, no jib and windward ability. Some time later, I saw a photograph of a junkrigged dinghy on a PBO letters page (March 1981) and wrote to the owner of the boat, Colonel Bob Tracey, who kindly sent me full details of the sail. Another friend sold me 16 metres of brand new Terylene sailcloth for a bargain price.

A mast is found

Cycling past a boatyard in Maldon I saw an old mast lying in the grass; no varnish, some cracks and a bit of rot at one end, but otherwise sound. I tracked the owners down, who lived on a boat in the yard and they gave it away, happy in the knowledge that it was gong to a good home. I tied all 17lf2 feet of it on my bicycle, attached plastic shopping bags fore and aft to warn the other traffic and pedalled back to the island, feeling more like Sir Lancelot at a mediaeval joust than a 20th century bicyclist. I cut the mast down to size and 'hey presto' it fitted exactly into the hole of the mast thwart, which I had made weeks beforehand.

A sail is sewn

I sewed the sail on two hot summer afternoons, zigzagging my way through acres of stiff crackling sailcloth in a stuffy sitting room. Oars were made with a drawknife from glued planks, and two rusty old ploughshares were attached to each other with an iron bar, to make a plough anchor in the most literal sense of the word. The dagger board was provided with notches and a catch, to adjust the draft in the shallow waters of the estuary. Boards were made to fit between the thwarts and on the daggerboard case, and this flat platform, well above the bilges, provides sleeping space for two when a cover is stretched over the boom.

Jetsam sailed (and still sails) like a dream. She goes to windward, beating up the tides of the Blackwater. She is fastest when reaching or running; then the Chinese lugsail acts like a squares ail, pushing the boat along like a spinnaker - a thing I don't have and don't need. Neither do I miss the joys of clutching jib and main sheet in one hand in a stiff breeze, and the resulting cramp. I find it a simple and versatile rig, especially for single-handed sailing.

When you live on a tidal island, a boat is a necessity, not a luxury. For when the tide is in and the causeway is covered under 18 feet of water,

the Farm

Jetsam is used for shopping, Ferrying people to and from the mainland, or sailing over to the pub for a quick drink. It is a three minute walk from our house to the creek where she is moored, another five minutes for getting the boat ready and you're offl

A boat for £50.

Was it worth it? Well, for a total cash outlay of around £50 and innumerable hours of work, I got a very good boat, which with normal care should last for years. And I learnt more about boats and sailing than I would have done if! had bought a readymade standard type of boat.

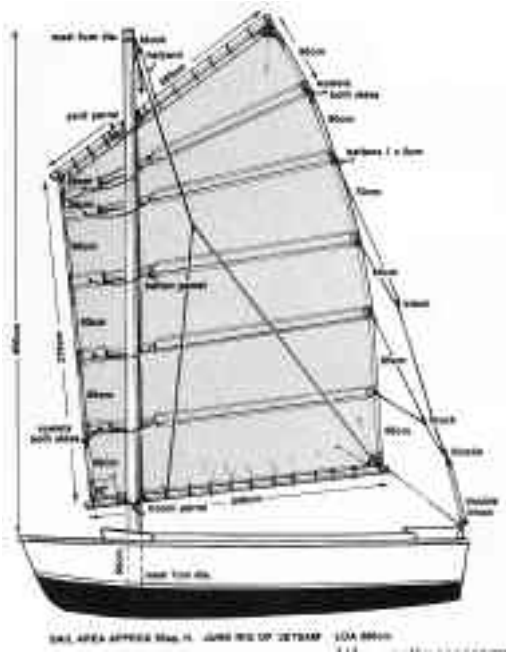
What shall I do next? Maybe some day I'll collect an enormous pile of driftwood, buy a large bag of galvanized iron nails, and build a 16-foot scow with leeboards, splash a few gallons of creosote on her, sew up a patchwork junk sail (using odd bits of tarpaulin) and sail the seven seas ...

Making the sail

First I made a 1:10 drawing of the sail. By comparing boats of similar size I calculated the sail area. Don't worry about putting on too much sail, you can always reef.

As a Chinese lugsail has no 'belly' like a western sail, I laid the sailcloth flat on the floor for cutting. Leaving 5cm extra at the edges for a double hem. I glued and taped the pieces of cloth together beforehand, to prevent everything sliding about when sewing, especially the batten pockets. The corners ofthe sail werestrengthened with gussets. I bought the brass eyelets in packs complete with punch from my local hardware store. Smaller eyelets were used along yard and boom (14 inch), larger ones (SAl inch) for batten pockets and sail corners. Don't forget to fit the eyelets of the batten pockets before sewing.

As I didn't have a large table, I put the sewing machine (normal household variety) on the floor. Use zigzag stitching if possible, but straight stitching will do.



Rigging the boat

The sail is lashed to the yard and boom through the smaller eyelets. The batten parrels pass through both eyelets on the fore batten pocket and the batten itself; aft they only pass through the batten. They are fixed at both ends by a simple knot. The sheets pass through the two eyelets on the leech of the sail and are tied with a knot; they also hold the battens in place and stretch the sail along the battens. The boom parrel is attached to the boom, wraps once round the mast and then down to a small cleat on the mast. I didn't find the running parrels (the ones that zigzag down and around the mast) necessary, as the yard and boom parrels hold the sail in place. The topping lift contains the sail when reefed, but i with a light sail like this it is . necessary to tie the sail to the boom as well, to prevent everything from flapping about.By moving the yard and boom parrels and the halyard attachment on the yard fore and aft I adjusted the balance of the boat by trial and error until it felt right. The mast is held in the mast thwart by gravity and two wedges and can be lifted out in seconds (with the sail still attached) by one person.

Sailing the

by Ralph Hill

This article was originally published in PBO, June 1998.

I Otherwise perhaps better described as a junk-rigged gaff. I am a cruising yachtsman, I like my sailingto be interesting, reasonably energetic, occasionally exciting but not frightening. I am not so masochistic as to enjoy a long flog to windward, but if that is the cost of reaching the warm sands of Araby (or whatever your own personal Utopia may happen to be) then so be it: but safely please! Foredeck work in a half gale is not sensible. R. M. Tetley summed it up in an excellent article in PBO 238 where he suggested these essentials for a cruising yachtsman: light helm, easy reefing and a controllable sail plan together with fast windward ability.

I am now a devotee of the junk

I have personally owned Bermudan, gaff and Chinese junk rigs (all sloops) and am now a devotee of the junk. But despite claims to the contrary it's far from perfect.

The advantages are: easy reefing; fast downwind and reaching; fast upwind in good breezes (F5 upwards); easy tacking; upright stance (little heeling) and a safe unstayed mast. The disadvantages are: very poor upwind performance in light airs; a not very impressive pointing ability and excess weather helm when reaching or running.

The disadvantages stem from; poor aerodynamic sail shape in light airs; no slot effect (see Jeremy Howard Williams's admirable book *'Sails'*); weather helm because of a generally large area of sail outside of the hull on a reach or run (C of E way outside ofCLR).

In considering ways round these disadvantages I considered what had been achieved in the past. The 'Wishbone Rig' had been one attempt to improve aerodynamic shape. This seemed beyond my capabilities, but by tapering the battens I was able to induce a better shape at lower wind speeds i.e. F4. My original battens had been stepped down in thickness about 3ft abaft the mast, but an engineer could tiemonstrate that a sudden change in tliickness leads to a catastrophic change in lateral strength. Two broken battens proved the point!

A gradually tapered batten overcomes this fault yet, since the bending strength varies inversely with the square of the thickness, a linear taper will induce the correct parabolic shape. I've done. it and had no failures in two years of use, often in extreme conditions, but have gained a considerable increase in speed on the wind.

The lack of a slot effect

The lack of slot effect was difficult to overcome because any attempt to add a foresail to a junk ends with snarl-ups at every tack since the batten ends in front of the mast foul the leech of a jib. Blondie Hasler tried to overcome the problem with a fore lug-sail which he called a 'Pilmer' after his boat. It worked and allowed him to win races but in my opinion was neither elegant or ergonomically sensible since foredeck work was needed both to rig and tack it. I believe that beauty and efficiency go together: did not Keats say that *'Beauty is Truth'?*

Gary Hoyt produced the 'Gun Spinnaker' and David Tyler the nylon foresail for the junk rigged Hunter Horizon, but both were specifically for light airs 'off the wind' working. Nylon would stretch too much for anything but full bellied sails but Tyler had given me the idea of how to modify the junk to add a conventional foresail ... to end the luff of the main at the mast. His design had the luff run in a track, but I liked the freedom of the junk to reef quickly and thought that a track might jam: certainly the forces at right angles to the axis of the mast would be very large indeed on a run, and sufficient, to distort most tracks.

The *'Weather helm'*, which I believe the Chinese tried to overcome by cutting diamond shaped holes in their rudders to reduce the tangential force on the water, *(they could not have known of the chance Venturi effect, could they?)* could be reduced by bringing some sail inboard i.e., by reducing the length of boom and battens. The resultant smaller sail area

junkette

would be made good again by the additional sail area given to the genoa or foresail. This genoa, in turn, would add some negative Ardency, thereby further reducing weather helm.

Some weather helm is built in to a design of yacht to ensure that the head will always come up to wind when the helm is freed, and this is obtained by keeping the pivot point of the boat (the CLR or centre of lateral resistance) in advance of the centre of effort of the sails, (the C of E). On ajunk having no foresail, the mast is mounted well forward to avoid the C of E being too far behind the CLR and promoting excess weather helm. However, although the balance may be right when close hauled, the great mass of sail outside the hull on a reach or run results in the C ofE moving outside of the CLR and again introducing weather helm in the same way it's introduced in other rigs when heeling excessively. The diagrams show (in exaggerated fashion) how the junkette rig attempts to overcome this much discussed problem.

Another alternative

The result of these considerations has been the 'junkette' rig, either ajunk rigged gaff or gaff rigged junk! It comprises; a fully battened Chinese-shaped, gaff-headed mainsail with roller reefing genoa. The original junk sail was of 364 sq ft. The new main is approximately 300 sq ft. (ex-Venturer sail with additional bottom panel) with a 150 sq ft genoa - which adds up to a total sail area of 450 sq ft.

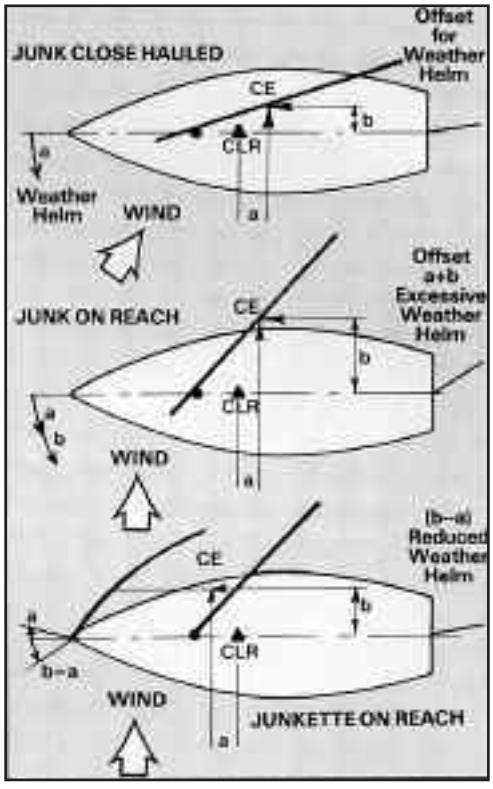
The original Junk had a free-standing, keel-stepped mast: now a pair of shrouds have been fitted to balance the forward bending moment of the forestay, but they are not under compression, being tightenedjust sufficiently to prevent bending of the top of the mast under load.

The top yard of the main has been fitted with gaff jaws and the sail laced conventionally down the mast. Mast hoops were considered and might still be employed, but cost and the chance of jamming under load while raising sail have, for the moment, led me to discount them.

A Rotostay with 150 sq ft genoa has been fitted to the masthead and the foresail now allows much closer working on the wind, and adds at least a knot of boat speed, while a bearing-out spar allows goose-winging when running in F3 or less. An additional halyard has been added to allow the occasional use of a cruising chute when running or broad-reaching in very light airs, but is only used for very occasional races.

The mainsail still operates with all the advantages of the junk and will drive the boat on its own but with reduced pointing ability, thus maintaining one of the great advantages of the junk: easy tacking in narrow channels.
The additions, then, to turn a lazy junk sloop into a fast cruiser are: smaller mainsail; set of tapered spars; genoa and roller reefing; pair of shrouds; pair of genoa winches - plus an optional cruising chute for racing types.

The cost of my conversion, based on available discounted sails, has been in the region of £1,200, but this could have been considerably reduced by modifying the existing mainsail, making my own battens from ash, spruce or pine and making up my own shrouds. However, until I was sure the idea worked I couldn't risk destroying any of my existing rig. Finally, I would prefer a greater distance between mast and forestay (currently 6ft) to avoid back-winding of the main by the full genoa, and am now considering fitting a bowsprit for next season. •



The Centre of Effort has moved forward in advance of the pivot point introducing negative ardency (a) which counteracts the offset C of E. At higher wind speeds. the foresail is rolled in and the mainsail then reefed to the top panels so the C of E moves both inboard and aft, thus ensuring safety and stability.

A better kind

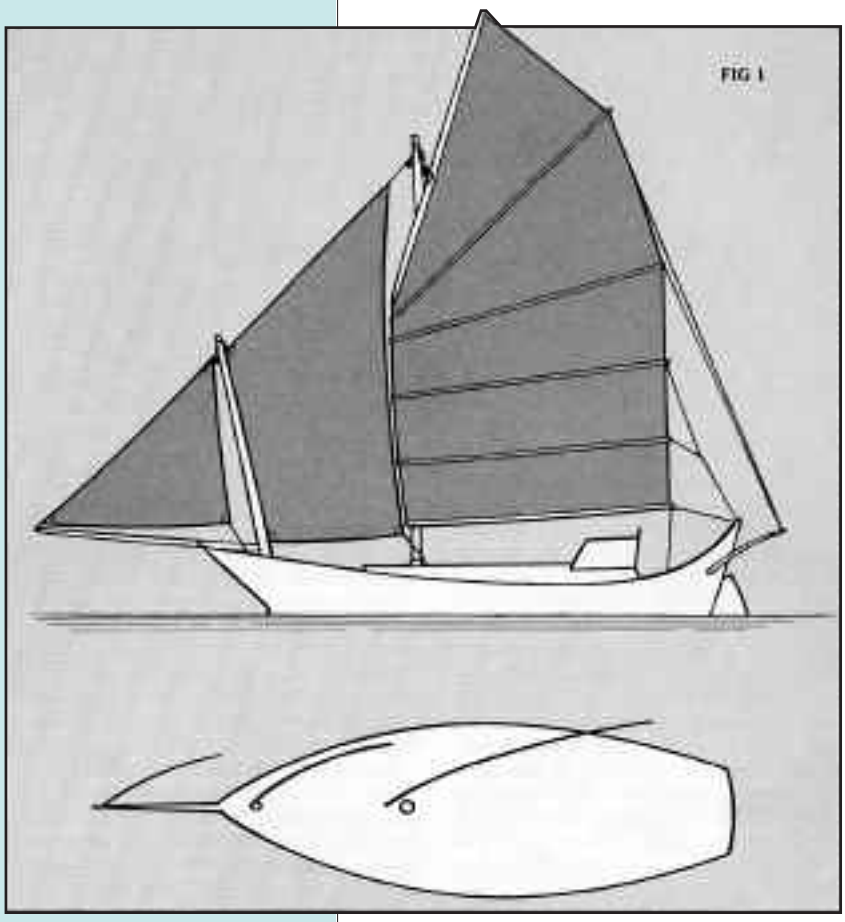
by J Walker & M Kinloch

This article was originally published in PBO, February 1989

We call it a Jung. Is it not remarkable that in this age of science and space technology. that sailing boats are still driven by rigs that were in existence during Roman times - and that experimentation and development has resulted in the widespread use of the simplest type of all, the three-cornered, or Bermudian configuration?

Nevertheless, the most ancient of all types, the battened lug, is still being used and experimented with.

Having heard a lot about junk(s), I began to study and experiment with sail types and developed a rig of untried configuration which I call the Jungrig (Fig 1). It may look like what some people call a "junk" rig, but what is a "junk rig" anyway? A bit of study on the subject of far eastern sailboats and ships will show that "junk" is an English invention. The bamboo battened sail was in existence before the English language and there were multimasted ships with these sails as well as smaller fishing boats with spritsails. There were also single-masted riverine craft - with flat bottoms, leeboards and rudders, and carrying a battened sail- called sampans. To call them all "junks" is rather vague even if "junk" does sound similar to the Chinese word "chaun" for a vessel or the Javanese "djong" for a Chinese sailing boat.



More recently, the battened lugsail has been used in English waters by Colonel Blondie Hasler and Jock McLeod on various keelboats, some rigged sampan style and others as schooners. It was they who promoted the now much vaunted point of safe and easy handling of sails through the elimination of deck work. However, later experimentation led to the development of the Pilmer, which counteracted this concept. In an attempt to retain the desirable characteristics but at the same time improve performance, we see, most recently, the development of the Junkette. In short, it seems well past time we cleared up some of the snowballing confusion about junks.

The junkette is a total departure from the fundamental principles of the fully-battened lug rig and is more a return to gaff rig than a development of the Chinese lug (Fig2(A». The configuration is clearly a fully-battened gaff-sail with jib, without the stressreducing function of Chinese-type battens.

Now, all boats are a compromise, none being ideal for all conditions. So surely, when choosing, designing or developing a rig, the purpose to which it will be put should be of prime consideration. Before yachting and the fashions that go with it, sails were used for a particular purpose to which they were designed or suited. The Vikings would use the square sail to augment oared propulsion on their boats designed essentially for easy rowing. Arab dhows travelled with the fair monsoons and spritsail barges worked convenient routes. Before any of these types, the "junks" of China evolved for the purpose of sailing on all points of sail. They had balllDced sail plans and could stand up to rough conditions. The junkette (like the gaff) seems, in contrast, designed to perform in light weather.

For heavy weather, where the safety factor is more crucial, the battened lug is easily reefed because the luff~ hauling parrel slackens when you release the halyard. Since the lug is balanced, it has no tendency to jam as it coines down (Fig. 2B). However, the battened lug has always been known for its poor performance - in light winds and this is its main disadvantage. So far, those who want light wind performance, go for a Bermudian rig or fit a motor. Likewise, those who prefer to have all the work done from the cockpit can fit roller reefing and roller furling mechanisms, plus remote-controlled electric anchor winches on the foredeck. Indeed, it has been well nigh proved that a Bermudian sloop or cutter fitted

# of Junk?

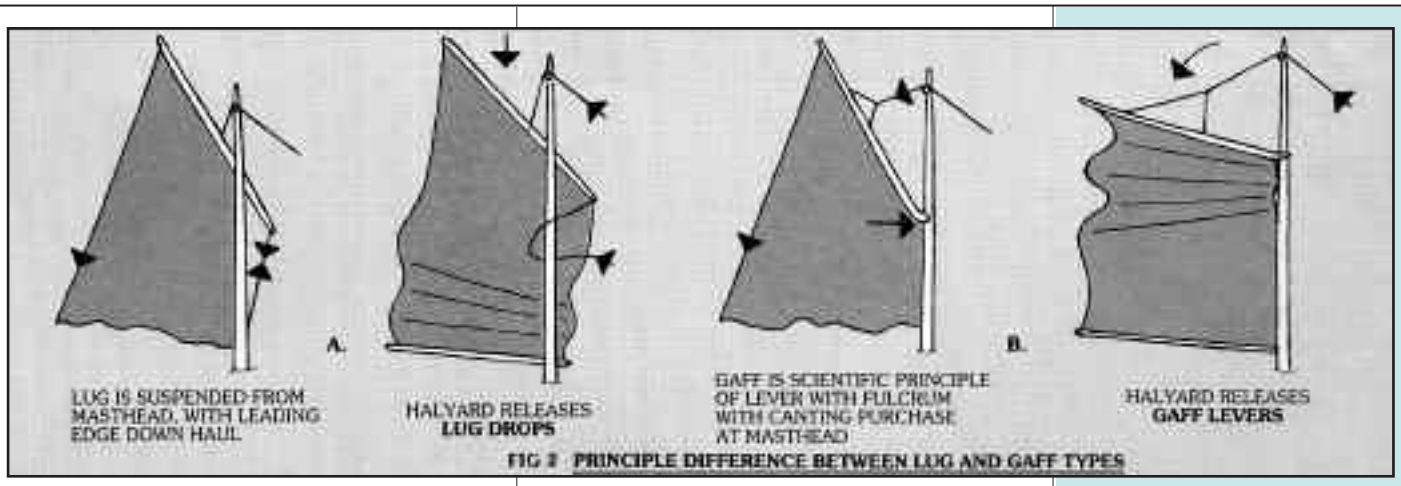


FIG 2 PRINCIPLE DIFFERENCE BETWEEN LUG AND GAFF TYPES

with modern gadgets is both convenient and reasonably efficient, so why bother with anything else?

If like myself however , you prefer a return to the essence of sailing - the satisfaction of hoisting, setting and reefing sails, exposure to sun, sea and wind, the handlingoflengths of linewith a rig that requires as few mechanical components as possible, the Jungrig should have great appeal. A rugged, handy, practical rig, it'scapable of sailing on all points of sail using essentially only sails, lines and spars, from the roughest of conditions to all but the lightest of airs. Moreover, it has the advantages of low tension, short spars, reduced cost, a large sail area for given mast height, flatness of sail, effortless sail control- and produces less heeling effort compared Fig 3 shows the Eastern practice of using a battenless s.ail on the foremast; an idea adopted for the jung. A foremast is the vertical spar that spreads. the sail and divides up the canvas in the same way that the battens support the main (Fig 4) which can be hauled well aft to prevent sagging the leech of the foresail (Fig 5). In practice, more than twelve combinations are possible with four working sails (Fig 6).
with unbattened sails ..

However, the original sea-going ships of the East were large craft with five, seven or more masts and are not practical models for scaling down to small-boat dimensions. So after some experimentation and much consideration I arrived at the modified Jung configuration which nevertheless adheres to essential eastern principles, in particular the fundamental concept of a low tension rig, which is what a fully-battened rig is all about. The spars and battens are used to create the shape in the sails instead of tension in the stays and at the various corners (tack, clew, peak and throat) of sails. Also, just as the Pilmer was the eventual development stage of Hasler's configurations, the presence of a foremast is the vital factor for arig based on this kind of ancient practice. A single fully-battened lug is good for protected waters as has always been the case in the East, just as the cat rig has been the equivalent case in the West. But for sea-going purposes a second mast stepped in the eyes of the boat, has always been desirable for sail balance. The problem is that a decrease in the proportions of a battened lug brings a resultant decrease in efficiency - which may be the reason for the Pilmer's battenless lug rigged foresail. In this respeCt the Jung rig attains an improvement

Fig 3 shows the Eastern practice of using a battenless s.ail on the foremast; an idea adopted for the jung. A foremast is the vertical spar that spreads. the sail and divides up the canvas in the same way that the battens support the main (Fig 4) which can be hauled well aft to prevent sagging the leech of the foresail (Fig 5). In practice, more than twelve combinations are possible with four working sails (Fig 6) overleaf.

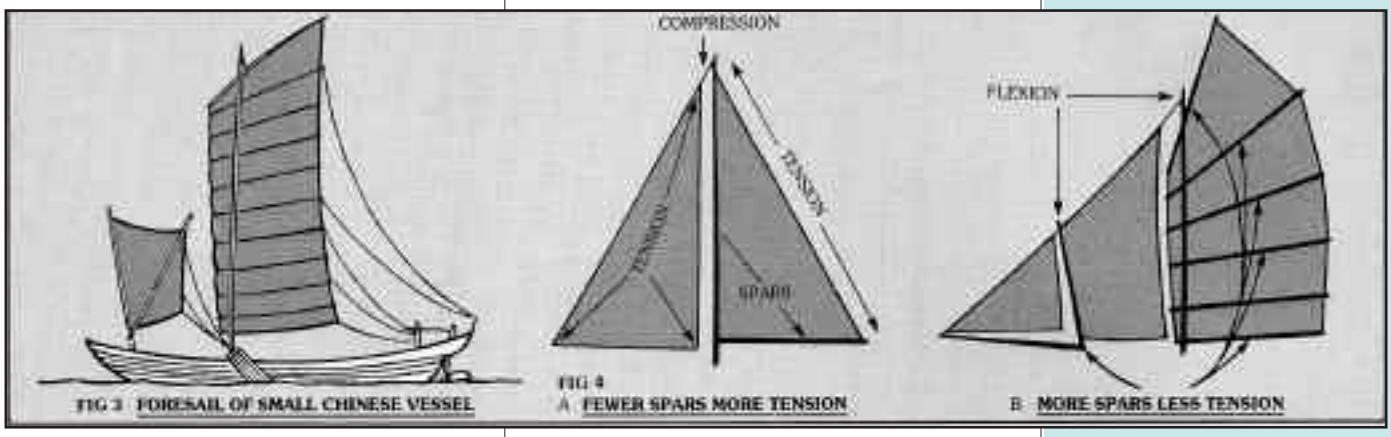
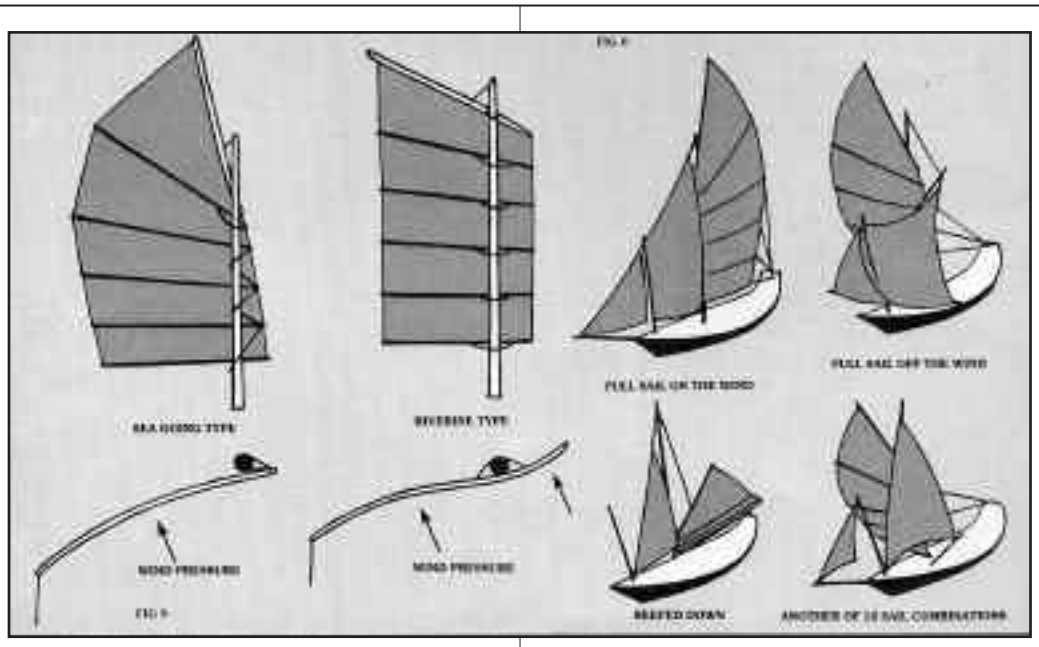


FIG 3 FORESAIL OF SMALL CHINESE VESSEL

FIG 4
A FEWER SPARS MORE TENSION

B MORE SPARS LESS TENSION



on previous "junk" type configurations by following eastern practice. for small craft of using a battenless sail on the .foremast (Fig 3) but with more modern dimensions and also using a baby jig set on a bowsprit. This not only creates a double slot, but also reduceS tension in this area by the original method of using a spar. The foremast is the vertical spar that spreads the sail and divides the sail area in much the same way that the battens supportt the mainsail area (Fig4).

The Jungforesail is dual purpose in that you set it like a fisherman sail when On the wind and a spritsail off the wind. This is possible because of the relative positions of the mast~ The main mast creates a point for the peak halyard or sprit vang as the case may be. The foresail provides the perfect solution to slot with the main and maximises sail area, while the problem of reefing a sprit or fisherman sail is eliminated by dousing this sail and substituting a main staysail or, in extreme winds, a storm jib.

Interference with the luff of the main need not be a problem because there's no reason why the main should not be hauled well aft to prevent it snagging the leech of the foresail or staysail (Fig 5). In fact, this bowsing down and aft at the leading edge of the main prevents the breakage of battens through their tendency to bend to an S-shape against the mast. Otherwise, the main is no different from the original fully-battened lug of the East and retains all of its advantages such as ease of reefing, maximum sail area for given mast height and twist control.

Because the main constitutes the greater part of the total sail area, the Jung configuration has proportions more akin to a cutter than a schoorier with the easier handling of a split rig and improved windward efficiency through a long leading edge from the peak of the foresail to the tack of the baby jib. More than twelve combinations of sail area are possible with the four working sails so that balance of sail is always good. (Fig 6).

The Jung rig, then, incorpOrates the essential, fundamental "junk" characteristics of low tension, short spars, battens, a foremast and divided sail area. It should appeal to those seeking the simplicity of sailing because it has the means to set a large area and variety of sail without excessive effort or cost. •

We are sorry to have to tell you that Jung Jung sank as she was leaving the Portuguese port of Lagos; local fishermen rescued her crew of four.

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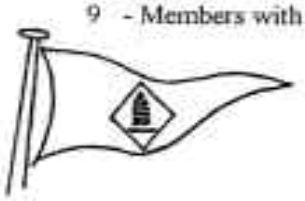

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Sailing without

by David Hockley

This article was originally published in PBO, March 1995

Evolution in animals, plants and rigs for sailing boats can be represented as a tree which emerges from the ground as a single trunk and spreads out with many branches. The rig tree first appeared above the ground when a member of one of our oldest sailing clubs tied a goat skin or whatever to some sort of spar and came home first in all the Sunday afternoon dugout races.

The many variations on this idea of sail and mast that have appeared over the centuries and round the world are represented by the branches of the tree. Some of the branches have died and fallen off and we no longer have any real idea what these extinct rigs were like.

There are also branches that are no longer growing and they are rigs that are now hardly in use, such as the square rig. One of the largest branches at present is labelled "Bermudan rig'. So many boats now have this rig that this branch has become one of the main growing stems if not the trunk. Small branches, however, keep appearing from the main stems and one ofthe most recently formed offshoots is called the Aerorig.

Exactly as in a real tree, it is difficult to know with the rig tree which of the small twigs will grow into big branches and possibly displace the Bermudan tree trunk and which will end up on the floor or in a bird's nest. In an attempt to see into the future we can take the tree analogy one step further (and then abandon it), we can look at the leaves. Nice big green healthy leaves and we know that the twig has a chance. Each leaf represents a boat and there are thousands of leaves on the Bermudan rig branch and a dozen or so on the Aerorig twig. If we look at one of these Aerorig leaves (= boats) in detail we might get some idea of the health and success of the branch and thus some idea of the potential and prospects of the Aerorig.

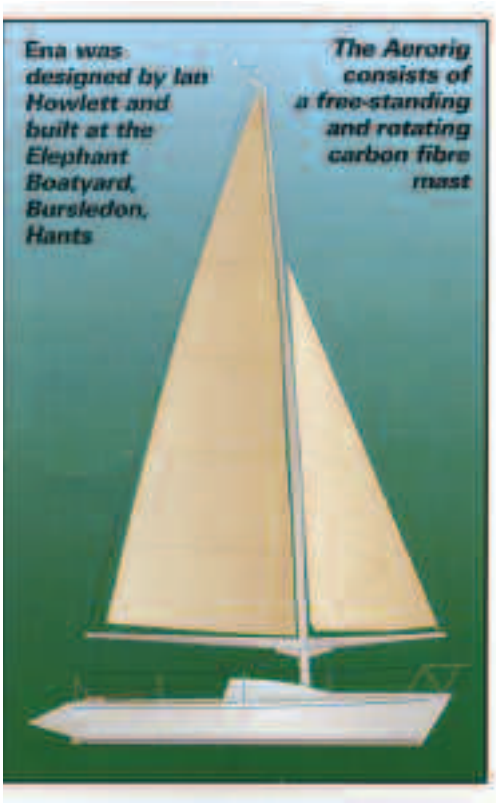
ENA is a dayboat and day sailing means simple sailing. Cruising is fun, especially in retrospect, but it takes time and planning and many cruisers often do little more than day sailing even though they are equipped with every known electric aid of navigation and all the comforts of home. So it seemed like a good idea to try and rethink the whole business and to get back to basics. The idea was to delete all the expensive gadgets and forego the home comforts or at least try to return to something like camping under canvas rather than towing a caravan. Needless to say a simple rig was also an essential part ofthis simple boat.

Making decisions...

In order to crystallize vague ideas like these into a real boat you need to find a boatbuilder. You might think you would need a designer first but this would be a big mistake. The builder will help to make your ideas realistic by helping you make decisions and ensuring that these decisions correspond to a boat he can build. He will also know an appropriate designer for the type of boat and he will know many other things as well. For instance,
in this case he knew about the development of the Aerorig and suggested that it would be ideal for a fast but simple boat.

There was no hesitation in accepting this idea; having sailed for some years and with much pleasure with the Freedom rig the idea of an unstayed mast and simple sail handling was immediately appealing. Indeed we had been without a boat for a few years because after the Freedom we didn't want to go back to all the bother of the Bermudan rig. Details of the construction of Ena are not important here but before we look at the finished product I would just re-emphasize that if you are going to build a boat you need to find a builder before you need a designer. Please try to

Shrouds



remember this when you start to convert your dream boat into reality.

The dream boat called ENA is about 29ft in length or 23ft on the waterline and 8ft in the beam; she has a big deep keel with wings on it and a sail area of248 sq ft in the main and 115 sq ft in the jib. There is a large cockpit and a tiny cabin with two berths (and possibly room for two more); a small galley with a sink and a single burner stove, a very small 100 compartment and a diesel engine. Not so much a day-boat, more a scaled down cruising yacht you might say.

To which I would reply that if you go sailing for a whole day you might want to have a lie down out ofthe sun/wind/rain, you will probably want to make a cup of tea and, if you will forgive me for mentioning it, you may even need to go to the 100. Anyway, as a friend once said, you can easily tell that Ena is a day-boat because there are no windows in the cabin.

On deck, however, we have achieved real simplicity thanks to the Aerorig. There are no ropes and no winches cluttering the decks; there is only the mast and the mainsheet and tiller for the helmsman. More accurately, the mainsheet is a two part purchase with a clam cleat and it controls the whole rig. All halyards and outhauls remain at the mast and use a single winch with stoppers. There is a second winch which is simply used for sheeting the jib after hoisting or furling; the jib sheet is never adjusted further while sailing. The jib furling (not reefing) gear, which is hidden in the boom, is operated by a continuous line which also emerges at the mast.

Thus the Aerorig does not go along with the idea of bringing all the ropes back to the cockpit where it is difficult to stand and get a good pull even when another crew member isn't in the way. Our day-sailer is meant to have a cockpit full of visitors, not ropes, and still less a mixture of the two; this is achieved perfectly with the Aerorig.

ENA was launched into the Hamble River on the 30th July 1992 with Aerorig and sails all in place. It was the hottest day of the year with no wind. Fortunately acceptance trials were arranged for the following day because we were all too tired and emotional to go sailing. Similar weather the next day meant that our first sail was little more than a test of the engine. The start of Cowes week, however, produced a bit more wind and our first real sail was on Sunday 2nd August. Most of the other boats going out that afternoon had put in a reef but we decided that we couldn't be reefed for our first real sail. I had kept a diary during construction of Ena and managed to continue for a few weeks after launching.

The entry for 2nd August says "a few tacks to Cowes, 6 knots, 10 W ferry wash over the bow and down mast, freed off and rounded


Ena in the workshop

Britannia, 7.9 knots".

Was I disappointed at the water down the mast and by not achieving 8 knots? I don't think so because the diary records that we fitted a simple plastic beading under the mast collar which was enough to stop the flow of water up under the collar. There is no further mention of water down the mast even when 8.4 knots is recorded in the diary and anyway seawater cannot harm the mast bearing which is constructed entirely from plastics.

On the 4th of August there was even more wind than on the 2nd and we practised reefing. Because the two sails are always working together and are controlled by a single line and because they are balanced against each other to some extent it is not possible to free off on only one sail whilst retaining control of the other. Thus in order to reef the main safely and retain control it is necessary to furl the jib before easing off on the main sheet and lowering the mainsail as required.

Once this fact is appreciated, reefing is no more difficult than on any other boat. The jib is small enough to be furled quick1y with the continuous line system and all ropes and controls for both jib and main are located at the mast.

During August '92 the diary records a variety of outings with friends and relatives on hot and sunny or mostly wet and windy days and on every occasion everyone seems to have been more than impressed. Most of all our visitors seemed to enjoy being in total control, even the most inexperienced sailors could take the helm and mainsheet and watch the speedo rise and fall as they taught themselves to sail. The balance in the rig means that there is very little load on the mainsheet so that even children can haul in or free off by hand.

Tacking made simple...

Experienced sailors realTy enjoyed showing off by tacking all the way ap the Beaulieu River because tacking means simply putting the helm over and almost immediately the sails are pulling on the other tack. Gybing too is equally simple and impressive. Not only is there no rigging and only one sheet to worry about but because the two sails work together thejib counteracts some of the force of the main and as they both fill with wind the slamming effect of the gybing main is much reduced. The whole ease, simplicity and lack of drama with the Aerorig means that even somewhat reluctant or elderly sailors can enjoy a day afloat. It would be churlish to mention the exact ages of the aged parents but their combined total is not far short of 170 and they can still enjoy an outing with the Aerorig.

In September ENA put in an appearance at the Southampton Boat Show and impressed everyone who sailed on her. In fact her speed and manoeuvrability may even have embarrassed some of the other exhibitors since by the end of the show they seemed to make sure they weren't doing any demonstration sailing at the same time as Ena.

The summer of'92 turned into a very wet autumn and Ena was soon laid up for the win-

ter. Laying up reveals another advantage ofthe Aerorig; maintenance is greatly reduced by the absence of standing rigging and minimal running rigging.

Our first season afloat with Ena had been even more successful than expected but we still needed an objective test to show how well the Aerorig performs in comparison to the Bermudan rig. It is easy to see when you are outsailing another boat but you never know if the other skipper is really playing the game and making a real effort. Similarly it is easy to ignore or make excuses for another boat which seems to be sailing faster than your own. If necessary you can just alter course and opt out of the comparison and you never know all the details of another boat so that accurate comparisons are impossible. Clearly in 1993 we would have to bite the bullet, get a rating and enter a race.

The CHS rating was obtained without difficulty; it came out as TCF = 0.888, we hoped 8 was our lucky number. The race had to be Round the Island (round the Isle of Wight). A good boat is not enough for a good race; you also need to make a good start and sail a good course. In order to fulfil all these requirements all I needed was a good crew.

Craig was helmsman and skipper if not captain and we were very lucky to have him on board because of the many miles he has sailed on many boats, including quite a few with the Aerorig. Anne from the Isle of Wight brought local knowledge and I called myself the navigator. Two other friends, Andrew and Anne (II), who had only been sailing once before on a lovely sunny day said that, as long as there were no gale warnings, they would like to come because it was Anne's 30th birthday on June 12th. There was also a strong shore-party who prepared the boat the day before.

Andrew, Anne II and I set out from Hertfordshire on Saturday 12th June 1993 at 2am and we tried not to mention the gale warnings and generally foul forecast. We put in a reef for the trip over to Cowes to pick up Craig and Anne 1. It was clearly not force 8 but also clearly not very pleasant weather. Just four minutes before the start Craig decided to remove the reef which he did singlehandedly thus proving that the reefing system is quick and simple to operate.

On the first beat down the Solent Craig didn't get much help from his crew who should have been sitting up on the weather rail but who had lost interest to such an extent that some of them occasionally had to lean over the leeward side. Nevertheless, Craig's numerous calls of "starboard" made it pretty clear we were going faster than some boats thought we ffiould

Under Anne's instruction we rounded the Needles exactly on the recommended line or even slightly inshore with no problems and then kept well inshore on route to St Catherines Point. There were never more than a couple of boats further inshore than us and of course everyone had spinnakers up except us. Even so we seemed to be keeping up well s;nce there was enough wind to give us all close to maximum speed unless we were going to start surfing.

A good result...

At St Catherine's Point, where it was specifically forecast to be force 8, the wind fell even lighter and the spinnakers began to pull ahead but Craig kept us on a good course for Bembridge Ledge. We rounded the buoy in a nice clear patch avoiding all the antics of boats lowering their spinnakers.

Again we kept inshore and our quick tacking ability must have helped us make up a few places on the way to Nomansland Fort. We could see boats going backwards at the Fort but again we found a gap in the fleet and rounded the mark with no problems. Soon afterwards, however, Craig was a bit let down by his navigator and Ena made brief contact with Ryde Sands while we were still trying to find the chart.

Fortunately we bounced off pretty quickly and after this the crew became a bit more alert and started to call out depths to Craig and give him the distances of any boats that seemed to be gaining on us.

With the end in sight we were all enjoying the close tacking to the finish.

We finished at 1504, an elapsed time of 8 hrs 50 mins for approximately 52 miles which seemed quite respectable. Anne II was even more impressed when she was handed a tankard from the committee barge and we told her it was a birthday present. I think she was slightly less impressed when she realised that everyone received a tankard but we all knew that Craig had given us a great day out.

The final results which came through the post a few days later showed that it had not only been a great day for us but also a pretty good day for the Aerorig. We finished 7th in our CHS class 10 which had 48 starters and 41 finishers, 62nd out of all the 417 CHS finishers and 15th out of the 103 that finished in CHS Group 3.

Our rating seemed to be quite fair and accurate since one boat with a more favourable rating finished 5 mins in front of us and the

Practical Boat Owner is continuing its coverage of Junk Rig with an article early in the new year by our technical editor David Harding. Whenever we publish a Junk Rig feature we receive a flurry of letters from aficionados of the rig, which encourages us to research and publish further articles. We welcome articles from boat owners for our Practical Projects section so if you have invented something, or made an interesting improvement to your boat, please do send in some photos and a couple of hundred words. Look out for the April issue, on sale in the first week of March for David's junk rig article. There are more to follow, and to be sure not to miss them, why not take advantage of our subscription offer on our website *www.pbo.co.uk*

Sarah Norbury
Editor PBO

four boats that were placed immediately after us all had TCFs of 0.88 or 0.89. All these figures surely show that the Aerorig is reasonably competitive with the Bermudan racing boats at the same time as being an ideal rig for cruising.

The Round the Island race was probably the highlight of our sailing in 1993 but there were also many other enjoyable outings. We particularly enjoyed showing off our manoeuvrability amongst all the yachts that assembled for the start of the Whitbread race. The ability to de-power the sails and spill wind just by easing one sheet is very valuable for reducing speed and avoiding other boats. Similarly speed is increased equally easily again without the need of any winches for hauling in the sheet.

Even though the Aerorig looks superficially like a Bermudan rig, at least at a distance, it does still attract a lot of interest and attention which can make us feel rather vain. Our vanity will receive less massaging and we will feel less like sinners when a few more Aerorigs are afloat. Indeed, the Aerorig would look good on many cruising boats because it would complement the smooth lines of the hull and deck of modern designs without appearing radically different to the traditional Bermudan rig. We hope that many others will be able to take advantage of this breakthrough in yacht design but if the Aerorig becomes as popular as it deserves to be then I must confess that we will miss the interest and admiring looks that we have enjoyed for the past two years.

In particular we will miss all the comments and questions that the Aerorig generates. These are not always easy to hear when you are afloat but I think they have mostly been friendly. Often they say "Bet she goes well downwind (- very true), "how does she go to windward?" (- better than any other boat we have owned) or "tell me in thirty seconds how it works".

I hope this brief description of our experiences gives some sort of answer to these questions and shows the potential of the Aerorig. It may also provide a suitable reply to the smiling man (vicar?) who called out (with just a tinge of envy?) "If God had meant us to sail like that he wouldn't have given us shrouds". •

Hinges that break

by Arne Kverneland

Thinking about hinges that break and cost money to replace, I have made a cardboard model of what I think is an improved and stronger hinge version; the "outside model". In the diagram which shows the basic idea, the internal stop block doesn't suffer much stress so can be made of just about anything and just be glued in place. However, I think the internal line is a must. I understand that Sunbird doesn't use it, which may be one cause of their problem.

The internal line solves 3 problems:

1. It keeps the parts from getting lost and spare battens can be kept folded but "assembled" in a locker.

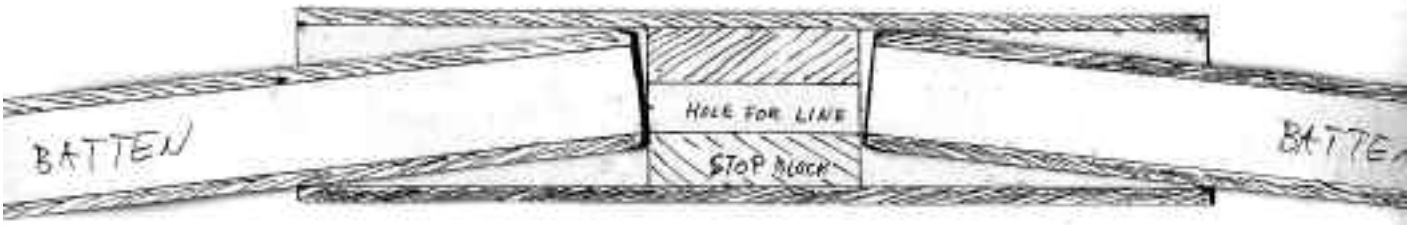
2. The stretch in the internal line will keep the hinges from working loose and re-adjust themselves.

3. With the line in use, battens can be inserted or pulled out of batten pockets, where fitted, just as easily as the one-piece battens.

A light filing of the sharp edges will prevent the parts from cutting into each other. They never gave mechanical problems in Malena.

I also notice that some boats are still using what looks like one piece keep battens on the side opposite the hinged battens. As many sails have metal grommets the keep battens are not needed for structural reasons . Unless the owner is a believer in the IFT there can be little reason to use them, particularly as they tend to restrict the movement in the batten hinges.

Aluminium hinge for aluminium batten. 'Outside Model' Note: A taut internal 5mm line must be used to keep the hinges working correctly.



Scottish Rally

Report 2009

by Peter Manning

In recent years our Scottish rally has suffered a little from lack of boats. David Tyler, with Tystie a regular at this rally is currently enjoying the hospitality of our antipodean friends in New Zealand. Meg Merrilees the Coromandel formerly owned by Ralph Yates is no longer in the area and so we now only have two 'local' boats, Alan and Gloria Parsons with Badger and Bob Maxwell with Clio. Robin Blain who for many years has towed his Macgregor 26 Bunny to this rally again agreed to bring her to this year's rally to ensure we had sufficient boats. Unfortunately Stuart Calcutt who normally brings his boat Karma was unable to come this year.

Our rally was held over the weekend of 19th and 20th September 2009. A little later than we would have preferred but we have to choose weekends with favourable tides.

We had two boats sailing out of Kippford, Badger and Bunny whilst Clio sailed out of her home port of Kurkudbright. Bob Maxwell very kindly agreed to come to Kippford to collect his crew.

28 members and guests came and helped make this another successful and enjoyable weekend.

We met as usual on the Saturday morning at the Solway Yacht Club Some of the members helped Robin launch Bunny whilst the rest of us remained in the clubhouse enjoying coffee and some convivial chat.

The weather was mixed over the weekend. Saturday was rather grey and overcast whilst Sunday was a much better day with plenty of sunshine. The light winds meant we had some pleasant if relatively unexciting sailing.

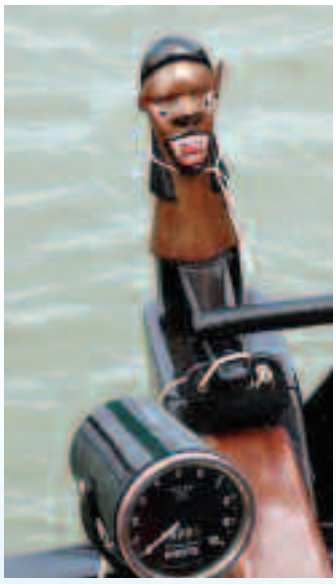
Just by chance our rally was held on the same weekend as many of the Solway Yacht Club members were having their boats lifted out for the winter so this meant the pontoons were rather busy. Happily we were able to get out of their way fairly quickly so as not to hinder their operations.

Alan and Gloria Parsons on board Badger provided wonderful hospitality as usual which also provided them the opportunity of showing off their new Dickinson solid fuel fire which was used to great effect as the evenings were rather cold. Badger has a good luck mascot on her tiller. This is a 'Caranca' which according to Annie Hill is a Brazilian God to scare off evil spirits. Unfortunately the original was stolen a year or two ago. Ian Sharpe, a regular at this rally and an expert model maker, came to the rescue made a new one. Sadly during the summer he lost an ear in a minor skirmish with a trailing log which was being set. Even worse, so Alan tells me, he has now lost his other ear. Come on Alan, you can't have a 'deaf' mascot. You need eyes and ears at sea. I understand Ian is coming to the rescue and has promised to make two new ears so he should be back on duty fully equipped for the new sailing season.

On Saturday evening we had dinner at the Mariner hotel as usual before retiring to the Solway Yacht Club where Robin gave us an informative talk on recent developments in junk rig sail technology and I showed some pictures from some of the earlier rallies in the year. We were delighted that Helen Maxwell could join us for the evening.

The Solway firth is a lovely sailing area but care has to be taken to watch the tides. This came home to us rather sharply on Saturday when Badger and Bunny had rafted up for lunch in a quiet anchorage. We were enjoying ourselves so much that we left it rather late to draw anchor and leave. We only just got out. What a weekend that would have been if we had got stuck!

Our rally weekends, enjoyable as they are, seem all too short and before we knew it we were saying farewell on Sunday after sailing back into Kippford. Our thanks go to Bob for his efforts in making 'Clio' available. Next year we are a having change in the hope of attracting more boats. The Kippford rally is to become the North West and in 2010 will take place at Caernarfon on the Menai Straits.



Top two pictures: Caranca on BADGER and her new stove.

Below: CLIO on the pontoon at Kircudbright

Right: Members about to go sailing.

A note from the Rally Organiser

by Peter Manning

We are making a change to one of our rally venues this year.

This years rallies have now been scheduled, please see the Hon Sec's report for the dates for your diaries.

I am delighted to report that we shall be holding our fourth Norwegian Rally on 7th and 8th August with a skippers day on Friday 6th which is also open to any other member who wishes to come along. If you have not yet been to a Norwegian rally we strongly recommend you to give it a go. The scenery is spectacular and the sailing in the fjords is wonderful even in strong winds. We base ourselves at the Lundsvagen Batforeng just outside Stavanger and we have the use of the clubhouse over the weekend which provides us with an excellent base and cooking facilities. Arne and Sven Magnus are very kindly allowing us to use their boats for accommodation which helps to keep us all together and makes for a great social occasion. This accommodation is allocated on a first come basis. We may be able to offer further accommodation aboard boats but this has yet to be confirmed. Anyone wishing to go and wanting accommodation should contact me as soon as possible and not wait for the invitations to be sent out. I would also advise members to book early flights to get the best prices.

We are making a change to one of our rally venues this year. In recent years we have experienced problems getting sufficient boats to the Scottish rally at Kippford and so this year we are having a North West rally instead. Perhaps we should call it a North Wales rally as the venue is Caernarfon on the Menai Straits. There will still be a Scottish rally but this will now be the Holy Loch rally organized by Malcolm Higgs. We hope you will give him much support.

The new North West rally at Caernarfon is to be held over the weekend of 11th and 12th September. Boats will be able to stay either in the Victoria Dock marina or in the inner harbour where boats moor against the quay . Trailer sailors are welcome and will be able to launch from the boatyard on the town side of the marina.

The Menai Straits offer spectacular scenery with Snowdonia as the backdrop. They can be quite challenging due to the tidal streams but as we shall be sailing either side of high water they should not be too strong when we leave and have to return to the dock.

We hope this new venue will attract local boats and those close by. Badger has already said she will be there and we have spoken to local skippers with good responses. As this is a new rally venue for us we shall do our very best to make this a great success. The Royal Welsh Yacht Club based in (and I do mean 'in') the Caernarfon castle walls has agreed to host our rally. I feel sure that those of you who come to the rally and do not know the area will be impressed. I know the area well have sailed around Anglesey for many years and it really is a wonderful cruising ground. Come and join us in September.

Right: Members boats on the East Coast Rally 2009

FOOTPRINTS – The Story so far.

by David Thatcher

'FOOTPRINTS' is one of two sister ships built in New Zealand to the Shoestring design in the mid nineties. Local architect and designer Gary Underwood developed the design as a low cost, easily constructed live aboard ocean cruiser. The original 'Shoestring' was designed for a New Zealand sailor who lost his boat, and by default everything he owned, in a severe Pacific storm in 1995. Returning to New Zealand with nothing; friends rallied around to get him back afloat again as soon as possible and for the lowest cost. Annie Hill's book '*Voyaging on a Small Income*' was the inspiration for this design including the junk rig.

Designer Gary Underwood enjoys thinking outside the square and each of his designs thumb their collective noses at convention. My family and I have a similar philosophy on life which sees us living in a converted country church in a rural area approximately one hour north of Auckland in New Zealand's North Island. In this part of New Zealand we are blessed with a coastline just made for summer cruising which includes the numerous islands of the semi sheltered Hauraki Gulf. We were looking for a new boat but dismissed most boats on the market at that time as too old, too much work needed, or too ordinary. Then we found 'FOOTPRINTS' and after just a couple of minutes on board we knew that this was the boat for us.

When we are out on FOOTPRINTS I am often asked about the age of the boat and people are surprised when I answer that she is just ten years old as the shape of the FOOTPRINTS is suggestive of a very traditional design. She has an overall length of 10 metres and the same waterline length. Beam is 3.3 metres and draft only 1 metre. The hull is a chine design with a flat under body, and lead filled shallow steel fin keel which seems to provide perfectly adequate lateral resistance. Construction is 2 skins of 9mm plywood covered with fibreglass set in epoxy resin. Two of the key features of the design are the flush deck providing a tremendous amount of interior volume, and a 'pinky' stern which provides a cockpit 3 metres long and 2.4 metres wide surrounded by bulwarks and lifelines.

The interior finish is mostly varnished frames and varnished plywood inner skin, but with a light painted tongue and groove deck head and an oiled hardwood cabin sole. The layout consists of a forward sleeping cabin; spacious main saloon and dining area; galley with acres of bench space; a full size chart table and under the cockpit aft is another sleeping cabin with a full sized double berth. The systems on the boat are designed with simplicity as the key principle. Water is stored in 20 litre jerry cans and the pump intake is simply swapped from one jerry can to the next. Battery charging is via 140 watts of solar panels but is still sufficient power to run an electric fridge, basic lighting, and radios.

There is no diesel engine on the boat but instead an outboard is mounted in a well at the

Footprints at anchor at one of our local islands

Relaxed sailing

Room to stretch out in the cockpit

Cockpit view, the motor is under the cover to the right of the picture

Galley – acres of bench space

Looking into the aft cabin

Top right: Under sail

Bottom right: A view of the re-worked sail

after end of the cockpit. This form of engine may seem surprising on a vessel the size and weight of FOOTPRINTS but the system works remarkably well. The engine is High Thrust version of the 9.9hp Yamaha four stroke motor. The motor is raised and lowered within the well by a 3:1 reduction winch. Although I would probably install a diesel motor if I was building this boat from new the outboard however is perfectly adequate and still proves to have good fuel economy. It is also great not to have a smelly engine intruding into the interior of the boat and the outboard has the advantage of being able to be raised from the water when sailing or not using the boat. Petrol for the motor is stored in the well area which is self draining and thus minimises the risk of explosion from this fuel.

Now to the junk rig, the main reason of this article. I did not buy FOOTPRINTS for the rig but rather for all the other positive features of the design. But having bought the boat I had to deal with the rig. When we took delivery of the boat I did not really have any idea as to how the rig actually worked, and at first had a lot of trouble getting my head around the whole mechanics of the thing. I did do a little background reading which gave me enough information to realise after just a couple of months that the rig as installed on her just did not work at all. There were four very bendy battens made from plastic water pipe which as soon as the sail encountered a reasonable amount of wind formed a big bow shape which acted as a very efficient air brake halting any worthwhile forward progress when on a reach or going to windward. The sail had no shape and hung from the mast full of wrinkles. This would not do!

I had to make the rig work if I was to have any pride in her performance. The first step involved getting online to Amazon.com to purchase a copy of *Practical Junk Rig*. I also purchased a copy of Van Loans book; *Build Your Own Junk Rig*, but in all honesty I did not find this book to be of much practical use. *Practical Junk Rig* however provided all the information required to understand just how a junk rig works and how to fix the problems with the rig on my boat. After many evenings of research I came to the conclusion that even though I had to work within the confines of the existing sail and rig I could still make some very worthwhile improvements and hopefully end up with a boat that actually sailed. Working to the instructions provided in *Practical Junk Rig* I redrew the shape of the sail;

designed in 6 battens rather than the previous 4; and also learnt just how the rig should be set up.

Over our winter months I left the sail with a local canvas worker for reshaping and the addition of the extra batten pockets. Meanwhile I set about making new battens. The various obvious material options were explored. Both carbon fibre and solid fibreglass battens would produce the desired stiffness and reduction in weight but would both have been prohibitively expensive for the lineal lengths required. Heavy wall alloy tube was another option I looked seriously at but this material was still quite expensive, was not as light as I had initially thought it would be, and I would have had to have some welding done as the available extrusions were not long enough. There was also the concern with alloy that it could bend during a hard gybe. This eventually brought me to the option of timber battens. I consulted the advice in *Practical Junk Rig* about various timber species, densities and

bendiness and in the end chose to build my battens from 65mm x 39mm red cedar and with unidirectional fibreglass either side for added stiffness. This material would give battens which were slightly less expensive than alloy; which were no heavier than the alloy; which I could fabricate myself, and which could be easily repaired or replaced in the event of a breakage while off voyaging. There was also the thought that the combination of timber and fibreglass would provide a construction method that I could manipulate to allow bend in the battens where required to produce an aerofoil shape. When making the new battens I pretty much followed the instructions for batten construction provided in *Practical junk Rig.*

The work was finally completed and I set off for the first sail with a great sense of anticipation. Now after a summer of sailing I am happy to report that I have a junk rig that works! I am enjoying just having one sail on the boat to deal with. It is also nice to be able to sail downwind without having to deal with flapping headsails. Reefing really is very easy, as is the slow reduction of sail when coming into an anchorage. Going to windward I have found the rig works well in either very light conditions in smooth water, and also once the breeze rises to 15 knots and above. However at present the sail is not working very well in lighter wind conditions with slightly choppy seas when the sail flops around too much to allow for flow to develop over the sail. I think this is because the battens are too stiff and so take more wind to produce an aerofoil shape and maintain lift over the surface of the sail.

So there is still some work to be done. But one of the good things I am discovering about the junk rig is that because the rig is so low tech it is possible to experiment without having to spend too much money. For this coming summer I am going to reduce the thickness of the battens to allow more bend. I will add an additional layer of unidirectionals over the after third of the battens to keep that area of the sail flat. For next year I am going to build an entirely new sail as the existing sail is now 10 years old and I can do nothing more in terms of reshaping it. I have found an interested sail maker who is already talking about cambered panels even though he has never built a junk sail. I will spend the summer carrying out more research into the technology, and the construction of a scale model of the new rig to make sure it all works before I commit the money. I would also like to lighten the sail which really means replacement of the heavy solid timber yard. It seems that extruded carbon fibre tube in the length I require is not as expensive as I had thought so this may be the direction I go in rather than alloy. Regardless of where I eventually end up with the development of our junk rig it is an interesting journey, full of new challenges for a sailor who has spent almost 50 years on boats with conventional Bermudan rigs. Anyone who is interested in the design or the development of my rig is welcome to contact me at ***ali.david@xtra.co.nz***

Another twist on fully battened sails

Readers may be interested in the rig on a catamaran belonging to some close friends of mine. I tell Don and Marilyn that their rig is just a modernised junk rig but I don't think they are really all that amused! Having themselves built their 16.5 metre charter catamaran they wanted an efficient easily handled rig. The not so successful Team Phillips catamaran inspired their rig which happily has worked out many times better than Team Phillips. On each hull there is a fully rotating, free standing carbon fibre wing mast. There is just one sail on each mast with an electric winch mounted under the boom gooseneck for raising the sail and for reefing. And there is just one manual sheet winch for each sail which is mounted adjacent to the helm position in the fully sheltered cockpit. This rig makes it very easy for just one couple to handle what is really a very large yacht. The rig is super efficient on all points of sail and like the junk rig downwind sailing is very simple with no headsails to worry about. The sails can be fully squared off for downwind work, and if you need to reef or drop a sail when going downwind, just fully release the sheet and the boom swings around so it is facing forward with the sail fully feathered. I recently helped sail 'COOL CHANGE' from New Zealand up to Tonga and the rig certainly proved to be efficient and easily handled.

***COOL CHANGE* with her twin mast rig**

Boom detail on COOL CHANGE

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26'	Macgregor, 1991, SMS rig, jointed battens, hinged mast. EU reg. Road trailer.		£ 9,750
28'	Ebbtide 1983, 10hp Yanmar (95), tan sail, A/H, Aries W/V, GPS, VHF (DSC)		£12,750
26'	Vertue 1988, Fenix sail, L/raft, S/panel, W/vane, T/cooker, Fridge. Spain		£15,000
29'	Van de Stadt, 1978, Steel, Jointed Battens, A/helm,Cabin heater. View Antwerp		£16,500
26'	Sadler (Fenix) 1985, solar panel, w/Vane, A/Helm, Osmosis Pro. VHF, GPS, Log		£19,750
38'	Hartley S-Seas, 1985, Ferro, SMS rig, 50 hp. Diesel. Wind pilot, Infl. Dinghy.		£19,950
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