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AYRS 115

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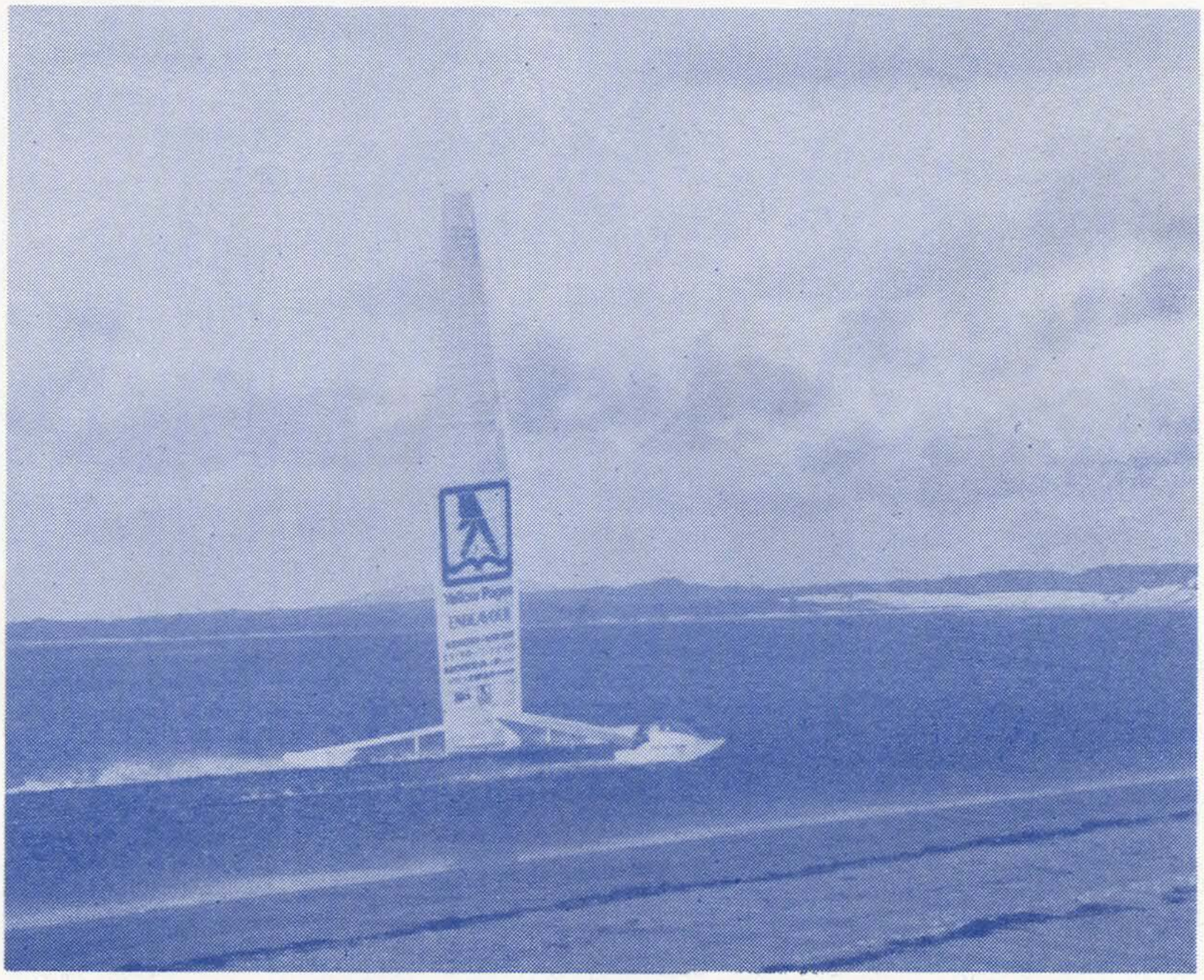
Speed Sailing and Speed Weeks 1992-4



Edited by Tony Kitson

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Speed Sailing and Speed Weeks 1992-4

Longshot and Yellow Pages
Weymouth Speed Weeks 1992-4
Experimental Craft at Weymouth
Vari Scari, Hurlam 106
Flying Fish, Calliope
Optimum Course for High Speed Sailing
WSSRC
How Fast?

Edited by Tony Kitson

Amateur Yacht research Society

BCM AYRS, LONDON WC1N 3XX

Contents

Introduction

The last few years have seen two major changes on the speed sailing scene, firstly the long-standing supremecy of the boardsailors has finally been broken and secondly Bob Downhill has presided over the rebirth of Weymouth Speed Week. Either of these two would warrant an AYRS publication, it will be difficult to do justice to them both in this one.

Since 1986, when Pascal Maka took the outright speed record with 38.86 knots, the world speed record books have been dominated by boardsailors. Expert opinion was convinced that the boardsailors would continue supreme, until Longshot surprised them all in 1990 by claiming and receiving the A and B class records with 37.08 and 34.53 knots respectively. In 1991 Longshot added the C class record 28.29 knots (and later 36.76 knots) , and increased the B class to 38.13 knots.

Eventually, in 1993, Yellow Pages 'Endeavour', neither a board nor a foil craft, took the record with a run of 46.52 knots. The boardsailors began to realise that they would have to look to radical improvements in design and started talking about foil supported boards.

After Speed Week had been moved from Portland Harbour to the Wirral the decline of the speed craft began, partly due to the domination of the boards and partly due to the unsuitability of the site for craft sailing, which required more space to manoeuvre than the boards. Bob Downhill, a previous competitor with Icarus 2 and with Crusader, had long been an advocate of the Portland Harbour venue and, when the RYA decided to abandon the event at the Wirral, he began his personal crusade to resurrect the Weymouth event. With no more than a few friends and a totally unbelievable amount of optimism Bob set about staging Weymouth '92.

I became involved with Bob's efforts early in 1992 and was, in turn, impressed by the amount that he had achieved, appalled by the personal risk he was taking in organising the event, and determined to help him to make it a success. Fortunately, I was not alone in going through these stages. Eventually, with everyone's help, but mainly because of Bob's personal optimism and determination, the event took place. It was a great success, see AYRS 112 for descriptions of some of the entries. Financially the event was not a total success, but AYRS, recognising the need for such events to stimulate the development of

speed sailing in the UK, stepped forward and provided the funding needed to ensure its survival.

The event was repeated in 1993 with nearly double the entry of both boards and craft. Once again, however, despite the increased entry level, a loss was incurred. It was made good this time by personal donations from competitors and wellwishers. But the efforts and personal risk have not been in vain and for 1994 AYRS agreed to provide a limited underwriting for the event.

With the demise of the Brest Week, Weymouth remains as the only timed speed event in Europe. It was resurrected without the aid of sponsorship, and, with the exception of AYRS, is still an unsponsored event. It can be done! The emergence of craft such as Longshot and Endeavour with their high budget attacks on records probably means that future records will be set only at specialist, one craft, self funded venues. Nevertheless, events such as Weymouth are vital for the development of new ideas and for the trial of craft which may not set records themselves but may prove the concepts which will later be used in record setting craft. At present Weymouth is our only test bed, let's keep it alive.

The Contributions

The articles on Longshot and Yellow Pages Endeavour are based on those published earlier in the newsletters and contributed by Michael Ellison. We are fortunate that Michael is an official observer for the World Sailing Speed Records Council (WSSRC) which frequently allows him to become our roving reporter for these attempts.

Reports on their own craft were provided by George Chapman, Jean Hurtado, Alan Blundell and Keith Dunstan.

I have included a small piece on the WSSRC. I was interested to discover their role in speed sailing and thought that other members, like me may have heard the name but wondered just who they were. Most of my information came from publicity material produced by WSSRC and anyone wanting to know more can obtain this material from them.

It is a pleasure to include some final thoughts and speculations by Michael Ellison on the future of sailing speed records.

Most of the photographs in this issue were taken by Peter Danby. You can tell which are Peter's, they are the best.

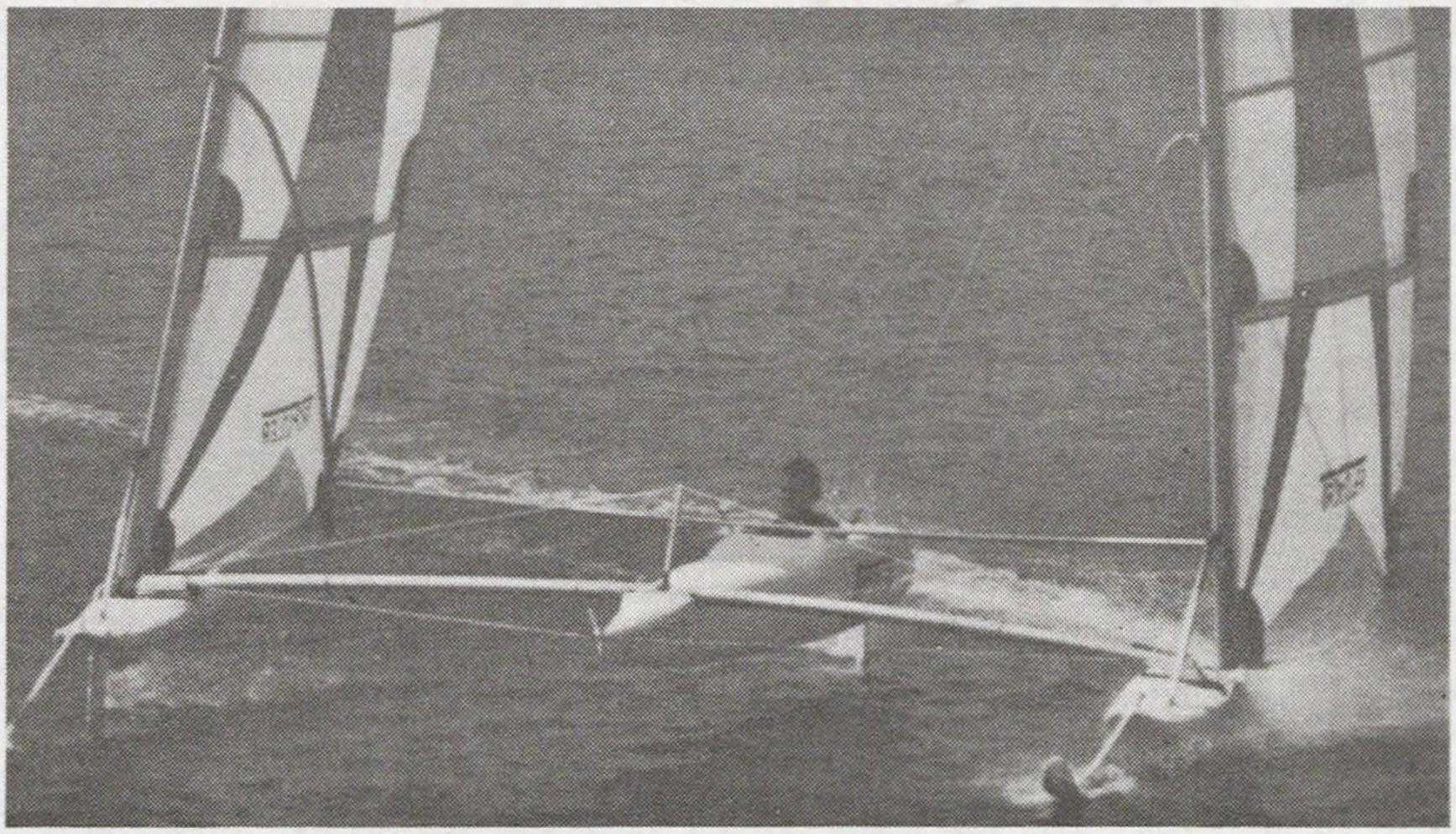
Longshot and Yellow Pages

A New Dawn for Speed Craft

So much has been written about these two craft that it is difficult to find something new to say. I will do my best, stealing heavily from AYRS newsletters, Michael Ellison's reports and comments from the competitors themselves.

History

Longshot is the boat that started it all. From the late seventies and throughout the eighties the boardsailors were the dominant force in speed sailing. In June 1990 Russell Long shattered the B Class record with a speed of 34.53 knots in his new foil craft Longshot. The previous record for that class was 29.49 knots set the year before by J Peironet and F Buleon on a tandem board, beating the long standing 28.15 knots, set in 1985 by David Pelly and James Grogono in Icarus. The new record was seen as the turning point in speed sailing. Craft were returning.



Longshot soon added the A Class record with 37.08 knots in October 1990, and the C Class with 28.29 knots, and subsequently 36.76 knots in 1991. In the same year the B Class record was again raised this time to 38.13 knots. During 1992 Russell Long concentrated on the A Class record and raised it eventually to 43.55 knots in July at Tarifa. This was the first time that a sailing craft, other than

boards, had exceded 40 knots. The outright record of 44.66 knots held by boardsailor Thierry Bielak since 1991 was starting to look vulnerable.

To capture the excitement that was generated by the early exploits of Russell Long and Longshot, I offer you extracts from a report sent by David Culp and published in an AYRS newsletter of 1991.

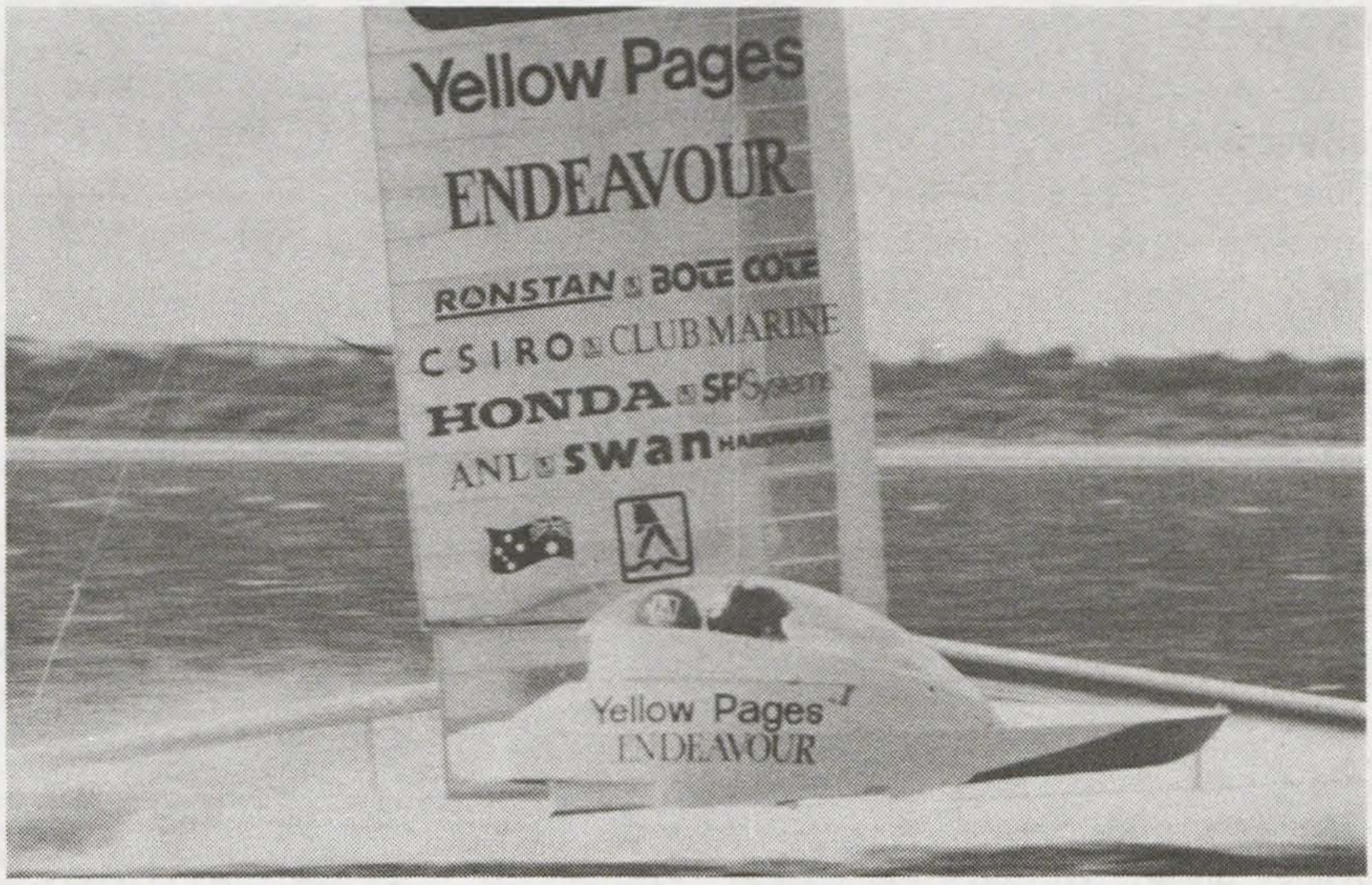
"I've just spent a sunny afternoon watching what is perhaps the end of an era, the end of sailboard domination of world speedsailing records. San Francisco's Russell Long has been making history with his Greg Ketterman designed hydrofoil Longshot. While Russ did not break the outright world speedsailing record today, there is no doubt that he will do it, perhaps by the time you read this.....

....So, what is this 'breakthrough' boat? What unheard of new technology does it embody? Well, actually, none at all. Greg Ketterman, thirty year old naval architect,read an article (in an AYRS publication of course) on the Pattison brothers' incidence controlled hydrofoil, Force 8, of 1976-78. He saw the potential in the concept (just as the Pattisons saw it in earlier Christopher Hook designs) and said to himself, 'I can do better than that'.

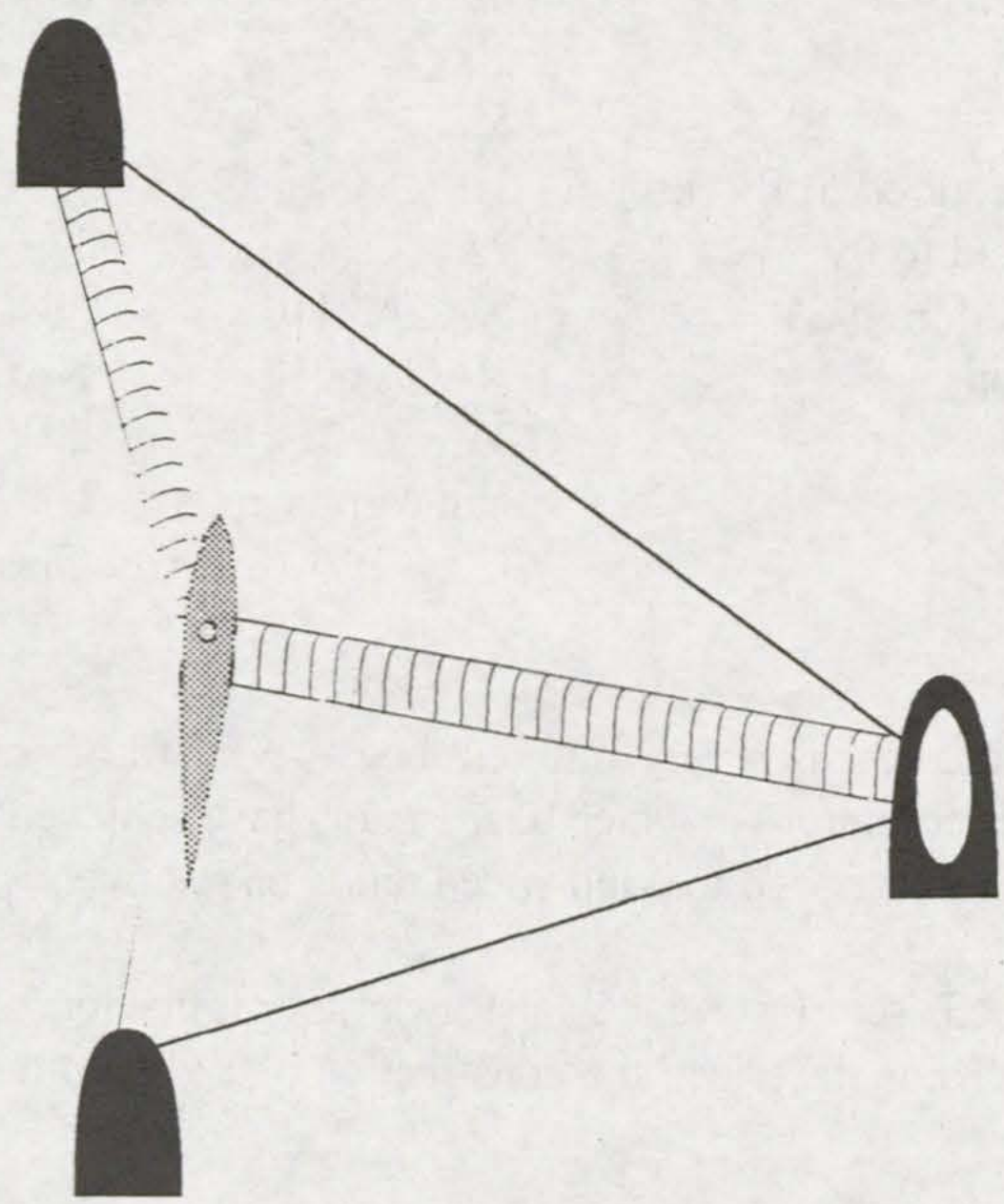
Greg kept the surface feelers/active incidence controls and the aeroplane configuration. He ingeniously simplified the mechanics of the system and added the innovative use of the crossbeam as torsion spring to pre-load the sensors/ foils. He added a 1990's technology biplane rig with wishbone booms. He used modern materials and computer optimisation to design the foils and to get the weight and windage down. The rest is history.....

.....Just as Dirk Thijs' 19 knot run at Weymouth in 1977 sparked a giant leap in sailboard development, Russ Long's multiple world records will surely spark a new beginning in sail craft development. I can't wait!"

Dave was right about sparking a new beginning but wrong about Longshot taking the outright record. Although she held the A, B and C Class records, the outright record eluded her and finally fell to the second of the new breed of speed sailing craft. In 1993 Yellow Pages Endeavour entered the scene. In February this craft secured both the B and C Class records, 44.65 knots for B Class and 39.24 knots for C Class. The new B Class record was thus within a hundredth of a knot of the outright record. Two months later Thierry Bielak raised the outright record to 45.34 knots. This was finally broken by Yellow Pages on 10th October 1993 and raised further by the same craft to 46.52 knots on 26th October.



In July 1993 Lindsay Cunningham, designer of Yellow Pages Endeavour had said 'our boat theoretically should do about 45 knots in something less than 20 knots of wind'. The record run was made in 18-20 knots of wind. Anyone want to borrow Lindsay's prediction program?



The craft

Anyone who had fixed ideas on the sort of boat that would break the boardsailors' domination was probably right. These two craft are so different that one of them must embody, at least in part, your own pet theory. On the other hand the differences show that the field is wide open for new ideas, or old ones re-engineered to use new technology. Now is the time to get out into the garage and start building!

Longshot is well described by David Culp (above). Greg Ketterman provided the following design and construction details of the Tri-Foiler (the generic name for both Longshot and the commercially available versions).

	Raceboat	Production Boat
Seating	One	Tandem
Displacement (lbs)	215	280
Main hull length (ft)	14.7	16.25
BOA (ft)	18	19
Sail area (sq ft)	80-150	212 or 150
Main foil area (sq ft)	0.45	0.56
Rear foil area (sq ft)	0.25	0.65
Max efficiency	2.8	2.2
Top speed (mph)	55	38
Minimum wind required to fly (kts)	11	9
Boat speed required to fly	22	13
Horizontal foil section	NACA 2410	NACA 2410
Vertical foil section	NACA 0010	NACA 0010
Rigging time (min)	35	20
Foil materials	Uni carbon epoxy	Uni S glass
Hull materials	Glass PVC foam	Glass PVC foam

Yellow Pages Endeavour is a very different beast. Whilst Longshot is built to cope with the same conditions in which boardsailors have achieved their records, YPE aims for high boat speed to wind speed ratios on relatively calm waters.

In a letter to AYRS, sent last year whilst awaiting ratification of the outright record, Simon McKeon described the construction of YPE and his experiences in sailing her.

"No formal plans have ever been prepared by Lindsay Cunningham for Yellow Pages Endeavour (nor indeed for his Little America's Cup contestants).

The wingmast gets its strength from an internal framework of carbon fibre tubing. Its asymmetrical shape is created by foam sections and the external material is a heat shrink model aeroplane plastic film called 'Coverite'. The wing has been recycled - it is, in fact, the original Victoria 150's wingmast which was used in its successful challenge for the Little America's Cup in 1985.

The tripod has three hulls which are made from plywood and internally reinforced with carbon fibre. The two main beams connecting the forward and crew hulls are made from carbon fibre with aerodynamic foam shapes. The aft hull is connected by a round aluminium beam.

During last winter, Lindsay made a number of modifications to Yellow Pages Endeavour. I think the most useful modification was the realignment and stiffeningup of the aft leeward hull which had previously planed under load at a sub-optimal angle creating unnecessary drag. I am not sure precisely how much this added to the yacht's speed, but I can say that it feels a little more 'slippery' with the hull in its proper alignment. Other modifications have included further work on the underwater foils so as to minimise the incidence of cavitation. The crew pod has also been remodelled underneath so as to give it a smoother ride when it hits the water from time to time - previously, it had a habit of rocking very severely fore and aft as it came into contact with the water.

Both Tim Daddo and I find sailing the yacht at speeds in excess of 40 knots very demanding. There is no time for exhilaration or joy - it becomes a very businesslike proposition getting the yacht from the start down to the finish. We both find that we need to concentrate quite intensely - it is possible to get mesmerised by the sensation which is potentially disastrous.

There is little time for me to communicate to Tim - I generally have to speak in words of one syllable. Tim and I actually face in different directions - I face forward and have a good view of the course and the wind conditions across the water. Tim, on the other hand, faces sideways towards the wing and is not able (and in any event would not have time) to gauge the wind conditions along the course. Accordingly, it is necessary for me to let Tim know in advance whether we are sailing into a gust or a lull, as the case may be.

It is very compact in our little crew pod. It has been designed around each of our bodies. Fortunately, a good run takes less than a minute from release to retrieval - I don't think we would last a conventional two hour race!

In setting the world record (which as I write to you is still subject to ratification by the IYRU), the wind conditions were around 18-20 knots. We would like to take Endeavour out in slightly stronger winds, say 20-25 knots, but unfortunately we didn't experience these conditions.

I suspect that Weymouth Speed Week would be a little too 'bumpy' for our yacht, nevertheless it is an interesting thought."

YPE has an all up weight 340kg, about 3.5 times the weight of a crewed sailboard but she has about 20 times the righting moment.

Her foils are solid carbon fibre, 9" deep, 4" chord at root, 3" at tip, standard NACA profile to minimise cavitation, 3 foils per hull. Steering is from the front hull. This is for safety, if they cavitate and lose grip the boat will turn away from the windward shore. The wing is a single element, NACA 23012 profile, the mast is a carbon fibretubular space frame covered with Coverite model aircraft material, heat shrink.11m high. The beams to crew pod and forward float are Nomex carbon fibre sandwich, streamlined, the forward beam is angled to give the leeward side a 40 kg lift at design speed. The trailing beam is round section aircraft alloy tube. The hulls are 4' wide by 5'9" long (the crew pod is a little longer), made from marine ply.

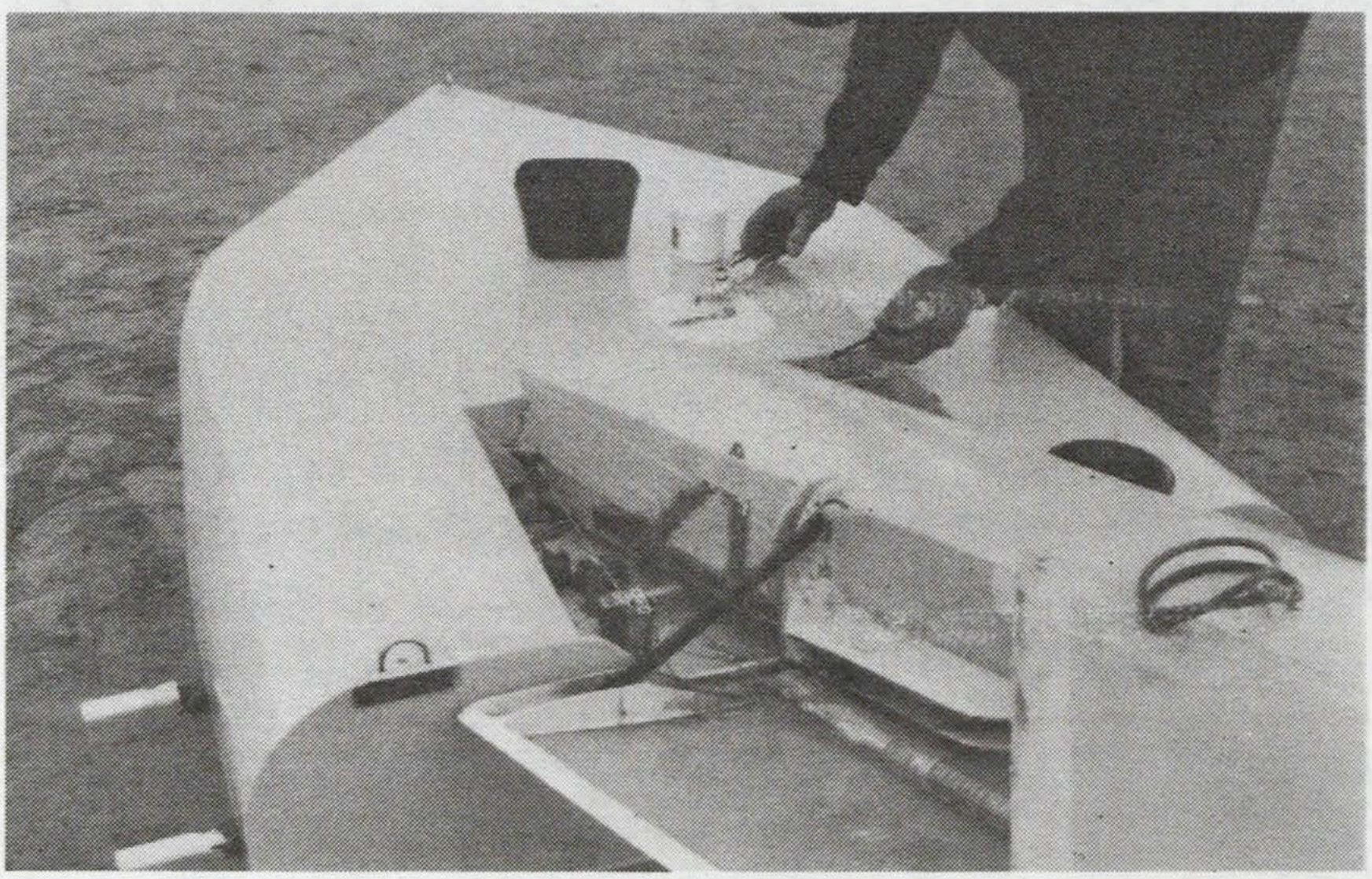
Current Status

1994 has been a good year for innovation and experiment, but not for records. The boardsailors have not given up, and experiments with foils and with streamlining the pilot have been reported. The latter approach seems more likely to be successful, since the planing hull is already very efficient (see Michael Ellison's report). As yet there are no reports of the use of dynamic buoyancy in the form of hapas, (see Bob Spagnoletti's ideas in the latest newsletter).

Longshot has tried new foils, both air and water varieties. The original hydrofoils seem to perform better on the boat than in the test tank, (again see Michael's report). The new wingsails were broken during a speed attempt earlier this year. Wind conditions were not suitable for record speeds.

The Yellow Pages Endeavour team have produced a new boat for 1994, this time painted red (Red Pages?). The wingsail is of lower aspect ratio and the beam to the crew pod is longer. With this smaller heeling moment and greater righting moment they must be seeking stronger winds for their next attempt. Unfortunately they also did not find the right winds for their October attempt.

It looks like both teams will be seeking the higher winds for 1995. And with these two craft modified and ready to go, plus the team from France, a serious contender from England in Simon Sanderson and the (foil) born again streamlined boardsailors it looks like 1995 could be an exciting year. See you at Weymouth!



Weymouth Speed Weeks '92 - '94

Speed Week Comes Home

When the sponsors abandoned the RYA's annual speed week it seemed that 'true sailing was dead'. The event had already been moved away from Weymouth, to the dismay of craft sailors who found the Wirral site too confined for their use. Into the breach stepped Bob Downhill and Norman Phillips, who had previously organised Spring meetings at Calshot and Weymouth. With Bob's enthusiasm and incurable optimism, Norman's organisational skills and a little bit of help from their many friends, including AYRS, the first of the 'born again' Weymouth Speed Weeks was held in October 1992.

Bob Downhill had developed a timing system capable of handling the expected numbers. Lacking access to the sophisticated timing cameras that have been used for sponsored events, Bob reverted to the older 'voice and radio' technique. The course was measured using a sextant and fixed markers at a measured distance on the beach. This method has now been replaced by the use of a laser-tape, which offers greater accuracy and allows the more rapid changing of course to suit wind changes. Observers on two stake boats give a voice signal by radio for the start and finish of each run, these are entered into a computer in the club-house. Bob has developed computer programs to record these start and finish times, and to calculate speeds for each run. He also has programs to automatically produce printed records of the day's times within minutes of the closing of the course. The latter is much appreciated by competitors who are always keen to know, as soon as possible, how well they have done.

The timing technology has been continuously refined over these three years. The laser-tape is one example, but there are also a multitude of small improvements that Bob has made to his programs to provide greater reliability, accuracy and timeliness of the results service. The latest improvement, which Bob hopes to have available for next year's event, is automatic wind speed logging. An anemometer, mounted on a stake boat, will transmit by radio regular updates of wind speed, which will be read directly into the timing computer.

These three Weymouth Speed Weeks have all been run by Bob with assistance from the Weymouth Sailing Centre, Sandsfoot Beach in Portland Harbour. There have been too many helpers to credit here, they know who they are, and so do we. They have all done a great job in keeping this event alive.

Boardsailors and Krankies

One of the delights of this event has been the camaraderie between the boardsailors and the 'krankies', their name for the experimental craft pilots. I am told that this was not always the case, particularly in the earlier, big money, events, when the conflicting requirements between boards and boats resulted in some acrimony.

The event has been well supported by some of the leading UK boardsailors, including Dave White, Gary Mason, Steve Freeman Tim Rumfitt, Caroline Rees, Sam Metcalfe, as well as a host of boardsailing enthusiasts without whose support it could not survive.

In 1994, when it was clear from the start that there would not be sufficient winds for the boardsailors to record serious times, the boardsailors, realising that the event would collapse without their support, dug deep into their pockets, paid their entry fees and made the best of it. It may be difficult to run this type of event without sponsorship, but it has its rewards. We would not get that sort of response for a sponsored event.

International Competitors

Weymouth has always attracted a number of competitors from across the channel. Now, with the demise of the Brest speed week, it is the only timed event available. It has been a great pleasure to see this tradition continuing with visits by Jean-Yves Salaun, Didier Costes, Jean Hurtado and Theo Schmidt.

The Experimental Craft

The main interest for AYRS members will always be the experimental sailing craft which characterise this event. There is always a mixture of the well developed concept, the new experiment and the downright silly among the fleet. It can be an amusing challenge to attempt to differentiate between the two latter categories, before they hit the water. Hindsight makes the task less challenging!

George and Joddy Chapman were clearly in the first category and have recorded the fastest (craft) time over the three year period. They took the 1994 craft prize with their immaculately engineered Calliope, recording 19.01 knots. The conditions were ideal for this craft, built not as an all out speed craft but for foil sailing in moderate winds. The development and tuning of Calliope has been aided by their innovative onboard data acquisition electronics. The first job of

the day was always to check that the timekeepers were doing their job correctly and that accurate times were being recorded!

A full review of the experimental craft is given separately.

Although no longer experimental craft, the Catapult inflatable catamaran was developed from experience gained at previous speed weeks. These craft have been regular performers at the recent events. A feature this year was the historical array of Jon Montgomery's inflatable catamarans. The production boats were augmented by Si Si (Jon's original experimental boat), Toastrack (Bob Hill's foil supported boat), and Jon's latest design, the Catapult 5.5.

Royal Dorset Yacht Club

Speed Week is not just about 'on the water activities', there is plenty of opportunity for evening discussion of the events of the day, the other craft, the other competitors or anything else that seems important at the time.

The AYRS meeting at the Royal Dorset Yacht Club is always well attended. Competitors are given the chance to explain to their peers why their boat will, without a doubt, break the World Speed Record.

Regular social events are also held as guests of the Weymouth Sailing Centre, the Castle Cove Sailing Club and the Mayor of Weymouth at the Pavillion.

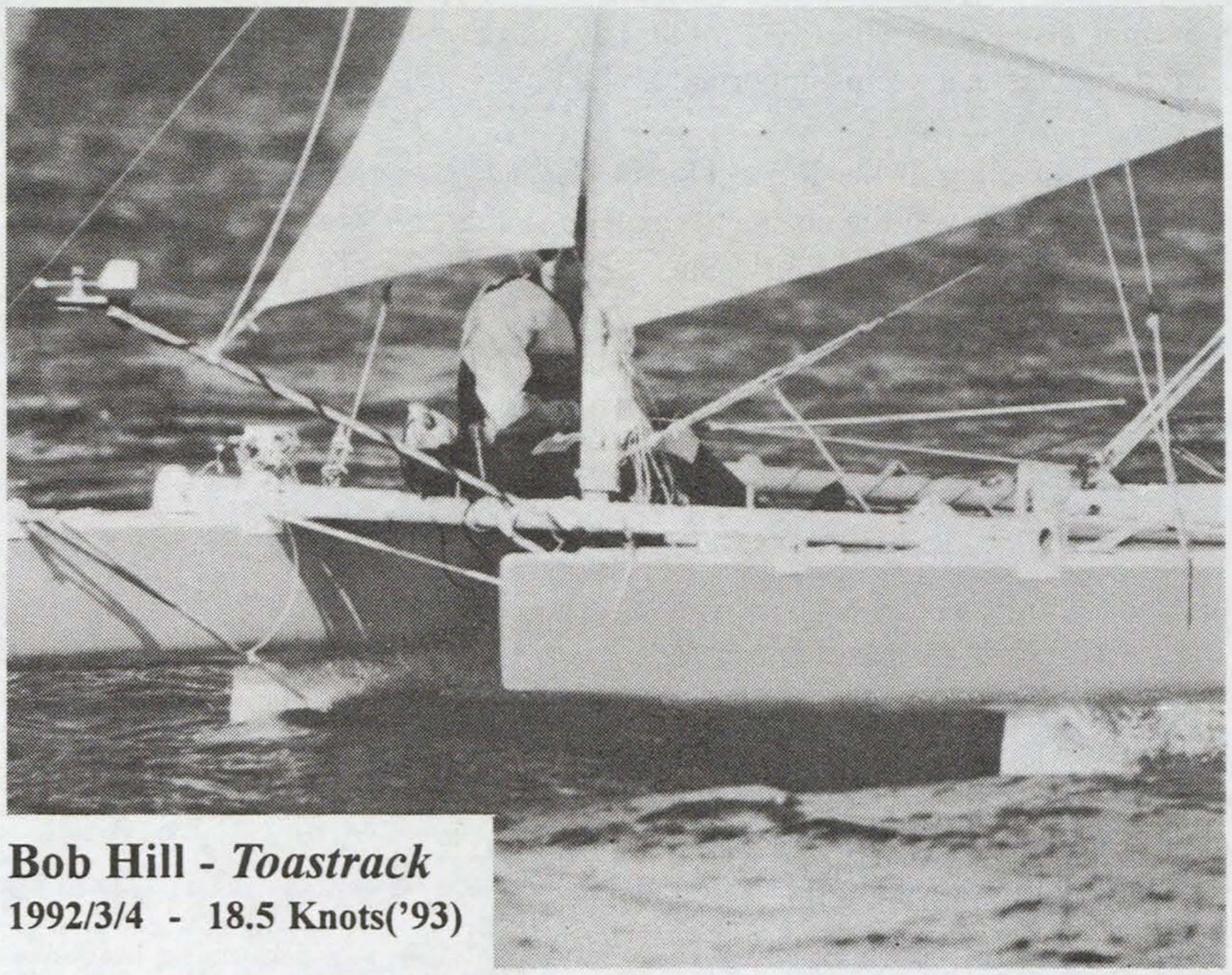
The Experimental Craft at Weymouth 1992-4

George and Joddy Chapman - *Calliope*

1993/4 - 19.01 Knots ('94)

A foiling catamaran developed and refined over the last few years. Designed for foiling in light air, rather than for ultimate speed, Calliope found the conditions, in 1994, ideal and took the first prize for craft. This was also the fastest time recorded for any craft over the three events and is particularly impressive considering the light winds at Weymouth this year.

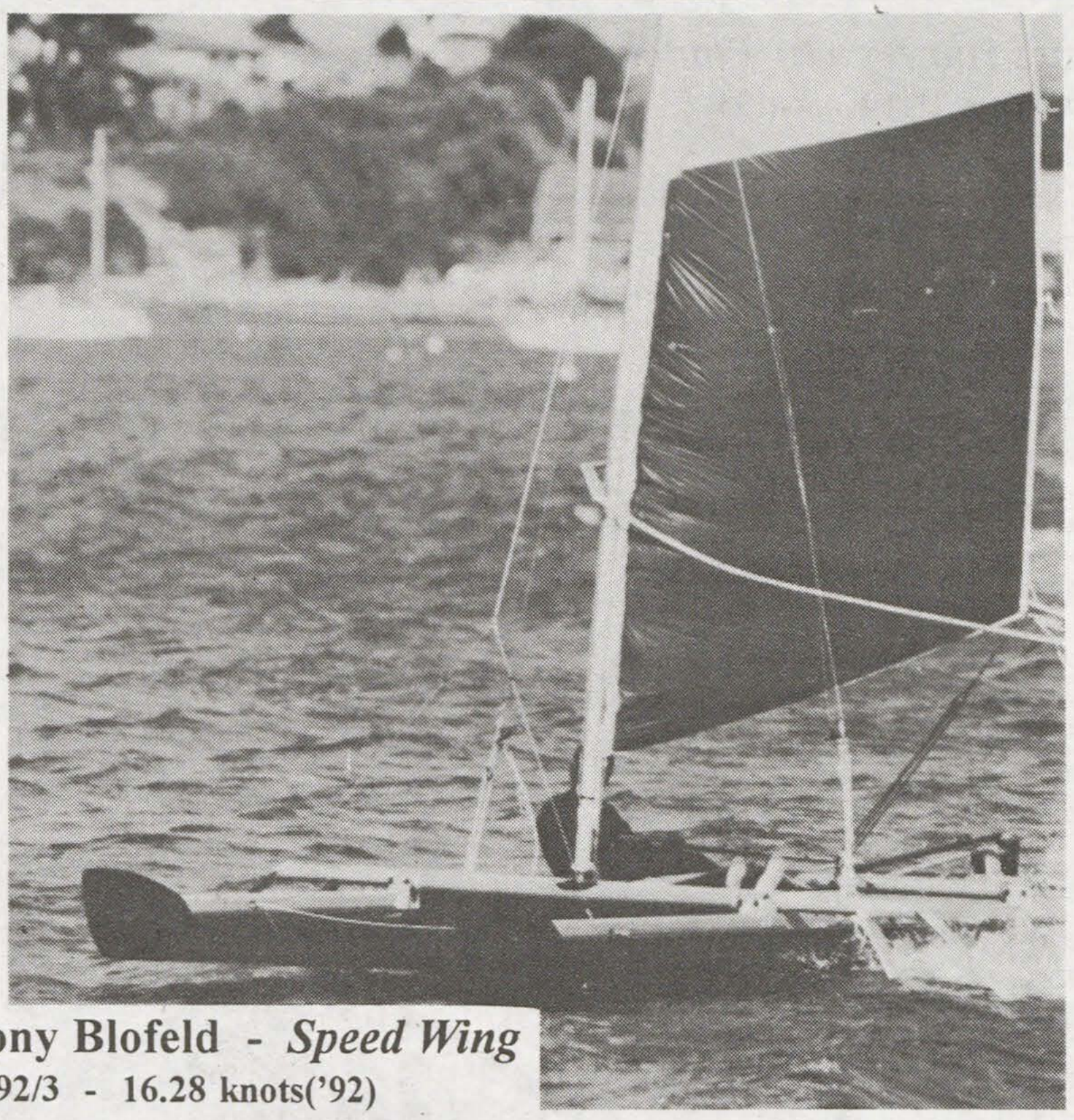
For a full description of Calliope see AYRS 112, and separate article in this issue.



Bob Hill - *Toastrack*

1992/3/4 - 18.5 Knots('93)

A Catapult with foils which has been well sorted over a number of years. In 1993 Toastrack was the fastest craft. In 1994 an experimental, soft wingsail (the Aitosail) was tried. The Altosail has a standard sail as the inner of three membranes. There are outer membranes on either side, the leading edges of which are supported by inflatable bags to sustain an airfoil shape.



Tony Blofeld - *Speed Wing*
1992/3 - 16.28 knots('92)

Speed Wing, a beautifully prepared foiling catamaran was first tried in 1992, when she recorded the fastest time for a craft that year. In 1993, Tony returned with a new rig and lightened hulls, but was unable to better the previous year's performance. Tony missed the '94 event but promises a return for '95.
For a full description of Speed Wing see AYRS 112

Alan Blundell - *Vari Scari*
1993/4 - 16.2 Knots('93)

A tri-scaph with an ingenious articulated forward float enabling tandem leeward floats on a two-tack craft. This craft first appeared in 1993, when, despite handling difficulties, Alan recorded the second fastest time for the year. This year he had modified controls to improve handling.
Further information on Vari Scari is given in separate article in this issue.

James Harvey - *Bi-Planche*
1992/3/4 - 15.1 Knots('93)

A 'board' catamaran which originated as a school 'A' Level project and has been developed for use as a trainer, a fun boat and for sailing by the physically handicapped. James campaigns Bi-Planche, with great enthusiasm, every year.

Keith Dunstan - *Flying Fish*
1992/3/4 - 14.96 Knots('92)

This planing catamaran has been improved and refined over the last three Speed Weeks. Despite this Keith's best time was recorded for the '92 event. This year Keith had modified the hulls to provide more planing surface and buoyancy aft. He also had a more powerful and better controlled rig. If '94 had provided suitable winds, the '92 best speed would surely have been beaten.
Further information on Flying Fish is given in separate article in this issue.

Simon Sanderson - *No Limits*
1994 - 14.42 Knots('94)

A new, experimental catamaran featuring independently sliding hulls on a rigid central platform. There are no rudders and steering is effected by adjusting the fore and aft position of the hulls relative to the sail-carrying platform. The craft is well prepared and of ultralight construction. When the tedious development period is complete she should record some fast times.

Jon Montgomery - *Catapult 5.5*
1993/4 - 12.64 Knots('94)

This craft was the latest in the line of Jon's famous inflatable catamarans. At 18' x 9' it is larger than the standard Catapult and features a variable geometry frame, allowing slewing of the hulls up to 45 degrees in either direction.

Adrian Nutbeem - *Free Energy*
1992/3 - 10.8 knots('93)

This craft is a planing trimaran with an air scoop in the main hull to provide additional 'slippery support' when at speed. Free Energy suffered from structural problems in the '92 event, but returned in '93. Ill health denied Adrian the opportunity to participate in '94 when the conditions were more suited to this, essentially flat water, craft. Adrian is rebuilding Free Energy as a single outrigger craft, and we hope to see him again in '95.
For a full description of Free Energy see AYRS 112

Peter Flannery - *Si Si*
1994 - 10.54 Knots

Si Si was extracted from the archives for the '94 event. This inflatable catamaran is a piece of speed sailing history, an early predecessor of the Catapult. Si Si was sailed by a number of people who discovered that she can still provide great fun.

Jean-Yves Salaun - *Cycland*
1992/3/4 - 10.19 Knots('94)

Jean-Yves has participated in all three events, initially with a typically French tri-scaph, in 1992. In '93 he brought over his French version of Longshot, with foils controlled by surface following floats. Performance has improved over the two events, but has yet to match that of the original.

Miles Handley - *Sting*
1992 - 8.53 knots

Sting is a well constructed and prepared tri-scaph. She appeared only for 1992, and despite appearing to have good potential, was beset with handling difficulties. Miles claims that he has now retired from speed sailing, we shall miss him and his beautifully constructed craft.
For a full description of Sting see AYRS 112

Torix Bennett - *Tri-Hydra*

1994 - 8.27 Knots

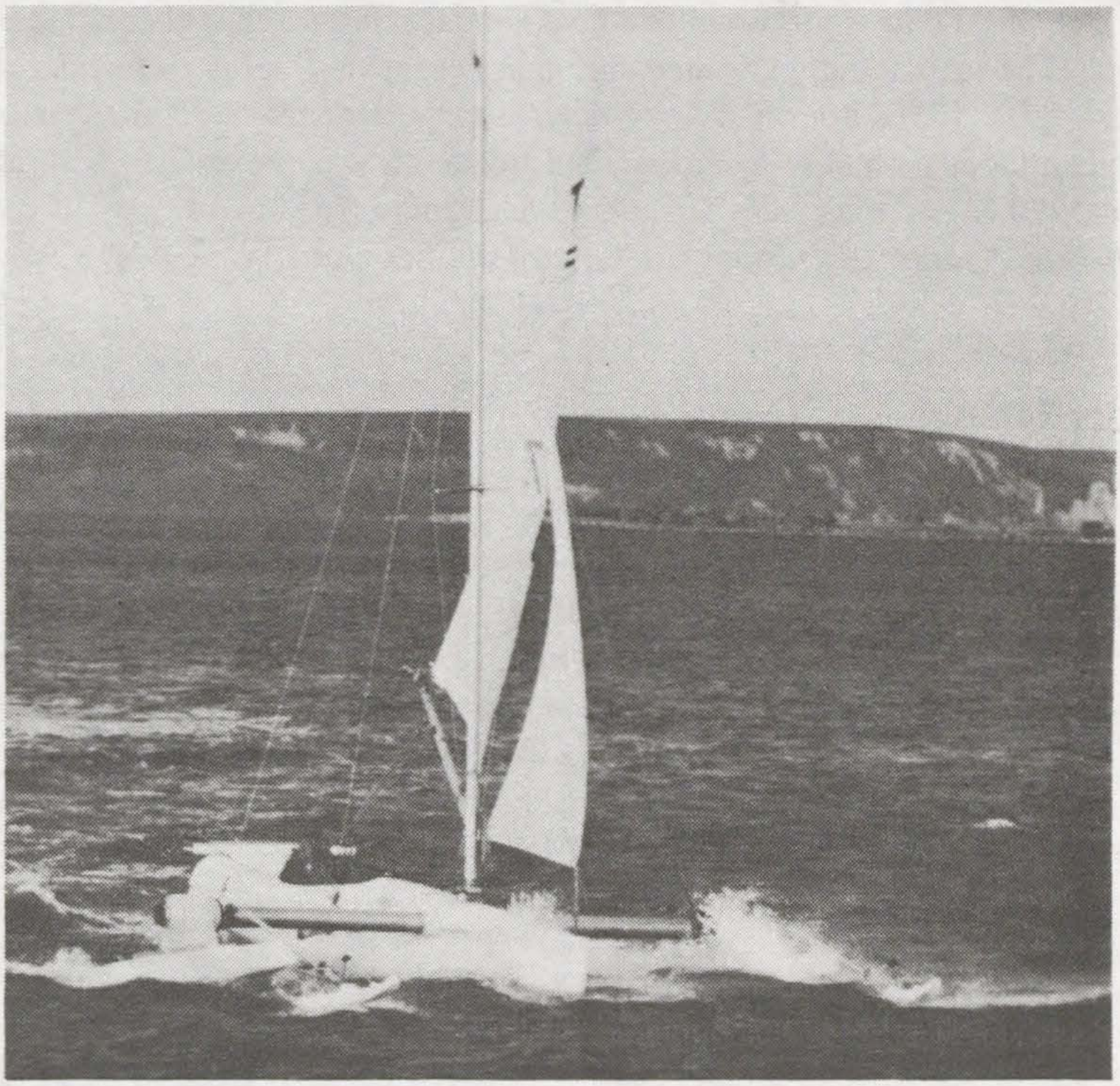
A one-tack tri-scaph, which first appeared in '94. Tri-Hydra was unfortunate to damage a skeg before getting onto the course. Later in the week, after repairs, she showed some promise under tow, rising easily onto the plane.

Bob Date - *Grange Builders Ltd*

1992/3/4 - 6.37 Knots('92)

This craft originally appeared in '92 under the name Connexion. It uses a similar configuration to Longshot, except that the foils are able to rotate around a tubular cross beam, instead of utilising beam twist. In '93 the two masted rig was replaced with a conventional rig, and the craft renamed Shotaway. Handling was improved but it was uncertain to which of the changes this could be attributed. In '94 only the name was changed, this time to Grange Builders Ltd.

For a full description of the naming of this craft see AYRS Newsletter.



Tony Kitson - *Are You Really Serious?*

1992/3 - 3.82 knots('92)

This was my first attempt at speed sailing and successful only in providing me with great fun. We suffered from designer incompetance, constructor incompetance and pilot incompetance, in equal measure. But primarily we suffered from lack of time on the water outside of the Weymouth event. I have retired from speed sailing until I can find a craft that I can launch and recover single-handed.

For a full description of Are You Really Serious? see AYRS 112

Jean Hurtado - *Hurlam 106*

1993/4 - no runs

This is the one that defies description! It is a trimaran with the floats mounted such that, viewed from aft, when one float is on the surface the other is almost vertical. The sail is rigidly mounted such that whichever float is on the surface the sail, again viewed from aft, is at 45 degrees to the vertical. The craft is tacked by rolling the main hull, a gymnastic and frequently damp exercise. Jean has calculated that he requires 25-30 knots for Hurlam to perform properly.

Further information on Hurlam 106 is given in a separate article in this issue.

Roger Glencross - *Hagedoorn*

1992/3/4 - no runs

This is not really a craft, more a set of ideas held together by some string! A kite takes the place of the sail and an underwater kite, or Hapa, the place of the centreboard. The pilot is suspended between the two, by the tension in the connecting cables. Roger is improving the performance of the elements at both ends of the string, but has yet to get them working together in perfect harmony.

For a full description of the craft Hagedoorn see AYRS 112, and for Prof Hagedoorn's original ideas see AYRS 114.

Bob Downhill - *TriFly*

1992 - no runs

This is the boat owned by Tony Blofeld prior to Speed Wing. Bob entered it in '92 but he was not allowed to perform any runs. The event organising staff would not let the boss out of the office! TriFly is now in the possession of Fred Ball, and we expect to see her out again for '95.

For a full description of TriFly see AYRS 112

Vari - Scari

Philosophy and Development of the Design

by Alan Blundell

Having designed and built a sailing catamaran, "Pencil", with three submerged and differentially controlled hydrofoils in the late seventies certain lessons were learnt from the project.

1. If a large number of timed runs are to be completed over a 500m speed course, the boat should operate efficiently on both tacks.

2. Although hydrofoils are an exciting challenge to build and sail, they remain vulnerable to damage, especially when launching and sailing close inshore. Damage to a foil, when it inevitably occurs is rarely light and may take a considerable time to repair.

Following the 'Pencil' project, the author became interested in windsurfing and built a number of boards and rigs of various configurations. The relative simplicity and performance of a sailboard was impressive and prompted the question, could a larger rig be used on a craft with a greater righting moment but still remain as simple to control?

The last board to be completed was a small 'sinker', 2.7m long, which performed well. Could the design be enlarged with the existing boards as outriggers? Immediately weight and complexity became apparent and a new mould would be needed - all of the authors boards were hollow and built in moulds. If the existing mould was used then two or three identical hulls could be built. Two 2.7m hulls would give a wide righting moment but would be unstable fore and aft. A possible way of improving this was to introduce a parallelogram motion where the helmsman's weight always opposed the thrust of the sail. Thus, when the sail was sheeted out, the hulls would be staggered and, when close hauled, they would be almost side by side. Problems would then arise when going about. If these could not be resolved then we would go back to a one-tack boat. Adding a third hull at the rear would improve the fore and aft stability but have a problem of where to seat the helm. Putting the third hull forward, in a central position, could lead to problems if the windward rear hull was allowed to fly. This would cause the bows of the other two to dig in and initiate a flip over.

Going back to basics, the specification for a speed sailing craft might include the following :-

A long waterline length on the lee side only.
A two-tack craft.
Simple planing hulls, all built in one mould if possible.
Centreboards or skegs that could be bought off the shelf.
A low profile and minimum buoyancy.
A wide beam.
The whole craft as light as possible.
A structure as rigid as possible without undue stress being placed on any one component.
The final design to be relatively easy to make, transport, rig, launch and sail.
A total cost within the means of the designer (say less than £1,000).

About the time that various models were being made to meet the above specification a friend, Bob Spagnoletti, was experimenting with a number of one-fifth scale model boards which he was towing bungee fashion across a local pond. One of these that looked promising had a stepped hull with the front part elliptical and broader than the rear. Watching it skip, 'ducks and drakes' fashion, the author wondered whether a full-scale version - possibly a catamaran - might not be a solution. But stepped hulls had been tried on boards and cats before and found not to be successful. However this model certainly went!

Back home and another look at the parallelogram model suggested a possible linkage for moving a third hull from one side to the other in order to provide a long stepped lee waterline. The original mechanism was provided by two parallel arms but a single arm with parallel wire stays either side would provide steering for the forward hull as well. If the sail was flown on the leeward side and the mast stepped onto the front of the swinging arm then it should work equally well on either tack.

To simplify the geometry the rear pivot of the swinging arm should be on the centreline between the two rear hulls. If the mast was supported above this point the sail would cant to windward which might prove beneficial - it worked on Pencil - but a mast support strut would dictate a change of tack by gybing and this could result in sheeting problems. However as windsurfers are happy to gybe by releasing the sail round the front of the board and catching it on the other side there ought to be a way of achieving this on a craft.

A one-fifth model was quickly made and tested with 'Spag' on the other end of

the rubber. Results were encouraging. Various adjustments were made to change the angle of attack of the hulls, the centre of gravity and the offset of the tow line.

The model was modified to see if rolling the front hull to one side or the other would steer it in the same manner that a board is foot steered. The roll axis was parallel to the hull which was at 5° to the waterline. First tests were disappointing until it was realised that the turning moment on the inclined hull was being exactly balanced by the forward skeg pulling in the opposite direction. When the roll axis was made parallel to the water this method of steering worked well and could possibly be used on the full scale craft to provide a fine trim or to augment the normal steering of the forward hull. This was to be achieved by pivoting it about a vertical axis at its connection to the swinging arm.

The exact positioning of the vertical steering axis on the front hull was something of a problem. At low speed it would need to be about half way along the deck. As the speed rose, however, the position would need to move further back. If the skeg was too far from this axis then unacceptable stick forces would result. However, if the skeg was moved too far forward, it would be too near the planing stagnation point, leading to possible ventilation! A further question concerned the effect that the flow from the front skeg would have on the rear one immediately behind it. Also the disturbed wake might affect the planing ability of the aft hull. Observation of the model planing showed that the flow between the two hulls remained fairly smooth. It seemed time to start thinking about building the full scale model.

Construction of the Hulls

Although the author's speed board on which the hulls were to be based worked well enough, it was decided to start again and build a better mould. A female base was made from faced chipboard and hardboard. A concave section with bevels at the front led into a double concave section at the rear. The bevels flared out to an almost flat portion at the mid point. The front rocker was 125mm and the rear 1.3m was straight. The hull was to be 2.7m long and 480mm at its widest point.

A male GRP mould was made from the hardboard one and a further female GRP one taken from this. Detachable side flanges were added, enabling a hull base with 25mm side rails to be layed up.

The first hull was layed up in the following order :- gel coat, kevlar, 6mm expanded PVC foam, glass cloth. This was designed to give a rigid sandwich

construction for the underside. The result was disappointing as the foam had failed to conform to the complex profile of the mould. The mould had been sealed in a polythene bag and a vacuum cleaner connected to it, but clearly this had provided insufficient suction. The solution was a proper vacuum pump but this proved too expensive. At last Bob Spag came up with an old aircraft pump and this was mounted and connected to a motor. Bob also recommended that, instead of the usual polyester resin that the author has always used before, epoxy should be tried. This would give a longer working time, be more suitable for use with a vacuum and was mechanically superior if cured correctly. The snag, of course, would be the vastly increased cost of the resin.

Hulls two and three were layed up with an extra layer of glass cloth between the gel coat and the kevlar. The pump worked well and seemed to be happy running at 6-8 inches of Hg for a period of about two hours.

Onto the hull bases a vertical glass/foam sandwich stringer was bonded between the nose and a frame across the front of the skeg box. The stringer then continued either side of the skeg box to the rear. Polyurethane foam mix was poured between the double stringer to seal it to the skeg box.

The original idea was to produce a hollow hull as in the author's previous boards, but finally it was decided to block in the spaces with 16 oz/ft^3 polystyrene foam. This was profiled with a hot wire cutter and smoothed. Then 25mm thick ply blocks were bonded in at the deck and side mounting points. A double layer of glass cloth was layed up over the whole deck and taken down into a rebate previously formed in the side rails. A further layer of glass was added to reinforce the area over the mounting points and the skeg box. Finally a flow coat of epoxy resin was painted over the deck.

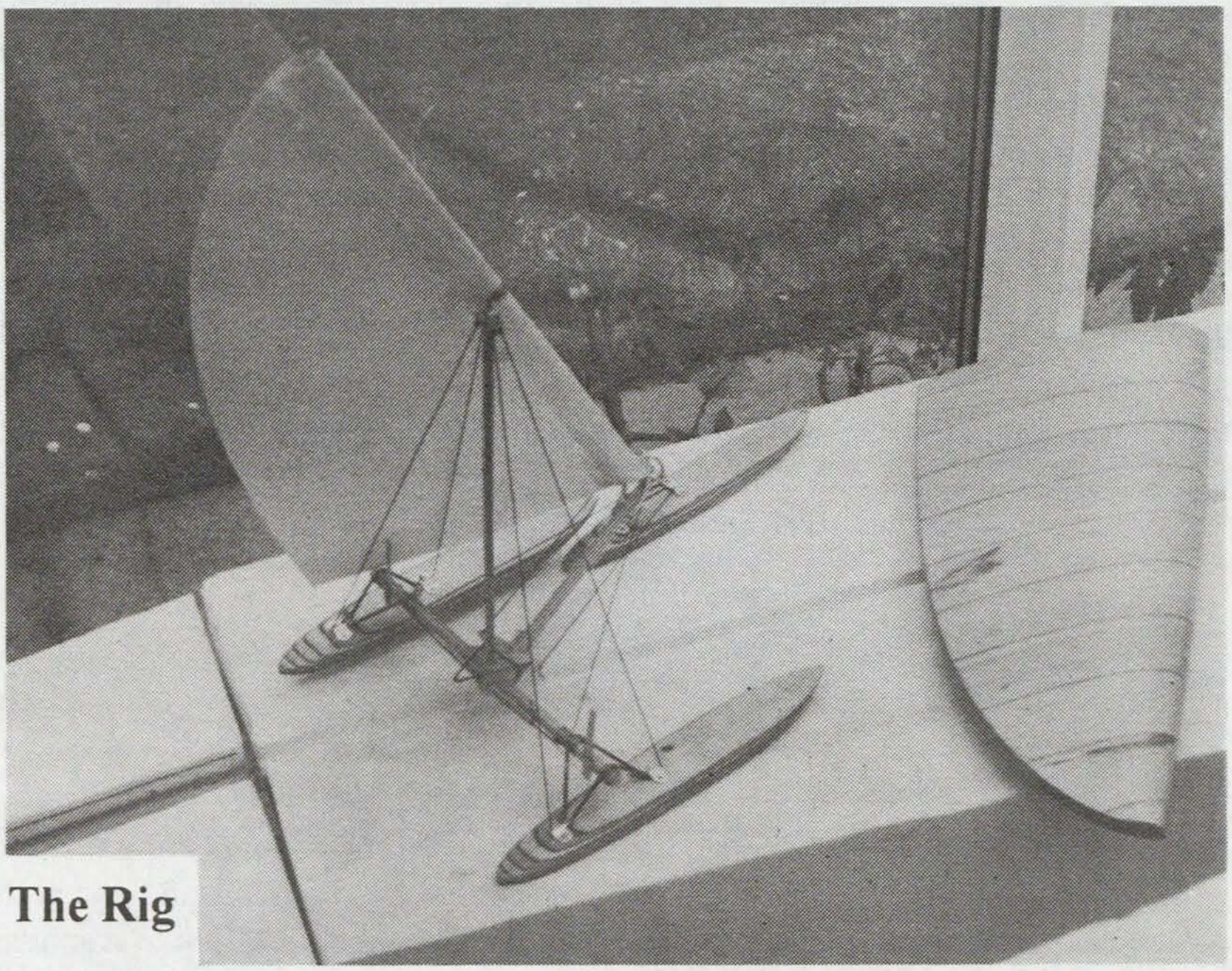
The Structure

The rear cross beam and swinging arm were recycled from Pencil and were 3" diameter 16 swg and 17 swg respectively in HE9 alloy.

Tubular steel in 17 swg or 18 swg was used for the frames connecting the forward and rear hulls to the alloy tubing. They were each built in jigs and joined by bronze welding. The swinging arm bearing support frame was built in a similar fashion. Each of the hulls was mounted with a fore and aft hinge line, the front having the facility to be roll steered and the rear to be rotated through 90^0 for launching in shallow water. For initial tests they were stayed from rolling with Dacron cord at each side. This gave a limited shock resistance from side impact.

The mast support was originally going to be a simple strut mounted centrally on the rear cross beam, but to reduce bending in the beam an 'A' frame was finally used. This mounted onto each rear hull support frame. With wire stays from the apex of the 'A' frame to fore and aft hinge mounting points on the rear hulls, the whole structure became a rigid unit, effectively tying the hulls together in pitch. The incidence of the rear hulls was controlled by the position on the mast at which the universal joint connecting it to the 'A' frame was fixed. The universal joint allowed the mast and swinging arm to be positioned for port or starboard tack sailing. It was clamped to the mast via a sleeve which allowed the sail full rotation forwards from one side to the other.

To complete the structure, the swinging arm was controlled by two Dacron cords attached at its front and lead through guides at each end of the rear beam. These cords were then connected together by a short shock cord at the centre. The swinging arm could then be locked in any position using clam cleats.



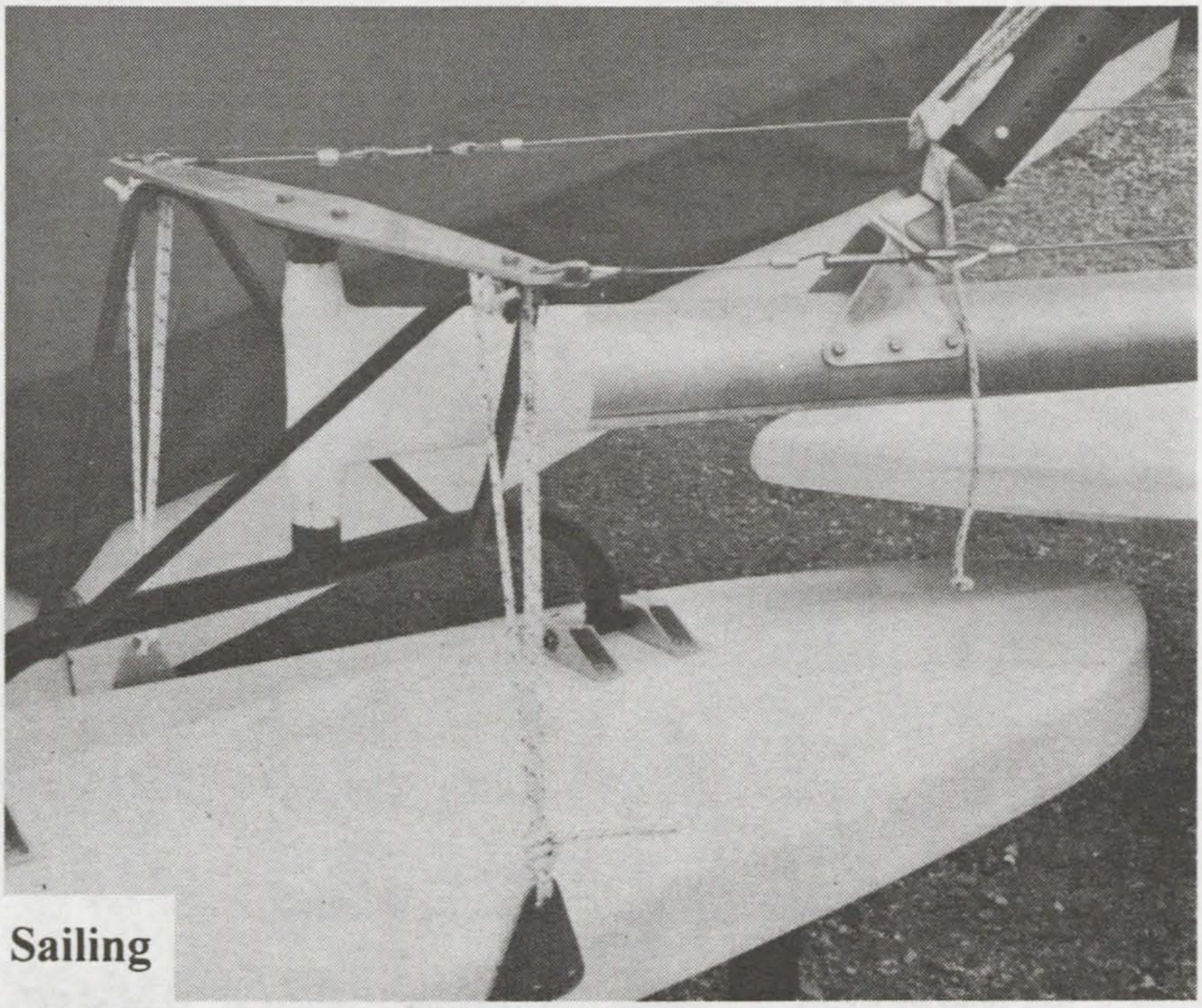
The Rig

For the initial trials a standard 7m² Neil Pryde windsurfer sail was used on a 5m alloy mast. The author plans to make a new 10m² sail for further tests. A 6m carbon mast is also being constructed for this project.

Controls

a. Steering The complete forward hull and skeg were steered by two parallel cables connected to a control lever pivoted through the rear swinging arm bearing. A tiller and tiller extension were attached to the rear control lever. The steering sense was in the conventional boat mode.

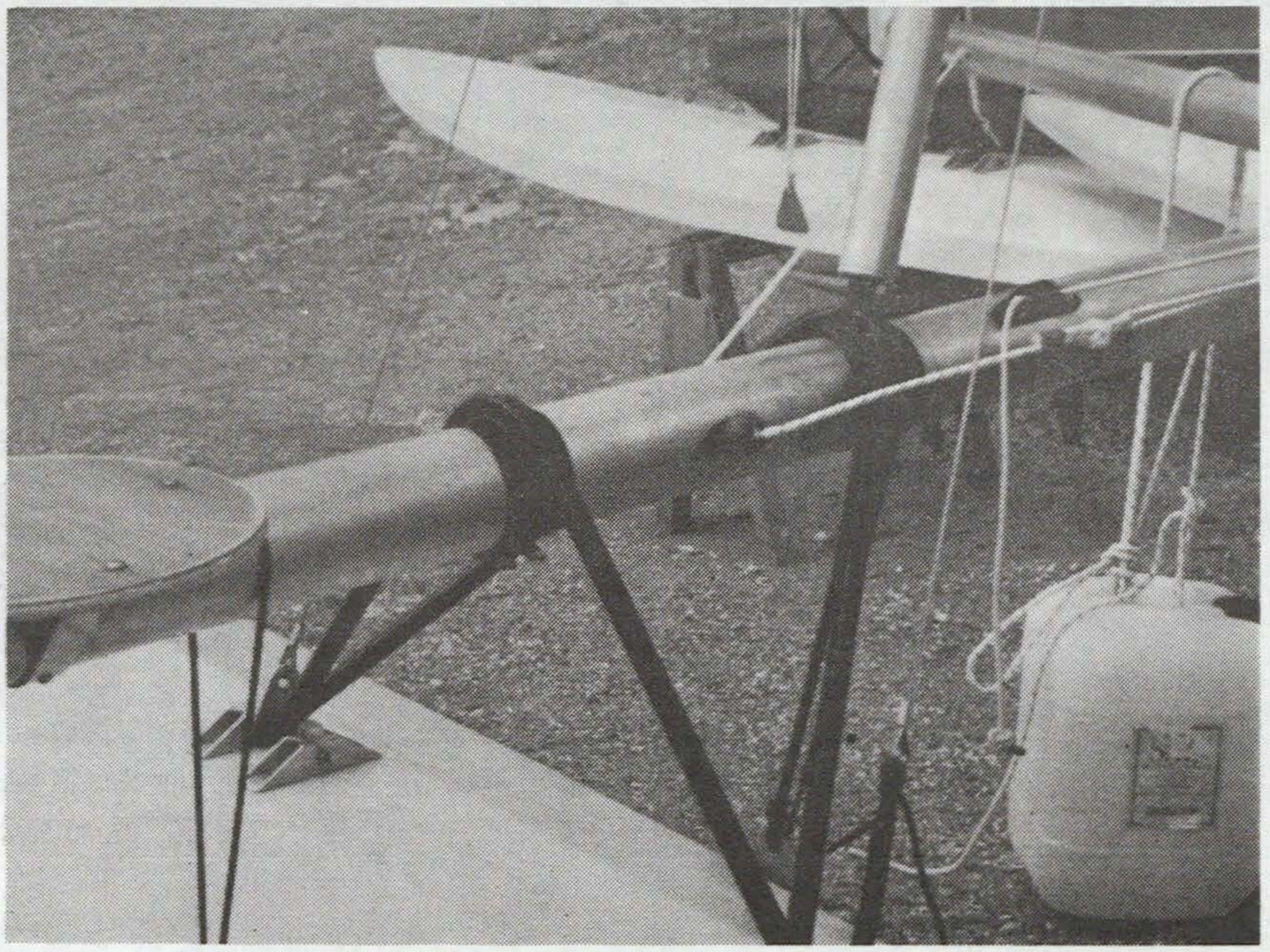
b. Sheeting Because, in order to change tack, the sail had to be rotated round the front of the mast, the sheeting arrangement proved one of the most difficult problems to solve. For initial tests the sheet, attached to each side of the rear end of the boom, was lead in a continuous loop round the back of the 'A' frame then round the mast to the other side of the boom. This arrangement produced unwanted slack rope when sailing and only allowed a one to one purchase when sheeting in - very tiring!



Sailing

Portland Harbour - October 1993 First flotation tests confirmed that the hulls had sufficient buoyancy to support one person but, as expected, there was little spare margin.

The first sailing tests were tethered, with Bob again holding the end of the line. Starting off soon showed itself to be a major problem. Once the craft was luffed to the wind there seemed little the helmsman could do to remedy the situation. Reversing in an arc and then sheeting in rapidly simply spun the craft back into the wind again. After playing for some time with no improvement at all we were offered a tow to the course where we could at least play in shallower water. The one mile ride under tow was particularly rough with the hulls slamming into the waves and the author began to wonder if the craft would survive the journey. We arrived intact however and were able to try some starts in shallower water near to the Chesil Beach. The wind was freshening and Bob finally said "Hang on I am going to hold you off the wind and see what happens". The sail was sheeted in and the craft accelerated rapidly and seemed to be planing almost immediately. Trying to stop the loose end of the sheet dragging in the water, the steering was somewhat erratic as we shot past the start boat rather close for comfort, but we were flying! This was sailing as the author had never experienced before except on a sailboard. The hardest part was hanging on to the sheet, and as we neared the finish line it seemed certain that all records were going to be broken on the very first run. Suddenly the sheet wrenched itself from the author's tired hand and the craft sank back onto the water a few yards short of the finish boat. Well that was quite some ride anyway! Then came the realisation that, in fact, we were now unable to start again but were slowly drifting backwards away from



the course. Luckily Phil Gollup was at hand in his inflatable and soon established the dependent routine of run and rescue that followed for the rest of the time sailing at Portland. Many thanks Phil!

Some turnarounds were achieved unaided and the best procedure was to jump into the water behind the crossbeam, swim across to the other hull holding tight to the tubing, then at the middle release the clam cleat holding the swinging arm and pull the rope sideways until the front hull had swung across to the other side. Then it was necessary to climb up onto the opposite hull as quickly as possible, drop the legs into the sea to act as a pivot and as the craft came round, locate the sheet and tiller extension and pull in the sail before the whole thing had luffed up into the wind. Sometimes it worked and we were off again.

Sailing at high speed, the hulls just skimmed across the water with very little spray. The steering was light but the sheeting was definitely not. Wrapping the rope three times around the wrist seemed the only sure way to hang on.

So there we are. There is a lot of development work still to be done but at least the first tests have been promising.

Acknowledgments are due to Bob Spagnoletti for his valuable advice and help, to Phil Gollup for his unstinting devotion to rescue services and to my wife Rosemary for putting up with a house full of boat bits for the past three years.

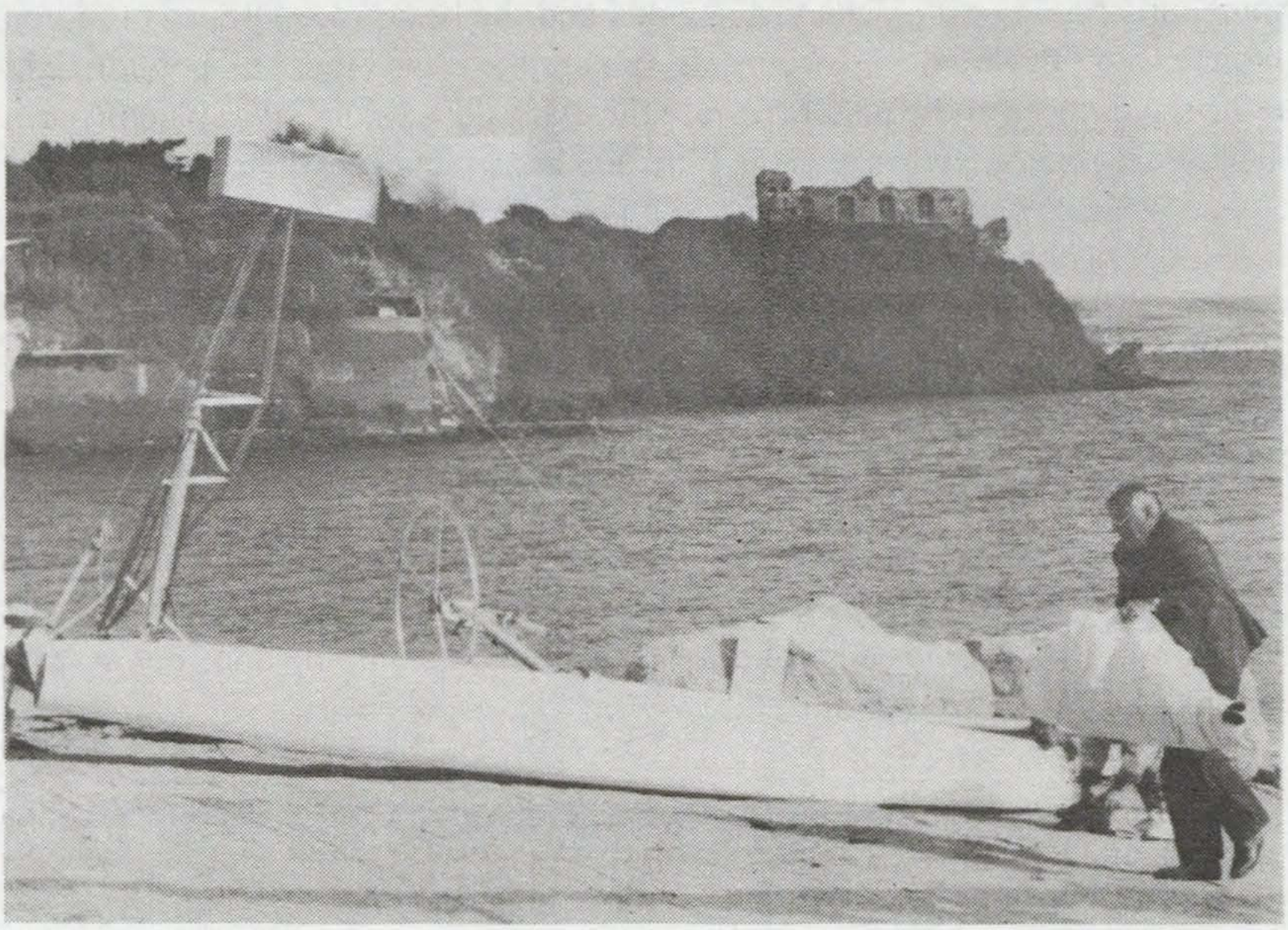
Hurlam 106

by Jean Hurtado

Hurlam 106, along with Vari Scari, was one of the most interesting craft to appear at Weymouth over the last three years. Like Vari Scari, this craft was one which caused most interest and discussions of 'how does it work' whilst on the beach.

Unfortunately Jean had an encounter with the Weymouth sewer pipe in '93 and with a contractor's crane whilst on the beach in '94, and has not yet managed to record a time on the course. However, he has demonstrated that the boat can be sailed and tacked, the latter with some gymnastics and not a little swimming.

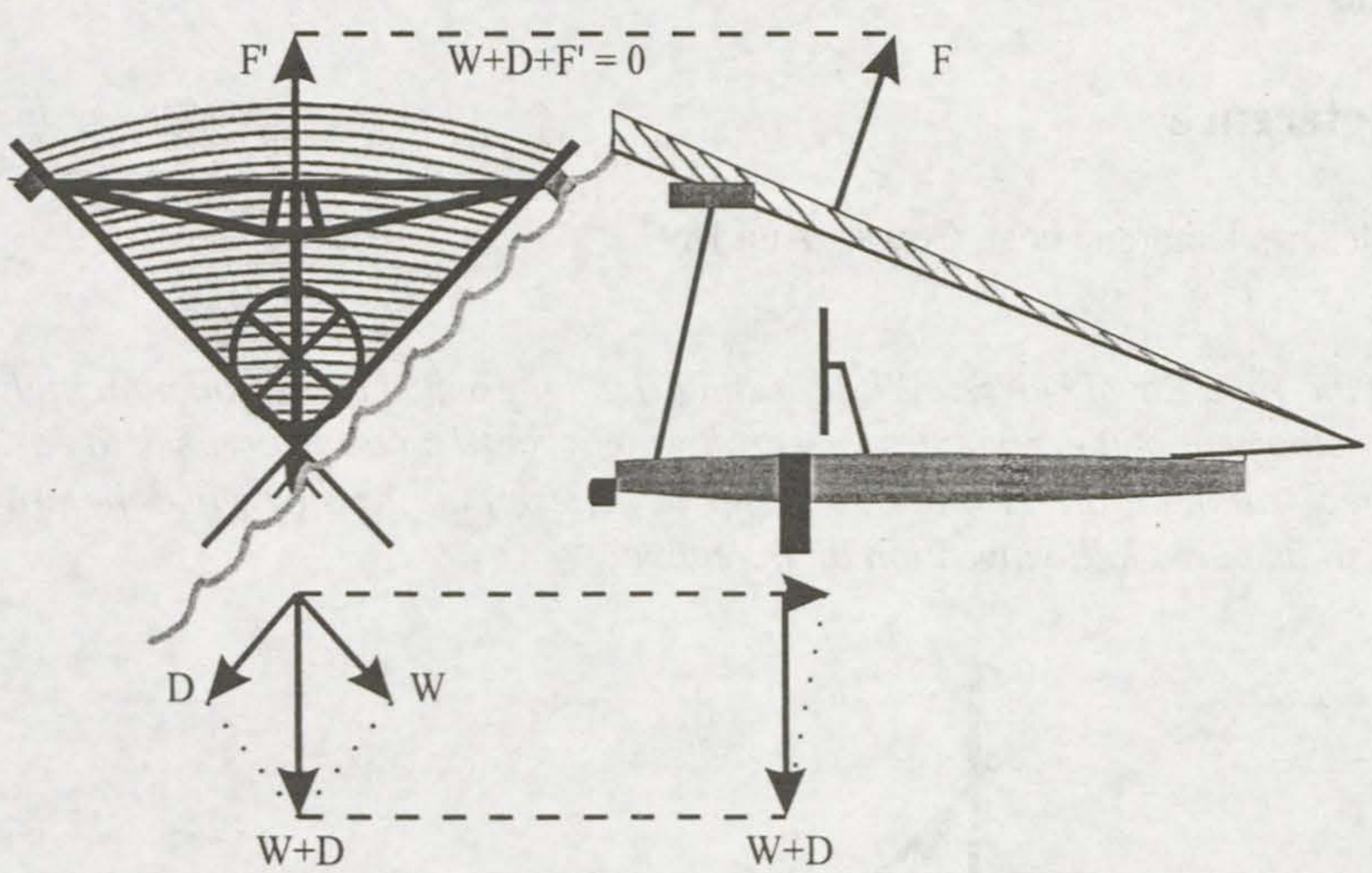
Jean Hurtado sent me his draft with instructions to 'give it a little English polish and improve it to make it more clear'. However I have chosen to publish it as sent. Firstly because it is already perfectly clear, secondly because this is such a revolutionary craft that I fear my version may actually misrepresent the truth, and finally because, like Hurlam 106, Jean's English has a Gallic charm that is irresistible.



Description

Hull: The hull is a NACRA 5.5 hull, 5.5 metres long.

Sail: The sail is triangular between two aluminium beams, radius 60mm, thickness 2mm, 7.65 metres long. The two beams are separated by a transverse beam at the top of the mast. The transverse beam is nearly perpendicular to the mast, but the angle can be adjusted by two pulleys. It can hold a compression of 400kg safely and is reticular to avoid buckling. At each end of that beam is a 60 litre float for stability when standing by; in action, the floats scarcely touch the water.



Rudders: There are two rudders, one for each tack, one operating when the other is out of the water. The rudders are simultaneously controlled by a steering wheel of 1 metre diameter, large enough to be reached by the pilot on either tack.

Fin: An aluminium blade is set on top of the hull, 0.3 metre wide, 1 metre long on each side, 8mm thick with increased thickness of the parts that are out of the water. Each side of the blade serves alternately as a fin and as a seat for the pilot. The position of the pilot is used to adjust the centre of gravity.

Mast: The length of the mast is 2 metres. It is made from aluminium tube, radius80mm, thickness 2mm.

Bowsprit: The bowsprit is telescopic and is used to adjust the position of the sail relative to the hull.

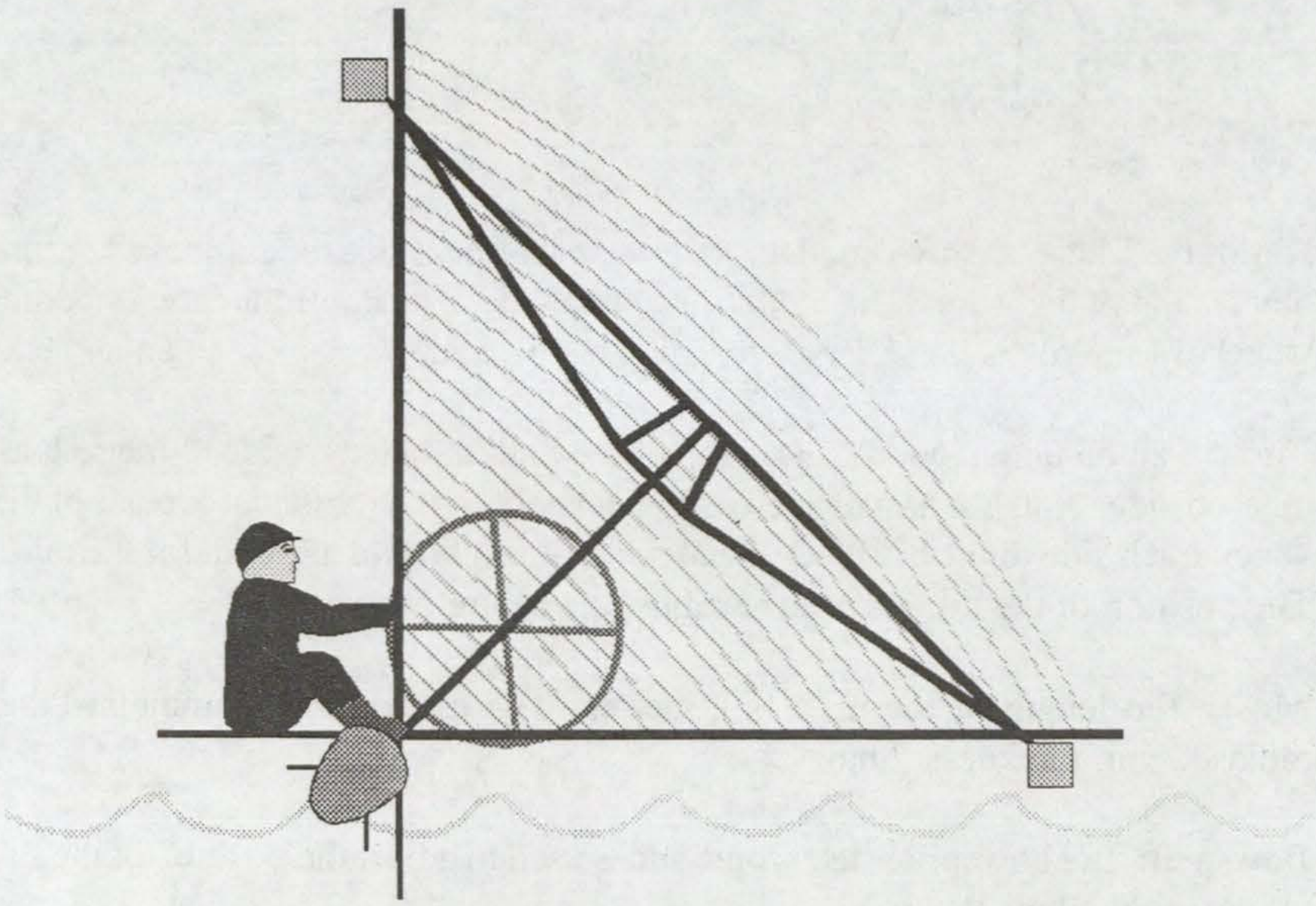
Theory

The craft is designed for a 30 knot true wind speed. For that speed only, the component of the sail force perpendicular to the hull is equal and opposed to the total weight (boat and pilot) and the lateral force on the fin and rudder. The boat, then, does not touch the water (except for the fin and rudder). The resultant is a force parallel to the hull direction, which should be adjusted to be just below the water resistance to ensure stability: the back of the boat touches slightly the water.

Reference

Pilcher's Umbrella boat, Cowes, Aug 1897.

At the 1993 Royal Dorset AYRS Meeting, Jean presented an explanation of the development of this revolutionary craft which traced an ancestry back to early Greek sailing craft. However, I prefer to believe that the story, like the craft itself, is pure Gallic invention and creativity.



Flying Fish

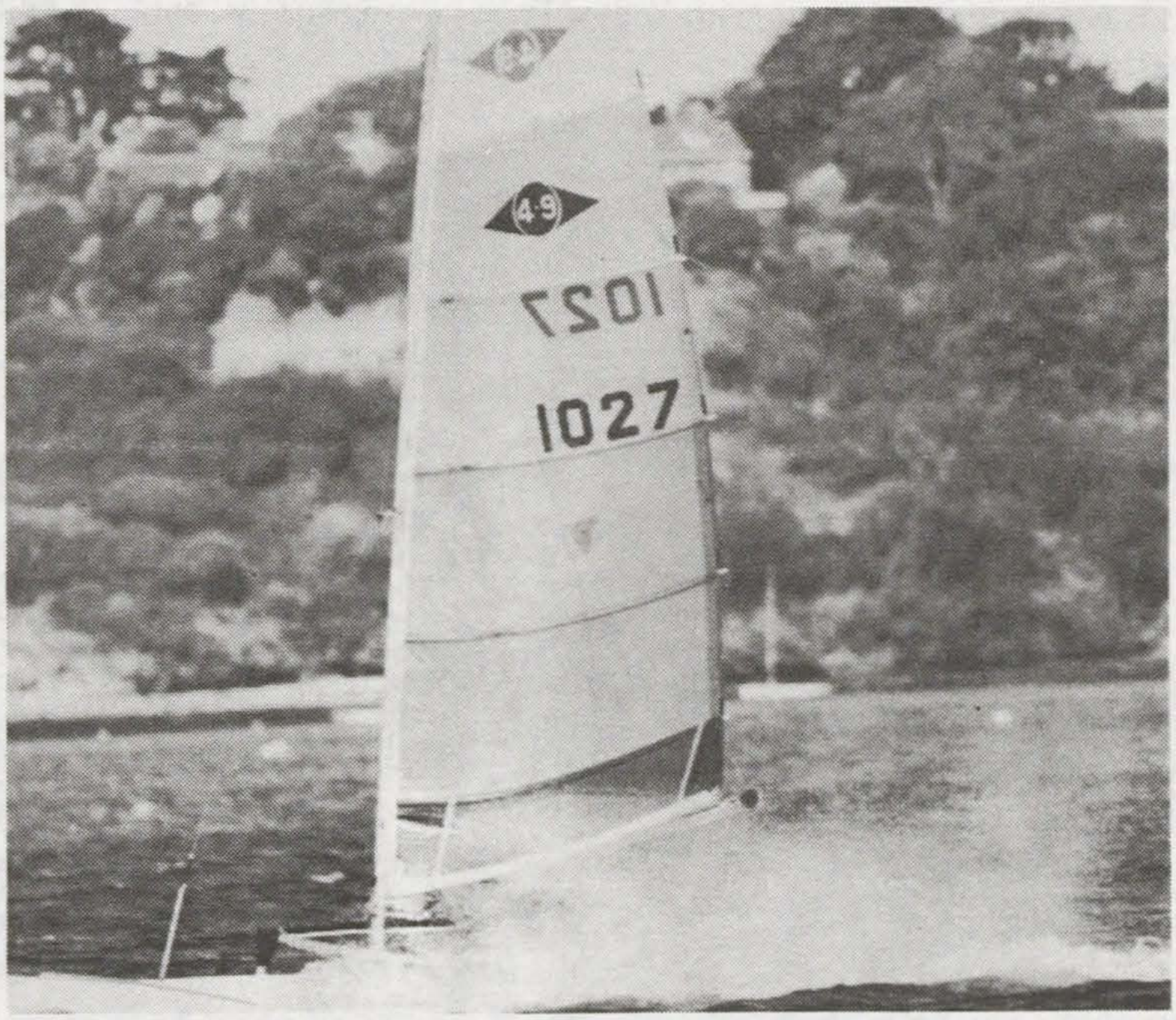
A Car-Toppable, Planing Catamaran

by Keith Dunstan

Another day board-sailing through the surf on Bantam Beach, my body was like jelly and the knee strain from which it would take six months to recover. It was time to start boat building

I wanted the excitement of board-sailing but with blocks and tackle to take the strain, a place to sit or even lie, and easy, one-man operation from the roof rack to the water.

The result so far is a 16ft x 9ft catamaran with very low volume planing hulls. To be launched off beaches it must perform in waves, so the hulls have fine deep V bows running to concave, then flat aft. To alleviate slapping and to produce a reasonable shape for low speeds the hulls are no more than 8.5 inches across the planing surface. The trampoline is raised on legs to keep it clear of the water when piercing waves or at low speeds.

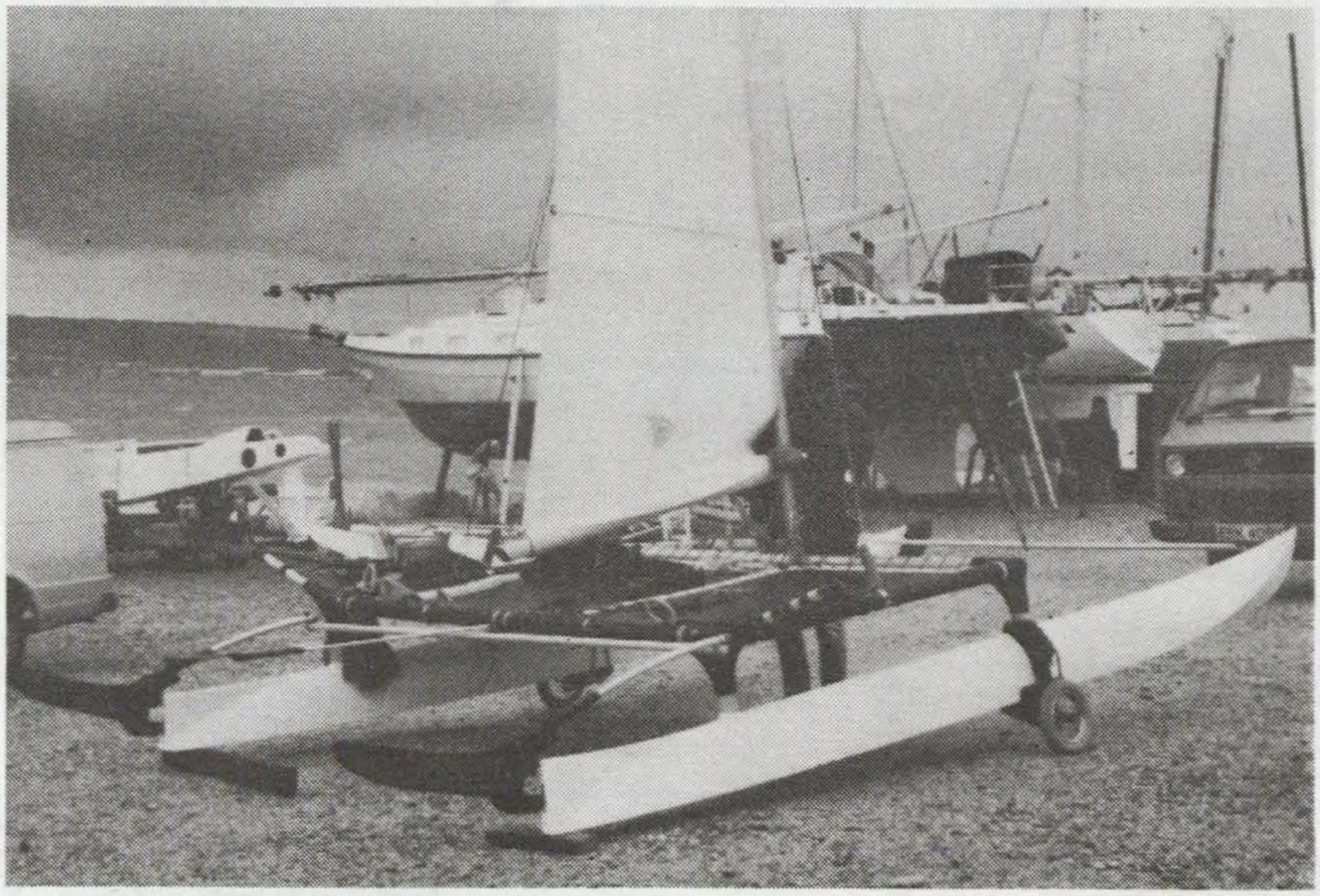


At Speed Week '92 I had twin windsurfer rigs which needed three or four strong men to raise. This year a conventional rig on the main beam with a dolphin striker proved much easier to handle. The rig was from a Pixie Cat, about 10sq metres. Sail shape was difficult to control and it felt very underpowered. On the course the lee hull was semi displacing, I needed either more speed or more planing surface. Only once or twice, when bearing right away and releasing the sheet did the boat really plane.

I now plan to increase the planing area at the stern by adding foam and glass to the plywood hulls. Courtesy of Bob Downhill's garage, I also have a 27ft mast (6ft taller than the present one) and a Tornado style boom with drum winches for clew outhaul and downhaul, also a mainsheet track. So I should be able to control sail shape next year and have more sail area. I also hope to modify the beam supports to make it easier for one man to assemble.

With some more refining I hope to get the boat up and planing easily on a reach. What speeds are attainable is open to speculation. When I find its maximum potential, maybe that will be the time to start experimenting with very small foils which will only work at speeds over 20 knots.

This is not a craft to compete with Yellow Pages for top speeds, but then Yellow Pages will not travel on a roof rack.



CALLIOPE

DEVELOPMENT DURING 1993

by George Chapman

In AYRS 112 - AYRS Projects we described Calliope as she was after her first, short season.

For her first outing of 1993, at the Weymouth Speed Weekend in May, she had sleeves fitted over the 8" chord struts, each with 2 fences (or walls). As the struts are lowered they slide through the sleeves until a ridge, or land, on the strut pushes the sleeve down. When fully down, the sleeve covers the strut from just inside the hull to a depth of 13". For the designed flying clearance keel-to-water of 6 1/2" (note the precision !), the fences are a further 3" and 6" deeper. Even so, ventilation still occurred if one tried to sail closer than about 120° off the wind.

Fitting seals at the top of the sleeves to stop the supposed leakage of air down inside the sleeves was to no avail. The solution, such as it is, was to move the trailing feelers from underneath the bows to positions inboard of the hulls. The feeler tips now sense (and turbulate) the water abeam of the struts, about 9" inboard of them. As a result, two-hull flight is possible closer to the wind, about 90°-100°. The occasional ventilation event still occurs even 120° off the wind if a wave breaks or one crosses a turbulent wake, but with careful steering there need be only a short curtsey of the lee hull.

Ventilation has hardly ever occurred with a single windward hull flying. The choice and utility of one or two hull flight depends on wind strength and direction and we are still learning where the advantages lie.

Improvements to the clutch mechanism enable one to clutch in or out at speeds up to 10 knots, at least. The introduction of a 'non-linear link' or crossed-over bell crank has modified the relationship between feeler/water height and flap angle, to reduce feeler drag when sailing slowly clutched in, giving a smoother lift-off.

While there is some dissatisfaction that the boat will not fly both hulls closer to the wind - and we are working on it - we believe the concept is proven. In the light winds at Weymouth of Saturday 2 October, averaging on our record around 6 knots, varying between 4 and 9, Calliope was the quickest timed competitor at

7.9 knots, when the foiling Catapult, Toastrack, did only 4.2. On the stronger wind days Toastrack with fixed inclined foils came into her own at 18.5 in a reported 22 knot wind. We are not overly disapointed with Calliope's best timed speed of 15.4 in a reported 18-20 knot wind. Our instruments and program, SPEED1, gave 16.4 knots (but add around half a knot ?) in a mean wind of 15 maybe 16 knots. Lies, damned lies.....!

Some of the difference between our estimation of wind speed and that noted on the timing boat may be due to the height difference, since our recording wind sensor is about 3'3" off the water when flying. On the other hand, when stopped, our masthead anemometer was showing the same speed as the lower one, suggesting little or no gradient. These two instruments show the same speed when the sensors are held adjacent.

In the final half-hour of sailing at Weymouth Keith Dunstan - no lightweight - came out for a ride and the boat showed that she could fly both hulls at 14 knots with two up; very satisfying on only 11 square metres of sail.

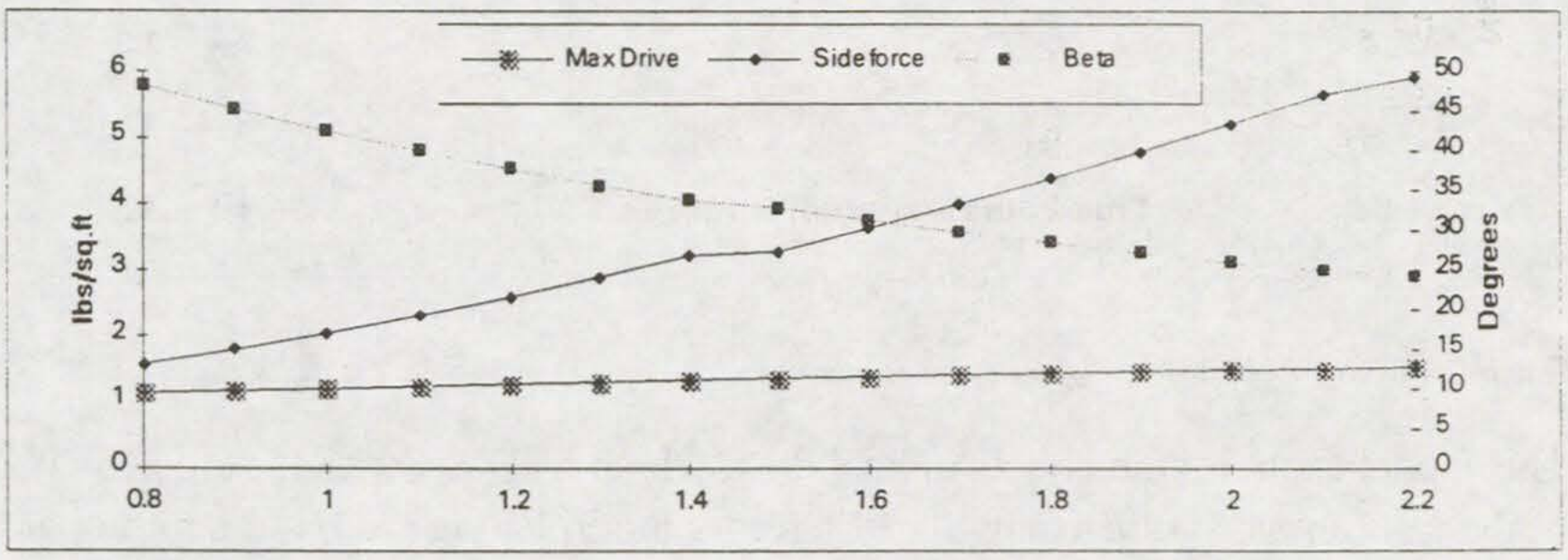
THE OPTIMUM COURSE

FOR HIGH SPEED SAILING

by Simon Fishwick,

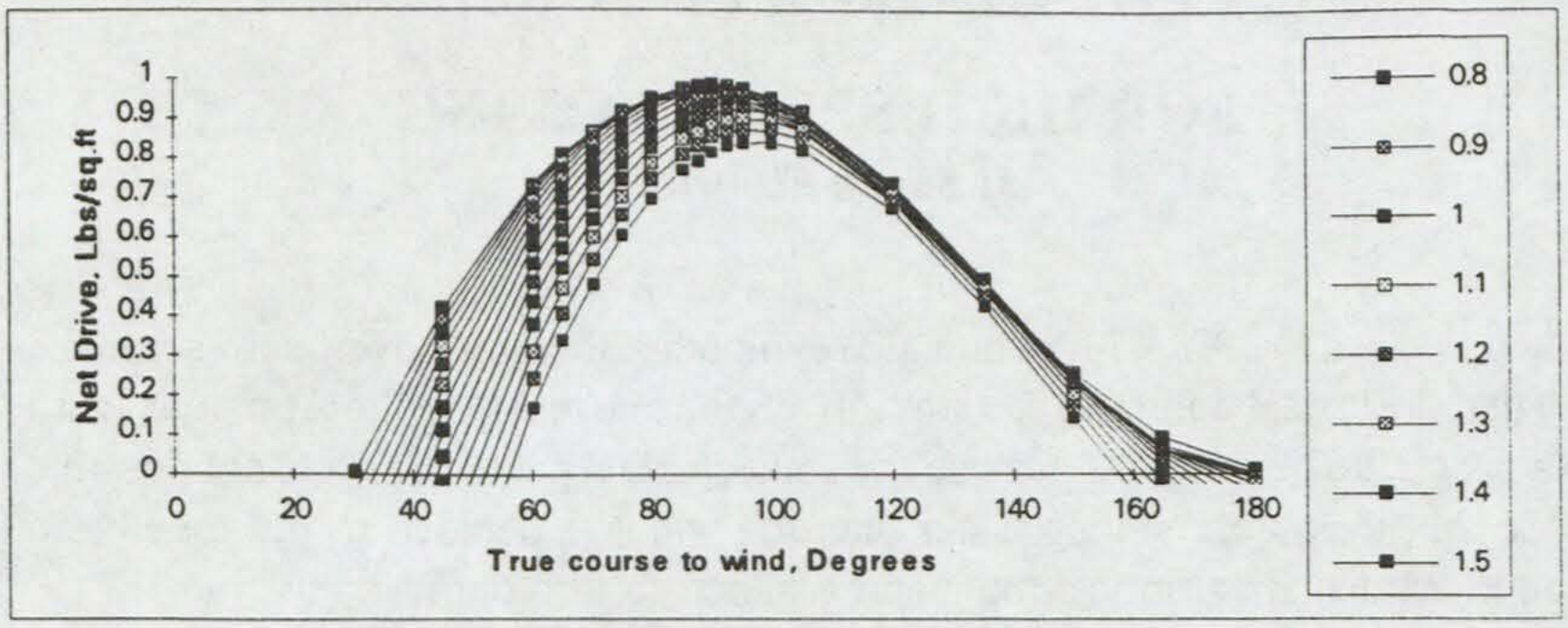
When I was at the AYRS Meeting at Weymouth, I thought I overheard someone say that the fastest course to sail was always the one that kept the Apparent Wind exactly on the beam. This puzzled me somewhat, especially as it is not possible to do that if you are sailing faster than the wind. I decided to put together a simple mathematical model (on a spreadsheet) to find out if it was true.

Finding out how fast you can sail at a given angle to the wind requires knowledge of the drag characteristic of the craft. I wanted to be more general than this, so I turned the problem round and asked "How much sail drive can you get if you sail at a given multiple of the windspeed at a given angle to the true wind. This is a lot easier to handle. Calculating the apparent wind speed and angle become matters of geometry, and a simple sail model (fixed angle of incidence, lift coefficient of 1.0, drag coefficient of 0.167) can give drive and side-force values. The best course to sail is the one that gives the most drive at a given speed.

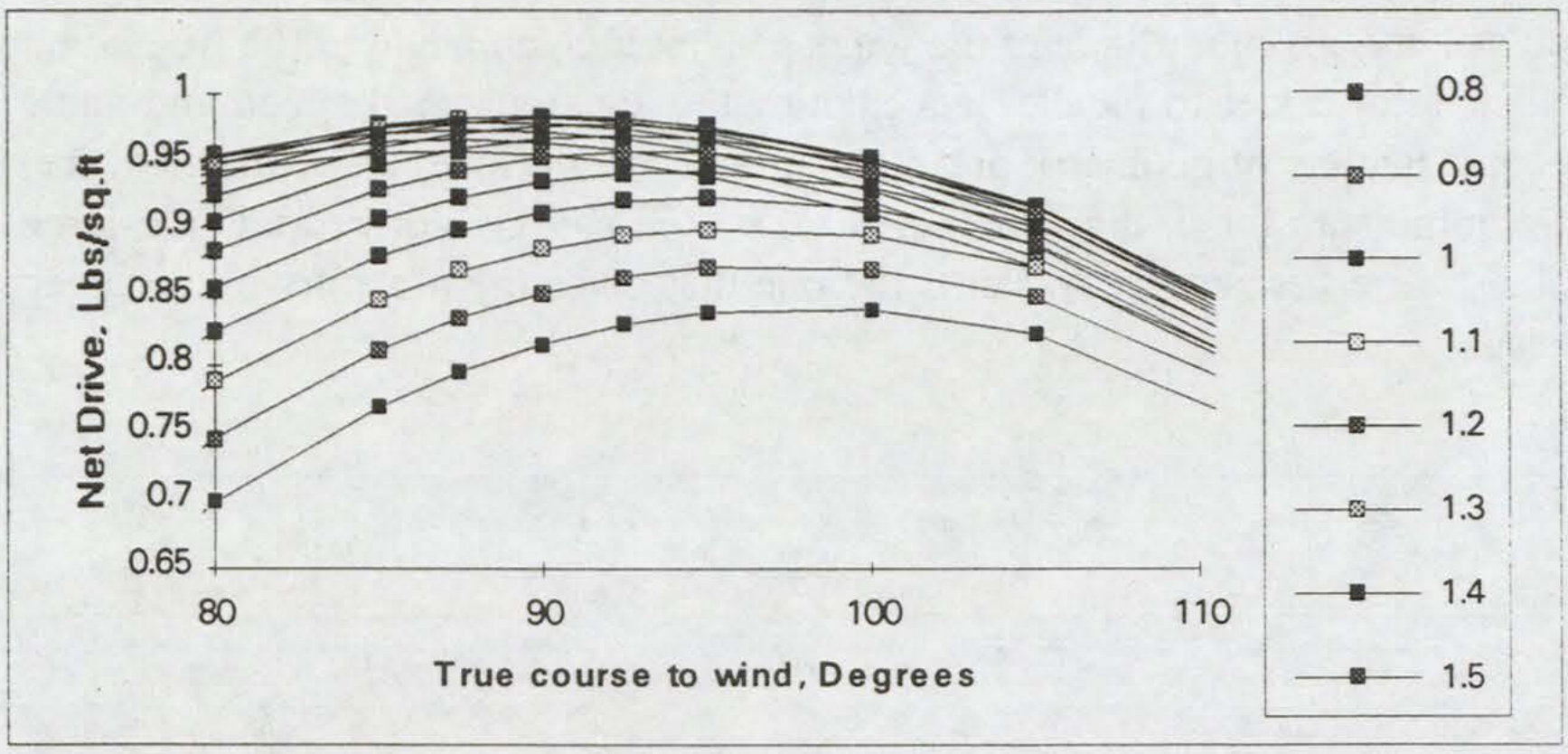


Graph A - Maximum drive-force, side-force and apparent wind-angle vs. boatspeed/windspeed

Graph A shows the greatest thrust and corresponding side-force obtained for each boatspeed/windspeed ratio. It also shows the apparent wind-angle at which this is achieved. This is of passing interest as it shows the shape of envelope within which the craft drag/speed curve must lie. I then extracted the drive values for each course and plotted them as a percentage of these maxima. The result is in Graphs B & C, Graph C being an expansion of the central part of Graph B.



Graph B - Drive force variation with course

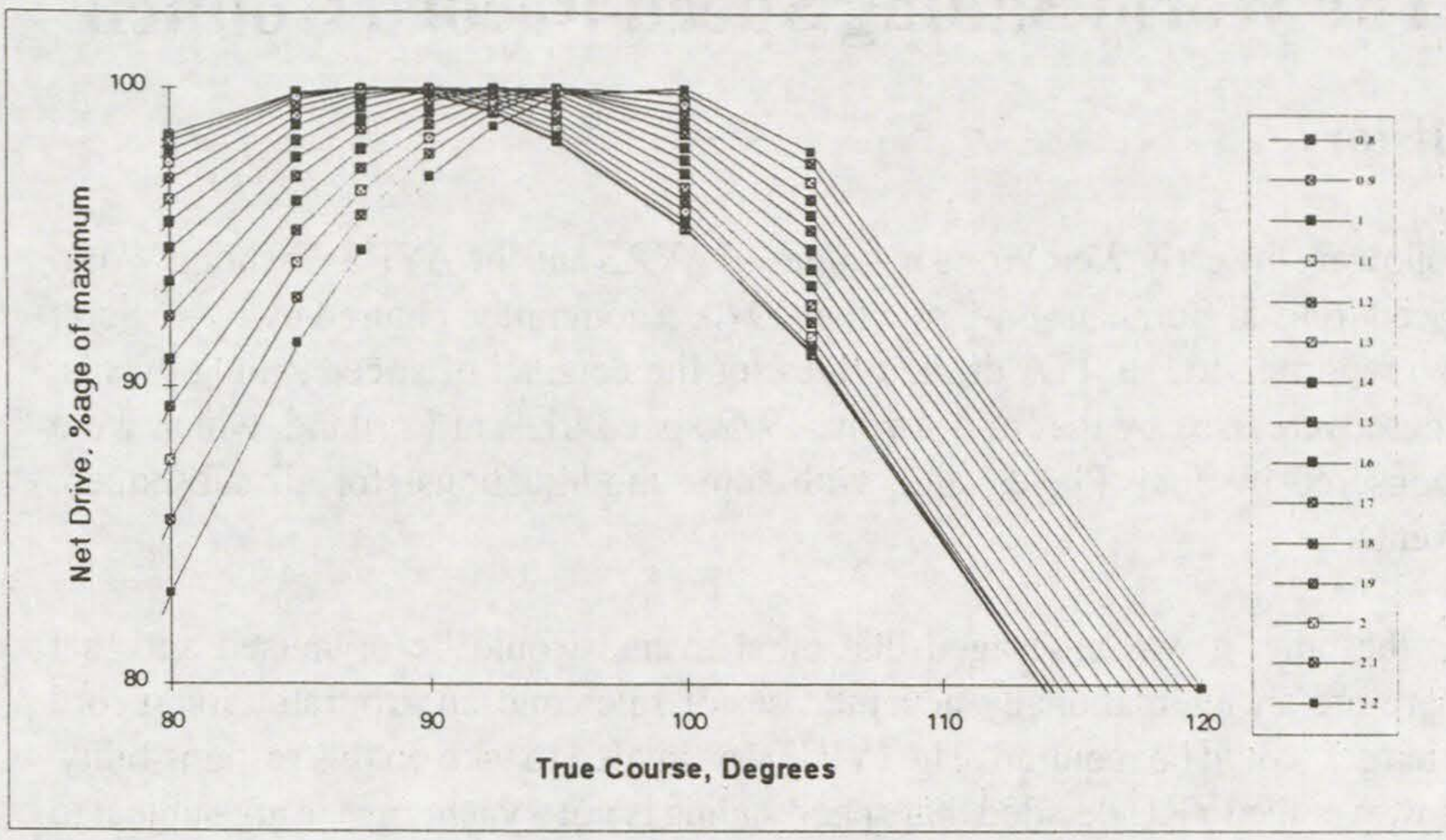


Graph C - Drive force variation with course (expansion)

This model excludes the effects of keel drag, which will vary with the side-force of the sail (amongst other things). I therefore modified the model to subtract a proportion of the side-force from the drive.. For simplicity I assumed that the keel could always achieve a lift/drag ratio of 8, and subtracted one eighth of the side-force. The final result is in Graph D.

This shows quite clearly that the best course to sail (at least for boat speed between once and twice the wind speed) is very close to 90° to the true wind.

For speed-sailing trials, this has the great advantage that the course can be sailed in either direction equally efficiently.



Graph D - Net drive force variation with course

Appendices -

A. Formulae Used

Ratio of Boatspeed/(True) Windspeed = R
Angle between course and True wind = γ
Angle between course and apparent wind = β = ArcTan(Sin γ /(Cos γ + R))
Ratio of Apparent/True windspeed = V = Sin γ / Sin β
Sail Lift Coefficient, Cl = 1.0
Drag Coefficient Cd = 0.167
Dynamic pressure = Δ = 1.0 lb/ft^2
Sail Lift (per sq. ft.) = L = $\Delta V^2 Cl$ = V^2 lbs
Sail Drag (per sq. ft.) = D = $\Delta V^2 Cd$ = 0.167 V^2 lbs
Sail drive-force = Ft = L.Sin β - D.Cos β
Sail side-force = Fs = L.Cos β + D.Sin β
Net Drive force = Ft - 0.125*Fs

B. Assumptions

1. The primary assumption is that the speed of the craft is limited only by the amount of sail drive available i.e. there are adequate reserves of both lateral and longitudinal stability. This is true for all craft in light winds (up to their design windspeed). The lateral stability required is not trivial. The dynamic pressure used above, 1 lb/sq.ft, is generated by a true windspeed of about 19 knots. At 2.2 times this windspeed, a 10 sq.m wingsail will generate a lateral force of the order of 600 lbs, and a heeling moment of the order of 6000 lbs-ft. On something like an International Canoe, the sliding seat would have to be some 33 ft (10 m) long! Clearly, some careful thought is required.

2. The other assumption is that the sail can generate the lift values required at the sheeting angles allowed. This again will not be easy with a soft sail, though a rigid one should achieve it easily.

3. This model does not assume that the hull lateral lift/drag ratio (beta angle) is a constant independent of speed. Nothing in my experience has convinced me that it is, so I am wary of "constant beta" diagrams.

The World Sailing Speed Record Council

History

Following the early Weir Wood meetings of AYRS and the AYRS/Yachting World speed trials at Burnham-on-Crouch in 1970, a committee chaired by Peter Scott and reporting to the RYA drafted rules for the conduct of speed sailing events. These were used by the RYA for the 1972 speed trials at Portland, which were sponsored by John Player, and, with some modifications, for all subsequent events.

At the time, it was envisaged that other events would be organised and that therefore an internationally accepted set of rules and an arbitrator for record attempts would be required. The IYRU was invited to take on this responsibility. However the IYRU decided that speed sailing is not a yacht race ie not subject to the International Yacht Racing Rules, and also substantial cash prizes were offered, again placing the events outside the IYRU remit. Therefore the World Sailing Speed Records Committee was set up.

In 1983 the IYRU officially recognised the World Sailing Speed Records Committee as the world authority for rules and ratification of sailing speed records. Eventually the committee grew into the World Sailing Speed Records Council and was finally affiliated into the IYRU in 1989.

Objectives and Procedures

The WSSRC set itself the following tasks;
To make and maintain rules for speed records under sail.
To examine, ratify and publish record claims.
To approve international speed sailing competitions and to assist and advise their organisers.
To provide commissioners who must be present at any record attempt.
To cooperate as closely as possible with national sailing authorities and their affiliated clubs.

The WSSRC carries out these tasks through its appointed commissioners, who attend all speed attempts at both private events and open events. The function of the commissioner is to satisfy himself that every condition of the rules is met before a record claim can be considered. No claim for a new record will be entertained unless a commissioner was present at the event.

The commissioner must satisfy himself particularly in respect of;
The accuracy of the measurement of the course or courses.
The accuracy of the timing devices and methods
The synchrony of the timepieces at the start and finish transits
The adequacy and numbers of timing operators.
The identification of competitors crossing the transits, by whatever means they are recorded.
The current or tidal stream at all relevant times.
The final list of competitors and their best times as supplied by the organisers

In addition to the above when a record is claimed the commissioner must report on;
The specific and entire timing operation in respect of this claim
The specific identity of the competitor claiming, as identified directly and by video.
The absence of any means of power or stored energy
The sail area of the sail(s) actually used
The wind speed, with especially accurate readings if a claim for efficiency is entered.

The ratification of a record claim by the WSSRC also requires the submission by the organiser of;
Certificate of accuracy of timekeeping equipment, published by an official timekeeping body.
A detailed plan of the course and its certified measurements from a qualified surveyor.
Timekeeper's report and calculations.
List of the names of the timekeepers and course observers.
Sail Measurer's report with commissioner's confirmation.

Scope of Authority

World records are recognised in the following classes determined by sail areas;
10 sq m (up to and including 10 sq m)
A Class (10 sqm - 150 sq ft [13.93 sq m])
B Class (150 sq ft - 235 sq ft [21.84 sq m])
C Class (235 sq ft - 300 sq ft [27.88 sq m])
D Class (over 300 sq ft)

Womens records are recognised in all classes.

Since 1972 the minimum distance over which a world record speed may be claimed is 500 metres.

The timing must be accurate to 1/100 sec., with allowance made for any current, which must be less than 1knot.

The time difference required for granting a new record varies with the conditions under which it is measured;

on the same course, with no movement of the recording equipment, the difference must be equal to or greater than the accuracy of equipment,

on a different course, it must be equal to or greater than 1/25 second.

As well as administering the records for the 500 metre course the WSSRC also covers the Nautical Mile Record and records for passage making.

Publications

All the information you will ever need to make your speed attempt official is encapsulated in their publication with the memorable title, "IYRU/World Sailing Speed Record Rules Including Record Rules for Individually Attempted Passage Records". The booklet includes the following sections;

Record Rules
Rules for the Nautical Mile Record
Advice and Instructions for Speed Sailing Event Organisers
IYRU/WSSRC World Records and Ratified Speeds, 1972-1992
IYRU/WSSRC Hints to Commissioners
IYRU/World Sailing Speed Record Rules for Individually Attempted Passage Records

This booklet and their other publication, 'This is Speed Sailing' are both available from John Reed at RYA, RYA House, Romsey Road, Eastleigh, Hants SOA5 4YA, England. (Telephone: 0703 629 962, FAX: 0703 629 924)

As they say in their own publication; "If the World Sailing Speed Records Council did not exist it would have to be invented, for exaggerated claims of the speed of ships are as old as sailing."

How Fast?

Some Thoughts on Speed Sailing

by Michael Ellison

John Morwood told us that plank hulls and cotton sails were in use by 4,000 BC. After 6,000 years of progress plank hulls and cotton sails were still available when AYRS members organised their Weir Wood sailing meetings which were followed and eclipsed by the John Player sponsored RYA Portland speed events. The question 'How fast' had been given urgency by the ever increasing and impossible claims for speeds obtained by the new multihull yachts.

When the first speed week was announced in 1972 our founder wrote;

> "At this moment one would guess that the big fast (offshore racing) cats and tris will win the main award such as Hugo Myers' 'Sea Bird', Philip Weld's Kelsall design 'Trumpeter' or Dick Newick's 'Three Cheers'. However Gerald Holtom's 52 foot foiler which is now being built will be hard to beat and Eric Taberly's trimaran 'Pen Duick IV' may well be the fastest boat afloat. In case the above should dishearten our less wealthy members, I think they may well produce a flying or stabilised hydrofoil boat which would be a strong opponent of the massive craft mentioned."

In 1972 the first record was set by the purpose built proa 'Crossbow' with 26.03 knots. 'Icarus' the Grogono Tornado cat with lifting foils got into the prize money with 21.06, while 'Mayfly' with 113 square feet of sail ('A' Class) made 16.04. Leif Wagner-Smitt from Denmark achieved 13.06 with 10 square metres of sail.

For 1973 we abandoned meeting at Weir Wood and agreed to help run the event at Portland in exchange for the introduction of classes for smaller sail areas in that event.

Since 1972 record speeds have steadily increased. The expected progress was totally disrupted by the introduction of sail boards (AYRS 58 predated the Windsurfer patent thus making the patent void, and freeing the concept for design improvements). Nobody, at that time, thought that a Windsurfer could exceed 10 knots. Challenging for the 10 square metre record was inconceivable. Board sailing became popular beyond the regions of warm air and water because of the development of wet suits which allowed sufficient movement whilst giving

protection from the cold. It is interesting to note that new sailing clothes have probably done as much to improve speeds as have computer aided design and carbon fibre construction. If a helmsman is cold both his fingers and his brain are numbed and that little extra required for a record is missing.

It took around 6,000 years to reach 26 knots, an improvement of say 20 knots, or one knot every 300 years. The increase from 26 knots to 46 knots has taken around 20 years, or one knot a year, on average. Can this rate be maintained?

The situation today is less favourable than it was for the development of new craft. Sponsored events which flourished to cater for the Windsurfers have almost disappeared as the chance of setting new records declines and reduces the opportunity for attracting publicity for the sponsor. Without the necessary publicity most of the sponsors have departed the scene. The cost of organising a private attempt with proper timing equipment and an approved observer put this beyond most amateurs, particularly with the need to maintain the team, equipment and observer over the extended wait for the ideal conditions.

Even allowing for the increasing problems of logistics and cost there are several factors which encourage me to expect that sailing speed records may continue to increase at an average of one knot per year. This will not be a steady increase, but I believe that another 20 knots over the next 20 years will be possible.

At present the target is 50 knots and there are three quite different types of craft, each capable of breaking the record. As the craft are from three different countries, Australia, USA and France, national pride will be an additional spur to their efforts. Boardsailors have not yet given up, and are seriously testing methods of streamlining the crew, including the use of a wingsail with the crew inside.

The record is now at the water equivalent of the 'sound barrier'. It was expected that hydrofoils would cavitate and lose lift at 45 knots, the claimed maximum for powered hydrofoils. It is not known how rudders and skegs resisting leeway will continue to function at higher speeds. At these speeds wind drag on hull and crew also becomes ever more significant.

The Australians have addressed these problems in detail. They do not use foils for lifting. They use forward steering via three blades and a further three blades aft to resist leeway. Russell Long of California had his foils (43 knots) tested at MIT in an enclosed water flow which showed cavitation at 38 knots. After further tests a new set designed for 53 knots have been built and tried with a new pair of rigid wings (with flaps to enable sailing equally well on either tack). So far the

trials and adjustments needed to match the foils to the boat are incomplete, however it has been shown that there is still sufficient power and lift available to raise the craft out of the water at low speed. Take off is always a problem when designing for top speed. The question of how Longshot achieved 43 knots in rough water with foils which should have been giving huge drag and little lift beyond 38 knots has not yet been answered. I suspect that, for part or much of the run (I have observed several runs at over 40 knots made by Longshot), the foil is acting as a planing surface able to slice through the wave crests. Given that 43 knots was the average speed this must have been exceeded considerably for short periods, since the speeds were not constant throughout the run.

Without doubt the French have the most expensive contender. So far this has suffered from a large design team and the lack of suitable water and wind for extensive trials. The composition of the design team is vital for the success of any record attempt, but for speed under sail matching water, air flow, construction and control person during a record run is only part of the problem. The complete craft must be assembled - probably on an exposed beach in driving sand. It must be launched, adjusted, and perhaps towed, all without damage to its structure. The people involved must be happy during long hours of waiting for wind, being called out before dawn or kept out until dark in the hope of an increase or a decrease or a change of direction of the wind, which most often does not happen. They must watch days of perfect weather pass while parts which were broken during aborted trials are mended. Many excellent and practical speed contenders have never reached the course in favourable conditions.

Prototype craft can be as complex as a team can devise, but the actual record contender must be simple. During a run the crew has 23 seconds to steer for the finish, look out for obstructions, control the sail angle, and look out for structural failures. He/she can see, hear and feel, which tales care of direction (sight), breakage (noise) and pitch/roll (feel). Radio link to a support boat can be very useful especially during the run into the measured course, but I doubt if wind speed or water speed instruments are of any value during a 500 metre record attempt. Being able to get back to start another run in quick time can be of the utmost importance especially for tuning. This was a major failure of 'Crossbow' which had to be towed back after each run, and it was a design requirement that 'Crossbow 2' should be able to sail (slowly) on the wrong tack.

There is no doubt that competition and the thousands of hours of unpaid testing by amateurs brought sailboards to their present performance plateau. Members are also dreaming, designing and, in a few cases, building strange craft, some of which could further confirm John's original opinion that big is not necessarily

beautiful. The main advantage of the individual approach is that the design is not restricted by our past knowledge of what will not work or what must break. I was taught that trains must go 'clickety-clack' on the track because expansion joints are essential to prevent the lines from bending. Now they weld miles of line. The sound and cavitation barriers are still present but they can and will be broken. Individuals can see how this may be done but they need encouragement and help. In the end success usually comes to a dedicated and well organised team, each member expert in one area but able towork with the others to overcome the common problems. The function of AYRS is to encourage the individual with ideas and communication to discuss problems. It is also interesting to watch the 'impossible' being achieved.

Conclusion

This issue has covered the two craft which have lifted the speed sailing records from the domination of the boardsailors, and the revival of the Weymouth Speed Week. Jointly these developments have encouraged a renewed interest in speed sailing.

However these two craft have also moved speed sailing records out of the range of the enthusiastic but impecunious amateur. We have not yet, and probably never will, reach the extreme heights of funding required for America's Cup racing, but a step along the way has been taken. The investment in these craft means that it is worthwhile staging their own timing trials at times and locations to suit themselves and it seems inevitable that future records will only be set outside of events such as Weymouth.

So what, if any, will be the future role for such events?

Board manufacturers will still want to sell equipment so there will still be a need for boardsailors to compete for boardsailing records though even here the level of investment has declined in recent years. However, fixed date events such as Weymouth are not ideal for boardsailors. They are better served by the type of event where the decision to go is made at the last minute and determined by the prevailing wind strength during that minute. Ease of transportation of their equipment allows the boardsailors to respond rapidly and to take advantage of the wind where and when it blows.

Hopefully there will always be a group of boardsailors who will turn up to support Weymouth Speed Week, but we should not look in this direction for future sponsorship.

I believe that the Weymouth event provides a much needed opportunity and incentive for the aspiring speed sailor to test out his ideas and to obtain feedback from the timekeepers on how well he is progressing. It may be as important to know, in the early stages of development, whether this or that change improves your speed from 14 knots to 15 knots, as it is in the later stages to know whether you have hit 46 or 47 knots. Weymouth is currently the only place you can do this.

Weymouth is useful but it is not enough. There should be other events at which development can be tested by the measurement of performance, but such events

are prohibitively expensive and demanding of organiser's time. There may be other ways, and these should be pursued. The Chapman's have developed effective on-board performance monitoring and analysing equipment (which will be fully covered in a future publication) for use on their craft. Availability of such equipment would allow speed trials to be organised with lower overheads than are incurred at Weymouth. Should AYRS encourage the development of such equipment and purchase several sets for use at events throughout the year? The sets could also be hired out for individuals to use between events.

I would like to hear your views on this and any other issues relevant to the encouragement of experimentation into fast sailing. If you have the skills and interest to assist in the development of such equipment, let me know. If you could organise additional events, let me know.

Whatever else we do, Weymouth should continue. It is as important as a source of feedback from other people as it is for accurate timing feedback. Many of those who were building and sailing craft in the early days of speed sailing still attend Speed Week. These people can help you to avoid making the old mistakes again. They know, they made them first.

So what do we do to encourage speed sailing? Well, first you do something. Almost anything is better than nothing. If you have a craft, you enter it at Weymouth 1995. No matter whether it will win or not, the larger the entry, the more people will be sharing the overheads associated with the event. I promise that you will not be disappointed. Whatever your performance is, you will, at least, know what it is. No more pretending that you really broke the record but no-one was watching! And you will learn a lot, even if it is only that no-one else understands what you are trying to do.

If you do not have a craft, contact Bob Downhill and offer to help run the event with him. He always needs more help, but if you are as lucky as I was he will probably find you a craft, or the bits to make one, and do himself out of another helper.

Whatever you do, get involved. We need you and you will have some fun. Next year AYRS will be 40 years old, just entering the prime of life. Let's make sure that the originators of speed sailing continue to contribute in a major way.

Contents

With contributions from;

David Culp, Russell Long,
Simon McKeon, Alan Blundell,
Jean Hurtado, Keith Dunstan,
George Chapman, Simon Fishwick,
Michael Ellison and Tony Kitson.