Catalyst

Journal of the Amateur Yacht Research Society

NUMBER 53 MARCH 2018

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As examples, the polar diagram p16 of *Catalyst 28* was re-created from a second generation photocopy, photos of shunting in the Champion article in *Catalyst 27* (pp 19-21) were screen grabs from a video supplied on DVD. The rest of the images in that article were scanned from photographs, and the text was OCRed (Optical Character Recognition software) or keyboarded.

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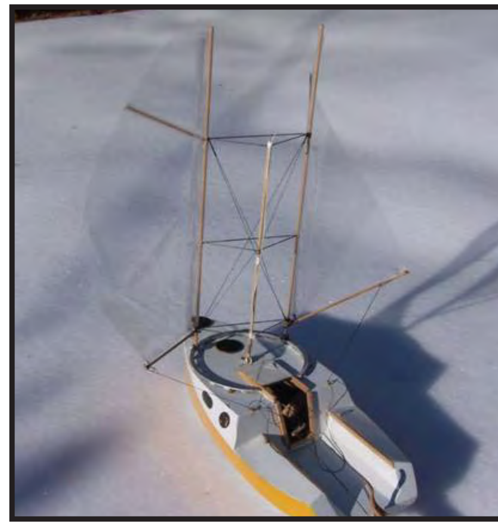

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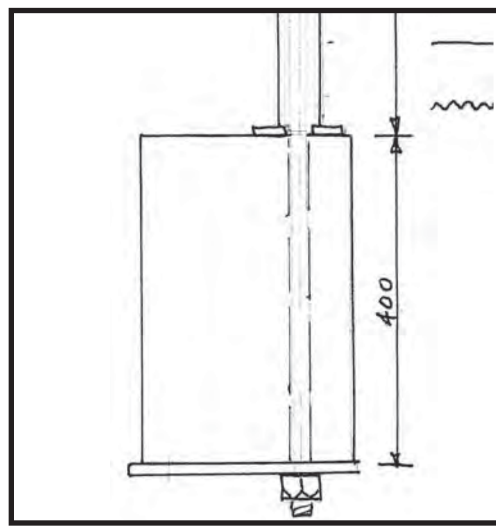

Regulars

Cover picture - Tersancta off Fowey (Photo: Elliott)

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Amateur Yacht Research Society

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The Howard Fund

In April 2005, Mr Donald Howard, a member of AYRS, died, and having no family, left his estate to be divided amongst a number of charities, one of which was, to our surprise, the Amateur Yacht Research Society. Of his residual estate, we were left some £42000, with the instruction that the Committee use the money to "provide funds as grants to members for further development of their practical ideas".

Of that money there is still quite a lot left (some £36000 at the end of last year) mainly because few people have applied for grants, and of those fewer still have convinced the Committee that their project has the potential to advance the knowledge of yacht science.

This year we have made two grants. one to Mark Hillmann to carry out work on proa capsize recovery (see Catalyst No 51), the other to Alex Quertenmont to continue building a prototype of his Roto-Duplex rig which adapts the reasonably well-established catamaran Biplane rig to function on monohulls. That project is described in this issue of Catalyst.

Those projects have in common that they have been started and largely carried through to their present state by the efforts of the members concerned, and the Howard Fund grant is being used to bring them to a conclusion somewhat faster than would otherwise have been the case. The Howard Fund is not big enough to fund any major development from start to finish, nor do we feel that it should be used in such a way, but by making smaller grants to projects to which members have already committed their own resources we can make a difference, or preferably a lot of differences in a lot of areas.

Your project could be one of those, but you do need to apply. You will find more information on the AYRS website.

KASALA 5,5m /18′ – An innovative seaworthy plywood micro-cruiser design.

Alex Quertenmont

Kasala stands for "self-esteem" or "self-satisfaction." In this spirit, I'm very proud to unveil this new boat.

The centerpiece of this model is a new type of rig, named "Roto-Duplex." Roto-Duplex has been successfully tested on scale models, but the time is coming to try it on a full-sized boat and Kasala is the perfect suitor.

In the 1950s, J-J Herbulot launched his Corsaire model. Drawn from the Glenan sail school, this micro cruiser revolutionized the coastal cruise and has become a reference in the field of micro cruisers. Kasala has the same length overall of 5.5 m or 18 feet and the same criteria that made the reputation of this boat: simplicity, reliability, stability, safety and wisdom.

The main parameters originally set out for this design are as follows:

Hull:

Directly constructed from the use of marine plywood and epoxy, the quickest work is a double-chine hull with a flat bottom. The result is a very stiff and efficient hull. This type of hull is particularly suitable for small-sized boats. Why a double chine hull as we can choose a single chine or multiple chine? A single chine hull with a "V" bottom could, when the boat heels, slap into the wave. On the other hand, a multiple chine hull loses the advantage of having a well-positioned chine that could increase stability. This type of hull is also more complex to build. However, the boats I have previously designed showed that a precisely drawn double chine hull would be the more efficient and the less expensive to build.

Optimization of hull performance was mainly achieved by keeping the residuary resistance as low as possible. With a vertical bow bringing a maximum waterline length, the displacement hull speed will reach 5.65 knots with a Froude number of 0.4. To keep this resistance as low as possible, the prismatic coefficient was adjusted to 0.6 which it corresponds to this Froude number and water length. Also, the localization of the center of buoyancy for this value, to keep the drag as low as possible, should be -3.6%, (i.e., 3.6% of water line length after the middle) and we have a -3.9% on the KASALA model. This intentional difference is due to extra movable weight (crew, auxiliary motor) found in the back of the cockpit of a small cruiser. To enable the unit to exceed a Froude number of about 0.45, a length displacement ratio about 5.7 is required. With a fully loaded boat, we obtained a ratio of 5.4. So, undoubtedly, this hull will be able to reach planing speed when in a lighter configuration or when surfing on a wave.

The wetted surface of a double chine hull often seems to be just as important. But in reality, when the boat is heeling, this surface diminishes as much as 6% at 15° and 15% at 30° and becomes comparable to or less than that of a round shaped hull in the same configuration. Mainly 3/8 and ¼ inch plywood are used in the entire construction process, minimizing the use of material. It will be a classical construction method, using mainly white pine and Douglas fir wood glued with epoxy in conformity with ISO rules. A safety factor less than 2 will never be allowed.

Due to its stiffness, the weakest point of the plywood is its mediocre impact resistance. Multiple tests show that adding a thin fiberglass mat inside the hull will minimize impact damage. So the three lower panels were glazed with 6 oz. fiberglass mat before they were fitted to the frame.

In classical plywood construction, all internals are part of the hull structure. Once the whole hull is assembled and before flipping it over, the boat should be nearly finished. Berth and berth facing frame take up almost the entire hull length and contribute to an important part in longitudinal stiffness and rigidity. This configuration will dissipate all shocks and vibrations of the road when the boat sits on its trailer.

Roto-Duplex rig:

This novel invention makes KASALA original and unique. Actually, KASALA was designed as a platform for testing this kind of rig. By increasing the sail area and keeping the pressure center low, this rig will be well-suited on a small boat and it's the heart of KASALA. Easy to handle, to erect and to operate it could be an interesting alternative to the well-known sloop rig.

The rig consists of a tripod mast. The two front and lateral masts support the sails and the third one, on the rear, is the pivoting point. The assembly rotates on a circular rail that is bolted to the flat deck. It's a self-supporting structure. In addition, three triangular frames tie the masts together. Stainless steel cables lace and stiffen everything together, forming finally a single tripod mast. There is no cable attached to the boat itself.

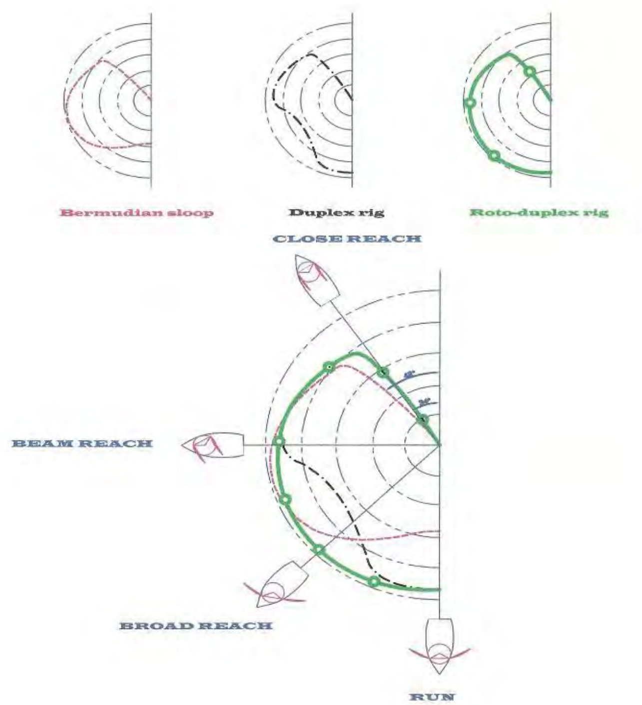
In a traditional Duplex rig (two masts symmetrically fixed to the hull) also named "biplane rig" or "catamaran-rig", we encounter some problems, especially on mono-hull on a beam reach where one sail shades the other. On KASALA's "Roto-Duplex", by rotating the rig, we bring the leeward sail ahead of the other and thus maintain the two sails at full efficiency in a clear wind. Yes, it's quite simple! We can use the same strategy on a broad reach to increase sail performance as well (laminar flow). But it's before the wind that we understand clearly that this rig is the perfect hybrid between a square rig and our traditional Bermudian rig.

The two sails open up like butterfly wings receiving all wind pressure. A boat equipped with a Roto-Duplex rig is perfectly balanced when running (wind astern). The center of buoyancy sits between the two sailing centers and thus the boat maintains a straight route. This is not the case with a traditional sloop, where the boat is always "weaving", mainly due to the fact that sometimes, the mainsail hides the jib and the two centers lose their precarious alignment. In fact, you have less effective sail area and the center of effort is no longer aligned with the center of resistance of the hull.

With the Roto-Duplex, a spinnaker is useless; hence we avoid all difficulties associated with it. On the polar curves (see figure) we can see that a Duplex rig performs better than a traditional Bermudian rig both close hauled and running. We expect that the Roto-Duplex will do equal or better on a beam reach than a regular sloop rig.

One of the main advantages of splitting the compression stress over three mast sections is that the mast profiles are thinner (less compression to withstand), so the sail works better. It is a well-known fact that a mast profile that is 33% more thick increases drag by 23% and decreases lift by 30%. Essentially, a thinner mast brings better performance. With KASALA, lateral masts are also rotating and it will nearly eliminate all kinds of interference with the sails.

When we study this type of rig in a numerical wind-tunnel (CFD) and compare it with the early planes, we can compare it with a biplane. Both the regular sloop and our roto-duplex rig use two sails, so does the biplane. However, the sloop uses two sails that sit one between the other in tandem configuration. The other uses two sails side by side, like a real "biplane", but could also use them in tandem. It appears that if we can trim both sails in biplane configuration, we can get more lift than in the tandem one without increasing drag. Yet with the roto-duplex, we can do both and be able to adjust the gap and also the overlap between sails. It's



Polar diagrams for bermudian sloop, duplex and roto-duplex sails arrangement

well-known by racing yachters that sail efficiency can be increased by moving the tack of the front sail to leeward (blooper, tall-boy, etc…). It's also true that individual performance of a mainsail is better than that of a jib. With our rig, we replace a "weak" jib by another main, well-placed, and this should lead to a better beating angle close hauled but also to a greater energy output. There are still a lot of things to prove with such a rig and hopefully KASALA will bring more light on this matter.

With costly CFD simulations, we should probably be able to prove without a doubt the efficiency of the roto-duplex rig, but we will never be sure that the algorithms used are really adequate. So, it would be best to put this rig in live testing. The weight of a Roto-Duplex tripod mast is normally less or equal to the one of a single sloop mast. The KASALA rig weighs 20 kg (around 44 pounds), a bit more than expected, but it's a prototype and I prefer to build a more robust unit for the trials. Later on, we will be able to replace stainless steel cables by Dynema ropes and reduce spreader scantling, for example.

Lifting the assembly is easily done by a single person. A small support, equipped with a roller at one end, is used for transportation when the mast is lying flat above deck. The same support, attached to a dedicated location in the pulpit, serves as pivoting point and will help to engage the rollers into the grooves of the circular rail. When this is done, we just have to lift the mast towards the rear and secure the central point at the bottom of the rear mast.

Undoubtedly there are plenty of advantages with this rig, like this one. If you have, for example, two rows of reefing per sail, you effectively can have twelve different ways to reduce the sailing area. Also, by using two parallel main sails, you lower the sailing center but also the center of gravity of all masts. This is particularly important on a light sailboat where you want to always to minimize ballast and increase sail area. If we compare KASALA with the aforementioned Corsaire, they both have the same overall length and same ballast weight, but KASALA carries 25% more sail.

A great safety feature of this rig is its ability nearly to eliminate the risk of capsizing. When maximum thrust is on the sails, close hauled, normally the two main sails are nearly parallel. They are somewhere just above the sheer line. If the boat tends to capsize, the leeward sail will first hit the water and absorb the rolling momentum. At this point, the boat will reach a heeling angle near 90°. Yet at this angle, the pulling force of the keel's ballast reaches a maximum value and the hull itself will have enough righting moment to bring the boat back to vertical position. Virtually uncapsizable!

There are plenty of advantages to adopt this system and we hope that you now understand my desire to try it on a real boat. Handling such a rig is easy! Even when the boat is gybing, one can smoothly handle one sail at a time. Finally, when storing the boat, one can place a tarpaulin above the mast that is lying on the deck. This will easily protect the boat from all kinds of weather conditions.

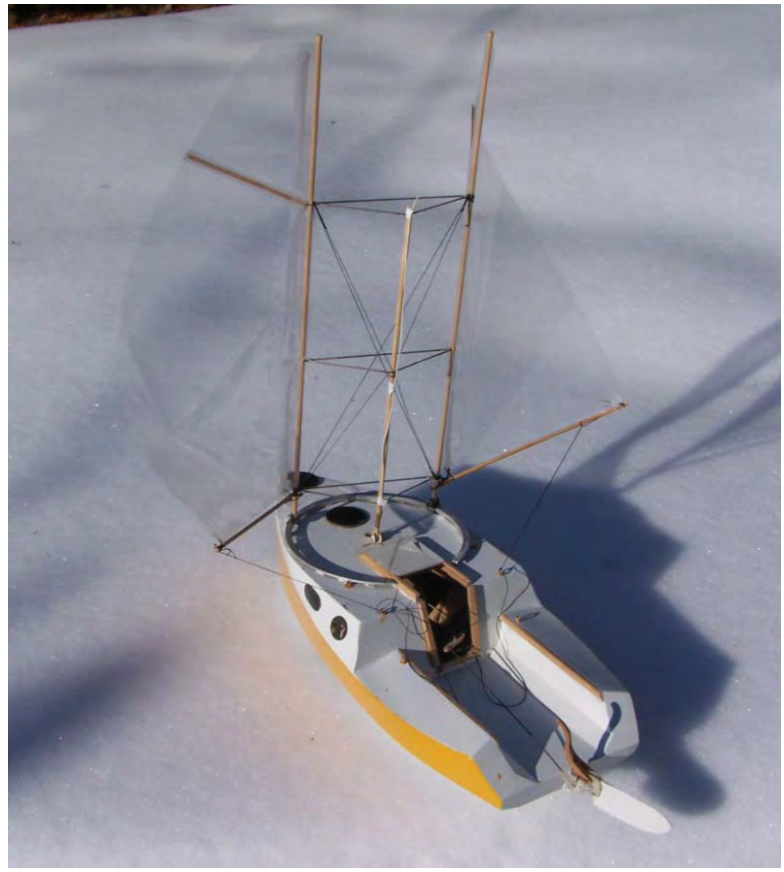
Rig controls:

The novelty of this rig requires an adaptation of the control devices. By explaining several of them, it will be much easier to understand how the system should work and what we need to do to simplify their use. On all boomed main sails, we find normally one main sheet for trimming and a halyard for raising. In addition, on our rig, we can find two other ropes which are used to rotate the mast.

Main sail hook: Sails are equipped with a hook system that automatically locks the sail at preset heights: fully extended and at reefing positions. By doing so, we release the pressure on the halyard and on the top pulley as well. Sail tension is made by pulling the goose neck down.

Boom: The two main sails are set loose-footed on a boom. Each boom looks like a light aluminum semi-circular pipe. A full-length aluminum rail runs at the bottom, facing down. The sheet traveler slides on it. Luff tension is adjusted by lowering the tack point. There is a regular boom vang with cascade pulley for controlling leech tension. A small gas spring keeps the boom assembly up when sails are not raised. It's easy to store each sail inside the boom when not in use. But the wideness of the boom will also minimize the air flow mixture from pressure side (intrados) to low pressure side (extrados) of the sail. All the control lines are taken to the cockpit where it's easy to adjust all the sails.

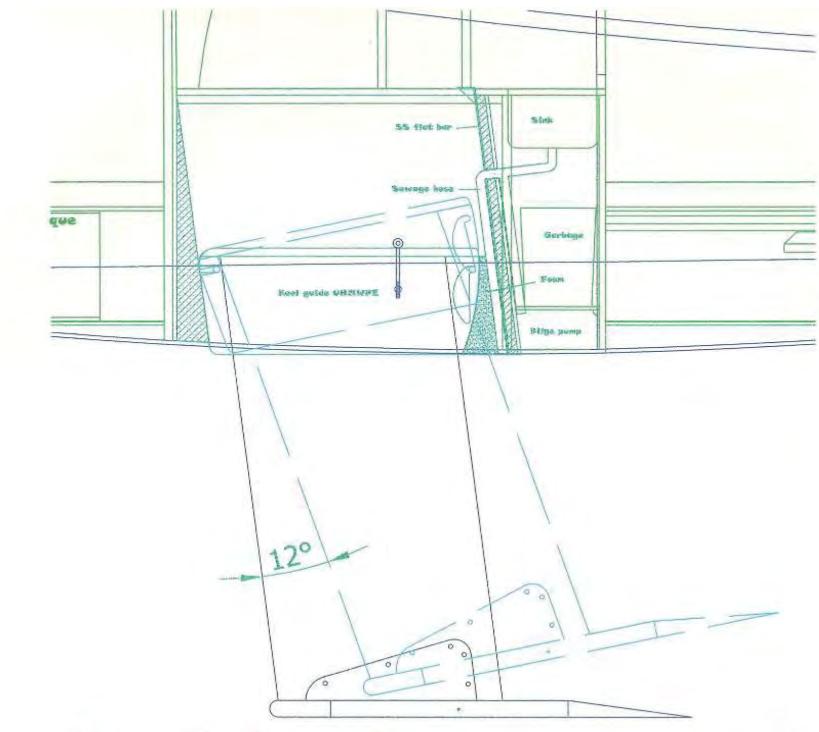
Positioning the lead block: One can easily imagine that the lead block would move each time a mast adjustment is required. A dedicated small rope provides a fixed point (located on top of the cabin) for one extremity of the lead block traveler. A bungee cord, fixed to the other side will help to keep the traveler all the time and automatically at the same vertical distance. So, when you pull, for example, the leeward mast forward, the bungee will pull the traveler back and the lead block will stay perfectly vertically aligned. At the opposite, when the windward mast is pulled back, the small rope will pull the traveler forward and tighten the bungee, but the traveler will stay at the same vertical position.



Keel:

The keel is another important piece of the puzzle. It's a dagger type, hiding completely inside the cabin when fully lifted. The entire ballast will be hanging at the far bottom end of the keel. The 330 pound ballast is in fact a 2 inch thick stainless steel plate from a scrap metal yard, recycled and machined to the most appropriate hydrodynamic shape. The keel itself is a real hydrofoil with a 63-0075 NACA profile made out of a core of solid hardwood, wrapped with two layers of carbon fiber. With this arrangement, we minimize drag and still produce an important lift coefficient at 4 to 5° angle of attack.

The keel slides into a UHMWPE plastic guide that is secured into the trunk by two large pins. A neoprene foam mat keeps the guide pushed forward. The weakest point with this kind of keel is when it hits a shoal bottom or a submerged rock, for example. Significant damage can occur, not only to the keel but also to the trunk and on the boat structure. When a light impact occurs, the neoprene mat will act like a shock absorber with no further consequences .But, if the shock is more severe, the guide will flip up and save the keel, by absorbing excessive impact energy. It's a question of the time it



Kasala - Keel Trunk Arrangement

takes to absorb the impact energy versus the inertia of the boat. When it happens, the system can be reloaded by replacing the rear locking pin.

This guide will also receive the flat back of the ballast plate when the keel is fully up. Thus, when the boat gets stranded, this guide will absorb all the weight of the boat. The keel is raised by a rope system assisted by a small winch bolted on top of the cabin. The draft is only 4 feet under sail and less than a foot with keel up.

The lightweight of keel is an important feature for a towable sailboat, because nobody wants to pull extra dead weight behind a powerful car when you can avoid it!

Rudder:

I decided to use a single rudder, even if the hull shape, from a plan view, looks like a wedge. With this kind of hull, when the boat reaches excessive heeling angles, a large part of the rudder will pull out of the water. To mitigate this, KASALA's rudder assembly will be able to swing from one side to the other on a circular sector bolted onto the transom. Handy ropes will control its movements. By using a single rudder, we reduce weight, wetted surface and keep a lively tiller.

As a result we also have a NACA 0010 profile compensate rudder that can be lifted completely out of the water when beaching.

Stability:

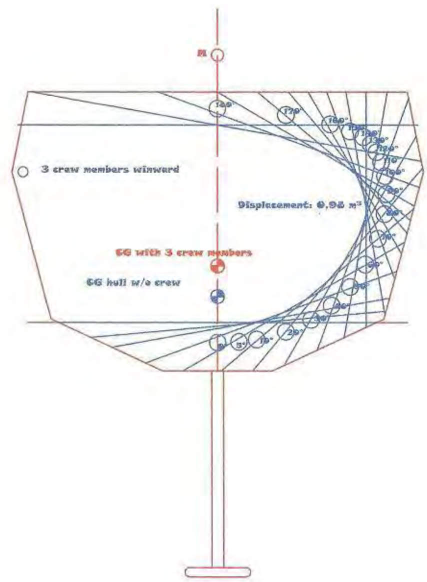
With lower ballast, short mast, and an appreciable waterline beam, Kasala is extremely stable. Kasala exceeds International Micro-Class stability limits (see micro-class.org) at small heeling angles and also at 90°. At small heeling angles, the Class requires that a 20 kg weight (44 lbs) be placed perpendicularly to the boat axis at 2.25 m (7´3") of the largest beam of the boat. Under these conditions, the unit should not take a heeling angle greater than 15° for prototypes, 12.5° for racers, and, 10° for cruisers. Under these conditions, Kasala only heels 5°!

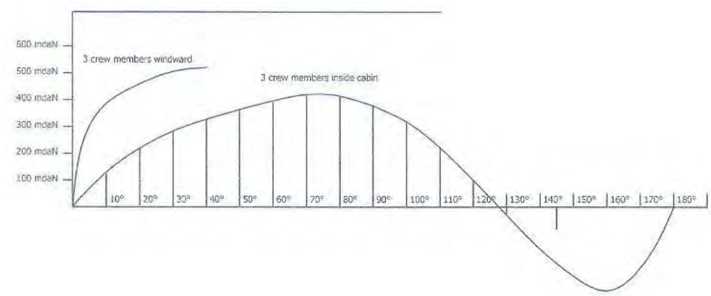
At 90°, Micro-Class rules require that a boat withstands, at the top of the mast, a weight of 10kg (22 lbs) for prototypes and racers and of 15 kg (33 lbs) for cruisers. You can put more than 55kg (121lbs) on top of Kasala mast and it will still right itself! As you can see, the boat is designed to sail in heavy seas and rough wind conditions. It's a safe family boat in nearly all weather conditions. But a single sailor can also handle it in bad weather conditions.

With all the sails on, two crew members windward and a 30° heeling angle, the boat can sail at a wind of Force 5 (56.4 Pa). With both sails at the first reefing line, the pressure can rise to 83 Pa and the wind can blow close to Force 6. With just one sail at the first reefing line, the pressure can increase to 166 Pa, meaning a Force 7. We have to put a second reefing line to reduce the sail area at 5 m² to be able to fight a gale warning conditions or Force 9.

On a small boat like a micro-cruiser, the weight of the crew is significant. This "meat load" can often reach half the weight of the unit. We must therefore consider this as additional "movable" ballast. Three crew members can safely sit windward in the cockpit at a heeling angle in exceed of 40°.

In Europe, boat classification is obtained by the use of a duty calculated stability index. They call it





Stability curve

STIX and for KASALA it reaches a value of 18.8, qualifying our boat for cruise type “C”, meaning that the boat can sustain force 6 winds and 2 meter high waves and that in both empty or fully loaded conditions.

Insubmersibility:

As we see, this boat is practically unsinkable. However, flooding can occur, due, for example, to a severe abaft wave or two pailfuls of water. Then, it will be well-appreciated knowing that you can stay afloat even if all the cabin is completely submerged. In a small boat like this it’s always costly, mostly in space, to inject about a thousand liters of foam to comply with insubmersibility conditions. So, why not use mattresses to help us to accomplish this function? So we use an EVA closed cell foam for the mattress and attach them to the settee, and here we are! Flat on water, these mattresses bring 325 liters of buoyancy and, if we add the two central and rear buoyancy tanks (450 liters together) we can easily keep the boat afloat having more than 800 liters of buoyancy. If the boat sits on her side, cushions and their backs with 190 liters combines with the same watertight tanks develop an upthrust of 750 liters of buoyancy which is more than enough to bring the boat back on its lines. To achieve this result, we have, eventually, to block up the storage under the dinette settee and fill them with Styrofoam chips. But it’s still feasible and it will be a question of choice.

Accommodations:

Space is, of course, limited inside the cabin of an 18ft cruiser. One can find nevertheless all the necessary space for a small family to live on board for a few days. The “dinette” sits far forward, leaving enough space to stand up in front of the companion-way. This place will be dedicated for cooking with the cook’s head outside the hatch on sunny days or sitting on the ice box when the hatch is closed. The ice-box slides under the cockpit in a large drawer which supports the steps that give access to the cockpit. In front, a hollow wood cylinder carries the round sink and also serves to stiffen the keel casing. Inside this cylinder we find, in the bottom, the well and the bilge pump, and just above, the garbage bag. The fresh water foot pump is also attached here. Just above the sink, an alcohol gas stove (it’s also a cabin heater!) is fitted on gimbals, and slides on a vertical tube. The top extremity of this tube emerges onto the deck and is fitted with a threaded mandrel that, via an eye-bolt, allows the boat to be lifted with a shore crane.

The table is fitted beside the keel trunk. Two half panels can be raised or lowered to make a 42"x20" table. When these panels are raised, one can find underneath practical handrails that can help one to reach the forward access. At night, two other lower panels mounted with hinges can transform the dinette area into two large berths (32" x 6'6"). We find two other berths at the rear (23" x 6'6"). In the

middle, in front of the keel trunk, sits the portable chemical toilet. Beside the toilet stand two integrated fresh water tanks, with a total capacity of 45 liters. Even further ahead is the battery box. At night, all this front part makes a “V” berth of 4'6" in length and a bit more than 4' in width, where small children can eventually sleep. This front part of the cabin can be isolated for privacy with help of a curtain. The round hatch above the toilet and the four lateral ports bring a profusion of light into the cabin. Ventilation comes from an air diverter placed near the anchor pit but can also be deflected by the round rotating front hatch. Fresh air is brought all the way through the cabin to the rear. Battery compartment ventilation is also provided through the anchor well. There is a lot of storage under the berths and in the compartment above the battery space.

During ocean cruising, the raft could be placed under the cockpit behind the cool box.

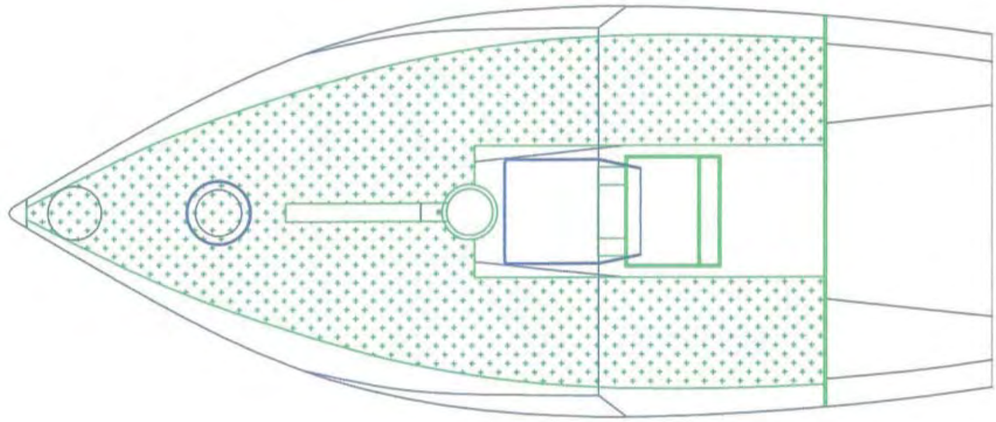
Navigation items, plates, glasses and kitchenware have dedicated storage on both sides of the companion-way panel.

Cockpit:

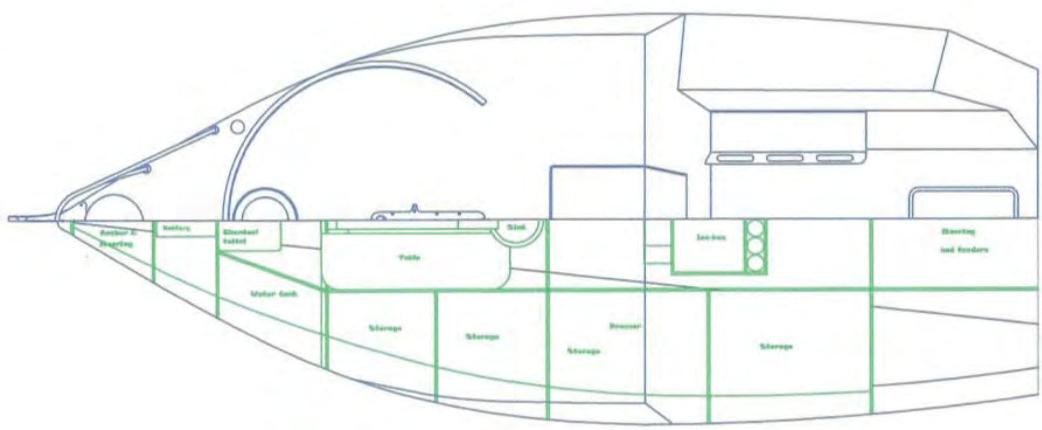
A six-foot long cockpit, totally open in the rear, invites the crew to swim or fish and is well-adapted for visits to beaches or for going ashore. When tacking, there is no boom ahead which makes it safer for sailing, especially with children. Two foot-rests at the bottom help crew to hike out. The ergonomic section of the cockpit allows the crew to rest, sheltered from wave spray. A 3" thick cushion made of EVA closed cell foam is attached to the gunwale and adds to crew comfort during long cruising rides. It also brings an extra 43 liters of buoyancy per side on severe heeling. We can find a large locker under the tiller for mooring and fenders and of course, an oar for sculling. There are no ropes or control lines in the cockpit.

Deck:

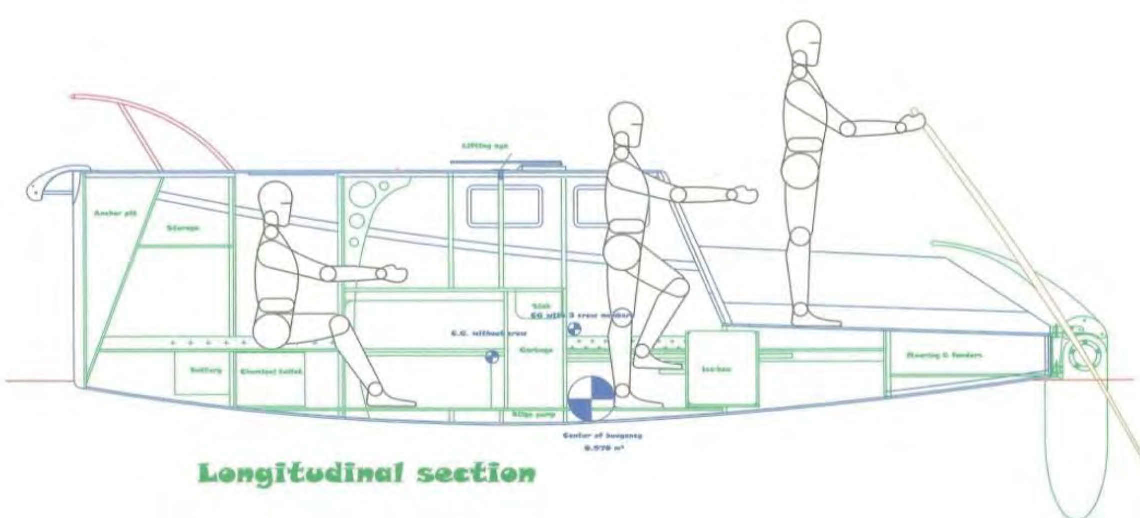
Access to the fore deck is strictly limited to mooring and fresh water filling. With the masts swinging from one side to another, this is not the safest place to be; and this fore deck is fully loaded with all kinds of stuff.



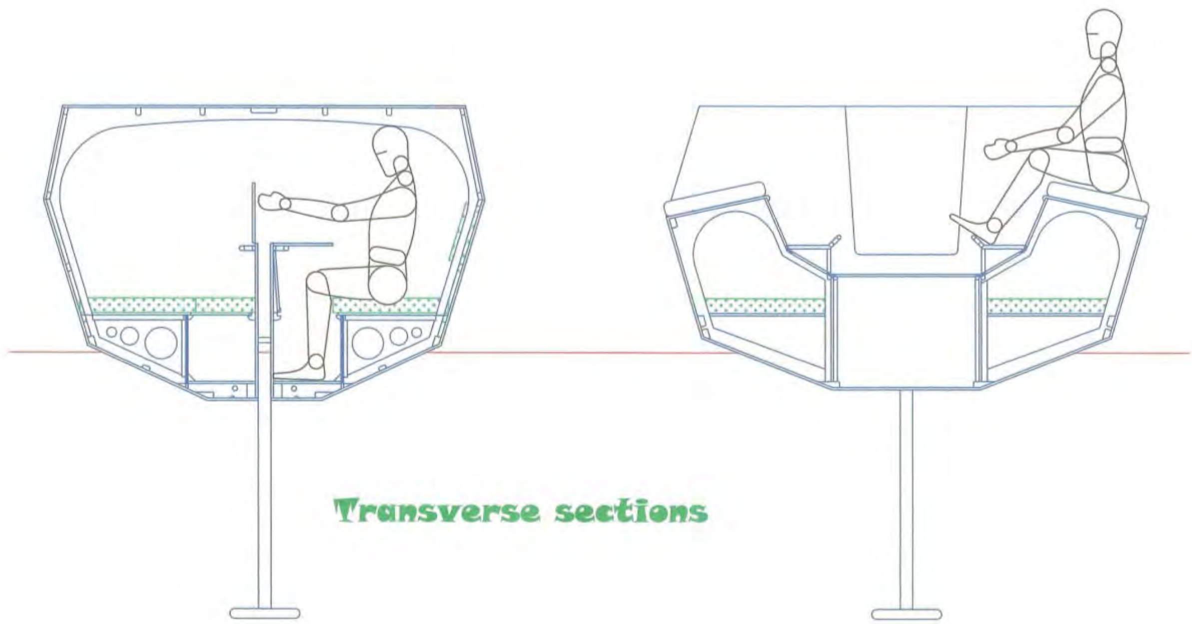
Sleeping arrangment



Deck layout and interior arrangements



Longitudinal section



Right forward, we can find a rugged bow roller, crowned by the pulpit. Just behind is the access door to the fore peak containing a special type of anchor, properly sized. It looks like a modern anchor weighing 14 lbs. This type of anchor has a minimum holding capacity (UHC) of 220 lbs which will allows KASALA to resist 40 knots winds at least. A center bollard is bolted on the front of the rail and the two filling plugs for water tanks sit on each side.

But mostly, the entire area of the deck is occupied by the circular rail that holds the rig. A continuous foot-rest surrounds the deck. We can also find two handrails next to the companion way hatch.

Auxiliary propulsion:

The dedicated auxiliary propulsion system will be Sculling. This efficient oar is perfect on a small boat with an open cockpit like KASALA. Studies, calculations, multiples tests and experiments conclude that a 9' long sculling oar with an asymmetric section blade can develop a static thrust

of 110 lbs. When not in use, the oar will be stored in a dedicated place, easily accessible, on top of the foredeck. For long cruising trips, a small motor can still be installed on a bracket on the rear transom.

Trailer :

KASALA is perfectly sized for easy road transportation and with a fully equipped weight of approximately 1600 lbs, it can be towed by a medium-sized car. A single axle trailer with a mass of 660 lbs is recommended. So the total towing weight should be around 2300 lbs.

KASALA can also be shipped in a 20' container.

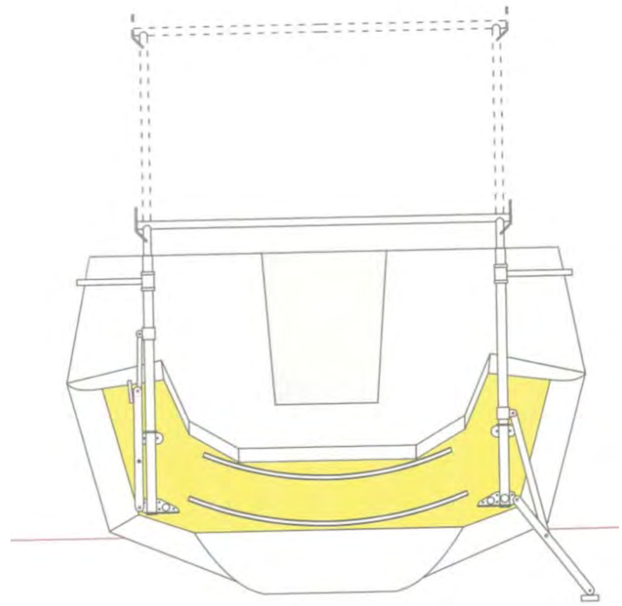
Shore up:

As we explained earlier, KASALA, keel up, can strand on her ballast. Yet we can improve stability by using crutches. Built with aluminum profiles, these devices are bolted on the transom. We can easily and safely raise or lower the support arms. This way, the boat sits on three points and there won't be any risk of damage to the lower chine. The mast holder slides into those tubular structures. In its upper position, it supports the mast when it is laid down, but it can also hold a tarpaulin in sunny days, shading the cockpit. Solar panels will also find a place on it. In the lower position, it serves as a guardrail across the back of the cockpit and two loops are fixed at the extremities for lateral safety guides.

Sailing equation:

With the calculation of all hull resistance forces, it will be possible to know what wind driving force is required to reach a certain speed. Attached, you will find a table that gives the curves of all calculated resistances. The lower curve corresponds to calculated value for wave and friction resistance. The second curve shows the same values increased by 30% to take care of all other kinds of induced resistance (front waves, viscous pressure, hull roughness, heel, etc.).

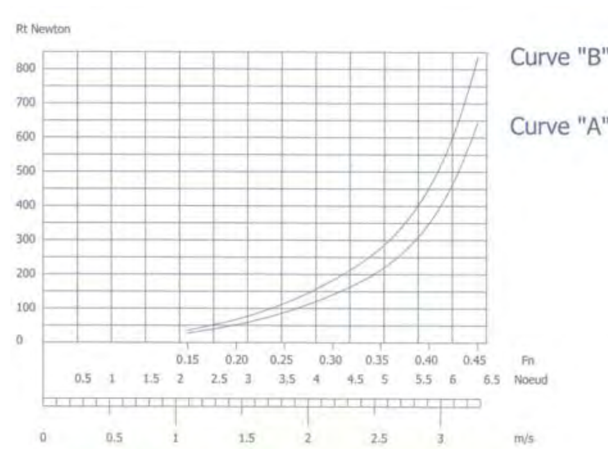
At a Froude number of 0.40, the boat speed will be around 5.6 knots and the total hull resistance is 455 Newtons. This speed will be reached before the wind with a true wind velocity of 8.61 m/s (force 4/5), at 6 m/s (force 4) on a beam reach and 7.6 m/s (force 4) close hauled at a reefing angle of 30° with three crew members to windward.



Crutches principle

KASALA and coefficients:

The use of specific coefficients should help in comparing different boats. In order to achieve this, all numbers should follow the same parameters, but this is rarely the case. For example, the displacement is often taken with no crew on board and with an empty boat. So this is a boat without batteries, mooring, head and all tanks empty. These are not real sailing conditions! The value selected for KASALA is a real value, estimated with three adults on board, half a water tank, an anchor and a battery in position, ready to sail!



Hull Resistance Curve

Even though we cannot compare boats, we can still verify if the boat we designed meets our expectations.

It then makes sense to explain all the numbers, what their purpose is and what their average value is for an 18 foot boat and how KASALA fits in the given range.

Prismatic coefficient: This is the filling ratio of the underwater volume compared to the area of the master width section multiplied by the length at waterline. There is an optimum coefficient for each LWL or each Froude number (v/√L). For a set length of waterline, when Cp increases, the critical speed of hull increases also. KASALA has a Cp of 0.6. This ratio is optimal with a Froude number of 0.4 at which point an 18 feet hull approaches planning speed.

Ratio sail area/wetted surface or ability of a boat to sail in light air. In light air, it's only the friction of the hull that makes the resistance; in other words, the wetted surface of the hull. But the more sail you have, the faster you go. For a cruiser of 18 feet, this ratio usually reaches 1.75 to 2.4 (2.4 is for light air sail boats). KASALA has a ratio of 2.13. With a 15° heel, we can improve this ratio to 2.23.

Displacement/length coefficient: This number represents the capacity of a sail boat to perform at medium speed. In the 18 foot fleet, such values can range from 0.8 for low speed to 1 for a higher speed craft. We obtain 0.915 with KASALA. The North American version of this coefficient is called the D/L ratio and it hits 171 with KASALA.

Length displacement ratio: It's actually the inverse function of the D/L ratio. This ratio compares the length waterline to the displacement. It tells us if the boat can reach planing conditions. 5.7 seem to be the attainable limit. Light sport dinghies are able to reach 7.5 or more. 5.44 is the coefficient for KASALA.

Performance coefficient: This is the ratio of the sail area versus the displacement. It will give us a good idea whether the boat will be lively or not. It will also show if the boat has enough speed potential to jump in a gust. For 18 foot boats, these numbers go from 13.4 to 18 for the more lively ones. 23.3 is the performance coefficient for KASALA.

Dellenbaugh angle: This is a good stability reference because it indicates the heeling angle a sail boat will reach close hauled with a wind speed of 8 m/s, nearly force 5. For the 18 foot fleet, the stiffer boat has a heeling angle of 19.5°, whereas the weaker boats reach 26°. As we seen, KASALA is really stiff and attains 19°.

To sum up, we can say that all these numbers are theoretical yet they give an idea of what KASALA is capable. Naturally, KASALA is not a racing boat, but it looks like a fast cruiser with good performances mainly in windy conditions.

Conclusion:

As one can see, much research was done on the design of this boat. All drawings are fully completed and the prototype is nearing completion. It was important for me to explain the different parameters I adopted and how all details were analyzed.

As I mentioned above, the kind of rig I used has never been tested at full scale. And, yes, we could be disappointed by the result. It's a possibility. I have named my boat "*Conundrum*", for this reason. There is a part of uncertainty. When you deal with a new design, it's never perfect at first glance and one can always find place for improvement. However, that's part of the game when you are a pioneer in something. My knowledge and background in mechanics, material properties, machining and technical skills in general, bring me enough confidence and maturity to resolve most of the technological issues that can be encountered, and that makes me optimistic about the result.

Yet it's true that I'm not absolutely sure about the "lead" distance, for example, (longitudinal distance between sail pressure center and keel center) because it was never calculated with such rig. I'm also concerned about the reaction of inertia of the mast in rough seas. However, there is nothing that one cannot fix. Cut or enlarge the rudder to recover the balance, modifying the rollers of mast holder, everything is in reach. It will just delay a bit the final achievement. Yet delays are better than disasters!

I would never invest this amount of my own money, time and energy in this project if I did not feel it were realistic. At least someone has to try it! So, I am trying! And it will be a great opportunity for me as soon as the unit will hit the water to collect all the data from the boat itself (and more specifically from the rig). It's really here that this project can bring a significant contribution to sailing science. There is nothing better than real polar curves and true data of speed and gain to windward to prove the validity of this design. There will be no place for speculation anymore.

Thus, the follow-up of the project is critical. It's easy to build a boat and it's easy to put some sails on and trace some wake in the water. Yet it's more critical to highlight that what you create can bring some advantages to our sailing community. It could also happen that the path you explore finally comes to a dead end. This is also science, and everybody has to know that that avenue is not viable. For sure, if you are interested with the subject, it will be an honor for me to share these future results with you.

Despite its originality, Kasala is a perfect boat for beginners. It is simple to build, handle and tow. With excellent sea-keeping properties, it is also easy to rig and has successful accommodation arrangements, suitable for a small family. The extra care taken in designing and building this unit in order to improve its efficiency, speed and reliability completes the portrait of a well-achieved unit that we hope will soon prove its performance afloat.

By now, you have almost completed the reading of this article, and I see a smile on your face. Did I convince you that this amazing rig can, one day, change something in our lives? Is it because you see the true potential of this innovation? Is it because you just understood that it does not concern the wardrobe of a tiny or even a mega yacht? Perhaps your smile is because you see a future bulk carrier propelled by a mimic sail arrangement? I will surely not go there. I think it's time to reveal the real performance of such a rig and what we can really count on.

Undoubtedly, AYRS can help me to bring to life this amazing project. "Videre usque, usque ratus" is engraved in the tiller of my boat, meaning "See far, think far" and that's the real soul of regattas but it could be applied in all life situations too. Thank you for your time and your patience and thank you also to the honorable Mr. Howard whose legacy can enable all this!

Alex QUERTENMONT
Naval Architect
Email :mertech@bell.net

Annexe1 : Cost analysis and forecasts.

You can find here my original cost estimates and also updated statements of expenses and of the amounts remaining to be spent. Presently, I have spent $Can21000 in the project. There remains approximately $10500 excluding the electronics.

Originally, in 2011, my budget was $30000. So the cost will certainly exceed my projections but not by much. I allowed $3000 /year of the family budget for this project. At that rate, probably in three years or so the boat can be launched but without having fitted the electronics.

If I have the chance to receive a grant of £5000 (± $8000) from your fund, it will surely help to speed up the process. That money will be used to buy all the costly hardware equipment and sails, and my personal investment could be applied for the remaining items including all electronics.

Timescale

Presently, I plan to launch the boat in 2020. Here is the schedule:

2017:	Install keel Fabricate & install mattress Fabricate rear masts holder and crutches Fabricate booms Adjust trailer
2018:	Buy and install hardware
2019:	Buy and test sails Buy all ropes, battery
2020:	First trial

Estimated pricing: KASALA 5,5 m - All prices in $Can

Items	Quantity	Description	Unit price	Est. price	Up datedcost	Status
Wood	30	Marine plywood	70	2100	3120	Complete
Wood	1	White pine, w.ash, BC fir	1000	1000	1925	Complete
Epoxy	1	Epoxy, paint, compound	3000	3000	2700	
Track	1	Circular track & travellers	2000	2000	350	Complete
Mast	1	Masts, booms, crossmembers	3000	3000	1400	
Sails	2	Main sails- 1 reefing line	1500	3000		
Hardware	1	Rope , blocks, pulleys	3000	5500	750	
Ballast	1	SS 2» sheet and machining	2000	2000	1555	Complete
Lexan	1	Main hatch-3/8 sheet & acc.	500	500	240	Complete
Equipment	1	Rear rectangular hatches	170	170	110	Complete
Equipment	1	Pulpit&railing	600	600	160	
Equipment	1	Round opening hatch	750	750	490	Complete
Equipment	4	Rectangular open ports	175	700	476	Complete
Equipment	8	Deck plate	13	104	45	Complete
Equipment	4	Air intake	30	120	90	Complete
Equipment	1	Bollard	88	88	36	Complete
Equipment	2	Cleat 8»	30	60	Stock	Complete
Equipment	2	Bow chock	15	30	26	Complete
Equipment	1	Bow roller	250	250	230	Complete
Equipment	1	Anchor and mooring	400	400	300	
Equipment	1	Main anchor hatch			35	Complete
Equipment	4	Fenders	50	200	Stock	Complete
Equipment	1	Bilge pump	100	100	75	Complete
Equipment	1	Battery	200	200		
Equipment	1	Battery switch			15	Complete
Equipment	1	Battery charger	200	200	110	Complete
Equipment	1	Electrical harness	100	100	550	Complete
Equipment	1	Portable head	200	200	155	Complete
Equipment	2	Water tank	250	500	260	Complete
Equipment	2	Deck fill 1½»			20	Complete
Equipment	1	Plumbing			160	Complete
Equipment	1	Round sink	100	100	80	Complete
Equipment	1	Cabin lights	100	100	60	Complete
Equipment	1	Electrical pannel DC	50	50	65	Complete
Electronic	1	Portable VHF	200	200		
Electronic	1	Radio CD player	200	200		
Electronic	1	Tridata	650	650		
Equipment	1	Magnetic Compass	200	200	160	Complete
Equipment	1	Alchol stove and heater	200	200	225	Complete
Equipment	1	Portable electrical ice-box	200	200	stock	Complete
Equipment	1	Fire extinguisher			65	Complete
Equipment	1	Foot pump	100	100	55	Complete
Electronic	1	Auto-pilot	500	500		
Equipment	1	Mattresses	2000	2000		
Electronic	1	Battery monitor	200	200	200	Complete
Trailer	1	Galvanized 1800# trailer	3000	3000	1050	Complete
Tools	1	Nails, screws and tools	3000	3000	3535	
Total				37770	20878	Complete

KASALA 5, 5 /18’ -- STATISTICS

1. Main particulars

Length overall:	5.50 m	18’
Water line length:	5.41 m	17’9”
Max. beam:	2.30 m	7’8”
Water line beam:	1.8 m	5’7”
Hull draft:	0.262 m	10¼”
Draft keel down:	1.367 m	4’5¾”
Draft keel up:	0.315 m	12” 3/8
Front freeboard:	1.238 m	48¾”
Rear freeboard:	0.395 m	15½”
Mast clearance:	7.25 m	23’10”
Full loaded Displacement:	980 daN	2160 lbs
Estimated trailer weight (fully equipped):	750 daN	1652 lbs
Ballast:	145 daN	320 lbs
Trailer towing weight:	1050 daN	2300 lbs
Wetted surface:	10.85 m^2	117 sqft
Head room:	1.39 m	4’ 6”
Stability at 30° with 2 crew members windward:	454 mdaN	3344 ft lbs
Stability at 30° with 3 crew members windward:	506 mdaN	3657 ft lbs
STIX:	18.8	
Possible navigation zone (CEE):	C	
Crew:	4 crew members	

2. Sail

Roto-duplex rig: 23 m^2 (248 sqft) sail area close hauled
2x main sail: 11.5 m^2 (124 sqft) - two reefing lines

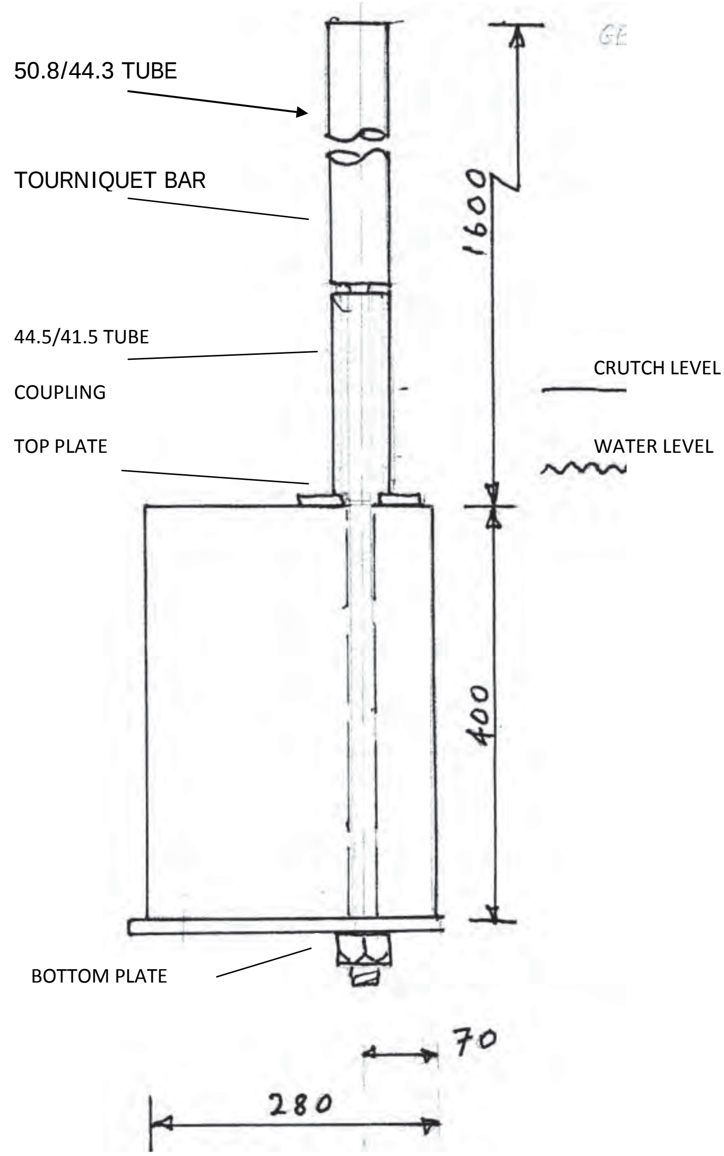
3. Coefficients

Prismatic coefficient:	0.60
Block coefficient :	0.384
SA/WS :	2.12 (0°) 2.23 (15°) 2.4 (30°)
Δ1/3 / 2L:	0.915
L/Δ1/3:	5.446
D/L ratio:	171
SV/ (D /1000)2/3:	23.3
Dellenbaugh angle:	19°

All ratios are at full displacement.
Because a boat is never completely finished, but always a project in development, all data could be modified at any time, without notice.

A Cardboard Blade for a Yuloh Oar

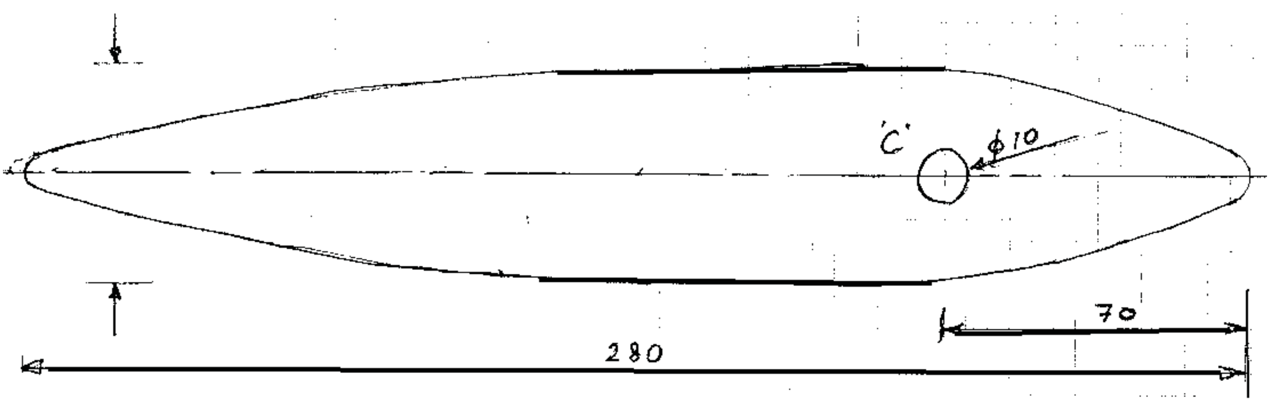
Mike Bedwell



EXPERIMENTAL YULOH PADDLE - GENERAL ARRANGEMENT
All dimensions in mm

Problem

While I have some 20 years' experience with my yuloh oar, I have had no basis for selecting the optimum blade planform for any particular craft in any particular environment. While my present discussion assumes the chord to be 280 mm – the same as my existing oar – the purpose of this note is to outline a design whereby both the chord and the length might be altered fairly simply, even if its strength may prove adequate only for experimental purposes.



Cardboard Blade, dimensions in mm

Constraints

The design should conform as far as possible to a number of constraints, among which there may be conflicts. The two most critical of these are that, as far as possible, the paddle should…. :

1. Be capable of having its blade area altered by using only simple portable tools, e.g. knife, pliers and two open-ended spanners to fit the nuts on an ISO862 standard coarse-pitched 10mm diameter length of studding.
2. When in use but not in the hands of the crew, be sufficiently heavier than the handle for the oar to fall into a near-vertical position.

My surprising hypothesis is that the best material for the bulk of the blade is corrugated cardboard, this being

i) Cheap and readily available
ii) Compressible in thickness, without alteration to its width and length.
iii) Once so compressed, sufficiently strong for its surface lift-generating role (c.f. The 'No Step' warning on parts of an airliner wing).
iv) Water absorbent, so is neutrally buoyant and so supports criterion (2) better than conventional materials, notably wood.

Structure

My second surprising hypothesis is that the blade components should be held together as a monolithic structure using internal cords under tension. The narrowness of the blade section make it difficult but not impossible to locate the cords near its surface; this is a limitation compared to the steel tendons in pre-stressed concrete with which my proposal might otherwise be compared.

As in concrete, one function of the reinforcement is to confer strength in bending, but more fundamental in my blade is the need to compress the cardboard components together. At one stage I considered achieving this by twisting the cord into a tourniquet, but a complication arises in using the tourniquet in any free-standing artefact, namely that its stability depends on tension, but not on the concomitant torsion. This we don't want because it would tend to shear the cardboard components apart.

Construction & Components

The above is intended to help understand how the oar should be built. The complete assembly is shown in the drawing headed 'General Arrangement' (Drawing 1) The materials apart from corrugated cardboard and a bought-out oar collar are:

1) Metal

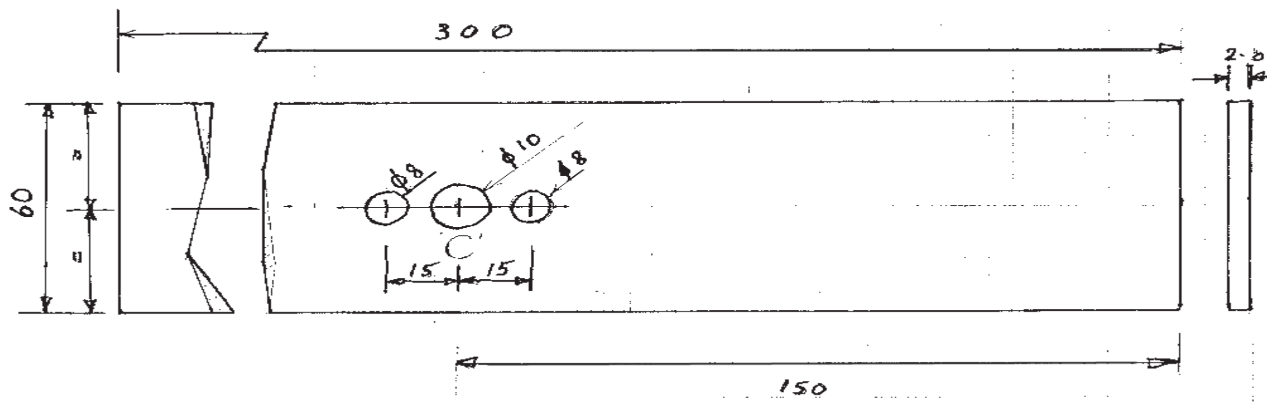
Two ISO standard-sized extruded aluminium alloy tubes.

The smaller tube of 44.5/41.5 diameter is 200 mm long and houses the 'Tensioner' shown in Drawing 2

The larger 50.8/44.3 mm diameter tube is about 1500 mm in length, and makes an interference fit over the smaller tube so constituting the oar handle; this can thus be removed for ease of carriage. The overlapping area of the two tubes is designed to coincide with the fulcrum (the oarlock on the craft), where the bending stress is greatest.

As shown in Drawing 4, the 'Tensioner' comprises

a. A steel stud of minimum 500mm length with a standard coarse-pitched 10mm diameter thread, provided with four or more standard hexagonal



Protection Plates, dimensions in mm

nuts, two lock nuts and a number of standard 10mm I.D. washers.

b. A machined 10mm-thick disc of O.D. slightly less than the I.D. of the smaller tube, pierced with four 6mm holes equi-spaced on a 14mm radius at 60º intervals. This provides the critical duty of transmitting the tension from the cords of the blade assembly through (a) to item (c).

c. A machined heavy-duty washer 10mm thick with its diameter compatible with the I.D.s of both tubes. This performs the critical function of sitting on the annular top surface of the smaller tube, so as to react the tension transmitted through the stud and disc.

2) Cords

As these will serve the demanding purpose of binding the other components in place, Kevlar boot laces are recommended. These are commercially available in lengths of up to 2600 mm and in a variety of colours. In the following section, we assume one red lace 1000 mm long and a second green lace 600mm long.

3) Cardboard and steel plates.

The drawing 'Blade Section' (Drawing 2) shows the shape used in my present oars, namely a standard aerofoil section in the range NASA 0010 to NASA 0015 with 280mm chord length. These are the dimensions I have used with some success both in my 2-tonne estuary cruiser Mercia Maid as well as in my current much lighter adapted catamaran, Tandem Yuloh.

Shown in that drawing is a 10mm diameter hole 'C', centred at the point on the chord 25% = 70mm back from the leading edge.

The drawing 'Steel Plates' (Drawing 3) shows three holes, one of which is 'C', and the other two smaller holes on either side. The purposes of these components are:-

First, to support Criterion (2)

Second, to protect the top and bottom of the blade, and

Third, and most importantly, to act as the cheeks of a cord-tightened 'vice' to uniformly compress the layers of corrugated cardboard.

Building Procedure

1).Using preferably thin metal sheet, cut a template to use for cutting the cardboard shapes. Cutting these is then a routine task simple to delegate ; at least 100 are needed in the first instance.

2) Make the three rectangular steel plates shown in Drawing 4. It is seen that these plates are of I.S.O. standard 2.5 to 3 mm thickness, and have both a length and a breadth greater than the template. The one that will form the top of the blade need have only the 10mm hole 'C', but for convenience it is suggested that all three should be identical and have all three holes.

To assemble:-

i) Pass the red bootlace through the two smaller holes in what will be the bottom steel plate, marry the two ends and pass them in turn through the single hole 'C' in:

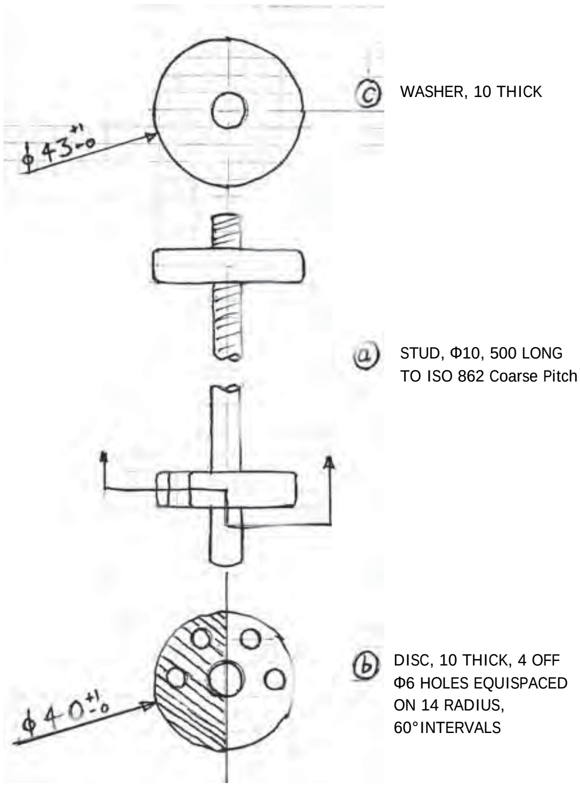
i) one of the other steel plates,

ii) all of the cardboard shapes, and finally

iii) the third, upper steel plate.

Then tie the two ends together to make a continuous loop slightly longer than the length of the assembly. Use e.g. a short pencil to prevent the loop disappearing down the 10mm hole.

Through this loop, next pass one end of the green lace. Pull this through sufficiently far to prevent its disappearing down the assembly.



Tensioner

ii) Now take the stud (a) and position the disc (b) at about its mid-point, using two hexagonal nut and their associated washers against what will be the lower side of (b).

iii) Thread the green lace upwards through one of the diametrically-opposite 6mm dia. holes in the disc, and then 'weave' through the other three holes so it points back downwards. Then pass one end through the red loop and tie into a second, linked loop. Adjust the lengths of the cords so that both are just visible from above the top steel blade.

iv) Ease the green lace to equalize the distance from the top of the blade to the disc on both sides; the object is for the lace to impart a purely coaxial tension on the stud.

v) Pass the stud up through the smaller tube and position the washer (c) about 50mm below what will be the top end of stud, again using two nuts and their associated washers to bear on the upper surface of (c).

vi) Tighten the nuts at the top of the stud to compress the washer (c) accurately against the annular surface of the tube.Take care to prevent twisting the two cords; the object is for the tube to come under perceptible compression between the washer at its top end and, the upper steel plate at its bottom.

vii) To protect the stud thread, at either end tighten together two nuts, one preferably capped.

viii) All is now ready to insert the assembly into the bigger tube. This may require using a round file to bevel its inside diameter, although there may now be sufficient barrelling of the 'tensioner' tube to permit a satisfactorily tight fit once there is complete overlap of the two tubes.

ix) Finally, secure a commercially available oar collar at a point along the overlap corresponding to the stern freeboard of the craft. To minimise drag, the top of the blade should ideally remain above the waterline throughout the stroke, though other considerations may compromise this.

The first experimental trial

Ensure your boat carries a pole or conventional oar against the possibility of failure.

As a precaution against dropping the trial oar, secure it with a lanyard to a point on the transom adjacent to the oarlock.

Position the oar in the boat so the collar is in contact with the inboard side of the oarlock

With luck, the oar will fall into the near upright position, although this may take time for the cardboard to become waterlogged.

If not, estimate what additional weight need be added on the bottom of the stud by way of additional nuts or steel plates.

Development

Almost certainly, the length of the blade will require changing, probably increasing. This will require some tedious disassembly and cutting of more cardboard shapes.

However, the opportunity can be taken to alter the blade planform to a tapered shape approaching that of the Spitfire, or indeed the blade of the marine propeller. This employs hydrodynamic theory immediately relevant to our cardboard blade.

Other suggestions are to replace the cardboard with corrugated plastic. This would both be more robust and allow more rapid penetration of water, so supporting design constraint (2).

Any comments? I hope so - I'd like to see my Tandem Yuloh going faster and with a bigger payload than just two people!

M Bedwell,
Submitted 7/11/2017

Tersancta – two octogenarians, three hulls and other reminiscences

Jean Elliott

"*Tersancta*" - thrice blessed – came into our lives as a result of hearing a lecture given by the Rev Clementina Gordon at an Amateur Yacht Research Society meeting in London, during which she described how she had built the boat herself in a disused hangar of Cox Marine in Brightlingsea, Essex. *Tersancta* was launched in 1968.

During the 1939-45 war, Miss Gordon and her brother, lately a professor of structures at Reading University, had worked on the construction of the Mosquito airplane, using the double diagonal cold moulded method. This method of construction was also used in the building of the gliders which landed at Pegasus Bridge in June 1944, then later still for the building of *Tersancta*. The original Hedley Nichols design had a serious fault which Clementina Gordon overcame by adding two very strong beams which held the three hulls firmly together. Happily they still do!

Miss Gordon sailed *Tersancta* on her own for some years mostly to France and to Scotland and the Isles, until she emigrated to New Zealand and *Tersancta* found a resting place on the tidal reed bed by the village of Landshipping in Pembrokeshire.

On January 1st 1978, we drove from Hertfordshire to Landshipping. Our first glimpse of *Tersancta* was not one to inspire confidence; she was lying in mud, a very rain-sodden and neglected trimaran. Ronald, my husband, ever the optimist, said "she has possibilities"! I couldn't see them, but was willing to be persuaded. At that time, we couldn't have afforded a seaworthy boat, so we had to settle for one which we could rebuild. Even so, I wondered what we would do for money!

And so we signed away most of our capital and *Tersancta* was ours for better or worse.

In the original wooden construction of cold moulded marine ply, resorcinol glue (one of the best according to the chief chemist of British Aerospace's guided weapons division) was used. Unfortunately Miss Gordon did not realise that woven fibre-glass does not bond reliably to wood, not does it fill the sharp-edged gaps between the adjacent plies. Consequently, when she came to clad the wooden hulls with polyester resin, rain water falling on the unglassed decks seeped into the gaps between the topside plies. This resulted in large areas of sheathing becoming detached, thus the old glass fibre sheath had to be painstakingly removed from the whole structure, and the gaps had to be filled with resin putty. Before re-sheathing with new fibre-glass, the exterior wooden structure had to be covered with a varnish to which polyester resin would bond chemically, eg: International's Universal Primer. This process only works if the polyester resin is applied to the varnished surface before it is touch dry; consequently, only about one square metre of varnished surface could be covered before the primer became too hard to bond satisfactorily. Warm dry weather was therefore essential, not an easy requirement given the uncertainty and vagaries of the Welsh climate. We devoted every spare moment, most weekends and holidays, to the task we had set ourselves. A long drive from Hertfordshire, where I was teaching and Ronald was working in the research department of British Aerospace at Stevenage.

Prior to 1978, we had sailed in chartered boats from the Solent and Devon to Alderney and France, as well as in Scotland from Oban. Ronald had sailed as a child, me never. At last after all those years, Ronald's dream of owning his own sailing boat, my baptism as galley slave and deck hand were at last to be realised.

Tersancta at Landshipping

After four years of hard work, in August 1984 we said goodbye to the friends we had made at Landshipping, especially the Rosser family: Mrs. Rosser, daughter of the last ferryman plying between Landshipping and the Picton Estate, and her large family, all of whom had been kind and tolerant of our comings and goings through their garden, and who kept a friendly eye on *Tersancta* during our absence. Bette and Geoff Cleeve and Viv and Mary Williams had also all offered us warmth and shelter in brief moments of relaxation. We are grateful to them all.

The O'Hara family of Pembroke Dock, Lannion Marine, gave us space to work on the boat in their boatyard and to have our caravan to live in there when working for longer periods of time during holidays from work and later retirement. The whole

Tersancata alongside Quai Charcot, Ouistreham

O'Hara family were all cheerful and always helpful, and not a little curious about this odd couple and their dedication to the task of restoring this unusual boat.

In July 1986, having received our SSR registration, we were at long last ready for our maiden voyage, destination Ouistreham, Normandy, to visit our daughter, her French husband and our two lovely grand-daughters. We had a set of Dover tide tables, the necessary charts, a compass, a log and a depth-sounder, but no radar, Decca or GPS, which were to come much later. This first voyage was quite eventful: we had no sooner set sail than the wind dropped and we were becalmed with French trawlers fishing in pairs causing us concern all night. Next day we were able to sail slowly across the Bristol Channel in reasonable visibility but not much wind, about force 3. That evening, off St Ives, fog descended and we were reminded by the charts that there were numerous wrecks in the area! Fortunately, just before Land's End, the fog lifted and we were able to proceed towards Newlyn.

At this point, we must confess to an error of judgement. In order to save weight, we had taken insufficient fuel to reach Newlyn in light airs. Happily, the friendly skipper of a passing trawler, Britannia, responded to our signal for help, and towed us from the Runnel Stone Buoy into Newlyn at 10 knots; it felt like flying! Next day, after buying more fuel, we rounded the Lizard without problem and spent a night at anchor off Durgan in the Helford River, then sailed to Salcombe in one go. Thence we made our way to France via a night passage across the northerly end of the Alderney Race, with Ronald on watch all of the time. To add to our troubles, more fog beset us off Cherbourg; however, a passing merchantman with a maple leaf on the funnel responded to our request for a position fix, then using full throttle we were able to avoid being swept eastwards past Cherbourg.

Next day, we sailed on, passing the historic D-Day landing beaches, and with the help of a position line obtained from the twin steeples at Douvres-la Délivrande, we finally made a successful landfall at Ouistréham where we were given special permission by a kind harbour-master to berth at Quai Charcot, the marina having refused us entry on grounds of width.

We made this journey every year until 1998; a special memory being when we sailed there to be present at the 50th anniversary commemoration of D-Day. In the marina there were many other British yachts including some veterans who had taken part the original landings in 1944. Everyone was expecting a high level of security, of course, but we were all outraged when we learnt that the Préfecture had decreed that only skippers of yachts would be allowed to cross the lock gates to be able to attend the ceremonies, leaving the crews and therefore some veterans stuck in the marina. Fortunately, our daughter and her fluent French rescued the day by pointing out to the relevant official that if all the crews were not given passes, the BBC would be informed immediately and would surely broadcast the less than impressive information to the world very quickly. Reason prevailed and we were all able to stand proudly along the canal bank and cheer as the Queen and the Duke of Edinburgh together with the President of the USA sailed up the canal aboard Britannia to Bénouville and Pegasus Bridge, recalling, as we watched, those momentous days of June 1944.

Naturally, we travelled by car to the area on many other occasions out of the sailing season, always visiting the Café Gondrée at Pegasus Bridge, the first house to be liberated there and now kept by Arlette Gondrée as a shrine to the Airborne Division. One year we were there to see the original bridge being removed when we met the actor Richard Todd and were able to drive him on a memorable tour. Firstly we went to Bénouville where unusually there are some British war graves in the civilian graveyard, twelve men all personally known to Richard Todd: one officer, one padre and ten soldiers who had fought during the battle that raged round the church. Next we drove Richard over the lock gates at Ouistréham to see where he had landed by parachute on D-Day, then on to the cemetery at Ranville where we stood at the headstones of many of his friends who had died during the capture of the bridge. During that same drive, as we were passing a small farm, he suddenly said: "That's where I had my 21st birthday". A most moving and memorable encounter.

Tersancta at sea
(Photo: Ellen MacArthur)

In this context, it is worth recording another incident from a much earlier visit by car. We were staying with our daughter and her husband, who at that time were living in a rather noisy flat opposite the railway line in Caen overlooking the main road in the days before the bypass was built. One afternoon, without telling anyone what he was doing, Ronald got up and drove off into the countryside for some peace and quiet in the direction of Carpiquet. Having noticed he had passed the entrance to a British War Cemetery and never having visited one before, he stopped, went back and walked in. Seeing the field of graves and wondering what to do, he decided to walk up the left-hand side to the third row and stop at the eighth grave on the right. Imagine his astonishment when he found that he had happened on the grave of his cousin John D. Elliott RA, who was killed in the pivotal battle of the crossing of the River Odon. He felt as though some hidden guiding hand had led him there that day.

We have naturally met many interesting people through our voyages on board Tersancta. Once, when we were tied up in Newlyn a very small boat came alongside and the very young girl skipper asked permission to raft up, which of course we granted and then invited her to supper. This young girl was in fact Ellen MacArthur nearing the end of her single-handed trip around Great Britain in Iduna. Tersancta may have been her first experience of a trimaran. We were able to lend her a chart, which she returned to us at the Royal Western Yacht Club in Plymouth. We still have the chart with her meticulously neat plots showing her route. The following day, we took photographs of each other as we were sailing across Mounts Bay, she on her way to meet the BBC in Plymouth, and us sailing on to Helford on our way home.

Tersancta spends the winter in Pip and Debbie's yard at Millbrook. Each summer we head for the Scilly Isles where we now have many friends, not least the harbourmaster of Tresco, Henry Birch and his daughter Lydia, Fi and Martin Nicole of Bryher, always friendly and welcoming, and we must not forget the cheery crews of Firethorn of Bryher and their interesting and exhilarating trips.

So at last to 2008, in April on going to Millbrook to begin preparations for this year's sailing, we were aghast to find our engine, a Yamaha 9.9, had been cut from its securely bolted fastenings. A replacement engine was ordered from Falmouth but unfortunately, on arrival it proved not to be an exact replica, thus necessitating much alteration and contriving for engine and steering to work properly. This was the second engine to have been stolen from

Off Britain Rock,Tresco, Scilly Isles

Tersancta, as was on another occasion all our safety equipment – life jackets, flares, etc. So we are truly fed up with VILLAINS.

In late August, at long last we sailed to the Helford River hoping still to make the Scilly Isles, but alas the weather was too poor and the outlook even worse, so we had to abandon our trip and make for home as soon as weather permitted, to lick our wounds and wonder if we shall ever sail in Tersancta again, as we are both in our 90th year! Maybe we shall, if our son takes over as skipper when he is back in the UK.

Looking back though, what enormous pleasure Tersancta has brought us over the past twenty-two years and over 15,000 nautical miles. Ronald was right, she did have possibilities!

POST-SCRIPTUM

After Jean's death in December 2008, Ronald continued to sail solo to the Helford River and the Scilly Isles until the age of nearly 92 in 2010. He died, still an AYRS member, in November 2017. This article was submitted by his daughter.

Mark Hillmann's Proa Project Update

I was delighted to arrive home after Christmas and find your kind offer of £1,000 for sails and £2,000 for a 3m model. I will certainly accept and am planning how a model can be constructed.

The proa was evicted when its barn was sold, so the hull is currently in our carport. Winter boat painting in a Cumbrian carport is not advised. Our house in Carlisle is now for sale and the completed proa float and mast have been delivered to Windermere. Somewhere we can float ashore when bits fall off. My sons may come and crew when our current yacht leaves England but seem reluctant to do performance testing.

I fully accept your reservations about testing: Early on I said that as a work project this would have a model followed by a small sailing version and then the full version.

The availability of the hulls as a kit and a barn 50m from the house persuaded me to jump straight in with a large version. If my various ideas are not successful they could each in turn revert to the original proa design. Knock down can perhaps be simulated on a mooring with a masthead rope taken ashore but all inversion testing will be easier on a model.

The weights and centres gravity of the proa parts have been measured and it was surveyed for this 3D computer model, although all measurements are approximate. They may be useful for model construction and the accuracy of my assumptions for weight, buoyancy and the distribution of both in various situations will be interesting.

This autumn our Mirror dinghy gained a telescopic mast and a wrap-round mainsail with a cambered panel jib, an initial version in rip stop nylon. Next summer with the holes in the dinghy repaired it can be taken on the lake for development. It is half scale to the proa rig.

Yours sincerely
Mark Hillmann

Brief Report on the AYRS Annual General Meeting

This is NOT the minutes, merely a brief summary.

There were only 18 people there, including the Committee!

The Minutes of the last meeting, the Chairmans Report and the Treasurers Report and Accounts were accepted.

Prince Philip, Mike Ellison and Dave Culp were re-elected as President and Vice-Presidents respectively; Graeme Ward, whilst resigning as Chairman, declined to become a Vice-President.

Fred Ball was elected Chairman, Kim Fisher as Vice-Chairman, but no-one was prepared to replace him as Hon Secretary nor to replace Slade Penoyre as Hon Treasurer (he having declined to continue).

This means we are short of two Officers (of the five positions)

In the meantime the Committee have asked Simon Fishwick to act both as de-facto Secretary and as Treasurer in addition to his elected post as Editor!

Robin Fautley will be re-appointed as Reporting Accountant, handling the niceties of company registration.

Discussions under Any Other Business centred on how we make AYRS attractive to potential new members. Various ideas were aired which the Committee will digest. Nothing concrete emerged.

The lack of two Officers is not a good situation. It puts a lot of responsibility and extra workload on the hands of Simon, who has enough to do anyway.

The Committee has the power to co-opt willing helpers without waiting for the next AGM, but we need those willing to step forward! How about it?

Contact Fred Ball, Chairman, tel: 0 1344 843690; email: fredball@ayrs.org

Catalyst Calendar

This is a free listing of events organised by AYRS and others. Please send details of events for possible inclusion by post to Catalyst, BCM AYRS, London WC1N 3XX, UK, or email to **Catalyst@ayrs.org**
For updates on events see https://www.ayrs.org/events/

March 2018

3rd - 4th RYA London Dinghy Show, Alexandra Palace London N22 7AY.
The RYA Dinghy Show is the only show in the world dedicated to Dinghy Sailing. It's a great day out for all the family and offers visitors the opportunity to visit the AYRS on Stand H24!

17th AYRS NW UK Local Group Spring Meeting, 2pm
Lydiate Merseyside
Contact: Mike Howard, email: ecotraction@aol.com

April 2018

20th - 22nd Sailing Meeting Coniston Water
Joint with Open Canoe Sailing Group; contact Mike Howard, email: ecotraction@aol.com

May 2018

21st – 25th Sailing Trials Weekend Portland and Weymouth Sailing Academy, Portland Harbour, Dorset UK
A weekend messing around with boats in Portland Harbour. For more details contact Norman Phillips email: wnorman.phillips@ntlworld.com

June 2018

1st - 3rd Beale Park Boat Show, near Pangbourne.
As before AYRS will have a stand and would appreciate small exhibits and displays and, of course, offers of help to run the stand. Contact: Fred Ball, email fredball@ayrs.org

9th 2pm AYRS NW UK Local Group Summer Meeting,
Contact: Mike Howard, email: ecotraction@aol.com

August 2018

11th Outdoor meeting, Winsford Flash Sailing Club CW7 4EE
Contact: Mike Howard, email: ecotraction@aol.com

September 2018

8th AYRS NW UK Local Group Autumn Meeting
Contact: Mike Howard, email: ecotraction@aol.com

TBA SW UK Area Meeting Wembury, Plymouth, UK
John Perry's house in Wembury, about six miles to the south east of Plymouth, will probably be the location for this meeting. For more details see https://ayrs.org/event/devon-meeting-2018/.

October 2018

13th – 19th Weymouth Speedweek
Portland and Weymouth Sailing Academy, Portland Harbour, Dorset UK. See http://www.speedsailing.com/ More experimental boat entries are welcome and wanted!

17th Speedsailing AYRS Weymouth meeting
19.30 for 20.00hrs, Weymouth Sailing Club, Nothe Parade, Weymouth, Dorset DT4 8TX. Contact: AYRS Secretary, BCM AYRS, London WC1N 3XX. Check the AYRS website before going just in case the location changes (unlikely)!

November 2018

4th AYRS London Area meeting
9.30am to 5pm, Thorpe Village Hall, Coldharbour Lane, Thorpe, near Staines
Bring your lunch - tea and coffee available. Donations invited to pay for the hall. Details from Fred Ball, tel: +44 1344 843690; email fredball@ayrs.org.

December 2018

8th 12.30pm AYRS NW UK Local Group Winter Meeting
Contact: Mike Howard, email: ecotraction@aol.com

January 2019

20th All-Day AYRS Meeting
9.30am-4pm, Thorpe Village Hall, Coldharbour Lane, Thorpe, Surrey .Tea and coffee available but bring your own lunch. Donations invited to pay for hall. Further details from Fred Ball, tel: +44 1344 843690; email: fredball@ayrs.org.

20th AYRS Annual General Meeting
4pm-5pm, Thorpe Village Hall, Thorpe, Surrey, after the All-Day meeting (see above). Agenda, Committee report and other papers will be posted in the AYRS Forum https://www.ayrs.org/forum.
AYRS desperately needs new Committee members, especially those with computer skills!
Contact: Fred Ball tel: +44 1344 843690; email: fredball@ayrs.org

Catalyst — *a person or thing acting as a stimulus in bringing about or hastening a result*

On the Horizon . . .

Nothing much really.

Would you like to write something?

Email it to catalyst@ayrs.org please.
Guidance notes are inside the front cover.

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