The NEWSLETTER

International Hydrofoil Society
P.O. Box 1130, Severna Park, MD 21146

Winter 2017 - 2018
Editor: Scott Weidle
Contributors: Mark Bebar, Björn Ljungdahl, Rod Muller, Alexander Sahlin, Ray Vellinga

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PRESIDENT'S REPORT

The International Hydrofoil Society has made good progress since the last meeting. This will be a brief summary. Details will come from the individual teams that made these things happen.

The main areas of progress are: the website, the planning for IHS participation in the 100th year anniversary celebration of Alexander Graham Bell's high-speed hydrofoil run, a reduction of expenses, an increase sustaining members thereby increasing income from them, and the work done on the hydrofoil exhibit at the Washington Navy Yard.

For the Canadian celebration of the 100th anniversary of the speed record made in the HD-4 in 1919, Mark Bebar, Bill Hockberger,

Martin Grimm, Joel Billingsley, and Scott Weidle have been working on ideas for them to have an exhibit at the event in Baddeck, Nova Scotia in 2019.

For the last several years, Lee Dick has generously donated his services in mailing our four CDs of academic and other AMV papers. This was done for a modest fee passed on to the recipients, and it has generated a few hundred dollars a year in income. However, if we are serious about being the center of hydrofoil information, we need to freely distribute whatever information we have to the broad hydrofoil

community, rich or poor. Therefore, we have post all the CD information on the web site with no cost for downloading. Rebuilding the Web site and uploading these papers has been a priority project of mine since August of 2016.

As mentioned, for the last two or three months I have given a personal priority to rewriting the IHS website. The project came up at the worst time because our competent Web Master, Bill White, was called away on intense personal business. The new web site was necessary because under the old system only Bill was licensed with the Adobe Dreamweaver software. He desperately needed back up, and additional programmers would need to have IHS pay over $300 for each individual DreamWeaver license. WordPress is free and can be used by all IHS volunteers.

The cost of our operation has gone down because our new website at Bluehost, contracted by Bill mid 2017, has taken over multiple costly rolls. We are able to incorporate in one place the Website, the bulletin board service, the photo service, all using multiple WordPress programs. Although learning the whole program has taking me some months and substantial effort, I am confident that volunteers will learn quickly to perform narrow tasks, like posting news. In this case, a more restricted "Author" license can be granted where one can upload articles, information, videos, photographs, and so forth without permission from the webmaster. It's simple and easy.

Any interested member, contact me and I will walk you through it. With the Bluehost package it is simpler to upload videos and other media. Links to YouTube and Vimeo, for example, are extremely easy and YouTube is exploding with new material. With YouTube there are no copyright issues because it's all published and we simply linked to the material.

While the expenses were going down, and we increased the income by taking on two new sustaining members. One is Senix, who designs and produces height sensing instruments, the other is the Gig Harbor Marina and Boatyard. As a matter of disclosure, I am a substantial owner of the boat yard along with my partner Ron Roark.

Of course, one of my favorite projects is increasing the membership rolls. This has slowed down while I've been totally immersed in the rewriting of the website. However, I recently began to get back to it in a small way. I have a list of about 200 new members, to be inducted with this issue of the Newsletter. One great source of new members is wading through the old bulletin board service posts. Each BBS contributor has demonstrated their interest and knowledge. In the days gone by it was required that they leave their name and email address. So they are natural candidates for membership and they will surely appreciate being brought into the IHS.

In recognition of their fine support and abundant skills, each Sustaining Member has been encouraged to put up a candidate for election to our Board of Directors.

Also, Roger Schaffer, Mark Bebar, Bill White, and others have been successful in working with the other East Coast members in reducing the cost of the joint ASNE/IHS meetings held at the Army-Navy Country Club. Thanks to you all, things just keep getting better.

Ray Vellinga

IHSPresident2016@gmail.com

DUES ARE HISTORY

As a key part of the incoming new administration, annual dues have been eliminated. The new program is to rely on Sustaining Member and donations from any member that volunteers to make tax deductible. Advertising in the Newsletter, Web Page, and Facebook will be made available for nominal contributions. Please inquire with Ray Vellinga to place an advertisement.

HYDROFOIL DEVELOPMENT EXPERIENCES

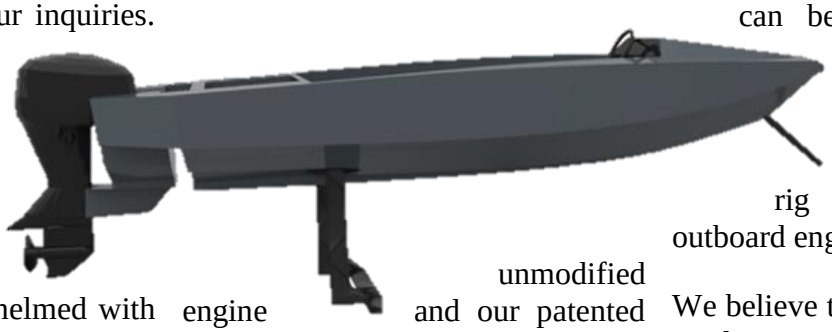
Björn Ljungdahl

Sometime back, we responded to a request and sent a hydrofoil kit to Japan. A couple of weeks after they received the wooden box we got the query: “Can we return the box to Sweden? Please put the kit on your test boat, and then send the assembled boat back to Japan?”- "Of course – no problem", we responded. "Just return to us and it will be done".

But the box never showed at our plant, and there was silence from Japan in response to our inquiries. We thought they had lost interest after realizing how complicated it was to install a working hydrofoil kit on an ordinary boat. However, I was overwhelmed with curiosity, and felt compelled to make a visit to Tokyo, which I did in the autumn of 2015. I met the customer representative in their their main office. As a result, a week after my return to Stockholm, the box reappeared. We put the kit on our test boat, made some calibration tests, put the whole thing into a shipping container, and loaded it onto a ship. The container was received in Japan, February 2016. Unfortunately, same story – no response. Finally reacting to our inquiries, they complained about problems with their Japanese government authorities, and could not get approval for testing this prototype. End of story...in fact, we believe that they simply lost interest in the unexpectedly complicated project.

This was helpful for us – we came to the conclusion: It is not a feasible to sell hydrofoil kits to be installed on ordinary boats. This was something most of the audience at boat shows still are asking for, but in reality, this approach is simply too complicated and expensive.

So, we start a new project, built upon experiences from the Japan experiment. The project was to make an adapted hull design that could be used with an unmodified engine and our patented Foiltwister technology, and still use an



unmodified engine and our patented Foiltwister technology (which lately also have been approved by The Patent Cooperation Treaty (PCT), ref. http://www.wipo.int/pct/en/

About a year ago, our in-house innovator, Alexander Sahlin, made the design and we commissioned a boat builder to start. The hull was ready in March, 2017, and we continued to install the hydrofoil system. During that summer and early autumn, we made extensive tests on the prototype. The results are really promising! It is as easy to drive as an ordinary boat. No problem to make steep turns – the hull hits the water surface before the hydrofoils ventilate. Top speed so far: 34 knots. Measured fuel consumption: 0,22 litre/nm (17nm/gal). Cruising speed: 24 knots. The foils and forward planing skid are retractable so you can traverse shallow waters and also transport the boat on a standard trailer. We call it “The Foiltwister Carport Boat”, FCB. It’s really a nice experience to drive – so smooth and silent.

You can see it in action on youtube

The altitude control is similar to what Alexander has been using on his Trampofoil - a planing skid in the bow taking up 10% of the boat weight. Because of this we don't need any elevator on the engine so it can be left unmodified. In order to keep it standard, we reduced the flying altitude so an outboard with long rig is sufficient. The outboard engine is 30 hp.

We believe this will be a successful product!

Government money has been granted to make a professional design, and we have several funding projects ongoing in parallel. The first design from Mannerfelt Design Group has been received, and it is beautiful (unfortunately, it is not ready for publication). During spring 2018, please check out our home page: www.foiltwister.se, and you will recognize the new design. We aim for a small transporter of four passengers including the driver. The purpose of this boat is to transport people, or light cargo, from A to B. Its length is only 4,9 meters (16 ft), and can be used on

lakes with modest waves. As with the previous design, an unmodified 30 hp long shaft outboard engine can be used. It is also possible to use an electrical outboard engine with fairly good endurance at 24 knots! We will publish information on our home page as soon as tests with electrical outboards has been done.

Björn is the CEO of Elektrofoil AB and Foiltwister Boats AB

THE JOY OF FLYING

Rod Muller

Sorry to report that my new foil design was not a resounding success. When it flew it was quite unstable, but now I am pretty sure I know why. More about that later.

So, I decided I was not going spend ship loads of time sorting foil problems for the rest of the summer and not getting out on the river. So, put the original foils from previous years back on the hull. I knew they worked, and I could get some flight time even though the weather was a bit rough.

Prior to launch, I shifted the front foil about a foot forward to make it easier to get on and off the trailer.

The process was like making a car's wheel base longer. This increased the length to width ratio. During the day the bay was messy, but as the sun descended, the wind settled down. I decided to launch the craft on the river for a test. It was a bit bumpy but safe enough.

WELL, to my surprise and joy she ran just beautifully. She was slicing through the waves with a nice stable feel about 300mm (1 foot) above the water. There were no white knuckles or fear of playing submarine. Away from shore, it was still a bit windy, but when I turned north I got into the lee of the island. I sat her on going about 28 Kph for a good 1/2 an hour. With the exception of a couple wobbly bits, she ran like a top. I was elated, because prior to this when the wind was coming from behind or side she was always cantankerous. It just felt so much more solid that I would have liked to stay out longer. However, it was after 8.00pm and I had traveled almost 20 kilometers. I also began to remember that I launched with less than half a 12-liter tank of fuel. With no gauge, I was beginning to estimate the boat was running on fumes. Certainly there was not much in the tank by the time I got back to the yacht club.

On the way there, I attracted some attention. I was about half way down the river on my return, and as always, I am very aware of who is on the water. As the light is failing, I happened to glance to my left, and to my surprise there was a couple of guys in a ski boat tracking along beside me about 30 yards off. Of course, here in Australia the locals are used to seeing kangaroos and wallabies, but hydrofoils are still rare, so I waved and returned to looking forward. Who knows how long they had been following me? After about 5 minutes went by I had another quick glance, and they were still there so I gently pulled away to the right, and slowed. I was a bit concerned about the deep trench they were carving into the river, so I was pleased when they were in my distant view further down the river. This can be a problem when you drive around in strange looking boats. They attract attention something fierce. My sympathy goes out to rock stars who must constantly deal with groupies and adoring crowds.

Technically, there is no doubt that increasing the "wheel base" made a huge difference to her handling. Next time out, I shall get someone to take photos of her in full flight and send them to the International Hydrofoil Society for publication.

I am feeling confident now that I can start tidying lots of rough unfinished parts on the boat. It can be seen in these photos, I had a new fabric front cover made. I was pleased with the way it turned out. These are things you don't care to much about when you are immersed in research and development, so I am happy to move into the FLY part of "Design, Build, Fly".

Rod Muller is a long-time member of IHS and owner/ operator of Strathsteam a maker of fine steam engines for marine and other uses.

Can Recycled Helicopter Blades be used as Hydrofoils?

Ray Vellinga

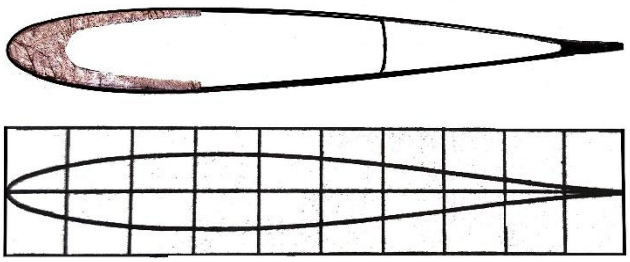
Recently, Bob Miller of Georgetown, South Carolina, offered to send to IHS two sections of helicopter blades he recently acquired. The purpose was to open a discussion asking, "Can Recycled Helicopter Blades be use as Hydrofoils?"

After receiving the blades, I did a brief analytical sketch to pass on to others who may have asked themselves this question.

Here are the details of the two sample blades. The chord is 7 3/8 in, thickness 1 in, span is 42 in x 2 for a combined span of 84 in. The skin thickness is .025 in.

The blades are Hollow except for the leading edge where an aluminum extrusion provides strength and form. Extending inward from the tip is a heavy metal insert 12 inches in length. Also, in this section, there is a mid-chord honeycomb aluminum insert extending away from the tip for two feet.

The chord type is very close to a NACA 63-012 cross section. Here is the comparison of the photo image and the text book image.

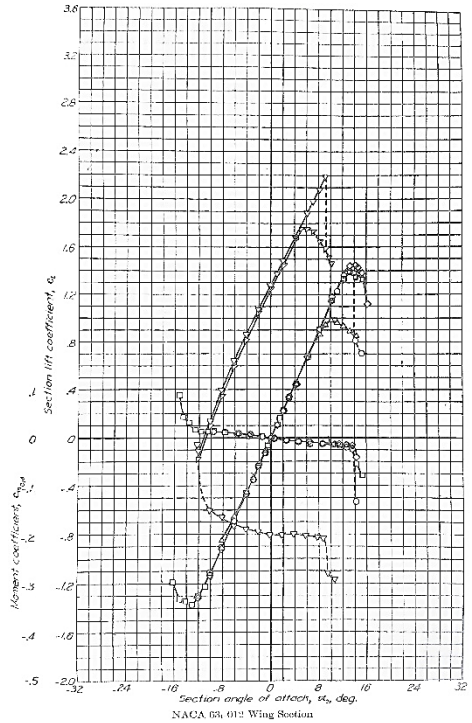


NACA 63-012 Chord Comparison

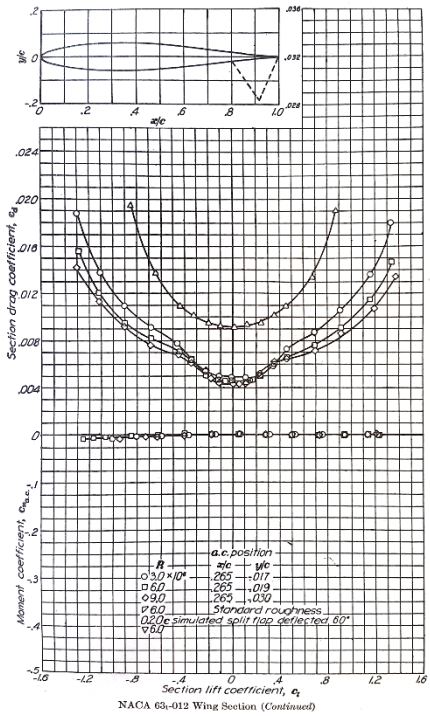
At first glance, I questioned why the heavy metal at the extreme end of one sample? Dwight Filley, a Viet Nam Marine helicopter pilot, reminded me that these weights provide a rotational momentum to the extreme outboard ends for the blades. In a power loss, the helicopter auto rotates to a low level where the pilot flairs using the rotary blade's inertia to provide energy to stop the descent. I also speculated that the added centrifugal force might stiffen up the blades allowing for lighter construction.

Here are some more observations. This is a clean piece of airfoil wing. It could be used as a hydrofoil wing except for a few challenges. First the bending strength of the structure is dependent on the outer skin and this is very thin soft aluminum. There is not much strength there. The Leading Edge is a solid aluminum extrusion but that's not enough to make a stiff wing for hydrofoil use, in my opinion. So, the wing would require additional stiffening, for example an "I" beam shape inserted inside the space behind the Leading Edge extrusion. To make the I beam and the existing assembly a single unit, somehow, they would have to be attached to each other. This could be done by piercing the skin and spot welding at intervals along the length of the foil. The skin would, of course, need filling and smoothing. Doing all this would be a challenge for the builder.

Here are the lift and drag curves for this particular section. They come from the classic book Theory of Wing Sections by Abbott and Doenhoff. Dover Publications, Inc.



NACA 63-012
Angle of Attack v. Lift Coefficient



NACA 63-012
Lift Coefficient v. Moment and Drag Coefficient

Reference *Theory of Wing Sections*, pg 518-519

As you see from the lift curve, the lift starts with an angle of attack of about -13 degrees with a coefficient of lift of about -1.4. Lift increases with angle of attack in a straight line up to about +13 degrees creating a coefficient of lift of +1.4.

The bucket curve on following page shows a typical relationship between lift and drag.

The other challenge is the shape. I conclude for this shape it is better to be used as a strut or rudder rather than a lifting foil. That is except for the type of front foil that requires negative lift at times. The most common foils are designed to create continuous lift, so these foils generally have cambered cross sections. That is to say they are curved on the upper surface and relatively flat on the lower surface.

So how to get some practical use out of these samples? Their strength is lacking, but using two strut places about 25% and 75% of the span would probably reduce the bending loads enough so the sections could be used for a personal, light weight, hydrofoil. As mentioned, a better use might be as struts or a rudder. In either case, there is going to be an attachment challenge, because there is not much "meat" to grab hold of.

Another potential use is as a male model for forming the upper side of a mold. The female mold would be used to create a composite material layup. The underside would be formed close to flat. The resulting form would be asymmetrical form similar to the NACA 4412 cross section, pages 488 & 489 of Theory of Wing Sections.

From a little research, I conclude that these particular blades were from the 1960 era. Today composite materials like fiberglass and carbon fiber bonded with epoxy are often used to make rotor-blades. They are stiffer, stronger, have improved fatigue life, and they don't corrode. Carbon fiber layers may be used for additional stiffness when oriented at oblique angles. Attaching struts can be done with layers of composite material. On the negative side, modern helicopter blades are often more complex incorporating taper, twist, etc.

Anyone with further interest is invited to start a Blog:"Recycled Helicopter Blades as Hydrofoils" in our recreated website at www.foils.org.

Multi-Agency Craft Conference
MACC
AT THE U.S. COAST GUARD YARD
July 17-19, 2018
Baltimore, MD

Registration, exhibits, in-water, and static display reservations are now open online. Preliminary information to assist in your planning is currently available online.

SAILOR'S PAGE

Foiler for AC-2021

Alexander Sahlin

Background

The idea of stabilising a monohull with canted hydrofoils is more than 100 years old. In 1903 Fredrik Ljungström (most famous among sailors for his furling, airfoil rig) patented hydrofoils for stabilising a monohull yacht. The successful Monitor from 1956 was also a monohull with high-aspect ladder foils on both sides. Some 20 years ago the late Sven-Olof Ridder was working on a concept with an inverted T-foil on a beam on the leeward side to stabilize light-displacement monohulls. When the modified L-foils were successfully used in AC-2012, some of us realized that hydrofoils for a catamaran could be designed much better. William Sunnucks and team installed T-foils, canted 20°, on the outer gunwales on his M-20/Vampire, so the active foil-system on the leeward hull worked as on a foiling Moth. On the water they demonstrated that this worked much better than other foiling catamarans of the same size.

The Defender's and Challenger of Record's concept AC-75 for the America's Cup 2021

The concept-boat, released Nov. 20, 2017, has improved over previous AC-foilers on one point: it has canted T-foils outside the gunwale. This provides for more righting moment, hydrodynamic, and structural efficiency than L-foils inside the gunwale.

But, they rely on ballast in the foils for stability in the harbour and for self-righting! The foils shall be controlled by powerful hydraulics. Standard hydraulic cylinders for the 2 swing-keels will weigh half a ton or so plus hydraulic pumps, valves and other gear. Or maybe they will build the hydraulic cylinders in high-modulus carbon?

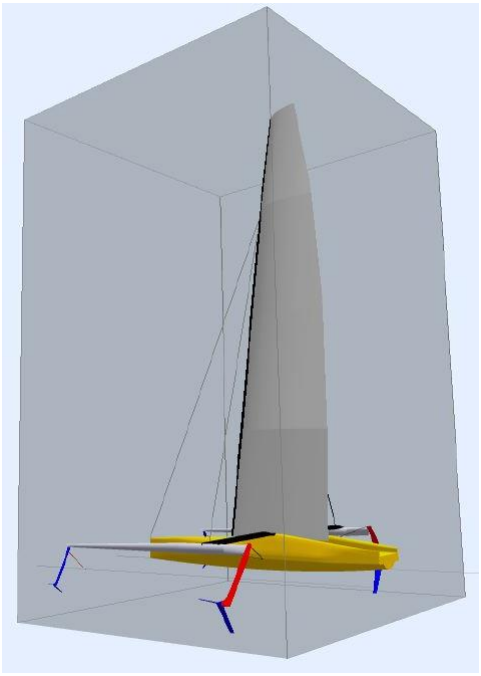
Two reasons for this type of boat are fast tacking and gybing. I estimate the time for lifting a 1.5 ton keel out of water from the sailing position to be half a minute by 4 very powerful grinders. And that is just lifting the 1.5 ton ballast. When lowering the foil, that is lifting the boat, the grinders have to lift the remaining 6 ton of the flying weight! But they will certainly store energy some way so they can tack faster. This is assuming they don't tack too frequently. And the system for that adds more weight.

And of course, the ballast itself contributes to the total weight. If the ballast is to be efficient, it has to be placed in the lower part of the keels, that is, in the water. With 1.5 tonnes in one T-foil they will have to compromise with the hydrodynamic efficiency to obtain a low C.G. Or will they put bulbs on the foils? That will probably be the best choice, but there will be higher drag than without ballast.

Another quite serious issue for the proposed foiler is that the rudder/stabilizer T-foil will be at the hull centreline, while the lifting main-foil is 7.5 m or so outside that centre-line. If the main-foil is controlled, so it flies on constant submergence, a sudden increase in heel, e.g. because of a gust, will cause the hull and hence-the rudder-foil to rise, and in worst case leave the water, so stability and control are lost. Or you will have to use a very deep rudder which will increase the drag.

Configurations with main foils far out on both sides and a central rudder-foil have been successfully used before on e.g. the Hobie Trifoiler and Windrider Rave hydrofoils, but here both the leeward and the windward front-foils are regulated so they keep constant submergence, so the rudder-foil trails safely behind in the water. All successful catamaran-foilers, that retract the windward main-foil, have foils on both rudders, and you can sometimes see the windward rudder-foil leave the water, which works fine, because the leeward rudder-foil is still in the water.

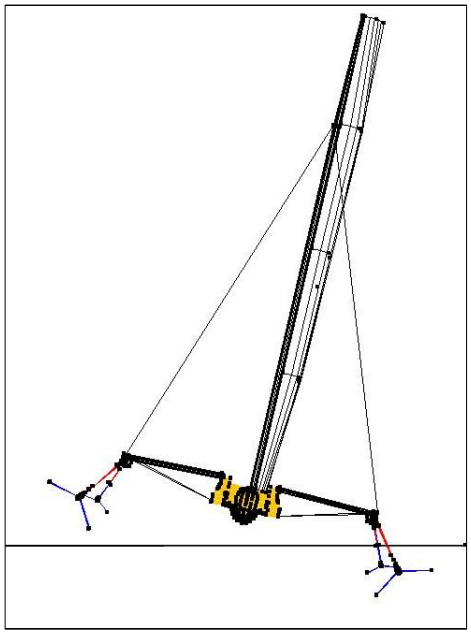
The AC-75 can be righted with the keels, yes. But if you make an ordinary capsize to leeward with the regular sailing configuration, you



need energy (stored or from the grinders) to move the keels, so they can right the boat up. Pretty much as you can do with the unballasted foiler, described below.

An alternative configuration

If the requirements for the new boats are that it shall be possible for the sailing crew to easily right the boat on their own after a capsize, the boats shall be easy to tack or gybe and they shall be faster than non-foiling boats. I suggest this configuration:



This is a monohull foiler with canted T-foils on wide beams. The rear beam is equipped with 40% displacement floats, to provide stability at very low speed. When sailing, the main T-foils are fixed, and in the normal flight-mode the boat is heeled some 10° to 15°, so the windward foil is lifted out of the water. The crew is in the central cockpit when sailing, so no trampolines are required between the hull and the amas.

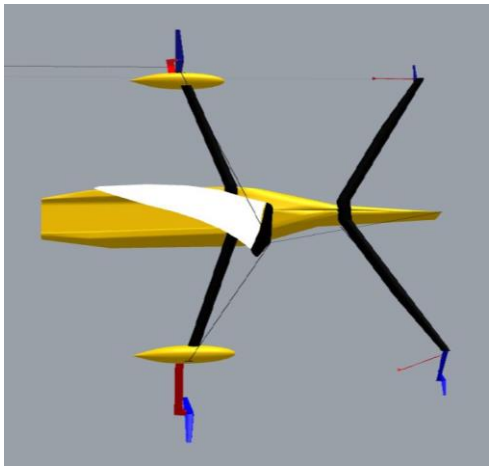
The shroud-base is wide, so a rotating wing-mast with diamond-stays is practical and also allows a light mast. The mast shall have the same volume as one ama.

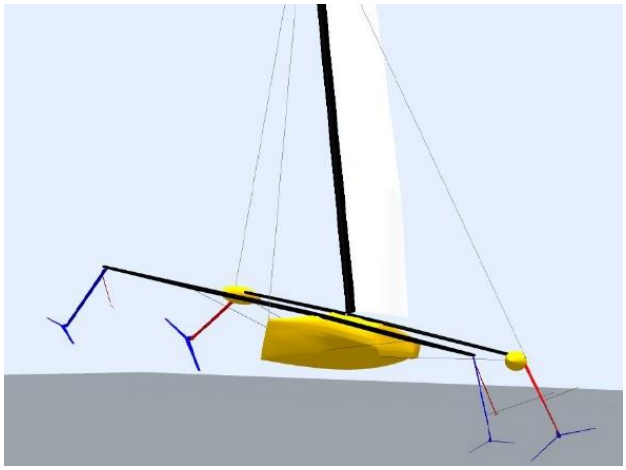
In the pictures the boat has a canard-configuration. The advantage is that the foils can keep submergence in a very stable and simple way: The canard's angle of attack is regulated by a surface-sensor (wand), that keeps the submergence with quite high gain, and then the main-foil trails behind in a very stable manner. By regulating altitude with the smaller foil, the control-forces are smaller than if you control altitude with the main foil, as on most Moth dinghies. The set altitude of the front foil can be adjusted from the cockpit. Eventual flaps on the main-foils are used only for trim. This configuration is used on several human-powered and engine-powered craft, like the Decavitator, my Trampofoil and the Boeing Jetfoil.

The hull is 1m wide in the water-line, but has a cockpit for the crew with 3m beam. The shrouds are adjustable, so the mast can be canted to windward. This can give some increase in speed on a long tack. But for short-tacking the mast may be kept in the central position, which also works quite well.

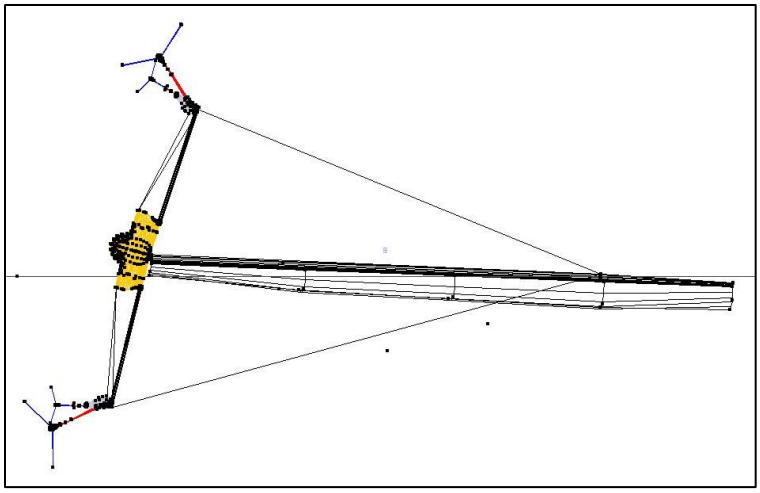
With 5 ton total flying weight including crew and 200 sq.m. sail the boat will have higher dimensionless sail-area/weight ratio than the AC-50. The righting-moment lever /displ.^1/3 is 70 % higher than for the AC-50. The main-hull will fly in 22 knots apparent wind. With low-volume amas, no trampolines and airfoil-section beam the aerodynamic drag will be low. Provided that the sail can be trimmed with optimum twist and camber, this boat has the potential to be faster than the AC-50.

You can do foiling tacks with the foils in their regular position, but when entering the tack you trim the altitude a little higher on the leeward front-foil just before letting the windward foils enter the water.

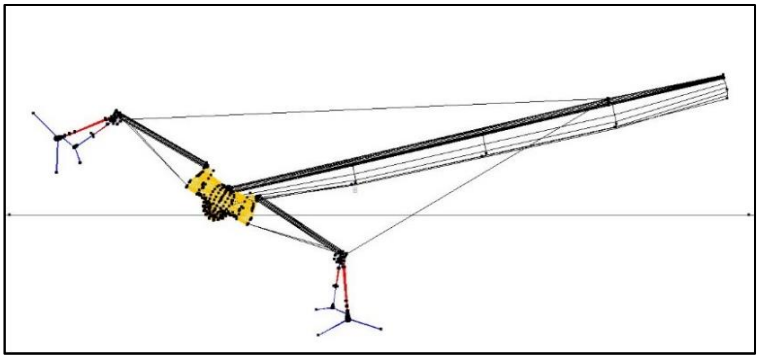




With only 40 % displacement in each ama and about the same in the mast, the stable floating position after a capsize will be on the side, as below.



By adjusting the shrouds with the winch intended for that in the cockpit, the submerged ama is moved, so it lifts the rig



out of the water:

The foils will be so light that the crew can retract them manually. Then the draft is 0.5 m, so the boat can be moored on shallow water. There have also been developed several systems to fold the beams on trimarans. If necessary one of them can be applied.

This proposed boat can sail more efficiently than the AC-75 without any reconfiguring of appendages or movement of ballast in tacks or gybes. The only system for handling the boat besides normal trimming of the sail is the winch for the adjustable shrouds. This is certainly easier than handling the 2 swing-keels of the AC-75.

This was one possible configuration for an efficient and practical course-racing boat and there are certainly others that may work as well or even better.

The new class-rule for America's Cup 2021

It has been announced that there will be a box-rule. But there is a serious risk, that the parameters will be adapted to the concept-boat of November 2017. If there e.g. is a minimum weight, there may not be so much advantage to make more efficient configurations.

The design-element of the Cup would be more interesting if the teams were able to develop more efficient, reliable and less complicated boats than the ballasted twin swing-keel foiler of November 2017.

If the development work in the America's Cup shall be meaningful, the class-rule shall be as open as possible. Such a rule shall only require reasonable safety and practical characteristics.

I suggest something like this:

1) The boat, ready to sail, shall fit inside a box, say 75 x 75 x 110 feet.

2) The onboard sailing crew shall be able to right the boat after a capsize in less than 10 minutes without any outside assistance.

3) If any system for storing energy shall be allowed, the energy of that system must be higher at the finish than before the start.

4) The sailing crew shall be able to haul down the sail(s) in 10 minutes on the water, so the remaining parts of the rig has a maximum projected area less than 500 square-feet.

5) There may also be a rule specifying that the boat shall be able to be dismantled for transportation in some specified time, say 12 hours.

SuperFoiler Grand Prix

The Program

6 teams of 3 world class sailors

5 locations around Australia

1 class of foiling machine /

Commencing February 2018

Go to https://www.superfoiler.com/ and subscribe to the Newsletter

See a Sydney, Australia Channel 9 news video and follow them on Facebook

The Platform

Not conforming to any existing geometry, the SuperFoiler brings together aerodynamic and hydrodynamic excellence to create the fastest foil-borne course-racing machine of its size on the planet.

The Design

Conceptually progressive, the SuperFoiler is designed from the foils up. Departing traditional limitations, the SuperFoiler is controlled by sophisticated electronic systems (created by a leading Aerospace Engineering firm) enabling the crew to adjust the pitch of the foils and thus the flight stability of the craft. The SF platform incorporates an aerodynamic cross-section "wing" to generate lift and aerodynamic efficiency. It is expected to result in the fastest course racing machine of its size in the world.

The Teams

Three crew members per team, all with key roles on board. Teams need a high level of continuity, excellent communication and courage to manage these machines.

HYDROFOIL NEWS

"USACE newbuild offers survey and SAR,"

RINA Ship and Boat International Nov-Dec 2017 reports that Aluma Marine & Fabrication in Harvey, Louisiana, has delivered the first in a series of foil-assisted catamarans to the US Army Corps of Engineers, that being the 18.7m long craft named 'Carlett'. The boats are designed for multi-purpose hydrographic survey and fast interdiction; however, the article doesn't provide further information on the details of the foil support. Survey operations at 10 knots, hull-borne and interdiction operations up to 38 knots, foil-borne are moved by twin waterjets powered by twin MAN V8 diesel engines.

"Hull Vane" Experiments

RINA Ship and Boat International Nov-Dec 2017 also reports in "Winging it in Rotterdam" of model testing with a hull vane "hydrofoil" support just aft of Van Oossanen's fast displacement hull form (FDHF). "The FDHF has a more rounded shape with a small submerged transom: none of it is revolutionary in itself but this performs better than conventional displacement and semi-displacement hulls across a broad range of speeds, right up to a match with full planning pace." The hull vane resulted in fuel savings of 20-30% compared when removed.

Anhedral Foil

Congratulations to S. Williams and Dr. Stefano Brizzolara for the publishing in of their paper "Dynamic Stablility of Foilborne Hydrofoil/Swath with Anhedral Foil Configuration." Read his thesis online.

Hydrofoil Bike

A company in New Zealand, Manta5, has recently developed a bicycle/hydrofoil made of carbon fiber. Currently the bikes are only available for pre-sale to those living in New Zealand, such that the Manta5 team can focus on delivering quality before scaling internationally. Read an article, watch a video, and visit their webpage.

MANDLES PRIZE FOR HYDROFOIL EXCELLENCE

Congratulations to 2017 Winners!

First Prize

"An Experimentally Validated Dynamical Model of a Single-Track Hydrofoil Boat"

By: Johan Schonebaum and Gijsbert van Marrewijk
Technical University of Delft, Netherlands
Faculty Adviser: Professor A. L. Schwab

Honorable Mention Awards

"An Investigation Into the Design of Surface Piercing Super Cavitating Hydrofoils"

By: Timothy Dutton
Massachusetts Institute of Technology, Cambridge, Massachusetts
Faculty Adviser: Professor Stefano Brizzolara

"Development of a Hydrofoiling Experimental Research Platform"

By: Annabel Vose, Asena Ayan, Fred Hayes, Tom Ballantine, Jamie Diamond, Sam Jones, and Jerome Carson
University of Southampton, United Kingdom
Faculty Adviser: Dr. Stephen Boyd

Click here for the complete papers

Background: Eight entries for the 2017 Mandles Prize were received, reflecting a wide range of hydrofoil-related technology. We assembled an outstanding panel of judges to review the entries, and they determined that this year's winners are from Technical University of Delft, Massachusetts Institute of Technology and the University of Southampton.

Our congratulations go to the many prominent schools of the previous (2014-2016) and 2017 Mandles Prize entrants. They include: Australian Maritime College, University of Tasmania; Cedarville University; Ecole Polytechnique Federale de Lausanne (EPFL), Switzerland; Florida Institute of Technology; Massachusetts Institute of Technology; Stevens Institute of Technology; Swiss Federal Institute of Technology; Technical University of Delft, Netherlands; Tolani Maritime Institute, India; University of Genoa, Italy; University of New Orleans; University of New South Wales, Australia; University of Southampton, United Kingdom; United States Naval Academy, Annapolis, Maryland; and Webb Institute, Glen Cove, New York.

The International Hydrofoil Society thanks every entrant for their interest in hydrofoil technology and for their excellent work. We wish you all the best in your professional careers and we sincerely hope that you will continue to participate in the activities of the IHS.

By virtue of applying for the 2017 IHS Mandles Prize, all students and their faculty advisers are now members of the International Hydrofoil Society. We invite them and anyone who is interested to volunteer for our not-for-profit efforts encouraging hydrofoil research, development and applications.

Now, with the 2017 IHS Mandles Prize in the record books, it's time to think ahead to the 2018 competition, the announcement for which has been posted on www.foils.org

The sooner preparations begin, the greater the chance of submitting a winning entry. Good luck, and we look forward to welcoming all of you and those who follow in your footsteps in 2018.

Finally, we want to once again express our sincere appreciation to Martinn and Connie Mandles for their continuing support as the benefactors and namesakes of the IHS Mandles Prize.

Sincerely,
Ray Vellinga and Mark Bebar
– co-chairman

2018 Mandles Prize Announcement

The International Hydrofoil Society is pleased to announce that thanks to the generosity of Mr. Martinn Mandles, a long-time member of IHS and his wife Connie, IHS will once again sponsor the Mandles Prize for Hydrofoil Excellence competition. The competition, now entering its 5th year, includes up to $4,500 annually in IHS hydrofoil achievement prizes for students, with a $2,500 First Prize and up to two $1,000 Honorable Mention awards.

In order to open the competition to a wider spectrum of qualified entries, submissions by students based on work completed since 2013 will be eligible for the Mandles Prize. The due date for Application Forms is May 1st, 2018.

This is an outstanding opportunity for the next generation of hydrofoil developers to be acknowledged for their efforts to advance the state of the art in hydrofoil and hydrofoil-assisted craft engineering, design and construction. Background on the Mandles Prize and Rules for the competition can be downloaded from the IHS website (www.foils.org)

Based on the 2017 entries and award winners, we anticipate a very exciting competition and look forward to receiving many high-quality entries. Questions on the Mandles Prize can be e-mailed to

Mark Bebar at:
mark.bebar@csra.com or

Ray Vellinga at:
IHSpresident2016@gmail.com

FROM THE ARCHIVE:

THE U.S. NAVY'S CNO FIRST HYDROFOIL TRIP

Robert J. Johnston

It was the Fall of 1953 and a small group of hydrofoilers were trying to convince the U.S. Navy that military hydrofoils should be seriously considered for future applications. The program had started as an appeasement to Dr. Vannevar Bush. Dr. Bush was scientific advisor to President Truman with considerable influence on the Navy's overall R&D program. Dr. Bush was convinced at that time that hydrofoils of World War II destroyer size could be used for rapid transport from the U.S. to Europe. Actually, this conclusion was based on data that would prove to be considerably optimistic. Nevertheless, the Navy did not want to cross Dr. Bush and developed a program of hydrofoil research. The program was administered by the Office of Naval Research (ONR) with technical support from the Bureau of Ships, the Bureau of Aeronautics, and the David Taylor Model Basin. A group of universities and contractors also supported the program. Interestingly the program was mostly classified, not because it was full of military secrets, but because of the desire to limit the dissemination of how the Navy was spending its R&D dollars. It was into this climate that your author became the Navy's Hydrofoil Project Officer.

Among the Navy's small test craft was a vehicle built by the Baker Manufacturing Company (a windmill manufacturer) called "High Pockets." This craft was a run-about with four V -shaped, surface piercing hydrofoils. The open cockpit seated eight people and was powered by an inboard gasoline engine, driving a propeller through a right-angle drive. The four foils were controlled in a turn to create inboard banking. As a result, the craft was quite maneuverable.

"High Pockets" had been evaluated by the Navy at the Patuxent Naval Air Test Center and had demonstrated good rough water characteristics and low power, high speed performance. After a series of instrumented trials at the Test Center, the decision was made to transit the craft to the Washington, DC Naval Shipyard for show and tell purposes. A non-stop flight was made from Patuxent to DC which at that time set a record for speed and distance for U.S. hydrofoils. At that time across the Anacostia River from the Washington Shipyard, or Gun Factory as it was sometimes called, was the Navy's Anacostia Naval Air Station. The Air Station accommodated naval aircraft for senior naval officers and VIPs including the CNO's plane.

Admiral Robert Carney, CNO, was approached to take a demonstration ride on "High Pockets." He countered by requesting that "High Pockets" provide him with transportation from the Pentagon to Anacostia for an upcoming air trip he was making. The hydrofoil group was only too happy to accommodate and firm arrangements were made to fulfill his request.

High Pockets, from SmugMug

CDR Jim Stillwell of BUSHIPS, who was to retire as a rear admiral, volunteered to be the coxswain. LT Bob Apple, who worked with me in ONR and myself, then a LCDR, were to be the crew for this trip. At the appropriate time we had “High Pockets" on-the-ready at the Pentagon boat landing.

As the Admiral and his party, consisting of a couple of Admirals and some staff, approached the boat landing, Bob Apple swung the boat hook he was holding around knocking my Navy cap into the water. Quickly retrieving the cap, we all came to attention and saluted, but unfortunately there was a trickle of water down my cheek as we met Admiral Carney. The trip to Anacostia was mostly uneventful. We made some sharp turns, drove through boat wakes to show some rough water characteristics and proceeded at a high and a low speed. About halfway to Anacostia at the running water level of the starboard forward foil a condom impinged. This caused the craft to roll slightly to starboard then recover lift as the condom submerged. Surely, we thought the impinged article would wash off. But no, it stayed on all the way to Anacostia. While the Boat crew was well aware of the problem and resulting motion, none of the passengers were aware or noticed the slight rolling motion. Admiral Carney's remarks were that he had made the fastest trip ever from the Pentagon to Anacostia and would we please transport him back to the Pentagon when he returned later in the day. We, of course, were delighted to oblige.

We now had several hours to stand by and we decided to use that time to give rides to various members of our offices who had requested a chance to ride a hydrofoil. So, for the next few hours officers and civilians from our offices and staffs were given rides and demonstrations of "High Pockets." Our riders included several interested women. Upon Admiral Carney's, return, we were at the dockside ready to return him to the Pentagon. The trip back was timely and uneventful. Since it was during rush hour traffic in DC, the Admiral was grateful for the quick return trip. As Admiral Carney's group disembarked, one of the accompanying Admirals handed me a bobby pin he had picked up off the rear seat. With a twinkle in his eye, he remarked that he hoped we had had an enjoyable time waiting for the Admiral's return. And so ended the CNO's first trip on a Navy hydrofoil.

Did the venture do anything for the program? Directly we never saw any significant accomplishment. However, indirectly, from that time on, money and support increased, ultimately leading to the construction of the Navy's two full-scale R&D ships the "High Point" and "Plainview."

IHS WEB CONTENT

Check it out (click on link):
http://foils.org/
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OUR ASSOCIATE, THE FOILING WEEK. SEE THIS VIDEO:
http://www.foilingweek.com/

THE NEXT ISSUE

Remember, if you enjoyed reading articles in this issue of the Newsletter, they were provided with thanks to fellow IHS members. If you are able to share news on new projects or research work and, better still, prepare an article for the Newsletter, please email: editor@foils.org