Cover photo above: SECRET SERVICE at full throttle and on its tip-toes in the Philippines.

Our Mini 40 experiments & developments

Ian Holt with David Burke

March 2019

INTRODUCTION

The photo that started it all for me – Mike Dann's Ghost Train foiling down the lake at Gosport back in the mid 2000s. I took one look at this and said to myself: *"I want to do that…….. "*

We have tried catamarans, we have tried wand-controlled T foils, we have tried unstayed una-rigs. We have achieved a top speed of 29 kmph recorded with a GPS tracker. We have capsized many many times. We have watched our trimaran cartwheel up the beach and over a fence. And we have had a tonne of fun!

We are lone multihullers in Perth (and Philippines) - everyone else here thinks we're nuts - so in the absence of any other rc multihullers in the region we quickly looked towards the challenge of foiling for entertainment, as opposed to designing boats to be quick round a conventional race course. If we had a racing fleet here, we would not be where we are now with our designs. I was inspired by a photo taken of Mike Dann's Ghost Train foiling at Gosport, and simply wanted to do the same but it's taken a few years to catch up with Mike!

I realise that restricting myself to a boat that fits within the Mini40 rules (max beam and length) might seem a bit unnecessary, but I like to work with a vision of how the concepts can be applied, and right now the Mini40 Class - or our little One Metre design - are the only places where I can see myself applying whatever we come up with. I did not want to create another class, as we have precious few rc multihullers around the world, so best if we all stick together.

To generalise, our hull shapes are nothing out of the ordinary. The maximum rocker of the main hull is just behind the mast, which on the Box is approximately half way back in the hull. On SECRET SERVICE the mast is slightly forward of halfway. However, nearly all our development work has been on the foils and the rudder, and how to locate and adjust them.

Left: My first Mini 40 – a Nightmare Mk VIII kit from rcsails that I built while working in Shanghai.

Above; the two culprits at Austin Lakes, Australia: myself driving and David Burke criticising. Clearly the instruction on the day was for blue uniforms.

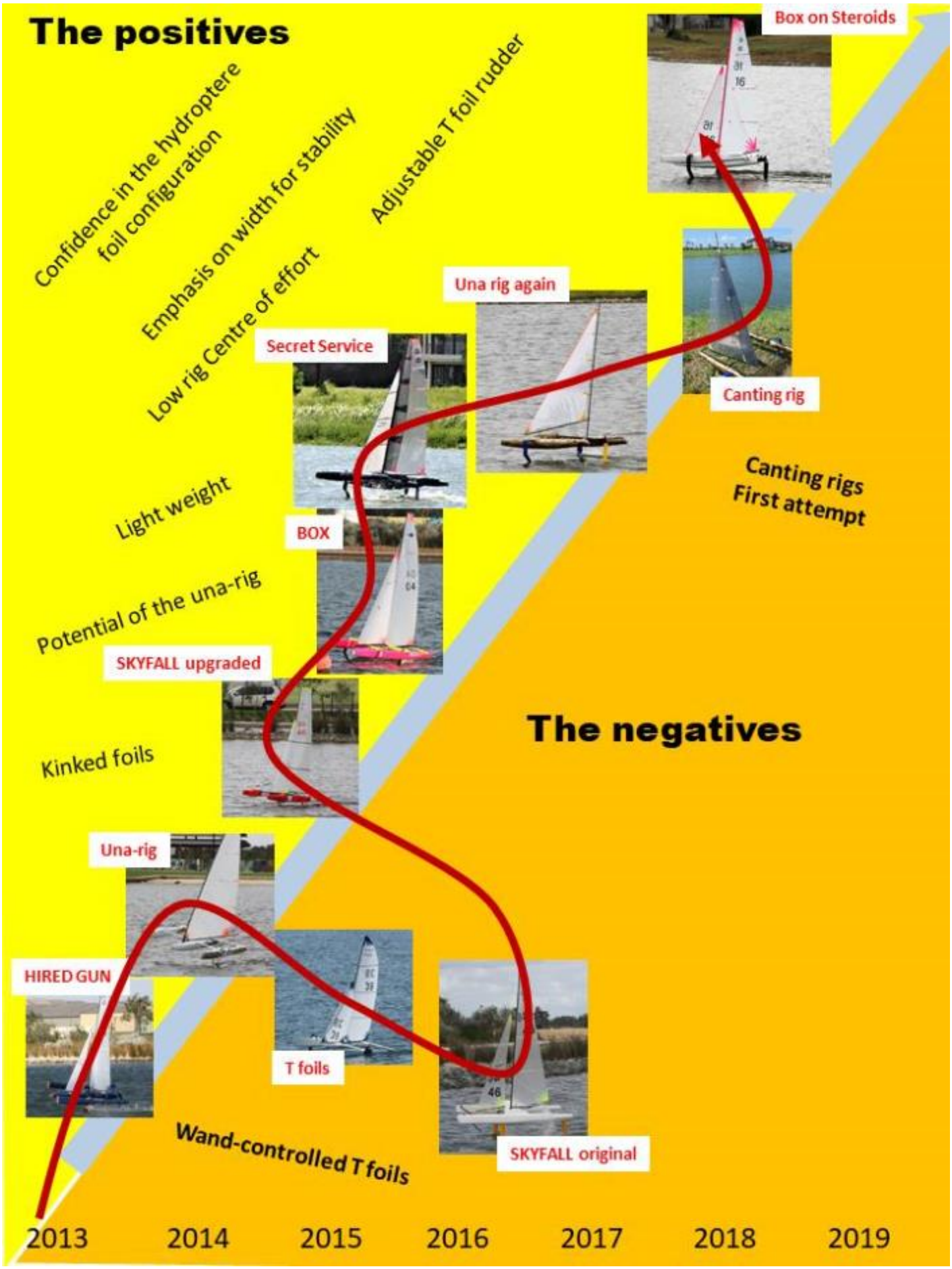
I am a Naval Architect by profession, with a BSc form Newcastle-upon-Tyne University, where the first words form the head of the faculty when we arrived were "if you have come here expecting to make a living form yacht design, you can leave now…."! With those words of advice in my head I spent the next 3 years racing Merlin Rockets at weekends while learning about anything not helpful for yachting during the weekdays. Graduating just as the British shipbuilding industry collapsed, I was lucky to move into the oil & gas industry two years after graduation and have been fortunate to see the word on the back of this career. In the 80s I briefly designed my own Merlins, and only took up rc sailing after a neck operation in 2003. My first boat was a lovely 6Metre, and my first ever rc race was at the 6Metre Nationals that same year, where I came last. Undeterred, I immediately ordered a 10rater from Peter Wiles and won my first ever 10r race, which happened to be at the Nationals that same year at the Round Pond in London. I still own that 10r, it is in a cupboard in an apartment in Volgograd. The cupboard is owned by my wife…. I became hooked on multihulls when I watched the America's Cup on the internet while working in Shanghai, and almost immediately, after some googling, found the famous photo of Mike Dann's Ghost Train. This photo changed my life!

I have put together a rough timeline on the next page of our experiments, successes and failures over the past few years as we have sought to improve our foiling rc multihulls.

You will see that whist we have dabbled with cats, our firm favourite is a tri, for two simple reasons. A) they tack more easily and B) when they go upside down the electrics stay dry!

Anyway, I hope you find some of the following of interest.

Left; with my current boat, the Box-on-Steroids in the Philippines


The positives
Box on Steroids
Confidence in the hydroptere foil configuration
Emphasis on width for stability
Adjustable T foil rudder
Low rig Centre of effort
Una rig again
Secret Service
Canting rig
Light weight
Canting rigs First attempt
BOX
Potential of the una-rig
SKYFALL upgraded
Kinked foils
The negatives
Una-rig
HIRED GUN
T foils
Wand-controlled T foils
SKYFALL original
2013
2014
2015
2016
2017
2018
2019

HIRED GUN – 2013

Above: Hired Gun flat out. Sails by David Potter in UK

After starting off with first a Nightmare Mk VIII and then a Firedragon from rcsails.com and "got the bug", I decided it was time to design and build my own Mini 40 trimaran, but with the emphasis on foiling. Hired Gun was the result. The floats were similar to the Firedragon concept – lots of buoyancy, especially in the bows – but the main hull was significantly smaller. I made the hulls over plugs and joined them along the centreline of the deck. Cross beams were 14mm stubs on the floats that slid into 16mm tubes bonded to the main hull. This needs an accurate jig to line up the tubes so there is no gripping due to a slight misalignment but the result is a boat that is extremely easy to dismantle for transporting inside a car.

However, the main change to the norm was the introduction of kinked foils. As far as I could tell at that time, all foils used on Mini 40s were in effect asymmetric rudders, slid into tubes fitted to the floats at 45 degrees to the vertical. This meant that the foils were joining the float hulls down under the inboard bilge line, so were considerably narrower than the maximum overall beam permitted. My idea was to fit vertical cases and have a 45 degree kink in the foil some 6cm below the underside of the hull. This gave some lateral resistance but also pushed the foils further apart, increasing stability.

Uncertain how to rotate the foils in the cases, I made a complicate slot in the case, and some short stubs in the vertical section of the foil. The foil was fitted from the underside of the hull, the stub engaged in the slot I the case, and a simple pin pushed through the foil at deck level stopped it falling out. The angle of the foil was controlled by screw adjusters on the deck.

The rudder and T foil were fitted so that the T foil was parallel to the waterline – no adjustment.

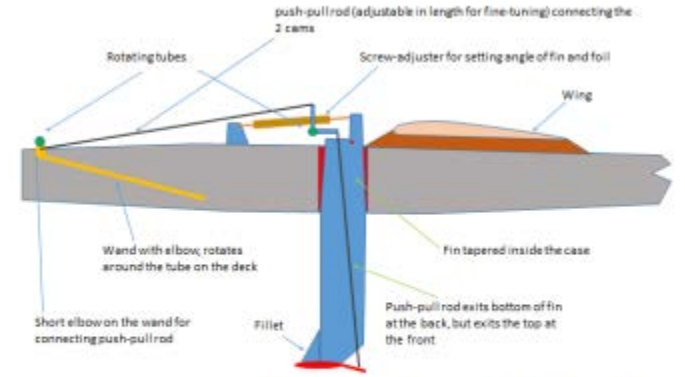
Hired Gun in its original blue paint job. You can see the large floats (similar to a Firedragon) but much smaller bow on the main hull. Sails by Andy Taylor in UK

The result was an instant success, the boat started foiling within 5 metres of launching, and we knew we were onto something interesting. It was a really successful boat and changed our whole concept regarding what we thought a Mini 40 should look like. For 2 years I sailed this boat in Perth and had a load of fun and in fact I still have this boat in my garage in Perth.

SKYFALL - 2015

Skyfall, foiling, but not as we expected it! Heavy and slow. Complete with T foils on the floats and big wands up in the bows

July 2015, and I now had the support of Dave Burke in Mandurah, an hour's drive south of Perth, who I first met when he offered to repair Hired Gun after a minor collision one weekend. We stayed in touch and together we decided it was time to try something different. Our definition of "different" ended up as a single cross beam the shape of a plane's wing, and wand-controlled T foils under the Floats. Simple……



1. wing needs to be immediately aft of the fin case. The further forward it is, the better it will be able to produce lift
2. Note: On main hull, the front of the mast box should be 55cm from bow
3. Mast box should be 3.5cm long fore-aft at deck level
4. Rudder stainless steel shaft is 5.5cm in diameter

Different it certainly was! The single cross beam was far too heavy and the wands did not appear to control the foils, they had a mind of their own! We had no idea when or why it might foil when sailing. It was also extremely slow. I tried a number of different wands – stiffness, length and surface area – but the result was always the same, unpredictable foiling behaviour. Another problem with adjustable T foils is the drag from the links attaching the push/pull rod to the T foil, plus you have double the surface area

under water when not foiling, plus the design and construction of the pivot mechanism itself. After a few weeks of trialling we decided that this was a miserable failure, so out came the saw and the wing cross beam was history, replaced by simple permanent 16mm cross beams, with an overall beam a little bit less than the maximum permitted so I could fit it inside my jeep. The T foils also went in the bin and in their place came some conventional (by our standards) kinked foils, slightly smaller than those on Hired Gun. The result was a nice boat that performed very well in light to medium conditions

SKYFALL with its original components

With the exception of SKYFALL in its original setup, all our boats are using the simple fixed hydroptere-style (or "V") foils, in a fixed position while sailing, and only adjustable when n the shore. We realise that this is not the ideal, but we are a firm believer in a simple setup, with minimal electronics. This concept has its limitations, especially when sailing upwind, but for a fun boat just for foiling around the lake it is hard to beat.

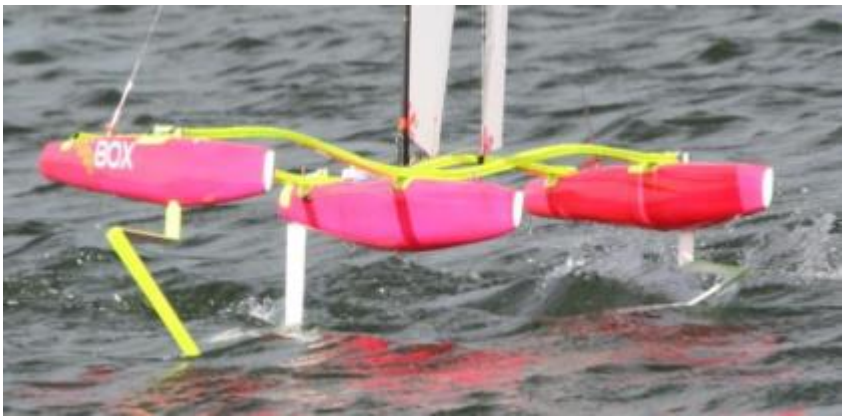
Above left: SKYFALL rebuilt with simple fixed cross beams and V foils. Very nice boat to sail in light to medium conditions. Sails on it are from Heinz Bohn in Germany.
Above right; HIRED GUN and SKYFALL.

BOX – 2016

Above and below. The prototype Box. Instant success as soon as it hit the water

Above left: A Box sailing with our "Z" foils, which made a significant improvement to performance in a breeze. Above right : a Box drying after painted, destined for New Zealand.

The "Box" One Metre started off as a little experiment to see if we could get a smaller tri to foil, and since everyone knows the one metre IOM class we decided to make it one metre long by one metre wide, to fit in a "box" one metre long, hence the name. The idea of a smaller boat came from all the frustrations of transporting full size Mini 40s inside cars and scraping the interior lining. So Dave got out some wood one afternoon and knocked up two hull plugs that "looked right" and we were in business. So now is a time to make a confession. We have no hull plans for any of our boats! Each boat is an iteration from the previous, and Dave makes wooden plugs for each design (or concept). He has a natural eye for doing this, and it is faster for him to make a new plug than modify and existing one. As a result, we have racks of wooden plugs in Mandurah! But for the Box Dave made moulds for everything: the hulls (left and right), and the cross beams which are made in two parts out of carbon – a curved upper surface and a flat bottom section. The Box hulls are made from fibreglass to reduce costs, the intention being to produce a "sports" boat that would be great fun to sail when the wind was up. Somewhat to our surprise it not only foiled but performed really rather well. We gained confidence in what we were doing with this boat and decided to make it available to anyone interested and to date have sold 8. We are pleased with this boat, it's a lot of fun and almost as fast as the Mini 40 in the right conditions. Naturally we soon started to look at how we could make it better, and since width has a significant impact on power, stability and hence speed, we soon developed our next line of foils, as Dave worked out how to construct "Z" foils that increased the distance between the lifting components of the foils dramatically and really helped foiling in a breeze, but their design meant that the boat had a lot of drag when not foiling, as the horizontal part of the foil was underwater when displacement sailing.



Above: A Box sailing at Champion Lakes, South of Perth
Below: the secret archive…. part of Dave's inventory of wooden hull plugs…….


02
03
BOX

SECRET SERVICE – 2017

Above: SECRET SERVICE sailing in the Philippines, 2018. The sails are my early attempts at sailmaking. I still have a lot to learn. To date I have been concentrating on lower aspect ratio rigs with larger jibs compared to the popular rigs in the class. The downside is I need more rig tension to keep the jib luff tight

In 2016 I started work in the Philippines and for a year struggled to find either anyone else interested in rc sailing, or even a venue. Then I struck lucky by tagging along with some fast electric rc boaters who managed to get us access to a private lake where some gas (petrol to us Brits) boaters were playing every Sunday. This opened the door to a nice sailing venue, complete with onsite rescue services in the form of a canoe operated by one of the ground staff and a water depth of just 4 feet so you could actually walk across the lake if needed. So, with SKYFALL sold it was time for a new boat, and thus SECRET SERVICE was conceived. Up until then we had made no consideration for a boat that dismantled for international travel, but the need to get the boat to the Philippines – and maybe back to Australia later - changed that. Dave developed a small flange setup on the decks of the hulls and using cut up BIC biro pens as compression struts inside the cross beams, we had a system for bolting the cross beams to the hulls. After a few trials, I developed

Above: Dave with SECRET SERVICE before shipping it to the Philippines.

some forward-raked kinked foils that work like a dream on this boat and have so far managed a top speed (with GPS tracker on board) of 29kph. Not only are they forward raked, but they have two components to the lifting foil section. The upper part is at 45 degrees to the vertical, but the lover section is 35 degrees to the vertical, thus reducing the rate at which the boat rises as boat speed increases. SECRET SERVICE was also the first of our boats to use what we call the "mini z" foil. After exiting the case, the foil then kinks outwards to get to maximum beam before then adopting a lift section.

I have also been teaching myself how to make sails, with the emphasis on low aspect ratio rigs to keep the heeling moment as small as possible. The luff on the #1 rig is only 1700mm compared to luffs of up to 1960mm in Europe.

Above: SECRET SERVICE with its #3 rig up. And yes, this is the same rig (mast and sails) as shown on the first photo of Hired Gun in this article. This David Potter suit of sails has served me well!
Below: you can see here the mini z foils we have developed, taking the foils out to the maximum beam

Above and below: SECRET SERVICE in full flight using my #2 rig.
Also the best recorded speed to date, 29kph

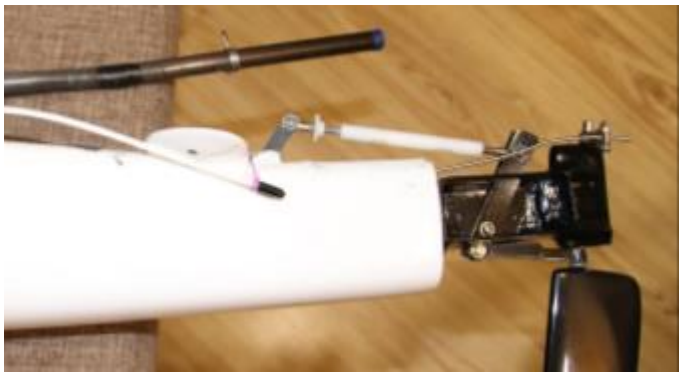
Above: A SECRET SERVICE destined for New Zealand. You will notice that the floats on SECRET SERVICE are not symmetrical. The inboard side is almost flat.
Right: A SECRET SERVICE with mini z foils
Below: who needs a mainsail? Foiling with the mainsail flogging

Above and below; lining up a SECRET SERVICE in the jig for its cross beams to be fitted

BOX-ON-STEROIDS - 2018

Above; The new Box-on-Steroids (BOS) foiling in light winds with its #1 rig up. This rig is smaller than the maximum allowed under the Mini 40 class rules but is as big as I dared put on such a small platform. Sails by David Potter.

While I was busy sailing SECRET SERVICE, Dave back in Australia was studying the Box One Metre moulds and photos and suggested we have another go at this boat, making it more competitive. I had been experimenting with a Mini 40 cat in the Philippines – mainly to see if the grass was greener on the two-hulled side of the fence - and had designed to be only one metre wide but have foils that stuck out transversely from the hulls, not vertically. This made constructing the foils something of a challenge but the concept worked, though it needed a change in thinking on how to adjust their angle of attack. It also meant that there was no case in the water, reducing drag. This new foil concept really opened the door to apply a sports package to the little Box One Metre and we decided to have another go with the smaller tri. We then had the crazy idea of a bolt-on gantry on the back of the boat to push the rudder further away from the foils to improve stability when foiling.



Left: The rudder gantry Dave designed for the BOS. The rudder pivots at the bottom while the rudder arm is at the top, minimising any change in steering geometry when the rudder is raked for or aft. Levers take the linkage below deck to a linear servo. Fine adjustment of the basic setup is via the screw adjuster between the two levers .

The foils are fitted inside rectangular transverse cases, installed just below the decks of the floats. They are set up with screw that can adjust the take and the toe-in and toe-out of the foils. Then we had another idea – let's start adjusting the rake of the rudder (and hence the T foil) while sailing. This became a reality when a googling exercise found the Actuonix linear servos in Canada, perfect for our needs, and so we had a plan. I modified SECRET SERVICE to test this idea in the Philippines while Dave was turning all these ideas into reality on Australia. Just to complete the picture, the hulls are now made from carbon and Kevlar reducing the weight of the Box by some 600gms, and the winch has been moved forward of the mast to compensate for the extra weight of the gantry at the back end. We are extremely pleased with the end result; a lightweight small tri that is much easier to transport (in a box or one piece in the car) that has better light wind performance compared to SS. And with the right rig in heavy winds (ie very small!) it is fast. Being able to adjust the T foil rake while sailing is a great help. Once the boat is up and

foiling, I reduce the T foil angle of attack, letting the bows drop and hence reducing the lift from the main foils. With less angle of attack the drag is less and the boat speed increases.

Above; now you can see why we have a deep rudder…..

The goal is to offer an all-round multihull that can be raced competitively in any wind strength, on a slalom or upwind/downwind course. We are currently trying different foil sizes to find the right combination for a round-the-buoys race course , and so far see no need to have main foils that can be adjusted while sailing. It will have its weak spots: In top end of #1 rig conditions, upwind it will suffer compared to Mini 40s with longer hulls, but maybe we can come up with another cunning foil concept to overcome this…..

To be continued……

FOILS – bit of a recap

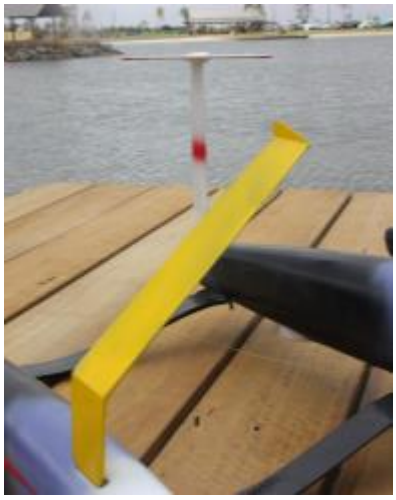
This is a bit of a recap of the developments that supported our progress with the new boats, described above. As we see it, we are still at the "Wrights' Brothers" stage - we have got airborne but have a long long way to go yet. We have two significant issues to overcome:
1/ Foiling upwind is very difficult (but not impossible)
2/ falling off the foils when foiling at speed

Our experience of rc boating makes us firm believers in simplicity. The fewer moving parts (and definitely as few electronic bits as possible!), the less chance of breakages! Wand-controlled foils will one day come (back) to the class and to date I have been most impressed by Michael Scharmer in Germany and his trials with wand-controlled foils on his cat but he has to reduce his cat's overall beam to make the foils fit inside the Mini40 max beam rule before he can contemplate using them in races. I believe that his new boat this year will be maximum beam so maybe he has discarded the T foils for now.

A couple of people are looking at installing gyros, as used in rc helicopters, but I am cautious about adding a lot of electrics to the boat. So we have retained our faith in the “hydroptere” style of foils that create a V. It’s a compromise but we think there is still room for improvement.

Until very recently, the angles of the foils have all been at 45 degrees, and there was no sweep-back or sweep-forward. We recognise that wand-controlled or gyro controlled foils would potentially make a more efficient foiler but based on our experiments, we find that fixed foils give us more hours flying with less breakages - in fact none of our foils have broken (touch wood). So we rely on beam of the boat - or the distance between the front foils – for our stability.

I have included here some photos of the different foil concepts we have experimented with.



Far left; Box foil with vertical tip

Left: Foils for my SECRET SERVICE

Above: U foil for my SECRET SERVICE

Our foils are asymmetrical. The shape was initially dictated by our ability (or lack of ability) to make them, and a few years back were quite thick in section, up to 9mm. These worked just fine, and gave us speeds in excess of 20kph. But - thanks to Dave's creativity - we are building thinner foils now. We use asymmetric because we want lift, with minimum drag.

Our foils are all shaped in a similar way. Flat on the underside, a relatively sharp point at the leading edge and as sharp an edge as we can make on the trailing edge. We have tried the more blunt leading edge of the NACA profiles but have not found them to work for us, and the flat underside is obviously a lot easier to construct. The foils start with a front-to-back dimension of 5.5 or 6cm , and then taper down to 3cm, with a lifting surface length of proximately 25cm. some of our foils are a constant 45 degrees to the

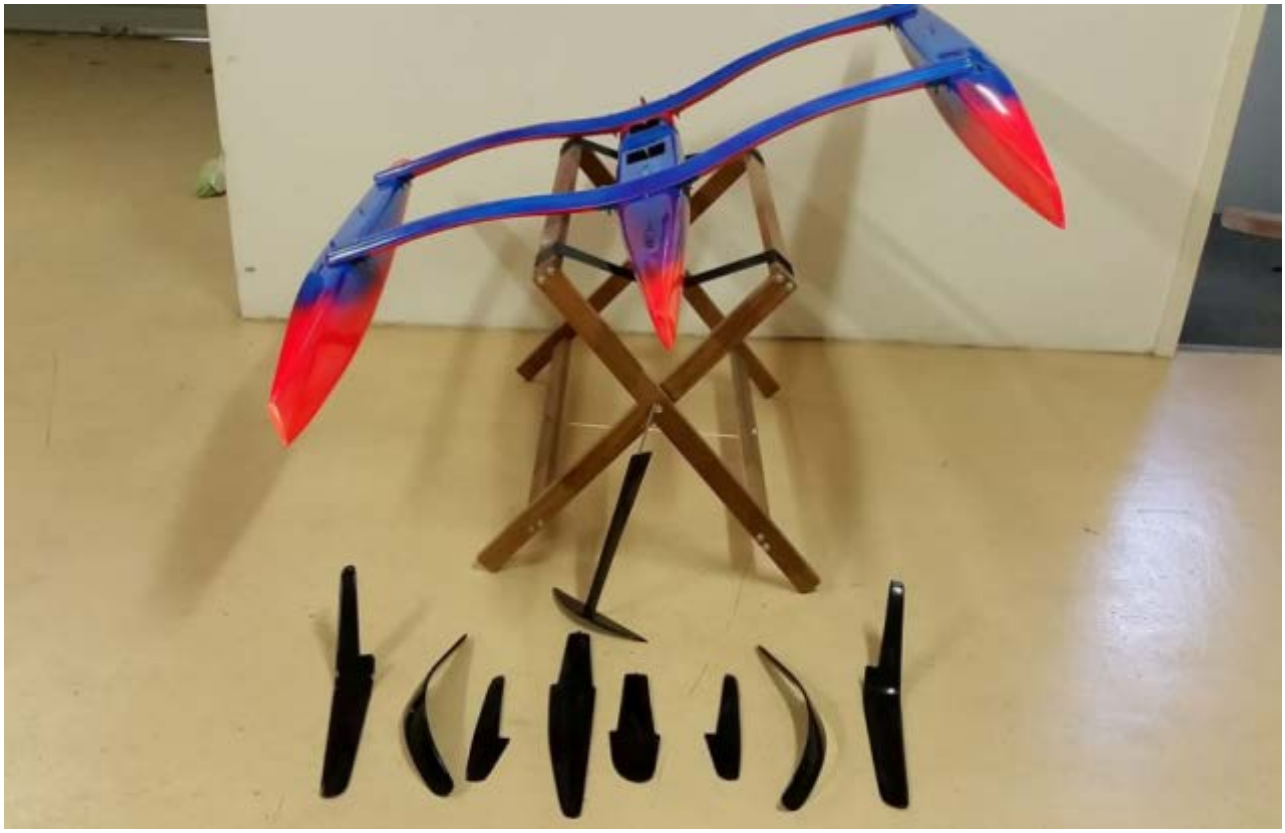
Above: the mini Z foil that we use on the SECRET SERVICE to get the foils out to the maximum beam

horizontal but on others we have tried a two-part foil, the upper section at 45 degrees and the lower section slightly more vertical, the aim being to reduce the rate of rise of the boat as the boat reaches a speed where the lower section of the foil is all that is left in the water.

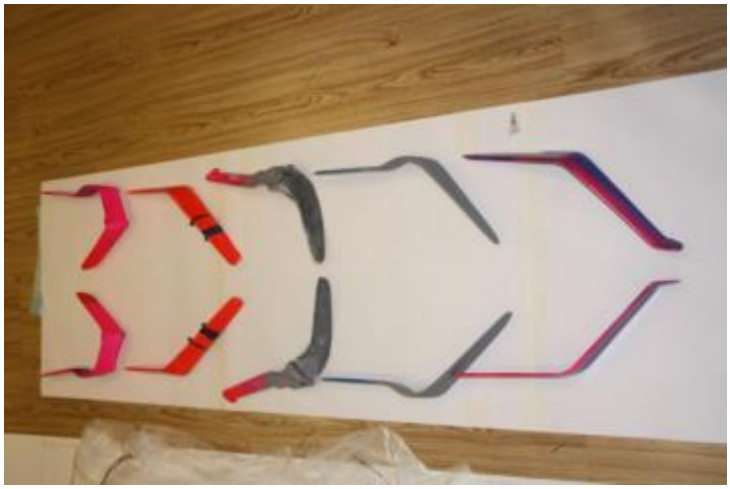
The section of the foil typically is about 7cm at the top, tapering down to 3mm at the tip.

Our foil system looks relatively crude but we have found simplicity always wins at the end of the day. There is no pivot point for the foil. It simply slides in from underneath the hull, has a pin to go through it at deck level to stop it from falling out. The aft edge of the foil at the underside of the hull protrudes back against the hull, stopping it from rising up. The foil "rotates" by simply rocking inside the hull rotating about the bottom back edge of the case. The case is tapered, with a smaller opening at the bottom than at the top. A screw adjuster on the deck controls the angle. There is slop in the system but since the water pressure is always pushing the foil back, this is not an issue when sailing. Initially we made complicated cases with notches in the bottom to accept a small "peg" that went through the foil to help with pivot, but then we realised that this was unnecessary, and fiddly and time-consuming to make. And if they twist a bit because of slop in the case, it's only the vertical section that is affected, and this will produce a bit of lift to windward, no real harm. The biggest pain is the very small screws that the screw adjusters are supplied with. Very fiddly to take on and off, and I always do this in an area with a concrete base - such as a road - so that when I drop them I can find them again. I have lost too many in grass.... To be fair, these screw adjusters are made as compression struts for main boom kicking straps (vangs) kits so they were not meant to be undone every time you go sailing.

Below: A SECRET SERVICE complete with a variety of foil configurations to test



Below left; some more experiments.
Below right; every so often, Dave will disappear for a few days and then announce that he "has made something". His up-out-down-and-under foils were just such an example.



THE RUDDER T FOIL

Until recently we made our boats with a rudder that we could adjust the rake when on the shore but not while sailing. Last year I heard that some people were looking into have the T foil adjustable when sailing but I did not see the need for this - the stern always follows the bows if the angle is right. I was just focusing on making sure that the boat never sails with the bows up. If it does, then it means that the T foil on the rudder has too much angle of attack, holding the stern down and hence creating unnecessary drag. The T foil dictates how the boat lifts out of the water. So we were fitting tapered rudder shaft cases that let us change the angle of attack for the T foil when on the shore using a screw adjuster.

Well, not any more . . . .

As described earlier when writing about the Box upgrades, when we decided to have a go at turbo-charging our One Metre Box design, we realised that we were going to have to be a bit more creative with the foils and decided to try making a rudder system that we could adjust while sailing, using a combination of levers that connect to a linear servo. This was tested on SECRET SERVICE last year and found it made a far bigger difference to the boat's performance than we anticipated. Four benefits:

1. Let's you find the right balance of the boat's trim quickly and easily
2. It lets you adjust the hold-down force as the wind strength changes. More for stronger winds
3. By reducing the hold-down when sailing upwind, you reduce the angle of attack of the foils and hence reduce the amount of lift when sailing to windward and stopping the boat from rearing up when it heels
4. By reducing the hold-down once the boat is up and foiling it further increases boat speed as the foils start to develop dynamic lift at higher speeds instead of relying on angle of attack. This was the biggest surprise of all

ONE RUDDER OR 2?

Personally, I do not see how two rudders (on a cat or tri) can work for us. I am using a single central Rudder T foil to:

1. stop the boat from pitchpoling
2. resist heeling (to a certain extent)
3. act as a tricycle wheel to get the stern of the boat out of the water

If you have two shorter rudders:

1. the windward T foil is likely to come out of the water so be of no use
2. if the windward T foil comes out, then there is no resistance to heeling coming from the rudder Ts
3. you need to keep the boat flatter to keep both T foils in the water - hard to do
4. there is more wetted surface area and resistance

Well - that's my view anyway!

We have found that any foil angle less than (ie flatter than) 45 degrees is too flat and the foils comes out of the water too fast to allow the boat to compensate in ride height. When my boat is foiling fast, it is foiling on two (sometimes only one) foils with only 5cm of foil in the water, and this is at 45 degrees. So if I had a J foil that was 5cm long and horizontal or only 10 degrees off horizontal, then I would have way too much lift and the boat would be porpoising like crazy.

A number of people have asked me about why our foils are so different to those seen on the America's Cup cats. I would not make any comparison between our Mini 40s and the AC cats (unfortunately). If you scaled down their T foils on their rudders to our size, they would be about 2cm long!!! Also, look at the size of our #1 rig - scale that up to AC size and it's a monster! And compare the rudder lengths.... So many people have made the mistake of scaling down a full size multihull to make a Mini40 and then wonder why it does not work. We need proportionately more buoyancy, especially in the bows, and we need proportionately bigger foils. L shaped foils only work if they are constantly being trimmed (by cyclists or whatever). We cannot do this at our size without a lot of complicated electronics, just waiting to get wet from a capsize…

As I go down in rig size as the wind increases, I actually reduce the angle of attack on the T foil on the rudder, because the centre of effort of the rig is coming down, thus reducing any tendency to bury the bows. It took me a long time to work this out. I had previously assumed that as the wind increased, I should ADD attack on the T foil, but this is not the case, the determining factor is the centre of effort of the rig. Obviously this is a safe thing to do, but you are just applying more drag to the system.

CATS

I am sure that somewhere here I have said I am a firm believer in Tris, not cats for radio control. If I didn't, I am now! Having said that, I have had two cats, one of them I built in the Philippines last year. The first one was a fraction over 100cm long (cannot remember why we chose an odd length), and was a strange failure. Initially I naively thought I could transfer IOM rigs onto a cat of similar length, but this was an instant and dismal mistake. Completely underpowered, it was apparent I would still the using the IOM top rig in a gale. The boat was set up to have foils attached into tubes epoxied transversely onto the deck and this was my first testbed for wand-controlled T foils. Did not work. In fact it behaved so badly I had no clue as to what was going on! Not a success……

Above; my first cat. Left pic shows with wand-controlled T foils. Very slow. Right pic shows with fixed outward pointing V foils – lovely!

Bellow; maybe one day I will work out what on earth is going on in this pic

SECRET AFFAIR – 2018

Yes I made a cat last year. The hull shape was based on SECRET SERVICE's main hull, but slimmer (but still pretty chunky compared to the slim hulls that Mike Cook and Mike Dann produce in the UK). I used a single rudder and put all the electrics in the entre pod. Assembling the boat is very simple - I have 18mm OD tubes on the centre pod section, and 16mm OD tubes epoxied on to the hulls which I have to admit is so much easier to assemble than the tri that has 8 bolts, but would be far more bulky to put in a box for shipping. I made my pod too small - it is easily 15mm clear of the water and I may make a bigger pod as I am really squashed for wind and servo installation. I currently have a PJ Sails winch in the cat but might change that to an RMG winch, since this is what I have in all my other boats and enables easy swapping of parts and batteries if needed.

Above: SECRET AFFAIR, showing the foil configuration and another Creed-special curved deck-scraping main boom. The black parts of the cross beams are spacers which can be changed in length to vary the overall beam of the boat. As shown here, the overall beam including the foils is 122cm, ie max Mini 40 beam. But I could achieve the same result by pushing the hulls further apart but sliding the foils inboard in their cases. Quite like this boat but It needs a new centre pod now – see later on in this file.

This was the boat I used to test the idea of the new foil configuration for the Box-on-Steroids. However, the way that I am adjusting the cat foils is by two bolts that push the inboard end of the foil forwards or backwards in its case, pivoting in the case about the exit point on the outboard side of the hull. So if I push the front of the inboard end of the foil backwards, I get a greater angle of attack, but as a result of toe-in of the foil, not rotation upwards. The first set of foils had an initial angle of 45 degrees, then increasing to 52 degrees (ie more vertical) at the tip, and when I applied toe-in the tips start to fight each other, pushing the boat sideways - should have realised this earlier! So I then made a set of foils with 45 degrees angle all the way down.

I can vary the beam of the cat by sliding the cross beams in and out of each other. The Centre pod uses 18mm OD tubes, the hulls have 14mm OD. I just insert or remove spacers. I was trying out the minimum beam yesterday (88cm). Currently I have 6cm spacers so I can increase to 100cm, but could go to 106cm I think without risking breaking the tubes

This cat project has been shelved for now as I concentrate on the little BOS trimaran

OTHER BITS AND PIECES

So this collection of info and stuff would not be complete without mentioning Dave Creed. I first met Dave (too many Dave's in this hobby) soon after I moved to Perth and wanted a new 10rater. Always prepared to do something different and always prepared to shy away from the established path, I ended up with the chined Defector. But that was just the beginning. To this we added a masthead rig and a curved, deck-sweeping mainsail boom.

Above left: Dave Creed. Above right: My Creed Defector 10 rater

Dave has been my biggest critic and mentor throughout my journey with multihulls, forever pushing us to go for lighter and simple solutions, and also helping with ideas on construction techniques. He even let me stand over him one winter's day photographing each step as he laid up a US One Metre (meter?) hull, showing me all his secrets!

And now, just a collection of photos from some of our more adventurous experiments!
Below: spot the difference. SECRET SERVICE with an overlapping jib (left) and conventional jib (right)

I had always been curious about the use of overlapping genoas on rc boats, having seen an old photo of such a setup many years ago on a 6 metre in the UK. For some reason I got the bug to try to do this on a Mini 40 and so when SECRET SERVICE arrived in Manila the first thing I did was fit two rmg winches inside it (cannibalised from a Box in Perth) and devise a system whereby one winch performed the conventional task of trimming the sails whilst the second winch tacked he genoa, using a slide switch on the transmitter. Worked like a dream! But of course I was now way over the maximum sail area limit. This genoa was the first ever sail that I made. I might revisit this concept again one day as it's a way to achieve the maximum sail area with the centre of effort low down.

The next is definitely a Creed idea. Dave kept on at me about simple rigs and indeed una rigs, so the poor cat became the test bed for jib-only experiments. The first test was relatively harmless, putting a small diameter stayed mast at the back of the boat and adding a big jib at the front. Worked pretty well, although more work was going to be required to stop the jib boom lifting and easing the leech in a breeze, but Dave was not satisfied. "Need to get lift from the sail, just like windsurfers".

Rightio. So out came the saw and I chopped off the pointed end of the centre pod…. No going back now. A new jib was made with a rod luff spar, and was attached to a carbon tube acting as a bridle, the idea being that the foot of the jib would be blown to leeward and I would get some lift out of the rig. Make sense?

Did not work. The foot of the luff spar slid far too easily along the tubular bridle – the merest change in the wind direction could send it shooting along the tube.

To make matters worse, I was still using the original "mainsheet" system to control this jib off the centreline of the boat, so if the sheet was set correctly for the jib in its leeward position, as soon as the foot moved towards the centreline the sheet effectively became far too long and eased the sail. It was simply impossible to sail the boat. The solution I think lies in a winch to manually control and move the foot of the luff spar across the boat from one side to the other. For now this project is shelved but it has given me some more ideas for a new boat.

Photo (right): the second iteration of the jib-only concept. This shows the jib luff spar slid to leeward (starboard) along the carbon tube bridle. Unfortunately it slid along this spar far too easily and was impossible to sail. Had to be retrieved with the canoe.

Below: Very early experiments (early 2015 I think) of an un-stayed una rig with a fixed boom. Twist in the leech of the sail was controlled by a backstay running from the mast crane to the out end of the boom. The boat here is an early prototype of the Box which came some 6 months later.

Below: two forerunners of the Box, and before the una rig experiments took place

That's the story so far…..

Ian Holt

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Footnote (reading this background info is optional……)

1970, Fleetwood,
With original brane steering

1972, with home-made
Vane steering

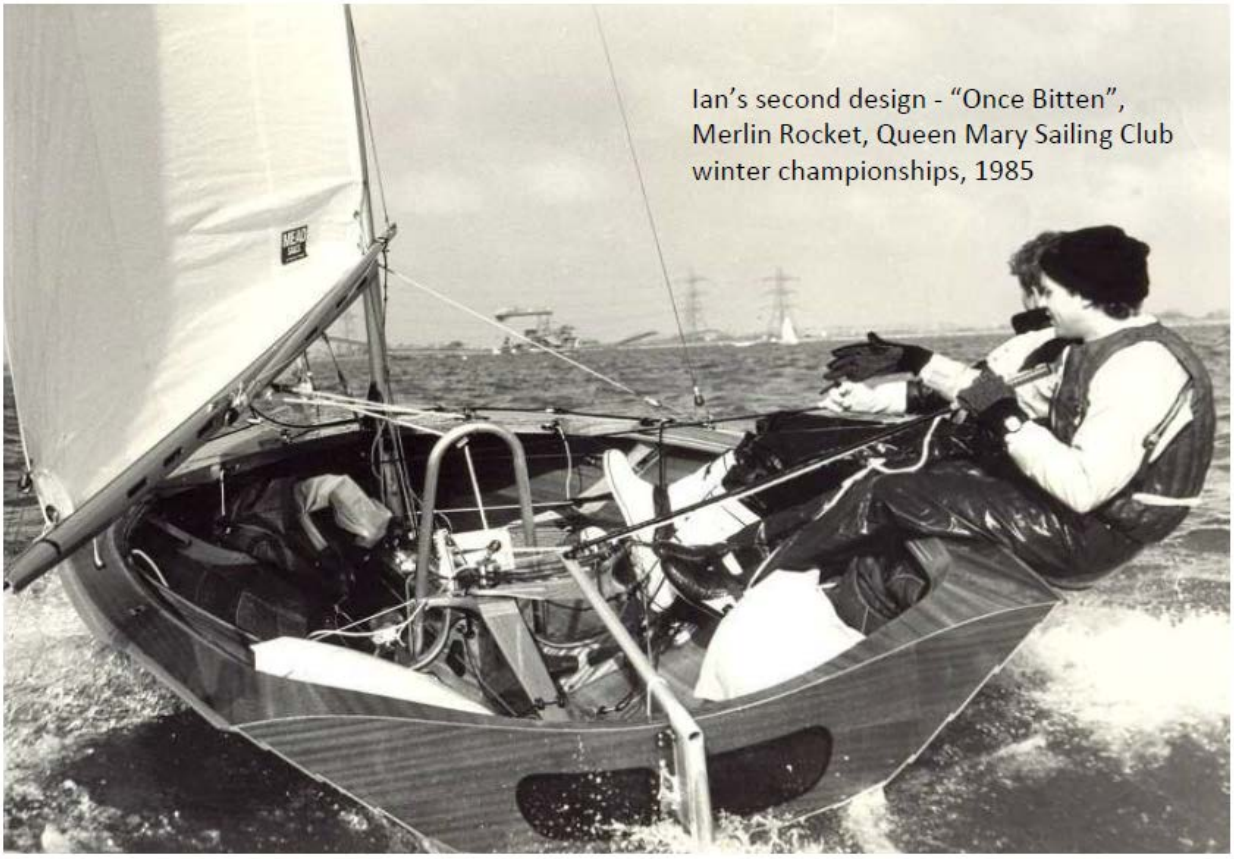
1974, Salcombe,
With radio control

Ian's first boat, the
Model Yacht, the 6 Metre "Defiant"

Above: My first ever boat, a 6 Metre; initially with Braine steering, which my father converted to early radio transmitter. Just one button: press once to turn left, press twice in quick succession to turn right
Below: In the Solent and on a lake in Austria

1979
Solent and sailing to Germany
On German Admiral's Cup yacht Tina-I-Punkt

Above; top left insert, sailing Tina-i-Punkt back to Norderney after the Admiral's Cup event



Above; My all-time favourite boat; Once Bitten, my second Merlin design. Seen here winning the 1985 Winter Championships at Queen Mary sailing club. I remember this moment well, I was shaking my right hand when the photo was taken as I was so cold I had lost all feeling in the hand.