



AMATEUR BOAT BUILDERS' ASSOCIATION

June July 2013

THE MIGHTY MULTI HULLS — BOATS OR PLANES?

Ocean Racing Multihulls (Chris Davis reports)

Philippe Peche of "Sailforce" was our presenter for the June technical meeting, and what a fascinating meeting it was – I'll complete that story later.

Philippe commenced by explaining that his presentation was based around the race for the Jules Verne Trophy which took its name from the author of the novel "Around the World in Eighty days". The Jules Verne Trophy is the prize for the fastest circumnavigation of the world by any yacht with no restrictions on the size of the crew provided the vessel is registered with the Jules Verne organization and has paid an entry fee.

The trophy was first awarded to the first yacht that sailed around the world in less than eighty days. That was the 70 foot catamaran Commodore Explorer which, averaging 14.7 knots, did the journey in 79 days 6 hours 15 minutes & 56 seconds in 1993. The trophy has subsequently been awarded to the challenger who breaks the previous Jules Verne record. The winner holds the trophy until such time as his/her record has been bettered. Over the 20 years since 1993 there have been a total of 24 attempts, from which only 8 records have been achieved. The current record was set in 2012 by Banque Populaire V, a 130 foot trimaran, which completed the circumnavigation in 45 days 13 hours 42 min & 53 seconds.





A great deal of Philippe's knowledge had been gained from his association with the Jules Verne Trophy boating network over a number of years. This included his experiences as a crewman aboard the 110 foot catamaran Orange in 2002 when it broke the record with a time of 64 days 8 hours 37 minutes & 24 seconds. These achievements were always enhanced by the need to traverse all the great capes in the southern latitudes – Cape Horn, Cape of Good Hope, Cape Leeuwin etc.

The average speed across the circumnavigations has increased from around 15 knots in 1993 to nearly 26 knots in 2012. These boats go so fast that hitting debris and even fish can be catastrophic.



An ongoing point of interest or debate is the relative merit of catamarans against trimarans. Cats are better at holding on one hull but tri's can be built with the pontoons higher than the main hull which assists minimizing wetted total hull area. This was a key feature of the tri Geronimo which broke the record in 2004.

Another interesting feature of these boats is the huge size of EVERYTHING. Philippe related how on Orange II, a 130 foot catamaran that broke the record in 2005, the mast had a chord measurement of 1.3 metres. Every four or five days it was necessary to check the rigging which

entailed climbing up the mast (inside the mast) using suction cups which held onto the internal surface of the mast as you went up on the internal halyard (wouldn't want to suffer from claustrophobia would you!). On some boats the headboard on the mainsail is up to 7 metres across, held out by a batten that is almost gaff like in its configuration. The headboard car area is very heavily reinforced to carry the loads which occur when reefing. The size of these mainsails also results in a mainsheet load of the order of 20 tons. (possibly the normal ratchet block and a pair of gloves won't do the trick here!)

Philippe talked about some of the current trends in the large cats and tri's that are continually under development to break the Jules Verne records. Boats now have longer, narrower waterlines to stop hobby horsing, manual winches are being replaced by electric winches and sails are now covered in electronic tell tales that are monitored by one person who trims the sails. The standing rigging on these boats is broadly similar in construction to a stainless stranded wire but is closely woven carbon fibre which forms a carbon rod. The terminals are somewhat like Norseman fittings used on stainless steel and are bonded to the carbon rod ends. Boats generally have water ballast but in this case the leeward hull is charged to give momentum and the windward hull kept light to allow it to lift.

These types of boat are all about creating records and apart from the Jules Verne Trophy races, there is always a world speed record to chase. Until last November the trimaran Hyproptere had held the world sailing speed record of just over 50 knots for a nautical mile since 2009. This boat has foils and becomes completely airborne at speed.

And then there was a segment of discussion about life aboard on these huge flying machines as they circle the earth. All the food (about 800kgs on the boat Phillippe sailed on) is reconstituted with water being produced almost exclusively by water makers on board. There is very little carriage of water from shore supplies. Small treats are provided on a regular basis to keep up morale. The other major supply is diesel required for power generation to run winches and all other requirements aboard.



An interesting point of note was that the crew sleep feet forward with clothes in the bottom of their sleeping bags to manage the risk of injury as the hulls slam through the waves.

During long passages, the concentration required by the helmsman is extreme and each helmsman will be on only a 2 hour watch. The helmsman steers to the sail trim because adjusting the sails under the extreme loads present over a prolonged period will burn out the ropes very quickly. The centreboards are also used to adjust the balance of the boat. These boats tack fairly well without having to back the jib but a great deal of preparation is required prior to gybing as the loads on the big battens during this manoeuvre can lead to breakages. Navigation on these long voyages looks 3 days ahead and is assisted by weather feeds from shore based operators. And on board, the navigator and the skipper run two different software packages and compare results to ensure accuracy.



And like everything else about these boats, mishaps are generally big and expensive. Philippe indicated that masts are fairly fragile and a capsize usually results in mast and rigging breakage. When Philippe was on Orange in 2002, they hit a whale near the Falklands which opened up the front of the rudder which they had to carry from there to the finish. Hydroptere hit a large turtle in the South Atlantic and nearly capsized. Philippe was also aboard the 60 foot tri Foncia when it capsized off Portugal. It was slowly towed into port upside down by a large tug – not a cheap exercise before you even commence the rebuild.

The closeout discussion was about why this segment of sailing is so popular amongst the French sailing fraternity. In France, these boats attract huge public interest and the publicity that goes with it. They are financially supported by corporate entities that calculate their costs to be about 10% of what they would be if they were paying for direct advertising. In turn, this level of profile has led to the recognition of multi hulls in France that far surpasses that of multi hulls in Australia. This lack of recognition of multi hulls in Australia is particularly pronounced in regard to racing.

This was a very interesting night on a very different subject to the 'norm' for ABBA technical meetings. We thank Philippe for sparing his time to share with us so much of his knowledge and experience gained during his association with these unique boats.



Who Did You Say Has a Birthday Tonight?

What is that you have in those bags Peter? Even the unknowing main character of the story hadn't noticed Peter Leggatt quietly sneaking into the meeting with bags full of goodies. Out came the implements — the plastic gloves and the knife especially selected for the purpose — and in his quite normal methodical workshop like approach, the preparation began. Spring rolls and other delicacies still hot from the oven appeared on plates. And then the crowning centerpiece—a birthday cake cooked to perfection by the master himself (his first actually, but he is already expert at bread, rolls and scones) - and what a success that was. Everyone so enjoyed the treats that they then sang a hearty 'Happy Birthday'.

And by the way, yes, your editor, not one to over indulge in such occasions did reach the milestone of 60 years on the night. Some thought it should be fifty (generous souls). Indeed, from left to right the other two fine gents in the photo look only 60 and 70, but I understand that's not correct either!

Thanks Peter. Your generous efforts were very much appreciated.



June Toolbox Visit — A Visit to Doyle Sails

(John Bougourd reports)

Our Toolbox visit for July was a visit to Doyle Sails, which is one of more than 80 Doyle Sails Lofts worldwide. To save travel time and costs we visited the Doyle Sails in Fremantle.

It appeared that people who buy sails know what they want and what they are getting. Not like a car showroom with salesmen selling an aspiration and a shiny piece of metal; just a small counter and then you are on the factory floor where the sails are made. To make sails you need space.

The walls of the loft area were surprisingly cluttered with ropes, battens, sail materials, hooks for hanging up sails and tools leaving as much empty floor space as possible. Six sewing machines were lined up along one side of the room, then you turned around and there were another three!

Many of them positioned for specialised tasks, for example sewing the corners and at least one with its working surface at ground level and the operator sitting below the floor.

Our host Will Hammond started by sorting out the seating. He even pulled out a bagged up spinnaker that could be used much the same way as a bean bag. Spinnakers are comfortable to sleep in apparently, sails with battens less so. Will then asked what sort of boats we owned so he could tailor the talk to our interests. There was some variety, mostly cruising yachts which were mentioned by class and caused nods of understanding by our host.



Will explained that when he started in sails they were still using canvas/cotton and mitre cuts. Canvas/cotton sails were "sailed in" to stretch them to the correct shape. Presumably canvas/cotton racing sails would have had a very short life. They moved on to Dacron in which each panel is cut to a pre determined shape then sewn together to create the overall shape in the sail. The weight of sailcloth is also important. This is now generally measured in grams per square metre but previously it was the weight of 28.5 inches square for American cloth. Yarns per inch or denier per inch are also used.

Dacron is a brand name of woven polyester fibre or yarn - polyester being invented by ICI and Dupont at about the same time. Dupont still holds the trademark on the Mylar brand which is a polyester film and the most commonly known name for polyester. As Dacron was woven you were able to select the direction of the weave to maximise the strength of the sail. A CNC cutter, which we didn't see, was downstairs and used for the cutting out task. A vacuum table is used to hold the panels whilst the machine marks, then cuts, the cloth. This includes spinnakers that might have at least 70 panels.

Will also mentioned that taffeta was used in larger boats over 80 feet long. Since nobody asked, we presume it to mean the twisted and woven technique they often use on the fabric of wedding dresses. This goes some of the distance in explaining why 80 foot boats are so expensive. Anything made of wedding dresses will cost a fortune. Otherwise Dacron makes a great material for cruising yachts.

In the early eighties, laminates were developed using a polyester film instead of woven polyester fibres. Early sails ripped easily until someone had the bright idea of overlaying the film with polyester yarns or carbon fibre filaments using them directionally to match the loads expected in the sails. The cloth was lengthways (warp) orientated to maximise strength along the direction of expected load. Spinnakers now use tri radial construction, matching the cloth to the loads. Again shaped panels are used to induce sail shape.



Whenever anyone seemed to look perplexed Will would help out with a diagram on his white board.

The next development was an XY plotter laying out strands of polyester onto a film then another layer of film. These were then attached with heat and pressure to laminate them together. The panels are then cut to shape and hot glued together.

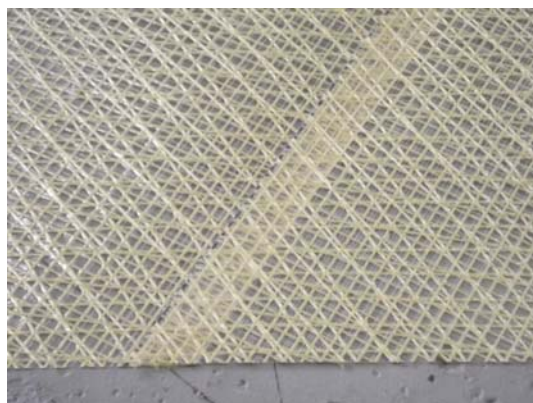
A Sydney loft developed a process where the sails are made up in a mould using vacuum bagging. The problem was that only one atmosphere of pressure could be applied. Doyle Sails use an advanced vacuum system combined with direct pressure rather than a simple vacuum system in order to increase the pressure applied to the heat laminating process. 3D and Stratis are two competing methods for 100-200 foot boat market. Laminating for Stratis sails are done at the Auckland loft. Will demonstrated a laminated headsail from a Foundation 36. It holds its shape no matter how much you tighten the sheet. He demonstrated how a change in sheet position can open the leach for heavy wind conditions.



The worst thing is to over tension the halyard and over stretch the film. When the sail breaks down, it is the Mylar 'windows' in the sail that break down not the 'reinforcing' yarns. Hence, allowing sails to flog will destroy them; they will rarely if ever blow out under wind pressure. Lamination failures can be caused by high temperatures and humidity. Other tips include; don't fold on same point and don't walk on them. Best to store sails below decks and out of the sun and don't dry sails in direct sunlight. The presence of diesel is also bad for sails as it weakens the glues, usually provided via a double sided tape.

Doyle Sails have a full time chemist in NZ working on glues, presumably with the window open and well ventilated. The overlap on the example shown was 60mm, but there was an 18mm

seam for a Kevlar Farr 70 sail on the loft floor. The stretch graph for different materials is 60%, 85% and 100% for polyester, Kevlar and carbon respectively. Kevlar is cheaper than it used to be and holds its shape longer. It makes it worth the approximately \$150 extra for a 20 odd foot boat to use Kevlar giving a much longer life and better performance.



Spinnakers used to be star cut but are now generally tri radial which hasn't changed in the last 30 years. The most common material is the hard to tear 3/4 ounce spinnaker cloth. There is also the choice of 1.5 ounce, which is very durable for cruising with stitching mostly used on spinnakers rather than glued seams.

After a short intermission with tea, coffee, biscuits and even some beer provided, we moved on to part two for the afternoon - Sail Handling.

The French obsession with single handed sailing has led to simplified sail handling becoming available to all. The best example of this is roller furling for headsails. Headsail furling causes very few problems except for the need to lubricate the head swivel. The main problem is adequately restraining the sails when furling and you are away from the boat. Sails and boats have been damaged from strong winds pulling a furling sail loose.

Mains have two main furling systems; one goes into boom, the other into the mast. The problem around Perth is that most sails are furling in winds approaching 25 knots when you've stopped racing or sailing and are going home. There is a higher risk of difficulties with 'in mast' or 'in boom' furling systems in these conditions. Stack packs as they are called with lazy jacks and slab reefing are a much safer and also a much cheaper alternative.

There are two main methods for spinnaker furling; one uses a torque rope where a Vectran rope coated with polyester and engineered to resist twisting, the spinnaker is wound up around the rope and the snake, as it is called, can be taken down and stored below. The other is spinnaker socks but these are being used less and less now.



Will then gave us an insight into a few of the other modern materials used around boats. Spectra is used in some specific areas in sails but used more in halyards. Carbon fibre now has a role in standing and running rigging as well as sails and many other boat components. Will showed us a very light weight carbon fibre spinnaker pole with non metallic composite plastic end fittings.



Despite all the modern technology, weight aloft can still be a problem. Modern materials can assist with solutions, for example a carbon fibre mast on a 44 footer is 90 kg lighter than its equivalent aluminium mast.

In closing, Will talked about sail making as a career. Sail making needs a passion, mostly a sailing background; there are no formal apprenticeships in WA as there are NSW and in NZ. Three or four sail makers here are using new technology so it's not just a case of cutting sails, there are technical skills needed that need to be learnt and mastered as well. This includes research and experimentation with solid sails which some suggest are the future direction. However, there remains many practical issues to resolve not the least of which is furling, stowage and the like.

On that note, the Toolbox afternoon came to an end. We thank Will for his very interesting presentation and for allowing us the opportunity to visit his premises and see first hand what he was so well qualified to talk to us about on the day.

ADMINISTRATION NOTES

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AUGUST TECHNICAL MEETING

The next technical meeting of ABBA will be held at the South of Perth Yacht Club as usual 7.30pm for an 8.00pm start on Wednesday, August 7th, 2013.

Our guest speaker for this meeting will be Aaron Woodall. Aaron is a professional shipwright and Director of AJW Shipwright, a business that he has established to specialise in modern and traditional fine wooden boat construction and ship's carpentry.

Aaron has generously volunteered to provide support to ABBA over the longer term by provision of presentations and a visit to his premises for a toolbox at an appropriate time when the projects current at the time are most likely to be of interest.

So this is the first of a series of visits that we hope to have from Aaron. On this occasion he has agreed to speak in a WA context on 'Timbers Used in the Marine Environment'. This will cover timbers, fixings, glues etc used in boat building both commercially and by amateurs — the what, where, how, why and when of it all. Future subjects include small timber boat building and small boat restoration.

I suggest that this subject is very relevant to many of us and it will be an opportunity not to be missed, to hear the full story from a true professional.

AUGUST TOOLBOX VISIT

The August toolbox visit will be on Saturday August 24th, between 2.00pm and 4.00pm (note that this is one week later than usual). This will be a visit to International Sailforce Pty Ltd, Philippe Peche's business at Unit 1, 18 Egmont Road, Henderson. In a practical workshop context, this will be an introduction to modern rigging, equipment and techniques.

Thanks to Harry Speight for once again arranging the Toolbox visit.

Its That Time of Year Again — MEMBERSHIP FEES NOW DUE

With the new financial year upon us, membership fees are now due. Subs remain unchanged at \$20 for the electronic newsletter and \$30 for hard copy. They are payable to the treasurer, Bruce Cadee, either at the evening meeting on August 7th or by post to him at 7 Fifth Avenue, Rossmoyne, WA, 6148. Please note that this will be the last newsletter to go out in posted paper format to non financial members.

VOLUNTEERS NEEDED to write up the toolbox visit for the next month.

Peter Leggatt has kindly volunteered to write up the next technical meeting — thanks Peter.

A volunteer is needed to write up the next toolbox visit. Please email me or let me know at the next meeting. Remember this is essential if we are to keep the 'boat' afloat. I've been doing at least one of the write ups myself for several months now and **MY BAILING ARM IS GETTING TIRED FOLKS.**