The NEWSLETTER

International Hydrofoil Society
P. O. Box 51, Cabin John MD 20818 USA

Editor: John R. Meyer | Spring 2005 | Sailing Editor: Martin Grimm

ENGINEERING, DESIGNING AND FUTURISTIC CONCEPTS

Courtesy of Rodriquez Cantieri Navali SpA

Based in Genoa, Rodriquez Engineering employs 25 people all with the specific tasks of designing and engineering Rodriquez vessels. This company can work with composites, aluminium alloys, and steel, and designs everything from yachts to ro-ro ships.

Current projects include a brand new SWATH (small waterplane area twin hull) vessel, designed by Mr Alcide Sculati, managing director of Rodriquez Engineering. The aim of this concept is to create a very fast ship, using as little energy as possible, creating as little pollution as possible, and producing no wake wash.

A prototype of this vessel (which is being built at the yard's expense, but following trials is expected to be transferred to Ustica Lines - a Rodriquez shareholder - for full-sized trials), has begun building in Rodriquez' Messina yard in October 2004. Rodriquez Engineering has named this vessel the AliSWATH. The vessel will be able to carry 500 passengers, and up to 50 cars, with a displacement of only 500tonnes. This AliSWATH design, Rodriquez claims, is totally rev-

Rendering of AliSWATH Concept

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WHERE ARE YOU IN CYBERSPACE?!

IHS relies on electronic communication with the membership to improve timeliness and reduce mailing costs. If you are a member with email, **let us know your email address!** Thank you.

2005 DUES ARE DUE

IHS Membership is still only US\$20 per calendar year (US\$10.00 for students). Your renewal or new membership is critical. IHS accepts dues payment by personal check, bank check, money order or cash (all in US dollars only). We have also recently arranged for payment of regular membership dues by credit card using PAYPAL. To pay by credit card please go to the IHS membership page at <http://www.foils.org/member.htm> and follow the instructions.

INSIDE THIS ISSUE

PRESIDENT'S COLUMN

Greetings to all IHS Members; I hope that all of you have successfully weathered the stormy days of the Holidays and the Winter of 2004 and 2005.

The Society can be pleased with its continued growth with a total of 40 new members added to the Membership roles during the calendar year 2004. By the way, you can view the Membership List by logging onto the IHS website and put in the proper password. All IHS members have been informed of this password. If you have been missed or forgot, please contact the webmaster (webmaster@foils.org). It is advisable for all to check the information on the List. If it is incorrect, please send changes to: Steve Chorney: schorney@comcast.net.

We have noticed that inquiries on the IHS Bulletin Board (BBS) are still going unanswered. **All members are encouraged to check the BBS for information and questions that you may be helpful in answering.** I encourage all members to make an effort to visit the BBS at least weekly and try to answer some of the questions, even if briefly.

In the last several issues I mentioned that the IHS Board of Directors established five Goals for the Society. "Desired Outcomes" were then developed for each of the Goals and priorities set for each. This information has been available to all of you on the IHS website in the Site Directory. Recently a spread-sheet (EXCEL) has been added to the site that summarizes the "Goals and Desired Outcomes" with a column listing persons responsible for action.

I wish to make a plea to all of you for your help in either taking on an item as prime responsibility or assisting someone who has volunteered to carry out a particular "Desired Outcome". Please contact me or the person so listed.

Note that you can obtain that person's e-mail address from the IHS Membership List.

In connection with this, the Board of Directors has committed to the establishment of hydrofoil exhibits in interested museums worldwide. To this end volunteers are needed to contact museums in their vicinity. An introductory "package" will be mailed to the museums you propose, identifying you as an IHS representative.

We propose to initiate an international "registry" of hydrofoil models from which model loans may be negotiated. A "manager" for such a registry is required. Volunteers are requested to contact Kenneth B. Spaulding: kbs1313@erols.com

As your President and Newsletter Editor, I continue my plea for volunteers to provide articles that may be of interest to our Members and readers. Please send material to me (jr8meyer@comcast.net), Bill Hockberger (w.hockberger@verizon.net) and Ken Spaulding (kbs1313@erols.com). We will be pleased to hear from you.

John R. Meyer, President

WELCOME NEW MEMBERS

Gerhard Kutt – Gerhard was born in Shanghai and grew up in Hong Kong. He attended Brunel University - Middlesex UK in Production Technology and Management. He was a champion water-skier in South East Asia in the 1970's and 1980's representing HK for 12 years. His working experience includes several management fields in Manufacturing mainly for export. Currently, he is with CAE Marine - division of Unistel and University of Stellenbosch developing a market for HYSUCAT and HYSUWAC patented foil systems.

Paul Kydd – Paul is retired after a lifetime in research and development, first with General Electric in Schenectady, NY, then with Hydrocarbon Research in New Jersey, and for the last twenty years in his own company involved in all aspects of power generation, fuels and propellants, as well as waste disposal, and electronic chemicals. He has been an electric boat enthusiast for over ten years. The EBAA sponsors an annual 21 NM race around Wye Island on the Eastern shore of Maryland and he has built a boat to compete in it. It is a catamaran hull from Stillwater designs in Chelsea MA with a 10-12 HP electric outboard of his own design. The boat won in 2003 with lead-acid batteries and won again in 2004 with what is probably the largest lithium-ion battery in the Eastern US. In 2005 Paul wants to add hydrofoils to cut drag and reduce power consumption.

Scott Littlefield - Scott is Director of the Naval Ship Science and Tech-

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olutionary, and a first of its kind. Mr Sculati believes that this vessel is the future of design - a high payload at a low price.

This 70m vessel will be fast, but will use less power than a standard ship of this type. Rodriquez Engineering see the reduction of fuel costs as an essential component in vessel design; a factor that will naturally appeal greatly to operators. This concept, it is believed, will be able to reduce costs across the board.

Another interesting design concept that recently came into fruition is a fully submerged hydrofoil also potentially for Ustica Lines. This vessel will contain a conventional diesel engine, but fuel consumption will be drastically minimised compared with other vessels of this type, while all other design and economic aspects will be maximised.

Rodriquez Engineering is also currently investigating other propulsion systems on the fully submerged hydrofoil concept. Tests are being carried out with a standard propeller, and with a brand new type of propeller, designed and custom-made by Rodriquez Marine System. After tests at the Russian model test tank, the Krylov Institute in St Petersburg, a prototype of this vessel will be built.

The fully submerged hydrofoil will have a stern drive with two counter rotating propellers and V shaped foils.

Both the AliSWATH and the fully submerged hydrofoil focus on a reduction in wake wash. Rodriquez Engineering sees this as the next big field of development, as coastal erosion is becoming a large problem, and a great deal of R&D will be carried out on this.

Rodriquez is continuing to build hydrofoils as there is still a demand for this type of vessel. At present, there are 6 under construction for Caremar and Siremar, two divisions of the Italian state-owned ferry company Tirrenia Navigazione, at the Messina yard, the first of which is set to be delivered in November this year. The remainder are to have staggered delivery over the next few years.

[Ed Note: All readers should be aware that the AliSWATH hullform has its roots in hybrid ship technology explored over a period of more than 30 years in the U.S., Germany, and Japan. The U.S. Navy pursued the HYSWAS (Hydrofoil Small Waterplane Area Ship) concept during this time through various studies, analyses, tank tests, and a demonstrator vehicle called QUEST (see Autumn 1996 IHS NL). Subsequently several HYSWAS designs in the 500 Lton to 2400 Lton size category were examined. (See Winter 1998 IHS NL). Kawasaki explored this hybrid ship arrangement as part of their TSL (Techno-Superliner) project, and also demonstrated the superior seakeeping and speed in rough water characteristics of the HYSWAS concept.

It is a credit to Rodriquez that someone is taking advantage of this technology and planning to construct a rather large passenger and vehicle carry ferry. We all look forward to its completion and successful introduction into service.]

MOTION CONTROL CAN BE CRUCIAL TO SHIP CONCEPTS

From Speed at Sea, October 2004

Motion control tasks - steady vessel motion, roll stabilisation and passenger comfort - may contradict each other in a number of aspects so the right choice of control system structure and algorithms is vital, maintains Russian specialist Avrora.

Automatic control of the actuators for the foils and interceptors is an inseparable part of foil-assisted fast catamaran concepts such as Superfoil passenger vessels, according to Victor Korchanov of St Petersburg-based Avrora Science & Production Corporation, a federal state unitary enterprise. FICS-3 type control systems are designed for automatic stabilisation and motion control of Superfoil-type vessels, and Avrora is a designer, manufacturer and supplier of such control systems. A FICS-3 control system is installed on the Superfoil-40 *Linda Express*.

Automatic control of its bow hydrofoil and aft interceptors enable the Superfast 40 to break away from the surface

"These systems can also be used for other types of vessels because the technical solutions required are sufficiently universal," Mr Korchanov said, "and the structure of the algorithms used exceed the needs of the

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majority of automatic motion control tasks."

"Vessels of the Superfoil type are equipped with deeply submerged bow hydrofoils and aft interceptors with the aim of partially lifting a vessel's hull above the water to decrease flow resistance - only the after part of the vessel remains in the water. As a result, high speed of motion is achieved. LindaLine's 40m *Linda Express* vessel reaches a speed of 55 knots in quiet sea conditions and around 45 knots in rough seas of Sea State 4-5. The vessel was designed at the Marine Technology Development scientific institution in St Petersburg, and built by Marine Yard Almaz JSC.

"The motion of the vessel, and semi-foilborne operation, is possible by using automatic control of the moveable control surfaces of the bow hydrofoils and aft interceptors. Automatic control of these actuators is provided by the FICS-3 system".

"A specific feature of FICS-3 systems is the simultaneous fulfillment of several tasks: steady vessel motion, roll stabilisation and provision of comfort for passengers as required by the ISO 2631/3-85 standard," Mr Korchanov said. "In a number of aspects these tasks may contradict each other, and that is why the right choice of control algorithms and the structure of the system as a whole is so important.

"In control algorithms for the bow hydrofoils and the aft interceptors, signals from altimeters fitted in the bow are used, as well as signals from a 'Mininavigatsija- I' type of sensor unit for angular and linear motion parameters. The optimum combination of signals from these sensors in control algorithms ensures stabilisation of vessel motion and passenger comfort.

"The structure of the control system corresponds to the requirements of maximum possible reliability and, at the same time, ensures strict limitations on the weight and overall dimensions of the system - and its price. To increase reliability of the system we have implemented the principle of independent operation of its control and information parts. Reliability is also increased by duplicating the system's main elements and circuits:

- control channel for bow hydrofoils and aft interceptors (upper level)
- electric power supply to servomotors
- inter-device communications (RS-485 interface and CAN)
- the information part of the system (main channel: flat panel color display under the control of the information controller; back-up channel: monochrome LCD indicator panel with its own controller)

"To increase system reliability and safety of vessel control, we have implemented measures in the system such as galvanic isolation of all the input and output signals, protection against operator errors, representation of complete information to an operator about place of failure and type of defective device, and automatic testing of the system before putting to sea and during the voyage," Mr Korchanov said. "During the operation of *Linda Express* on the route between Tallinn and Helsinki in 2002 and 2003, the FICS-3 system proved its fault-free operation, ensuring steady motion of the vessel and the required level of comfort for passengers".

FICS-3 System Main Functions:

- providing steady motion for a vessel, both in quiet and rough sea conditions (significant wave height up to 2.5m) with predetermined average values of parameters, which determine its spatial attitude: trim, list and deepening of bow hydrofoils
- pitch stabilisation
- roll stabilisation
- heave stabilisation and lowering of vertical overload; in this case vertical accelerations are lowered to a level, which meets - with a large margin - the requirements of the international ISO 2631/3-85 standard for a two-hour limit
- co-ordinated vessel turning with the automatic creation of an additional internal list angle, which improves manoeuverability of a vessel (round-turn radius decreases by 1.5-2.5 times)
- providing a programmed take-off mode for the transition to the main (hydrofoil) mode of vessel motion as smoothly and rapidly as possible
- automatic detection of failures in the system equipment, control circuits and software with switching of corresponding back-up channel or unit
- implementation of crash-stop algorithm

HYDRO REVOLUTION-FOIL

Courtesy of Rodriquez Cantieri Navali SpA

To respond to the increasing demand for more efficient fast transportation and with 50 years experience in the hydrofoil business, Rodriquez is developing a new submerged foil hydrofoil concept. The results? More speed, less fuel consumption, greater safety and minimal environmental impact.

For over fifty years, Rodriquez Cantieri Navali SpA has built and delivered high-speed ships for the transport of passengers and freight. Specifically, since 1956 Rodriquez has been at the forefront of the construction of hydrofoils with surface-piercing foils.

Today, almost fifty years later, this type of hydrofoil continues to be regarded as one of the most economic vessels to operate, based on ratio between the high speed and passenger capacity versus low installed power. For example, the latest generation of Rodriquez hydrofoils, the Foilmaster, has a capacity of up to 250 passengers and a cruising speed of 38 knots with an installed power of only 4000 kW. Furthermore, the surface-piercing hydrofoil is intrinsically stable because the foil surfaces that generate lift are located both above and below the water surface. Also, because the hull in foil-borne mode never comes into contact with the water, the craft has excellent sea-keeping characteristics.

In their never-ending quest for improvements, over the last two years Rodriquez has been heading a complex research project to develop a new and even more efficient hydrofoil, one with fully-submerged foils. Financed by the Italian Ministry of Research, this project involves research into and the design and development of two full-scale prototypes, each with a different propulsion system, of a new type of hydrofoil able to combine all the traditional advantages of a hydrofoil (high speed, reduced fuel consumption, excellent sea-keeping capacity, etc.) together with an even more efficient craft.

The design of this innovative vessel has been headed by Ing. Alcide Sculati, Managing Director of Rodriquez Engineering, the group's research and development centre. Rodriquez Engineering's efforts have focused on a hydrofoil model with foil surfaces completely below the water surface to greatly reduce the vessel's sensitivity towards adverse sea states whilst at the same time increasing the vessel's overall efficiency.

Each of the two prototypes of the fully-submerged-foil craft, the construction of which started a few months ago, will have a length of about 37 meters, a capacity of 280 passengers, a maximum speed of 50 knots with an installed power only slightly above that of the surface-piercing-foil craft, i.e. about 4500 kW.

Rodriquez Cantieri Navali Rendering of Their Hydrofoil With A Fully-Submerged Foil System

This design will focus on the optimization of the basic design characteristics and will have an electronic control system for the foil surfaces, which incorporates the stabilization and directional control equipment, along with great deal of attention paid to the shapes and dimensions of the hull appendages and propulsion system. Stability, which in a vessel of this kind is not intrinsic as with a surface-piercing hydrofoil, will be ensured by trailing flaps placed on the foils which in turn will be electronically controlled. The system will have sufficient redundancy to provide the maximum safety possible and allow the hydrofoil to maintain its foil-borne mode even in the event

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of the mechanical failure of a single component.

In order to optimize the propulsion system over the vessel's complete operating range including hull-borne, take-off and foil-borne modes, the reduction gearboxes will be two-speed units. First gear will allow the vessel to reach the speed required for take-off when the hull emerges from the water whilst not overloading the engines. Second gear will allow the engine power and vessel speed to be ideally matched for high speed performance. The captain, simply by pressing a button, will be able to switch gears in less than 0.2 seconds. According to the results at the test tank, the new hydrofoil will have excellent performance even in rough seas. In a parameterized wave, i.e. significant wave height equal to one meter, and with a head-on sea and a speed equal to 40 knots, the accelerations on the centre of gravity (RMS) were less than 0.08 g.

The two prototypes will be developed with two different propulsion systems: One with traditional shafts connected to fixed pitch propellers and the other with special dual propeller Z-drives developed by Rodriquez Marine System, with carbon fibre shafts.

With the aforementioned characteristics, the hydrofoil with fully- submerged foils is the ideal vessel for medium distances. In addition and because it creates very low waves, it is ideal for inshore routes near large coastal cities where there would be a need for a very effective year-round alternative to urban road or rail transport to reduce vehicular commuter traffic in a way that would be impossible to obtain otherwise. This project will allow Rodriquez Cantieri Navali to maintain its technological advantage over its worldwide competitors and allow the group to maintain the high level of specialization and innovation that has always set this firm apart from other shipbuilders.

TEMPEST & VENTURILLA

From Speed at Sea, August 2004
By Emma Roberts

With a service speed of 28 knots, two 23m foil-assisted catamarans offer their Bermudian operator a significant increase in speed and will lessen the load of two fast ferries already in service, according to Australian builder North West Bay Ships (NWBS). The 177-passenger *Tempest* and *Venturilla* were shipped as deck cargo from Australia in June 2004 and entered service in late August for the Government of Bermuda's Ministry of Transport. The aluminium catamarans were designed by New Zealand-based Teknicraft.

North West Bay Ships' (NWBS) latest deliveries, the 177-passenger Tempest and Venturilla, represent a significant increase in speed for their Bermudian operator, and their low draft makes it possible for the local department of marine and ports services to open up new routes.

Francis Richardson, designate director of Bermuda's department of marine and ports services said: "Phase one of our high-speed ferry programme involved the acquisition of *Serenity* and *Resolute* - two 25m catamarans from Gladding-Hearn. With a service speed of 23 knots, these two vessels met public demand for a faster service. The two new NWBS/Teknicraft vessels have a service speed of 28 knots and will provide faster transit for the longer routes to St Georges. Importantly, the new vessels have approximately half the draft of our current ferries, enabling new routes to be established."

In addition to running commuter ferry services, *Tempest* and *Venturilla* will be used to ferry passengers from visiting cruise ships to local attractions. Mr Richardson added: "The boats look fantastic and are finished to a very high standard. *Serenity* and *Resolute* raised the public's expectation and we are confident that *Tempest* and *Venturilla will* be equally favourably received. The new vessels will be pressed into service, allowing *Serenity* and *Resolute - which* have been running a grueling 18-hour- a-day service almost continuously for two years - some much needed maintenance time." .

Tempest and *Venturilla* each feature four Detroit MTU 8V2000 M70 engines, each rated at 525 bKW at 2,100 rpm, and each direct driving a Hamilton HJ362 waterjet via GWB universal shafts. NWBS said that the engines are of similar configuration to *Serenity* and *Resolute* to standardise service and spare parts.

Teknicraft said that: "Designed for operation at *28* knots at *85* per cent MCR, the vessels exceeded the contract speed, achieving 30 knots at *85* per cent power. Maximum speed recorded during trials was 40 knots."

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The vessels accelerate normally up to *20* knots, but once foilborne the speed increases rapidly to 37 knots at full power when half loaded, said the builder.

Teknicraft's design features asymmetrical hulls and a fixed lifting foil. The company said: "The hull form is a semi-planing type catamaran. It employs a combination of symmetrical and asymmetrical sponson shapes, thereby combining the attributes of both shapes in one hull. The symmetrical bow section ensure directional stability in short swell conditions and following seas, whilst the asymmetrical midships and aft sections ensure softness of ride and reduced wetted area which enhances comfort and economy.

"In applications where speed is of essence, a hydrofoil is fitted to the hull. It consists of an underwater wing profile spanning the tunnel at approximately midships position. The lift produced by the hydrofoil reduces the hull resistance, which increases speed, whilst at the same time increasing the load-bearing capability".

The foil gently lifts the vessel onto the plane from around 16 knots, raising the hull about 300mm to 400mm. "The foil action reduces the power needed to maintain service speed, and therefore fuel consumption and running costs are reduced. The hydrofoil is designed to only partly reduce the draft, thereby reducing resistance, but still maintaining good seakeeping by having the hull still partly submerged. It further enhances the softness of the ride, especially in choppy seas. "The ability to maintain high speed in rough water conditions makes the hull particularly well suited for para-military and passenger ferry applications, when voyages or scheduled crossings need to take place in all weather conditions," said the designer.

Tempest can carry 177 passengers at 28 knots

The vessels' delivery was provided by its new owners to target the tourism industry. Both vessels have interior capacity for 104 passengers, with a further 73 seats on the open upper deck. Seating was supplied by Beurteaux and comprises 104 Ocean Diner seats arranged in a combination of forward/aft facing seats and small conversational group seating. Beurteaux Ocean tables in various shapes are also provided for approximately *50* percent capacity. The passenger lounge is arranged to accommodate bow loading; side loading is also possible at the aft quarterdecks. The bow features space for the shore-based boarding ramp and for carriage of six mopeds.

Passengers enter via forward-facing doors into a lobby/luggage area featuring large overhead atrium windows.

A full-width wheelhouse provides partial protection for upper deck passengers.

The wheelhouse is located on the upper deck and is set up for single-man operation. The console layout was determined in conjunction with Bermuda Department of Marine & Ports Services operational staff. A Hamilton MECS steering system has also been fitted, allowing steering from either a joystick mounted on the central helm chair or a wheel.

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Disclaimer

IHS chooses articles and photos for potential interest to IHS members, but does not endorse products or necessarily agree with the authors' opinions or claims.

Interested in hydrofoil history, pioneers, photographs? Visit the history and photo gallery pages of the IHS website. http://www.foils.org

BUMPY FLYING

[This is a continuation of this article that appeared in the Winter 2004 Newsletter]

Martin Grimm wrote: "The "Whale Bumps" email has generated some interesting feedback. I was also intrigued by the article, but think Tom has a point that the explanation in the case of the whales may be other than hydrodynamic.

"All the same, it would be interesting to read the May 2004(?) issue of Physics of Fluids in which the comparative results are apparently presented. Then we could all study the lift and drag coefficients vs angle of attack for ourselves. Also, we would know what Reynolds Number was being used for the wind tunnel and whether that equated to a typical swimming speed of humpback whales."

"As for Otto Lilienthal (1848-1896), I have always felt that his pioneering work in flight was overshadowed by the Wright brothers efforts. Wilbur Wright acknowledged "we were of the opinion that Lilienthal was the first man to make a serious attempt at leaving the earth in an airplane". He achieved flights of up to 300m until he was killed in an accident with one of his gliders. One can note from an image of one of his biplane gliders, probably from 1895/96, that the geometry of the ribbing which is apparently both longitudinal (like sail batons) and transverse (structural ribs) to the flow."

Tom Speer replied: "The Wright Brothers found Lilienthal's data overstated the lift, and understated the drag, of the airfoil wing, and subsequently had to conduct elaborate tests of their own to ascertain the correct performance. The Wright results were said (on the program) to be accurate to within 3%, based on current knowledge, while Lilienthal overstated lift by 1/3 or more.

Perhaps it was airframe workmanship - perhaps the Lilienthal wing did NOT use a smooth leading edge, but rather the airfoil ribs bulged substantially, protruding the fabric, to produce some of the dual-vortex lift enhancement recently noted?.

"Nope. John Anderson from the Smithsonian's National Air and Space Museum presents an absolutely fascinating talk on this topic. It turns out there was nothing wrong with Lilienthal's data. It was a matter of properly interpreting the data.

"Problem number one was the air density. The Wright's believed Lilienthal used "Smeaton's coefficient" to reduce his data. He didn't, but the Wright's bad assumption resulted in the dimensional forces from Lilienthal's coefficients to be more than 50% too high.

"Problem number two was the effect of aspect ratio. The first Wright gliders had fairly low aspect ratios. When Lilienthal's data were applied to the Wright gliders without compensating for the difference aspect ratio from Lilienthal's gliders, the result was a significant over-prediction of the Wright glider's efficiency.

"Problem number three was the use of a different airfoil section. Lilienthal used a circular arc section, while the Wright's used a parabolic section with the camber farther forward than for Lilienthal's. This gave the Wright's section a smaller angle of zero lift, so it took a higher geometric angle of attack to get the same lift as Lilienthal.

"Once you make the corrections that modern aerodynamicists do as a matter of course, the Wright and Lilienthal data are in agreement. It's too bad Lilienthal has been getting a bad rap for over a century on this!

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DYNAFOIL UPDATE

By Todd Miller

I've had a major break through in my 1977 Dynafoil and wanted to share it with you. My brother and I found 3 of these at the local swap meet. Initially, I found that new old stock (NOS) 340cc Chaparral/Xenoah engines were readily available because the ultra light aircraft use so many of them. $200 for a new engine was a great deal, so even though the Dynafoil came with the 440cc version of this engine, I made the purchase. To make a long story short, the 340 is just not capable of the performance needed to really fly the Dynafoil as it was meant to be flown. After riding it during the summer (2004) with the 340cc engine that I installed, I wasn't happy with the performance and started looking for a 440cc engine. I purchased a 440, installed it and took the Dynafoil up to the lake for testing. The transformation is nothing short of amazing. It now launches itself out of the water by pulling a "wheelie" as fast as I can roll on the power. This immediately brings the front strut and the entire hull completely out of the water and only the rear foil and prop remain submerged.

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DYNAFOIL UPDATE

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It's an amazing craft to ride now, where before it was a lot of fun but very tame. Now it's like riding a 1200cc sport bike. Above is a photo from a brief bit of testing.

INTERESTING MESSAGE

Boeing Jetfoil Program

I just thought I would send a note about the Boeing Jetfoil, and the documents you have on IHS. I am a SNAME member of the Pacific Northwest Section, (#17706) and the senior Staff Chief Engineer for Washington State Department of Transportation Marine Division.

One of my fun times was a part of the Boeing Jetfoil test program in Seattle. These vessels were absolutely a dream to work and ride. It is a shame that as much work was not put into them to make them work as the negative attacks. Compared to many vessels today they were a good melt of airplane and vessel. I have many hours of riding and night maintenance to remember. They were a blast. Now after 38 years, I am retiring to pursue my consulting business. Clark Dodge, President CED Consulting LLC 225 SW 171st. Street Seattle, WA. 98166

ANOTHER INTERESTING MESSAGE

In response to someone's question about the "Bruce Foil", Tom Speer (IHS Member) wrote:

Bruce's Foil: The best information is by Edmond Bruce himself - "Design for Fast Sailing," The Amateur Yacht Research Society, 1976. I think there's also some information on Bruce foils in the AYRS book, "Sailing Hydrofoils." (Some background: the Bruce foil is like a daggerboard or centerboard placed on an outrigger instead of on the centerline of the boat. The foil is canted to provide a stabilizing vertical force as well as a horizontal force to counter the side force from the rig. This greatly reduces the heeling of the boat, using the hydrodynamic moment from the foil for lateral stability instead of the hydrostatic moments from hull form stability or keel ballast.) Bruce typically canted the foils at 45 degrees from the vertical (tip inward). Both low aspect ratio foils and moderate aspect ratio foils were used. His small scale tank tests showed an aspect ratio of 1 gave him the best performance, although he only tested aspect ratios of 3 or less and at low Reynolds numbers. In his moderate aspect ratio sailing experiments, he mounted the foil on a small outrigger float with a pivot so that it could be raked aft like a centerboard when the foil was to windward. One needs to have the center of lateral resistance aft with the foil to windward and forward with the foil to leeward to get the same directional balance as a centerboard, because the force from the sail is inclined forward. As for sizing the foil, I'd be inclined to use 40% more area than you'd use for a conventional foil. I'd also go with a high aspect foil rather than the low aspect ratio that proved best in his tow tank tests. Naturally, a symmetrical section is required because the foil has to operate on both tacks.

IN MEMORIAM

RAYMOND ERNEST HOOP

Major RAYMOND ERNEST HOOP, USAF (Ret.), of Longwood, FL and Bethesda, MD, passed away on November 25, 2004. He was born July 25, 1923 in Hopkins, MI and was a native of Grand Rapids. He retired from the United States Air Force as a Major after 40 years of active and reserve service. He was a P-51 Mustang fighter pilot during World War II and an instructor for both the P-51 and AT-6 aircraft.

He obtained his Master's Degree in Electrical Engineering from the University of Michigan and worked at General Motors and A.C. Spark Plug before moving to the Washington, D.C. area. As a Program Manager with several engineering consulting firms, he supported numerous U.S. Navy projects, most notably, the U.S. Navy Hydrofoil Program based in Key West, FL until the hydrofoil fleet was decommissioned.

He retired in 1989. He is survived by his devoted and loving wife, Patsy Jackson Hoop, of Bethesda, MD; a daughter, Kimberly Hoop, Grand Rapids, MI; a son, Richard, and wife, Krystol Hoop, Grainger, IN; a sister, Mollie, and husband, Dr. Neil Harris, Goshen, IN; a sister, Millie, and husband, Wesley Bazan, Jenison, MI; and others.

A funeral service with full military honors was conducted on Thursday, January 6, 2005 at 9 a.m. at the Ft. Myer Chapel with interment at Arlington National Cemetery.

Ray was a long-time member of the IHS, and will be sorely missed by many of his hydrofoil colleagues.

INSPEED SAILING RECORD RE-CAPTURED BY WINDSURFER

Source: Australian Sailing, January 2005

Pending ratification by the World Sailing Speed Record Council, the outright world sailing speed record of 46.52 knots set in October 1993 and held by the purpose designed Australian speed sailing craft *Yellow Pages Endeavour,* has been broken by Finian Maynard using a customised wind-surfer achieving a speed of 46.82 knots.

Finian Maynard's record run (Gilles Martin-Raget picture).

In the past, the World Speed Sailing Record Committee (WSSRC), which sets the rules and ratifies sailing speed records, required that the contending craft must maintain an average speed over its course that should be in excess of the previous record by a speed margin of at least 2%. In this case, the margin is only 0.6% so it remains to be seen if the record will indeed be ratified. Maynard has certainly exceeded the immediate past speed sailing record of 44.66 knots which was achieved by Thierry Bielak in April 1991 also using a windsurfer.

Maynard, from the British Virgin Islands, also achieved a second record-breaking run of 46.6 knots on the Saint Maries de la Mer trench in the Camargue region in southern France.

"We were getting 35-45 knots of north Mistral wind that was coming down the canal, making it very difficult to keep the trim, because the power source was up and down so much," Maynard said.

According to website "The Daily Sail", Finian Maynard weighs 117kg and used an asymmetric boom instead of the typical wishbone used on windsurfers to reduce drag from the leeward side of the sail. The sails made by Naish Sails in Hawaii are asymmetric and designed to be used on one tack. His board is from F2 while mast was from Maverx.

The centreboard/skeg foils have been developed by French company Deboichet to minimise cavitation at high speed. These are used to generate a sideforce opposing the sail force rather than to lift the board, which acts as a planning surface. His suit was made from a low-drag material used by speed skaters.

SCAT UPDATE

By Sam Bradfield, IHS Member

We're still living (even after being blown away) on the "Space Coast", so-called because of our proximity to Cape Canaveral and of course SCAT is docked at Florida Tech. I recently noted that the bus line that serves our community uses "SCAT" as acronym for Space Coast Area Transit, which is their business name. I thought that an amusing coincidence.

I'm hoping to put the finishing touches on the SCAT Project in 2005. The next stage is ocean testing for the average speed capability of the boat. We'll be shooting for Vbave = 20kts* averaged over 1 hour in moderate conditions for the first batch of data during January and February 2005. Then we'll extend that to as many hours as we can get. If we make that mark early on, we'll boost it to 25kts and if we make that mark, we'll try for less than moderate conditions of wind, sea, and current...and so on.

In March we'll do the ocean race from Miami to Nassau again. I'm hoping we have success with that this time. I'm hoping to do a Summary Report on the SCAT project and close it out by getting rid of the boat in 2005. Wish us luck in that!

* *Vbave: average boatSpeed Over Ground (in GPS-speak, "(SOG)ave"*

CATRI MARINE

The CATRI concept was conceived and developed by a group of talented scientists who were also multihull enthusiasts, keen to advance the 'state of the art'. Our aim

Continued on Next Page

CATRI MARINE

Continues from Previous Page

was to design, engineer and build a folding trimaran which is exceptionally fast (relative to multihulls of similar size), stable, strong, durable, and easy to handle, all at a competitive price.

Over thirty years in the multihull industry, having developed high levels of technological and theoretical expertise, has enabled CATRI to address this exciting task. During these years, a program of extensive experimentation and development (both theoretical, and in relation to advanced construction techniques) has resulted in the CATRI concept. Central to this concept is a patented hydrofoil system which provides new levels of speed (on all points of sail), stability and sail-carrying ability. The float mounted hydrofoils also allow elimination of the traditional main hull centreboard/case, giving considerably more interior room and flexibility with design of the interior.

PERFORMANCE

The CATRI has a system of two float-mounted hydrofoils (one inclined dagger board in front of the main crossbeam, and a fixed foil at the rear of each float) which act to provide substantial dynamic lift (an upward force on the float which increases with boat speed, while inducing minimal drag). The third rear foil is mounted on the rudder. The CATRI performs exceptionally well on all points of sail, in all wind and wave conditions that could reasonably be expected. It has three different operating modes:

In low wind strengths of 2-8 knots the CATRI functions as a conventional trimaran, though with the advantage of asymmetrical dagger boards and a bigger rig/larger sail area than most boats of this size (which is possible due to the increased stability from the foils). In these conditions the float-mounted stern foils and the windward dagger board are out of the water, minimising drag. At boat speeds of above 5-6 knots the horizontally mounted rudder foil comes into action, minimising back wave, and associated drag at the rear of the main hull.

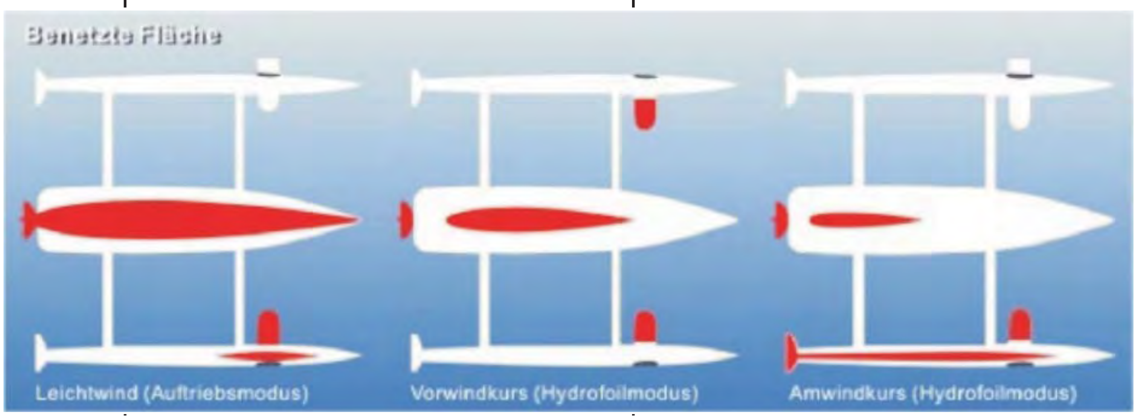

Diagram Showing CATRI's Three Modes of Operation

As the wind strengthens the CATRI hydrofoil system comes fully into action. On any point of sailing, other than running downwind, the CATRI is supported primarily on three points: the rudder mounted foil and the two leeward float-mounted foils. The V shaped bottom of the leeward float skims the water surface, minimising drag (and thus maximising speed and efficiency). Lift to windward (prevention of leeway) is provided by the forward float-mounted hydrofoil (being angled at about 50 deg. to the horizontal, across the boat, it provides both horizontal and vertical lift). This is an asymmetrical foil, intrinsically much more efficient at providing such lift than a conventional symmetrical centre- board: thus, windward performance of the CATRI is exceptional. The leeward float acts as a powerful water surface sensor, ensuring that the rear foil is always correctly angled to the water surface.

There are minimal moving parts (except for raising and lowering the forward float mounted foil, as you would with a conventional centre- board), and the hydrofoil system is largely self tending. In this operating mode, all-round performance is truly exceptional, with the hydrofoil system acting to maximise speed and stability.

Boat speed at wind strengths of 8-20 knots, at an angle of 90-100deg to wind direction, is calculated to be 1.3-1.5 times wind speed (based on testing of prototypes). 25 knots should be easily attainable, and 30 knots looks distinctly possible. Running directly downwind , both forward foils are lowered, the rear float-mounted foils are not in contact with the water and the rudder mounted foil is providing some main hull lift aft: the bottom of both floats is skimming the water with minimal drag.

[Other characteristics of the CATRI concept will be described in the Summer NL issue.]

WELCOME NEW MEMBERS

(Continued From Page 2)

nology Office (ONR 33X) at the Office of Naval Research. He manages ONR programs in advanced ship hull forms and advanced electrical systems and components, including ONR's super-conducting motor program. He is panel chairman for the Department of Defense ground and sea vehicles defense technology area plan, and serves on the tri-service electric power technology initiative "tiger team". Prior to his appointment as Director, Mr. Littlefield was the Deputy Director of ONR 33X starting with the creation of the office in 2000. From 1998 to 2000 he served on the staff of the Chief of Naval Operations Executive Panel as Assistant for Science and Technology, where he assisted with studies on Naval Warfare Innovation. For his work with the Panel, he was awarded the Department of Navy Superior Civilian Service Award by the Chief of Naval Operations. Scott's undergraduate degree is in Mechanical Engineering from the University of Michigan, with graduate course work in Acoustics at Pennsylvania State University.

David Smith - David is a Structural Engineer who specialises in commercial building facades. His particular expertise is in cable supported glass walls. These tension structures work in a similar manner to spreader supported stayed yacht masts. He is also a keen sailor and race a 49er on Sydney Harbour, Australia. While doing 20 knots and going airborne while hanging off a wire is exciting, he is fascinated with the prospect of going even faster. David is currently fitting hydrofoils to an A Class catamaran and hopes to start formal testing soon.

William J. Steelman - Jeff Steelman graduated from the United States Naval Academy, Annapolis in 1971. His U.S. Navy career included command at sea of three warships-patrol gunboat USS WELCH (PG 93), ASW frigate USS GARCIA (FF 1040), and guided missile frigate USS ESTOCIN (FFG 15). He served in combat operations at Grenada, Lebanon, and against Iraq. Following retirement in the grade of Commander after 20 years of service in 1991, Jeff was employed by DynCorp to coordinate conversion of a former Soviet TARANTAL I missile boat. He later joined Litton Ingalls Shipbuilding, Inc. as a combat systems engineer and later Director, Business Development. Jeff is currently Director Naval Programs for Thales North America, Inc., responsible for all aspects of military and commercial maritime business development.

Jon Winsley - Jon Winsley resides on Oahu, Hawaii, where he was born and raised. After serving 6 years as a Machinist Mate in the U.S. Navy he received a Bachelors degree in Mechanical Engineering which was followed by 3 years of work as a process engineer for W.L. Gore and associates. Following this he returned to Hawaii and earned a Masters of Science in Ocean and Resources Engineering at the University of Hawaii while working for the National Marine Fisheries Service. He is presently employed at Pearl Harbor Naval Shipyard and is working on hydrofoils designs which will work better in surf than the one frequently used now which is designed for seated use behind a boat. He is interested in contacting anyone with experience with making hydrofoils insensitive to angle of attack

IHS OFFICERS 2004 - 2005

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George Jenkins	Treasurer

MEMBER BENEFIT

IHS provides a free link from the IHS website to members' personal and/or corporate site. To request your link, contact Bill White, IHS Website Editor at webmaster@foils.org

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The NEWSLETTER

International Hydrofoil Society

P. O. Box 51, Cabin John MD 20818 USA

Editor: John R. Meyer | Summer-2005 | Sailing Editor: Martin Grimm

A CENTURY OF HYDROFOILS - ENRICO FORLANINI

By Martin Grimm, IHS Member

This year marks the centenary of the development of the first fully foilborne manned hydrofoil (See Footnote on page 3). The hydrofoil was one of a series of 'Hydro-Aeroplanes' designed and built by the Italian engineer, inventor and helicopter and airship pioneer, Enrico Forlanini.

This tribute to Enrico Forlanini is compiled from various articles and website references, however primarily "The Hydro-Aeroplane Boats of Enrico Forlanini" written by George Zangakis which appeared in the January 1963 issue of Hovering Craft and Hydrofoil.

Enrico Forlanini was born on 13 December 1848 in Milan. In 1870 he graduated from the Scuola di Applicazione del Politecnico di Milano. He was a man of many interests, including helicopters, airships, airplanes and hydrofoils.

Forlanini's Hydrofoil with Air Props in 1905

See Forlanini, Page 3

2005 DUES ARE DUE

IHS Membership is still only US$20 per calendar year (US$10 for students). Your renewal or new membership is critical. IHS accepts dues payment by personal check, bank check, money order or cash (all in US dollars only). We have also arranged for payment of regular membership dues by credit card using PAYPAL. To pay by credit card please go to the IHS membership page at <http://www.foils.org/member.htm> and follow the instructions.

INSIDE THIS ISSUE

PRESIDENT'S COLUMN

Greetings to All IHS Members

The year 2005 is one for hydrofoilers to celebrate for several reasons. First, it was 100 years ago in 1905 that Enrico Forlanini flew his 1.2 ton hydrofoil on Lake Maggiore in Italy at over 48 knots. As you can see on Page 1, Martin Grimm has written an article commemorating this occasion. Secondly, it was 35 years ago in 1970 that the IHS was founded in England by a group of hydrofoil enthusiasts including Countess Juanita Kalerghi, Mark Thornton, Baron von Schertel and others. We owe a great deal to these early pioneers! Thirdly, it was 50 years ago in 1955 that the hydrofoil sailboat, Monitor, first sailed on Lake Mendota, Madison, Wisconsin. Martin Grimm, again, has written a review of a book by Neil Lien (IHS Member) entitled: "Monitor Hydrofoil Sailboat, Design in Review" that appears in the Sailors Page section of this Newsletter.

Another book, entitled: "Fastest in the World – The Saga of Canada's Revolutionary Hydrofoil" is reviewed by Bill Ellsworth (IHS Member) and appears on page 4 of this NL.

I am very pleased to report that the IHS has acquired its first "Sustaining Member", namely Island Engineering, Inc., Piney Point, Maryland. Sustaining Members are corporations, companies institutions and other organizations who wish to support the work of the Society. The names and/or corporate logos of Sustaining Members will be prominently displayed on the IHS website, Newsletter, and letterhead stationery. Additionally, links from the IHS website to the Sustaining Member's website will be provided. Once annually, Sustaining Members may submit for publication in the Newsletter an article (not to exceed 250 words) describing its corporate/institutional activity in the recent past and intentions for the future. Up to 12 employees of the Sustaining Member may be designated as Regular Members. Annual dues for Sustaining Members will be $250. Note IEI's logo on the front page of this NL; also a short description of the Company's capabilities appears on page 7.

I am encouraged to report the Society's continued growth with a total of 22 new members added to the IHS Membership roles during the first half of 2005. By the way, you can view the Membership List by logging onto the IHS website and put in the proper password. All IHS members have been informed of this password. If you have been missed, please contact the webmaster (webmaster @foils.org). It is advisable for all to check the information on the List. If it is incorrect, please send changes to: Steve Chorney: (schorney @comcast.net)

As your President and Newsletter Editor I continue my plea for volunteers to provide articles that may be of interest to our Members and readers. Please send material to me (jr8meyer@comcast.net) Bill Hockberger (w.hockberger@verizon.net) and Ken Spaulding (kbs3131@erols.com). We will be pleased to hear from you.

John R. Meyer, President

WELCOME NEW MEMBERS

Mike Dobrzelecki - Born in Newark NJ in 1955, Mike has worked for various engineering companies after graduating from Rutger's University in 1978 with B.A. in Economics. He is currently employed as a Project Procurement Manager by Foster Wheeler North America (FWNA), a global corporation, which is primarily engaged in designing and building electric power plants, refineries and pharmaceutical facilities. An avid modeler since 1962, Mike donates his talents and spare time serving as a Project Supervisor creating museum exhibits for various museums and institutions, such as the Intrepid Sea-Air-Space Museum, Museum of Polish Military Heritage in America and many others in tribute to the service and sacrifice of U.S. veterans and those of our allies.

Douglas Hamblett – Doug has a Masters License in the Merchant Marine. In his spare time he is planning to use some foils on a 27 foot cruising trimaran that he is building. He has obtained a Dave Keiper CD and is using that information as a guide in his design.

David Mallinson – David's interest lies in building a small, very lightweight catamaran using tortured ply techniques and glass and resin. He has inherited a number of rectangular fiberglass very lightweight and immensely strong fibreglass tubes that he will be using for the cross-beams etc, and may go for a twin rig as he conveniently has two sets of Skibat rigs. David is basically a hands-on research technician who

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Forlanini
(Continued From Page 1)

By about 1898 Forlanini started experiments with hydrofoils, which he referred to as "Hydro-Aeroplane boats". Initially the experiments were in the form of a series of model tests from which he arrived at several simple mathematical relationships.

The picture on page 1 illustrates a full scale hydrofoil he built based on a ladder system of foils. The hydrofoil weighed approximately 2650 lb (1.2 tonne), had a 60 hp (44.7 kW) engine, and designed to operate at a speed of 56 mph (48.7 knots). The craft was driven by contra-rotating, coaxial airscrews, one at each end of the craft. It is understood that this craft was tested on Lake Maggiore between 1905 and 1911 and was reported to have attained a speed of 42.5 mph (36.9 knots).

Forlanini's Craft - Water Props

In 1906-7 Forlanini was joined on Lake Maggiore by another aviator, General Arturo Crocco, who built the first-ever hydrofoil boat to possess a dihedral surface-piercing foil system. This development will be reviewed in a forthcoming IHS Newsletter.

Shown here are several figures depicting Forlanini's craft.

In 1911, Forlanini found his first hydrofoil client. During Alexander Graham Bell's world tour he and 'Casey' Baldwin met with Forlanini and were given the opportunity to ride in one of his Hydro-Aeroplanes on Lake Maggiore. Baldwin described the ride was as smooth as flying. Bell was sufficiently impressed with the concept, that on returning to Canada he purchased a licence to build and develop the Forlanini ladder-foil system in North America. Among Bell's other associates in this venture were Glenn Curtiss, Lieutenant Selfridge and John McCurdy. Bell and Baldwin developed a number of designs, called Hydrodromes, culminating in the HD-4, which set a world water speed record of 70.86 mph (61.57 knots) in September 1918.

Another View of Forlanini's Hydrofoil

Forlanini's Craft at Rest on Lake Maggiore

Enrico Forlanini died on 9 October 1930 in Milan at the age of 82 years while still working on the design of a new flying machine with the same passion and ardor of the early years. The city of Milan has dedicated its city airport, Linate Airport, as "Airport Enrico Forlanini" in his honor.

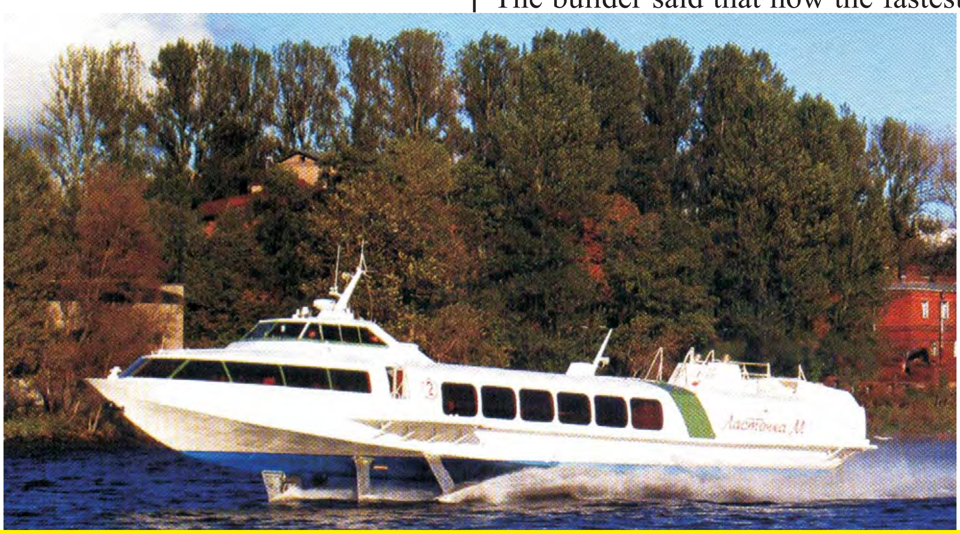
Footnote: Although Forlanini was the first to build a full-size craft that operated under its own power, the first known experiments with foil configurations had been undertaken between ten and twenty years earlier. In the United Kingdom in 1881, Horatio Phillips conceived the first ladder foil system that was successfully demonstrated with the aid of towed models. In 1891, Comte de Lambert demonstrated a craft on the Seine in Paris. Although often described as a hydrofoil, it appears to have been a planing craft with four transverse 'hydroplanes' to generate lift for high-speed skimming rather than foiling. According to contemporary press reports the vessel only lifted slightly. In 1894, two brothers, M. and L. Meacham designed a boat equipped with fully submerged incidence-controlled foils. A planing sensor, attached to a feeler arm aft of the forward foils, was designed to vary their angle of incidence and hence lift, according to the height of the waves, but there is no record of the craft being built.

[Editor's Note: A more comprehensive treatment of Forlanini's work described by Martin Grimm appears in the "History Lovers and Collectors" section of the IHS website. All are encouraged to view this excellent article.]

48-KNOT HYDROFOILS ARE THE WORLD'S FASTEST RIVER PASSENGER VESSELS

(From Speed at Sea, December 2004)

A demonstration trip has recently been completed onboard two Lastochka-M passenger hydrofoils in Russia. This trip precedes the transfer of the vessels to their owners, which is a Chinese company dealing in river passenger transport. The 86- passenger capacity boats were built at Volga Shipyard JSC under a contract between High-Speed Ships Financial Industrial Group (FIG) and the Chinese owner. Both ships came to the port of St Petersburg from Nizhny Novgorod for their delivery voyage by a freight ship.



Lastochka-M Passenger Hydrofoil

The main volume of work on the Lastochka vessels was undertaken by FIG High-Speed Ships enterprises. RE Alekseev Central Hydrofoil Design Bureau, based in Nizhny Novgorod, developed the project on the basis of a Voskhod hydrofoil vessel. The designer said that considerable changes were made to the power plant installation, which included two engines instead of the one engine. This was done in accordance to the existing authority's regulations. Improvements to the hydrofoil scheme and propellers were also made, so that a maximum speed of 48.5 knots (90km/h) could be reached.

Zvezda JSC based in St Petersburg developed and manufactured the four DPA470PM diesel engines for this project, each with an output of 990kW, based on the third generation of this engine. The installation of the electrical equipment was carried out by Albatros Maritime Elecrotechnic. Almaz Marine Plant JSC provided assistance in the vessel's pre-selling stage. The hydrofoils were constructed under the control of the Russian River Register of Ships' Verkhnevolzhskaya inspection.

The builder said that now the fastest river passenger vessels in the world and at 48 knots can allow its Chinese customer to meet its service schedules. Passengers are accommodated in two lounges fitted with airline style seating.

It is the first project that renews the program of building modern hydrofoils at Russian shipyards, said FIG High-Speed Ships. It added that more than 50 years' experience in developing projects, construction and exploitation of such vessels is one of the great achievements of the Russian shipbuilding industry. FIG High-Speed Ships expects a growth in interest of this type of vessel and an increase in orders both from foreign and Russian shipping companies.

"FASTEST IN THE WORLD, THE SAGA OF CANADA'S REVOLUTIONARY HYDROFOILS"

Reviewed by Wm. Ellsworth (IHS Member)

FASTEST In The World, by John Boileau is a beautiful book with numerous illustrations of hydrofoil ships and craft, many of which are in color.

Initially, the author illustrates the early work of Alexander Graham Bell and his colleague Frederick Walker "Casey" Baldwin to develop and demonstrate hydrofoil craft. In 1885 Bell & his wife had visited Cape Breton in Canada and were impressed by the cool summer weather and the beauty of the area. They decided to build a beautiful summer mansion on Cape Breton on the Northern shore of the Bras d'Or Lakes. In addition to his many other ventures, Bell, with the collaboration of Baldwin, undertook many experiments with various hydrofoil craft designs. After some 11 years, they finally developed the test craft called HD-4. On 9 September 1919, piloted by Baldwin, the HD-4 reached a speed of 114.01 km/hr (61.5 knots), the fastest watercraft in history up to that time. Unfortunately, Bell was ultimately unsuccessful in getting the US Navy and others to undertake a hydrofoil development

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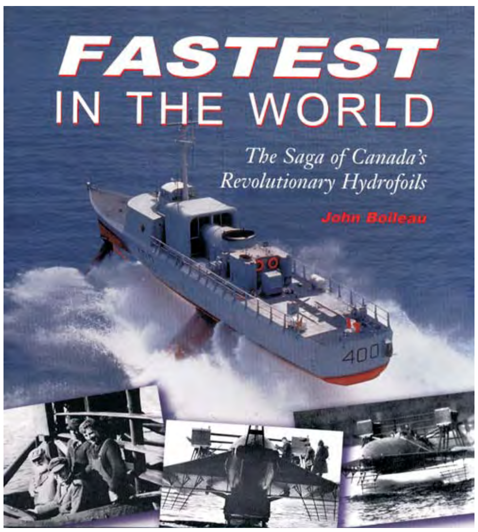
FASTEST In The World
(Continued From Previous Page)

based on HD-4 and he turned his attention elsewhere. There is a HD-4 replica in the Alexander Graham Bell museum in Baddeck, Canada. Bell died on 2 August 1922. After his death Casey Baldwin continued to pursue new designs and seek to market them with little success. His later efforts are also covered in the book.



The author then shifts some thirty years to a number of projects to develop a hydrofoil ship funded by the Canadian government. In June 1949 the Canadian Defense Research Board (DRB) awarded a contract to a boat shop on Lake Massawippi for construction of the hydrofoil test craft *R-100* to demonstrate the value of hydrofoil craft for naval applications. In January 1950 the R-100 craft named *Massawippi* was finished. Built of plywood, it was 14 meters long and weighed 5 tonnes. It used the Bell/Baldwin classic ladder hydrofoil design. In the early trials the craft experienced a number of problems and in 1951 the project was transferred to the Naval Research Establishment (NRE) for further testing.

In 1951, NRE decided to design a hydrofoil craft similar to *Massawippi* but more capable of meeting navy needs to tie in with British research. It was designated R-102 and came under the control of Dick Blake, head of Engineering at NRE. The author notes that Naval Architect Michael Eames*, who migrated to NRE from UK in 1952, soon became a key member of his team and eventually achieved worldwide recognition for his hydrofoil work.

Phil Rhodes, a Naval Architect and long time associate of Casey Baldwin, received a contract for a design study of R-102. It specified a 26-metre anti-submarine hydrofoil. However, Rhodes became ill and DRB transferred the contract to Saunders-Roe in UK. When DRB found the completed design marginal in several respects, Saunders-Roe countered with a 42-tonne craft. After much discussion, DRB awarded Saunders-Roe a contract for design and construction of R-103. It was launched as *Bras d'Or* on 22 May 1957 and in the trials it developed an alarming roll problem. This generated much debate back and forth. At this point, the author notes that while R-103 was under construction, Mike Eames designed a 3-tonne experimental hydrofoil craft constructed in NRE's workshop. It was designated *Rx* because any prescribed set of foils could be fitted.

Transport of R-103/*Bras d'Or* was made as deck cargo on Canada's aircraft carrier *Bonaventure*. It arrived in Halifax on 26 June 1957 with the expectation that trials at NRE could determine a solution of some of her problems. NRE's first priority was to find out what caused the problems. Mike Eames fitted *Rx* with a set of foils like the ones on *Bras d'Or*. As a result of these trials, he concluded that Bell & Baldwin had made a mistake in the design of the HD-4 foil system. He postulated that the forward foils and the aft foils should have been reversed. Further research supported his conclusion and proved that the R-103 foil system was at fault. Based on this new finding, new foils proposed by Eames were installed on *Bras d'Or* and further tests were undertaken which proved that he was correct in his conclusion.

In the final two chapters of the book, the Author focuses on a New *Bras d'Or***.** Canada had accepted ASW as its naval role in NATO and means were sought to do the job more economically. At NRE *Massawippi* and the old *Bras d'Or* were laid up and NRE's attention was redirected to an ASW warship design designated R-200. It was to have a foil system with a single foil forward and two foils near the stern as recommended by Eames. In 1959 his feasibility study for an open ocean hydrofoil ship neared completion. He proposed a 40 meter 180 tonne ship designated R-200. In early in 1960, Eames pitched his proposed design to naval experts from Canada, Britain, and the US. They were impressed and recommended that NRE continue with the study. NRE passed their recommendation to the DRB who concurred and sought a company to undertake further development. De Havilland Aircraft of Canada responded and was given a contract in August 1960. In October 1962 the Canadian Naval Board approved limited funding of $1.2M. A short time later, the Treasury Board approved $13M to build the hydrofoil ship and develop its weapons. The author gives a detailed description of the design and construction of the ship designated FHE-400 for **F**ast **H**ydrofoil **E**scort.

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FASTEST In The World
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In November 1966 the nearly completed ship had a serious fire in the engine room, which almost ended the ship's life before she was launched. After the fire, the government's decision on rebuilding was not readily available. However, after much serious consideration, the Minister of National Defense approved rebuilding and in April 1967 the Treasury Board approved a new ceiling of $50M.

The ship needed extensive work to return it to pre-fire condition along with some design improvements. Finally, on 13 July1968, The 200-tonne ship, mounted on its slave dock, left Sorel towed by navy tugs on the way to Halifax. Upon arrival at her new berth, the ship was christened ***Bras d'Or*** by Helen Cotaras, the wife of the first Commanding Officer, Commander Tino Cotaras. Chapter 7 of the book focuses on the voyages and trials of FHE-400 that followed. It is replete with a number of pictures.

As noted in the final chapter, on 2 November 1971, it was announced in the House of Commons that the shift from ASW to Canadian sovereignty led to a decision by DRB to lay up the FHE-400 for 5 years. Cmdr. Gordon Edwards, who took over command of this beautiful ship in 1970, commented: "once abandoned, it was gone".

In 1983 the Musée Maritime du Quebec acquired *Bras d'Or, a*nd towed her on her slave dock to her new home on the St. Lawrence River. The ship was opened to the public in 1993.

As a final note, on pages 92 & 94 of the book, there is a Chronology of Hydrofoil Development and a Selected Bibliography that are very useful.

**I feel compelled to make a personal note regarding my relationship with Mike Eames and his family. In the course of the Canadian and US hydrofoil development, programs, I became very close to Mike, his lovely wife Judith (Judy), and his two lovely daughters, Alexandra (Alex) and Jennifer (Jenn). They all became very special to me, and even after Mike died prematurely on 16 March 1995, I still try to maintain close contact with, Judy, Alex, & Jenn.*

Also, please note that this book was published by the Formac Publishing Company in Halifax NS, however, it can be purchased in the US from Casemate, 2114 Darby Rd., 2nd floor, Havertown PA, 19083 or www.casemate.com. The US price is $19.95 plus $2.50 for shipping and handling.

ROLLS-ROYCE STABILISERS UNDERGO IN-DEPTH DESIGN REVIEW

(From Ferry Technology/Speed at Sea, February 2005**)**

The best-selling range of Rolls-Royce stabilisers is the Brown Brothers' Neptune product, which has recently undergone an in-depth design review to further strengthen its market position, said the company. Since its launch in 1992, over 100 shipsets have been sold. Rolls-Royce said that it demonstrates a customer focused approach to ship stabilisation and relies on well-proven design and manufacturing techniques, combined with the highest standards, reliability, and maintainability.

Neptune's new features include a simplified crux assembly, lower weight, and the option for a fin locking mechanism for extra security. There is a tilt ram arrangement, which means that both the cylinder and seal can be maintained without the need to drydock the vessel, and also the new design has an improved hydraulic and lubrication system, said Rolls-Royce.

It added that continued development with Rolls-Royce products has resulted in a combined fin and tank stabiliser system, which offers complete stabilisation throughout the speed range and many operational and technical advantages. Products also include anti-heeling systems, stability test systems, and parametric roll prevention systems.

Recent applications for the Rolls-Royce range of Brown Brothers stabilisers include orders and deliveries to both the Eurpoean and Far East ferry markets. Most recently, the stabilisers for Color Line's *Color Fantasy* have undergone a successful sea trial of the Neptune 500 size of folding fin, said the company. *Color Fantasy is* the world's largest cruise ferry and was recently delivered by Aker Yards.

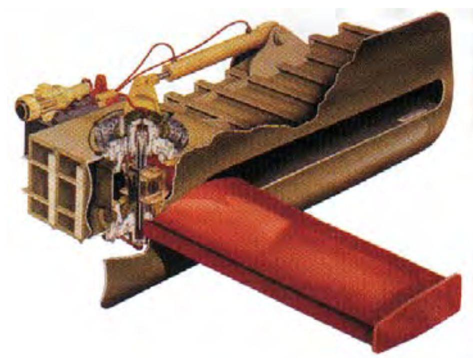
The company has also delivered stabilisers for the new ferry *Bute,* which is currently being built by the Remontowa Group in Gdansk, Poland for the Scottish operator Caledonian Macbrayne. This is to be fitted with the Aquarius 50 model, which

Continued on Next Page

ROLLS-ROYCE STABILISERS UNDERGO IN-DEPTH DESIGN REVIEW

(Continued From Previous Page)

has been popular for small ferries and the larger yacht market in terms of low weight and high performance. Other references in this market include a series of ROPAX (vehicle/passenger) vessels being built by Cantieri Navale Visentini in Italy, which has the Neptune 200 size stabiliser.



The Aquarius Design of Folding Fin Stabiliser has Fin Areas from $1.8M^2$ to $5.78M^2$

Further orders come from an existing customer for Stena's new ships being built at Fosen Mekaniske Verksteder AS in Norway. Rolls-Royce also highlights continued success in Spain with orders from Barreras SA for the Transmanchc Ferries, which will be fitted with its stabiliser equipment.

In addition to these European orders, in China - where the company said it is seeing increasing activity - Rolls-Royce is currently manufacturing stabilisers for two train ferries being built at Tianjin Xingang shipyard.

The Neptune range is currently available in six sizes from 100 to 600 and is suitable for fin areas from $4.2m^2$ to $22.4m^2$. This range of stabilisers is suitable for a variety of vessels including cruise ships, ferries and container vessels. It uses a folding fin arrangement in which the stabiliser foil can be folded into pockets in the hull, flush with the vessel's side when not in use. The folding fin design offers the highest lift from a one-piece fin (no flap type) and the latest innovation in controls and user-friendly control interfaces, said the company.

Rolls-Royce also offers the Aquarius design of folding fin stabiliser, which is aimed at the smaller end of the market for large yachts and small ferries, with fin areas from $1.8m^2$ to $5.78m^2$.

SUSTAINING MEMBER, ISLAND ENGINEERING, INC., JOINS IHS

Island Engineering, Inc., (IEI) has become the first Sustaining Member of the IHS. The Company, formed in 1999, is dedicated to design and engineering support of high performance marine vehicles-primarily for the development of advanced ride control systems. These systems are analogous to an aircraft flight control system. Unlike traditional fin roll stabilization systems, a ride control system often reduces dynamic variations in pitch, roll, yaw and/or heave motions simultaneously - while concurrently maintaining list, trim, heading or height above the surface at user-defined values. Proper design and implementation of the entire integrated system, from the effectors and their servo dynamics to the main control algorithm software, is essential in achieving the highest possible performance.

Island Engineering Inc. personnel employ 3D CAD/CAM, Algor FEMPRO FEA with MES, plus various vortex lattice and panel based CFD analysis tools to optimize the effectors for these systems. Seakeeping simulations, model tests, a vast experience base and scientifically performed sea trials are also used to refine system parameters.

The most advanced IEI motion stabilization system, fielded jointly with Quantum Marine Engineering of Florida, is currently installed on the U.S. Navy's LSC(X) 'Sea Fighter'. The system consists of two actively controlled titanium 'T' foils mounted near the bow, two active transom interceptors, and two actively controlled flapped skegs for yaw control. System components are linked via an EMI resistant fiber optic LAN.

'Spectrum' systems can be provided for vessels of all types in the 50-300 foot range. IEI recently installed yacht trim tab systems on a 56 Ft monohull, as well as a 65 foot catamaran built by Multihull Technologies in Florida.

IEI personnel, and IHS Members, include: Bill McFann, Rick Loheed, Bob Morezes, Tim Pannone, Bruce Sommers, and Bob Bain.

Disclaimer

IHS chooses articles and photos for potential interest to IHS members, but does not endorse products or necessarily agree with the authors' opinions or claims.

Interested in hydrofoil history, pioneers, photographs? Visit the history and photo gallery pages of the IHS website. http://www.foils.org

RIDE CONTROL HYDROFOILS REDUCE OPERATING COSTS

(From Ferry Technology, February 2005)

The Hydrofoil Supported Catamaran (HYSUCAT) hydrofoil system has been fitted to many catamarans and ferries around the world and has proven to be one of the most cost effective way of improving passenger comfort and reducing operating costs at the same time, said *Hydrospeed*, the international marketing agent and supplier of the HYSUCAT system.

Close Up of HYSUCAT Aft Foil

The HYSUCAT hydrofoil system consists of a main foil mounted between the two hulls at around the midships and a stem foil or foils near the transoms.

The company said that basically the foil system carries around half the vessel's full load about 50 per cent more efficiently than the hulls themselves. The end result is more speed with less power use. It also added that passenger ride comfort is improved by around 30 per cent. This is because the hydrofoils are not affected by waves, and because of the dampening effect that the submerged foils have on the movement of the vessel in rough seas.

The other major advantage of the HYSUCAT system is that the foils span the tunnel at keel level, said Hydrospeed, and normally do not increase the draft or limit the use or docking of the vessel in any negative way.

Hydrospeed highlights the main benefits of the HYSUCAT system as:
- A 30 per cent reduction in engine power required to reach operating speeds of around 25-30 knots
- About a 30 per cent reduction in fuel consumption at operating speed
- A 30 per cent increase in existing range
- Around a 30 per cent reduction in pitch and heave in rough seas
- Reduced wake and emissions at operating speed
- Increased payload with reduced speed loss
- Low maintenance as there is normally no moving parts
- Easily retrofitted to fast catamaran ferries mainly in the 15m to 30m and 25 to 45 knot range.

Hydrospeed said that one of its most successful installations has been on board the 22m catamaran *Sea Princess* which operates in Cape Town in South Africa. The 170 passenger ferry is fitted with the HYSUCAT tandem foil system with manually adjustable stern foil. It achieves a top speed of 32 knots and has the lowest fuel consumption and operating costs when compared with other 20 to 22m ferries operating in South Africa, Hydrospeed said.

REPORT FROM VIETNAM

By Ralph Patterson, IHS Member

Although hydrofoils and other advanced marine transportation systems are scarce in North America, this is not so true in many other places in the world. During a recent swing through New Zealand, Australia and a number of places in Southeast Asia, I observed that advanced water transport is widely used in many places.

Vung Tau Hydrofoil

One of these countries where hydrofoils are in regular service is Vietnam, where a fair number of old and well-used Soviet/Russian designed hydrofoils are in daily use along the Saigon River, connecting Ho Chi Minh City (HCMC-Saigon) with the seaside resort and fishing community of Vung Tau. From a brief internet search, it seems that the center of Vietnamese hydrofoil construction and repair industry is in the port city of Danang, much further up the east coast of Vietnam. We did not visit Danang, but saw the operational results of this activity between Vung Tau and HCMC.

Our short visit to Vietnam began when our large cruise ship anchored off Vung Tau on a windy day, with a fair chop and swells of 1-2 meters in

Continued on Next Page

REPORT FROM VIETNAM
(Continued From Previous Page)

the bay open to the South China Sea. The task of moving a good portion of the 2600+ cruise passengers to shore and then to HCMC for brief cultural and shopping tours in busses, hydrofoils and ships boats was formidable, and not entirely trouble-free.

Close Up View of a Hydrofoil Near Vung Tau

A number of us chose to travel from the ship to HCMC on our own, not with the ship's arranged tours. We transferred to Vung Tau, and then to the regular hydrofoil service, which takes about 1-1/3 hours to make the 70-75 km trip up the river. Fares are quite reasonable - about US$10 each way. The initial course across the bay was a bit rough with some pounding, but it was not uncomfortable, and the boats seemed to be able to remain foil borne. The boats are equipped with what appeared to be large window-mount air-conditioning units for this tropical country, and the cabins were generally comfortable if these were operating.

Once in the Saigon River, the ride was smooth and fast - I estimate that 25-30 knots were maintained with relative ease, passing large and small ships that make up the river traffic, sometimes by running in the shallow areas outside the main channel. Once or twice the boat slowed and landed to avoid congestion, but it soon picked up speed and made the rest of the trip into downtown HCMC easily.

On the return trip, the hydrofoil landed and stopped its engines several times. Once it moored to a buoy while there was much activity in and out of the engine room - when foil borne again, speed was reduced; the 80-minute trip took nearly 3 hours.

The hydrofoil service is operated by what seems to be 3 or 4 companies, but I suspect they are all under the same (government?) authority. It was hard to tell just how many hydrofoils were operating, as we never saw them all together. There seemed to be several variations of the basic configuration, as was typical of Russian designs. I estimate that there were at least a dozen craft in operation, and several more at the piers in Vung Tau and HCMC. The condition of the boats varied from those in reasonably good condition (considering their age) to some that appeared to be in rather poor shape. It should be remembered that these craft are all of fairly old design - at least 30 years - and some may have seen service in the Soviet Union or Russia before being transferred to Vietnam. Given the slow development of roads and other forms of transit in Vietnam, however, these hydrofoils, although not trouble - free, represent a useful service.

Mr. Patterson is a charter member and former director of IHS. He was active in the development of the SEAFLITE service in Hawaii, and then was the national sales manger for Boeing JETFOILS. He is a retired Navy Captain and now resides in Austin, Texas.

DAVID MELLOR JAMESON

A recent letter from Mark D. Jameson has informed us of his father's passing at the end of September 2004. David was a Life Member of the International Hydrofoil Society that implies he was a colleague of the founders of the Society, such as Juanita Kalerghi, Mark Thornton, Baron von Schertel and others in the early days after its founding in1970.

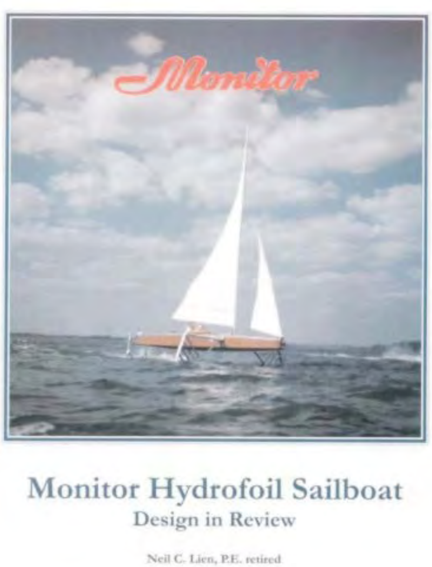
David was born at Sourstow Hall, Spurstow, near Tarporley, Cheshire, England on Christmas Eve 1916. His family later moved to Bridgnorth, Shropshire. He was educated at Abberley Hall prep school and then at Charterhouse. His interest in mechanical things and mathematics led to classes at North London Polytechnic. He learned to fly at White Waltham aerodrome and in 1939 joined the voluntary reserve of the RAF. The War Department allocated him to fighters, but later he was transferred to a Bomber Command. By 1941 he was flying Wellingtons of the No. 57 Squadron. On a flight over Germany, he was shot down and it was at that time that he lost his leg, but survived that ordeal and German imprisonment.

According to his son, David was always a very busy person, having a broad interest in many areas such as aircraft, air safety (he received a coveted citation in 1953), motor cars (that he converted to suit his disability), music (particularly the organ), sailing, and advanced marine vehicles such as hovercraft and hydrofoils. [Editor's Note: Mark Jameson provided a multi-page biography of his father that will be placed on the IHS website for all to see. Truly a very interesting story about a very interesting gentlemen.]

MONITOR HYDROFOIL SAILBOAT, DESIGN IN REVIEW

by Martin Grimm, IHS Member

Last year, Neil Lien published his book "Monitor Hydrofoil Sailboat, Design in Review" to detail some of the hydrofoil design developments of the Baker Manufacturing Company, with a focus on the Monitor, one of the earliest successful sailing hydrofoil designs. The book also covers the earlier developmental towed hydrofoil boat, hydrofoil runabout, and smaller scale hydrofoil sailboat, built by the company.



Cover of Neil Lien's Book

As an employee of the company from late 1949, Neil had a significant involvement in the development and subsequent sailing of Monitor, and so was in a good position to prepare this book, which primarily reviews the design and construction of Monitor.

In the forward to the book, Neil writes: "When sailing 'E' Scows on Lake Mendota, Gordon Baker conceived the idea of putting hydrofoils on a sailboat to drastically increase speed by lifting the hull above the water. When he returned in 1938 to Baker Manufacturing Company in Evansville, Wisconsin after a stint of 10 years at Westinghouse Research Laboratories, he instigated a program for his engineering department to research and design such a boat."

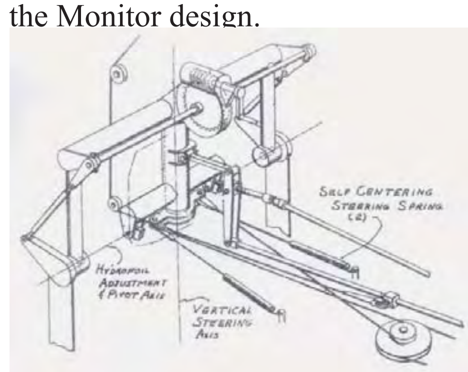
Neil Lien and Gordon Baker in the Cockpit of Monitor on the First Day of Sailing

Neil goes on to describe how Monitor was originally intended to be fitted with a tandem rigid sail arrangement however, although a single such sail had mostly been completed, this was never fitted to the craft. The design later reverted to a conventional jib and mainsail to reduce cost and complete progress production.

Monitor was first sailed on 24 August 1955 on Lake Mendota, Madison, Wisconsin. As such, Neil's completion of the book comes in time for the 50th anniversary of this event.

After Neil re-discovered the craft in a deteriorated condition when he returned to the Baker Manufacturing Company in 1974, he and others in the company set to work on restoring the craft. Today, Monitor is thankfully preserved and on display at the Mariner's Museum in Newport News, Virginia, USA.

The 61 page soft cover book includes 19 drawings and sketches of various elements of the monitor design covering the foils, hull, sail and control arrangements. Also contained in the book are 25 photos of Monitor and other Baker hydrofoil craft. This is undoubtedly the most definitive single source of information describing the Monitor design.



An Example of One of the Illustrations in the Book, in this Case, the Rear Foil Mounting

The book can be obtained from Neil Lien in hard copy or on CD-Rom by contacting him: nlien@inwave1.com or +1 608-882- 5551.

ROHAN VEAL TAKES OUT 2005 MOTH WORLD CHAMPIONSHIPS WITH FOILER 'OUTLAW'

After reports in the Newsletter of the successes that Rohan Veal has had with his Foiler Moth in national and international competitions in the Moth class, we can now report that he has secured the 2005 Moth world titles after winning every heat of the event in Melbourne, Australia by a considerable distance.

Continued on Page 11

ROHAN VEAL
(Continued From Previous Page)

At www. rohanveal.com/news.html, Rohan provides a good overview of how he has arrived at this point and the following extract is from his site:

In April 2002 I made my way over to Perth with Andrew McDougall to have a sail on Brett Burvill's 'Windrush' Moth foiler before it was sold to the West Australian Maritime Museum and hung up above the successful America's Cup challenger Australia II. From this day on I was hooked on foiling Moths!

At this stage the class was still unsure about whether this configuration would be legal (consequently it was deemed illegal due to a 'tight-tape' rule and thought it was not best for the development of the class). However this did not stop Brett and John Ilett from each coming up with their own new bi-foiler system (Brett's boat actually had two foils on the centerboard). Garth Ilett (John's brother) used the 'Ilett - Fastacraft' system for a few races in the South Australian Nationals with good results but Brett struggled to get any sustained lift from his system and reverted back to his surface piercing foils for the same event on a new boat named 'Sideshow Bob'.

I was keen to have a go on John's set-up (this did meet the class rules), so I went back again in Feb 03 for a sail on Garth's boat. I immediately ordered a boat with the first set of 'Fastacraft' production foils. I had no proper training on them prior to the 2003 Worlds and ended up a disappointing 3rd place *[editor: others are pleased with less!]* but was still determined to persuade as many Mothies as I could that this was the future. Slowly members came around (generally after having a sail), and the class voted to accept the foils as long as they were fully submerged T-foils. A few other Mothies picked up foils (without even trying them beforehand) and never looked back! Every event that I attended since 2003, the number of serious foilers participating has doubled. In the 2004 Nationals there was two, 2004 Europeans there was five, and in the recent 2005 Worlds we had about 10 foilers! This more than anything gets me pumped and I am probably more excited about this than my results as it shows that there are more people giving it a go an enjoying every minute. Photos like that below just sum it up!

Foiler and Standard Moths at Starting Line at the Moth World Titles, Melbourne, Australia

In the National Championships everyone was asking me what happened in that race that I finished 17th? Basically it was a very light wind race, i.e. 1-5 knots. In that breeze the foilers are dragging around extra baggage underwater (we cannot foil in less than 7 knots) which works out to be about 10% slower than a fast skiff upwind and about 20% slower than fast skiff downwind. We could not change our configuration for the event, and it is not what I wanted to do anyway as I have had enough criticism in previous events for doing so, even though the international rules do not prohibit any foil changes. So all the foilers drifted around for two hours doing one lap and we all had bad results, but who cares! We made up for it on every other day.

In the end, I was second behind Les Thorpe who sailed consistently throughout every race to win the Australian national championship, but when the results were added up for the open championships (including all the international competitors results), I won overall from Les on count-back. I can't recall much of the action during this regatta, but I think I led around every mark in every race except heat 3. This is the race that I remember most. I got pinned by another boat tacking on top of me at the start and then had to cross every transom to get over to the favored side. I made one tack to the top mark and managed to remain in the top 10. However downwind is a different story. I watched boat after boat sail straight past me and there was nothing I could do. It is important when hullborne to keep the boat dead flat. Bow down will induce negative angle of attack on the foils and create drag and suck the hull down to the water more. Sail with the bow up slightly, and the transom drags. You basically just have to grin and bear it until the wind picks up. It didn't pick up in this race at all, but it did in at least two races in the Europeans and is the reason I won that regatta.This shows it can go either way for a foiler (which is what I have said all along) but there are some who prefer to point out all the negative points about sailing a foiler or a low-rider.

Anyway, apart from that heat, I won all other races in both the Worlds and Nationals from anywhere between 2 to 17 minutes (usually from GBR foiler Simon Payne). The 17 minute win was a light to moderate wind race where it was crucial to say on the foils as long as possible. I was able to do this downwind all the time as my gybing on the foils was a lot more refined than the other guys, hence the boat never touched the water and slowed down. Upwind it was just a matter of tacking only in pressure and sticking in shore where the wind was more concentrated. I ended up lapping the leading non-foiler in both racesafter 3 laps.

[Continued Next Issue!- editor]

WELCOME NEW MEMBERS

(Continued From Page 2)

fancies one last fling as a high speed boy-racer (aged 60) and would ultimately like to write up a technical article, always assuming the boat flies!

Dr. Igor Mizine - Igor was born in St. Petersburg - marine capital of Russia and Former USSR. He received his Ph.D. degree from Krylov Ship Research Institute, where he worked for 20 years at various science, research and management positions. He also worked in ship design and research firms in the area of high-speed ships, and at the present time he works for SAIC. His working experience included hull forms development for various types of naval and commercial ships; development of CAD/CAE systems, based on multi-disciplinary optimization approach; model testing; research and design studies for hydrofoils, WIGs and Surface Effect Flying Vehicles. Currently he leads the High speed trimaran studies developing drag reduction and hydrofoil techniques for various applications.

Sebastian Muschelknautz- Sebastian's interest in hydrofoils dates back 15 years when he finished his PhD in mechanical engineering at the Technical University of Munich on a thermo-hydraulic subject. At that time he was fascinated by a book on high-speed sailing. The chapter on hydrofoil sailing took his attention, and did some aerodynamic and hydrodynamic calculations on speed potential. Currently he is employed in the engineering division of the Linde Company, based in Munich, in the position of general manager for the R&D division. He has embarked on a private venture with a colleague and has built 2 prototypes of manned hydrofoils with surface piercing canard foils similar to the *Bras d'Or* arrangement. Unfortunately they were not very successful in marketing the concept although the boats performed quite satisfactorily. After a literature study and theoretical analysis, they started working on the fully submerged foil concept with the focus on very high speeds for an offshore environment. Their current concept is a waterjet powered 60 knot+ hydrofoil craft with automatically controlled fully submerged foils. Regarding design principles, they were inspired by *Tucumcari*, *Jetfoil*, and PHM.

Brett Radford – Brett works in the Seattle and Tacoma Washington area. He is Commander of the 175th TC, an Army Reserve Watercraft Maintenance Company. The Unit consists of a floating machine shop, a covered deck barge two LCM-8 and one LCU-1600 landing craft. Brett had previously worked 18 years as a pilot flying many types of aircraft including Boeing 737 and Airbus A-320's. His interest in hydrofoils began when he spotted a PHM from the air being tested in Puget Sound. It was a perfect combination of his interest in flying, ships and technology.

Yoichi Takahashi –Yoichi has been researching radio controlled model aircraft as a hobby for 35 years, having designed and built many models. Recently he has applied radio control technology to hydrofoil and SES models with great enthusiasm resulting in several models including: PHM-1 PEGASUS, Boeing Jetfoil, a Japanese Self Defense missile boat, and a Norwegian Naval forces SES type missile boat..

NEW BENEFIT

IHS provides a free link from the IHS website to members' personal and/or corporate site. To request your link, contact William White, IHS Home Page Editor at webmaster@foils.org

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The NEWSLETTER

International Hydrofoil Society

P. O. Box 51, Cabin John MD 20818 USA

Editor: John R. Meyer | Autumn-2005 | Sailing Editor: Martin Grimm

UNMANNED SEA SURFACE VESSELS

High Speed and High Tow Force Vessels Built by MAPC

(Courtesy of Maritime Applied Physics Corporation)

MAPC has teamed with EG&G and the Naval Surface Warfare Center, Carderock Division (NSWCCD) on the design and fabrication of a High Speed Unmanned Sea Surface Vessel. The MAPC role in creating the hydrofoil craft includes design of machinery systems, machinery control systems, integration of network protocols, foilborne flight control systems, foil structure, mission system integration, and fabrication of the vessel. The NSWCCD led program features extensive mechanical engineering design, naval architecture, software development work for unmanned operation, power management, vessel flight control and condition monitoring.

Whale's Eye View of High Speed USSV Hydrofoil

Following are the characteristics and performance values for this hydrofoil craft:

Parameters:

Length: 34 ft – 7 in
Beam: 10 ft
Draft: 1 ft – 10 in (Foilborne)

See USSV, Page 3

2005 DUES ARE DUE

IHS Membership is still only US$20 per calendar year (US$10 for students). For payment of regular membership dues by credit card using PAYPAL, please go to the IHS membership page at www.foils.org/member.htm and follow the instructions.

INSIDE THIS ISSUE

PRESIDENT'S COLUMN

To All IHS Members,

Greetings with sincere hopes that you enjoyed the Summer with associated vacations and time to relax. But now IHS is back in full swing.

We started off with a Joint Dinner Meeting of IHS and SNAME SD-5 members in September. Phil Wasinger, IHS Member, Managing Director of MTU Detroit Diesel Washington Office, and Jeff Martin, Director, US Government Programs, GE Marine Engines, Cincinnati, Ohio, gave a joint presentation on "High-Performance Propulsion Systems for High-Performance Ships". Phil Wasinger described propulsion systems from a diesel engine perspective, whereas Jeff Martin presented a complete history of GE's marine gas turbine developments. It was well received by all. It is planned to obtain a CD of this program and post it on the IHS website.

At the June IHS Board of Director's meeting it was announced that the Board Member Class of 2005-2008 had been elected by the general IHS membership as a result of the Spring balloting. They are: Joel Billingsley, Jerry Gore, John Monk and Ken Spaulding. Also, election of Officers was held at the June Board meeting. The following officers were elected: John Meyer, President; Mark Bebar, Vice-President; George Jenkins, Treasurer; Ken Spaulding, Secretary.

Please note MAPC's logo on the front page of this NL. A short description of Maritime Applied Physics Corporation's capabilities appears on the IHS homepage. Also a description will appear in the next issue of the Newsletter. We welcome this very creative and capable company as a Sustaining Member of the IHS.

I am encouraged to report the Society's continued growth with a total of 36 new members added to the IHS Membership roles during the first nine months of 2005. By the way, you can view the Membership List by logging onto the IHS website and put in the proper password. All IHS members have been informed of this password. If you have been missed, please contact the IHS webmaster (webmaster@foils.org). It is advisable for all to check the information on the List. If it is incorrect, please send changes to: Steve Chorney (schorney@comcast.net).

I want to call your attention to an article by Sumi Arima, on page 4. Here he asks the question, "Where is IHS going?" from the standpoint of member participation, and inputs as to what the Society can do for you. We need inputs from the general membership to help direct the goals of the organization.

I, too, as your President and Newsletter Editor, continue my plea for volunteers to provide articles that may be of interest to our Members and readers. Please send material to me (jr8meyer@comcast.net), William Hockberger (w.hockberger@verizon.net) and Ken Spaulding (kbs3131@erols.com). We will be pleased to hear from you.

John R. Meyer, President

WELCOME NEW MEMBERS

James (Ben) Bacque, Ottawa, Canada - Ben grew up sailing dinghies and windsurfing on the Great Lakes in Ontario, but always dreamed of flying his boats continuously, as opposed to occasionally, and by accident. Ben has a Master's Degree in Electrical Engineering from the University of Toronto, and is currently stretching the limits of his memory and intellect in trying to re-acquaint himself with mechanics and fluid dynamics. While his interest in hydrofoils is currently "just" a hobby, he hopes to soon apply some of his ideas more practically. Taught to be something of an empiricist by the school of hard knocks, Ben believes there is nothing like building it to see if it really works!

Dr. Robert W. Bussard - Dr. Bussard was educated in Engineering at UCLA (BS and MS, 1952) and Physics at Princeton University (MS and PhD, 1961, after 7 years of work at Oak Ridge and Los Alamos Laboratories). He has created, directed and managed R&D in advanced energy and weapons fields since 1950, at these labs and several other firms. He is currently Technical Director of EMC2, San Diego, CA, where he is trying to develop a unique high power US Naval electric power system that could be used to drive large-scale hydrofoil ships. He is a Fellow of the American Institute of Aeronautics and Astronautics, a Member of the American Physical Society, and a Member of the Amateur Yacht Research Society (AYRS). His article on hydrofoil effects on ACup boats was published in the AYRS journal

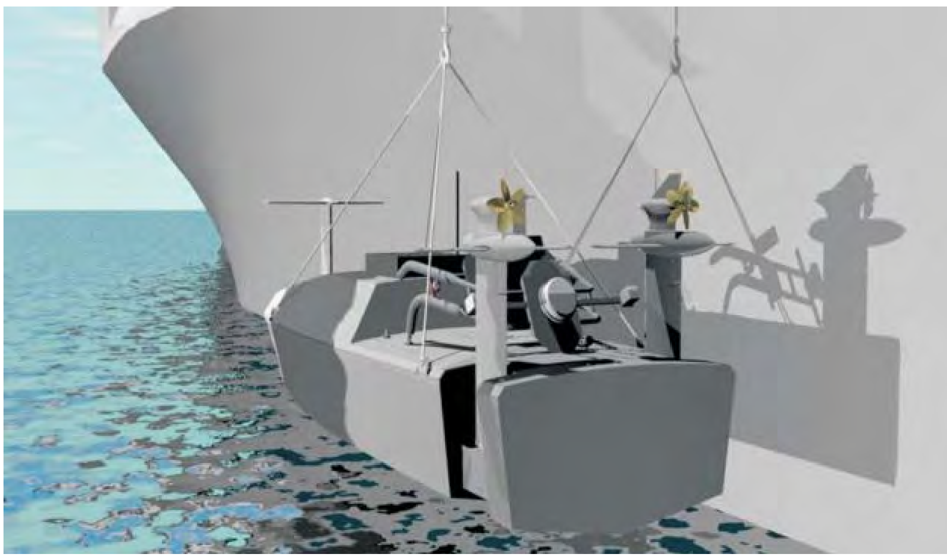
Continued on Page 12

USSV
(Continued From Page 1)

integration of network protocols, mission system integration, and fabrication of the vessel. Following are the characteristics and performance values for this craft:

High Speed USSV - Note Narrow Wake

High Tow-Load Boat



High Speed USSV Launch and Recovery Showing Foils Retracted

Full Load Displ: 20,500 lbs
Lightship Displ: 15,000 lbs

Performance:
Top Speed: 40+ kts
Cruise Speed: 35+ kts
Full Capabilities: Sea State 4

The same organizations have also teamed on the design and fabrication of the Low Speed Unmanned Sea Surface Vessel. MAPC's role in creating the semi-displacement craft is the design of machinery systems, machinery control systems,

Parameters:

Length: 39 ft
Beam: 9 ft – 6 in
Draft: 2 ft – 3 in
Full Load Displ: 18,000 lbs
Lightship Displ: 9,050 lbs

Performance:

Top Speed: 20+ kts
Cruise Speed: 20+ kts
Tow Speed: 20+ kts
Max Tow Load @ 19 kts – 2500 lb
Max Tow Load @ 21 kts – 2000 lb

This craft has been delivered to the Navy and recently underwent test and evaluation. See related article on Page 4.

Stern View of High Tow-Load Boat

HIGH-SPEED USSV EXPECTED LATER THIS YEAR

ONR'S LOW-SPEED UNMANNED SEA SURFACE VEHICLE UNDERGOES TESTING

By Jason Ma. Reprinted by permission from Inside the Navy; July 4, 2005.

A low-speed prototype of the Office of Naval Research's Unmanned Sea Surface Vehicle has undergone testing in upstate New York in recent months, demonstrating its propulsion system, maneuverability and ability to tow payloads for minesweeping missions.

A high-speed USSV prototype is expected to go in the water by August or September, said Scott Littlefield, director of the ship science and technology office at ONR. To reach speeds of more than 45 knots, the high-speed USSV will use hydrofoils, which will fold down when the vehicle is in the water and fold up when it is in stowage aboard a ship. The low-speed USSV will be optimized for towing payloads, traveling at 20 knots on a semi-planing monohull. The high- speed USSV is envisioned as a counter to small, fast ships.

Littlefield said he is trying to get the Sea Fighter (FSF-1) – previously known as the X-Craft - to perform launch-and-recovery tests with the USSV sometime in fiscal year 2006. The Sea Fighter is an experimental ship the Navy is using to explore different ship characteristics and as a test bed for mission package technologies that could be used in littorals. The ship also is seen as a way to reduce risk on technologies for the Littoral Combat Ship.

The USSV could be a mission module for the LCS, and the testing is geared to demonstrate that, Littlefield said. ONR has talked to the program offices for LCS mission modules and the LCS hull form about using the USSV, he said. For now, the unmanned surface vehicle planned for the first flight of LCS is the Spartan, which is adapted from a rigid-hull inflatable boat.

But future LCS flights could include USSVs, he said, describing it as complementary to the Spartan.

"For LCS Flight 1, I think its still a pretty open playing field, "Littlefield said in an interview June 29. Flight 0 is the first generation of ships in the LCS class and Flight 1 is the second generation.

The USSV program is focused on becoming part of the LCS mission module package, which will have areas for at least two 11-meter vehicles, he said.

Two teams led by Lockheed Martin and General Dynamics are building different LCS designs. Lockheed is supposed to deliver the first LCS by late 2006. By then, USSVs will be ready for LCS experiments, Littlefield predicted.

Challenges remain for the USSV. Launch and recovery of the high-speed USSV will be more complicated than for the low-speed version because the hydrofoils would have to be retracted, he noted. The USSVs also need to be more autonomous, he said. The USSV is capable of wave-point navigation, in which the vehicle follows Global Positioning System coordinates. It also can avoid known obstacles, but not unexpected ones, he added. During tests, an operator still rides on the USSV as a failsafe, he noted.

On the high-speed USSV, getting enough power from the propulsion system to the hydrofoils will be another challenge. But Littlefield is confident the problem is solvable.

"I think that'll work", he said. "We've got a solution that looks pretty good on paper."

WHERE IS IHS GOING?

By S. Arima, Member IHS Board of Directors

I ask the question, "Where is IHS going?" from the standpoint of member participation, and inputs as to what the Society can do for you. We need inputs from the general membership to help direct the goals of the organization.

First of all, as an all-volunteer organization to maintain the services we already provide, any additions we make will require new volunteers to support the effort. Volunteers are welcome in all areas, including becoming a board member. Although we call our group as International, at the present time, there are no board members from outside the United States. You may have noticed that the election to the Board of Directors has been limited to four names, and you vote for four. The primary reason is that the nominating committee has been unable to locate members willing to participate. I ask that you step up and toss your name into the hat. We do have a qualification requirement, but let the nominating committee determine your eligibility.

Continued on Next Page

WHERE IS IHS GOING?
(Continued From Previous Page)

Second, in recent years, most of the activities with hydrofoil ships have been outside the United States. The Board has been looking at ways to promote hydrofoil ships, but in general, the contacts are all based in United States. We could use lots of help in contacting officials that could support our causes in many other countries. The use of the local language alone would be of great help. Your effort of a few hours a year would support the Society immensely.

EXPANDING THE ENVELOPE OF FAST FERRY DESIGN

(From Ferry Technology, June 2005)

The beginning of May 2005 saw Austal's largest delivery, the 127m trimaran *Benchijigua Express*, enter service with European ferry company Fred Olsen SA. With a speed of 40 knots and the capacity to carry 1,291 passengers and 341 cars, the ferry now serves the port of Los Cristianos in the south of Tenerife and the islands of La Gomera and La Palma.

Benchijigua Express Trimaran

The contract for the vessel was signed with the Western Australian builder in May 2003. It represented the culmination of a three-year design, research and development program to create a new hullform that would provide a "quantum improvement" in the performance and operability of large fast ferries, said the yard.

James Bennett, Austal's technical manager, said that: "We were contracted to build a vessel that could achieve a speed of 40.4 knots carrying 500 tonnes deadweight using four 8.2MW engines at 90 per cent of the upgraded rating for the engines. We are delighted to advise that during sea trials - with operating ride control - *Benchijigua Express* achieved this." [Editor's Note: The article goes on to describe the ferry operations and background for development of the trimaran. Excerpted here is that part of the article dealing with the foils used for motion control.]

Vessel motions are controlled by the movement of three sets of control surfaces fitted to the centre hull. The system comprises a single T-foil forward, two roll control fin stabilisers at about two-thirds of the length aft, and two interceptors at the transom.

"During the first set of sea trials the composite fins failed on the trimaran's ride control system," Mr. Bennett said. "We are now involved in legal proceedings with the composite foil manufacturer so this can't be discussed further. It really knocked our confidence in this technology though, which is a shame as it provided terrific weight savings and has such great potential.

"After this we fitted the vessel with temporary aluminium fins in mid-January so that we could continue sea trialling the vessel whilst high tensile strength steel replacement fins were being manufactured.

"Before the steel fins arrived, we started our second set of trials with the aluminum ones. During these sea trials we encountered some quite severe weather. The waves were around significant heights of 3.8m and wind speeds were between 38 and 45 knots. It was in these quite extreme conditions that we discovered the vessel's steering ability required some improvement. In consultation with our client we discussed a program of investigation which involved tank testing sea trialling and simulation work.

An extensive series of tank tests were carried out at Marintek and MARIN

"As a result of this work it was decided to fit a second high speed steering rudder to the vessel. The new rudder also meant a slight loss of service speed. However, when the vessel is at speed the waterjets are locked into position and the rudders take care of the steering. Their movements are so slight in comparison to waterjet steering that the overall loss in speed is negligible. The final ride control

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EXPANDING THE ENVELOPE OF FAST FERRY DESIGN

(Continued From Previous Page)

arrangements are now essentially the same as that adopted for monhull-type ride control systems".

"Understandably Fred Olsen didn't want to carry out the vessel's final speed trials until the high-tensile steel fins had been fitted. These were installed at the end of March and the speed trials were successfully carried out in April.

The last set of trials that were undertaken were the HSC Code Annex 9 trials. These trials measure the lateral accelerations on the passenger deck. The trials are used by some flag authorities as a means to determine the operational limits for the vessel. Typically many fast ferries are limited to seas of about 3.5m significant. The initial results for the trimaran are showing that the limitation will be around 4.5 to 5.0m significant. It was also not possible - because of time constraints - to conduct wake wash measurements, but from CFD modeling and our own observations during sea trials the wash is showing to be less than a catamaran.

With sea trials satisfactorily completed the vessel was presented for delivery and accepted by Fred Olsen SA. The vessel was sailed from Fremantle to the Canary islands by the client's crew. The route chosen was via Cape Town rather than through the Suez Canal. Near Port Elizabeth the vessel experienced some very bad weather with a combined sea and swell of 8m. The delivery crew told us that this was the worst weather that they had encountered on such a trip, but that the vessel handled the conditions well.

HISTORY OF THE VIKTORIA

Here is an interesting item contributed by Barney Black, IHS Member:

According to the webpage, the "Nixon" hydrofoil was named after Brezhnev's wife Viktoria. Here is the history from that page:

The Hydrofoil was a gift from then Secretary General Brezhnev of USSR to President Nixon during his visit to the Black Sea port city of Barumi, Georgia in 1972. After it's presidential tour the boat went to the US Fish and Wildlife Department where it was used as an undercover boat for a poaching operation. Although the boat was run down and dilapidated, it had quite a past.

During the summer of 1981 the boat became available through the Federal Surplus Property Assistance Department. Competition was keen, with seven states applying for ownership of the boat. The State of Virginia was awarded the boat, but after examination, did not want it. Nebraska was then awarded the boat.

In April of 1982 the Hydrofoil arrived in Ogallala. Nearly $3,000 in expenses were incurred to bring the boat to Ogallala. Cash and in kind donations from individuals and businesses were given to help with the expenses of repainting and upholstering the boat. Mechanical repairs and a custom built trailer completed the work. The final touch was naming the boat "*Viktoria"* after the wife of Soviet Premier Brezhnev. Four months later the craft was once again seaworthy and mobile.

The *Viktoria* was christened with champagne and launched July 18, 1982. The craft has not been in the water since the late 1980's. In the years since, the *Viktoria* has been used to promote tourism in Western Nebraska by traveling to various sports shows and other promotional events. In 2003, new floor and carpeting was installed, the seats and dash recovered, and a snap on tarp made to protect the interior.

The "Nixon" Hydrofoil

SPECIAL NOTE

For an interesting article and pictures of very fast hydrofoil sailboat concepts, see the October 2005 issue of *Popular Science*, starting on page 62.

CFD EASES PROPULSION SYSTEM DESIGN

(From Marine Propulsion, February/March 2005)

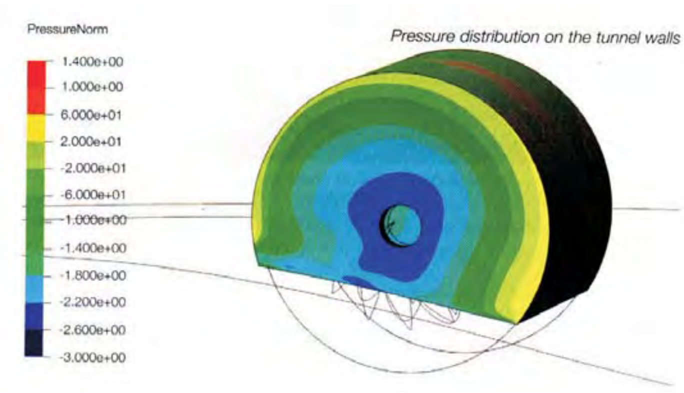
Computational fluid dynamics (CFD) methods have emerged as a powerful tool for calculating the performance of ship propulsion systems, offering many advantages over potential flow-based methods.

Among the merits of CFD methods, explains Moustafa Abdel-Maksoud, are the following:
- **Consideration of the surroundings:** in many cases the interaction between the propeller and other components of the propulsion system strongly affects the inflow to the propeller and therefore its performance. The correct estimation of this influence is important for propulsion systems which consist of more than one element, such as pods (shaft, gondola and propeller), ducted propellers (duct, struts and propeller) or bow thrusters.
-**Investigation of off-design conditions:** in a potential flow-based method the viscous influences on the performance of the propulsion systems are considered by applying simple formulas which arc unable to consider the effect of flow separation on the pressure distribution around the propeller blade due to high variation of the inflow angle, as in the case of an off-design condition.

Applying accurate methods in the off-design condition is important to keep a high level of ship safety. A wrong estimation of the forces acting on a fixed pitch propeller can lead to inaccurate prediction of ship manoeuvring behavior, especially stopping manoeuvres.

- **Consideration of scale effects:** with the increasing size of container ships the only way to carry out model tests with available experimental facilities (cavitation tunnels and towing tanks) is to increase the applied model scale ratio. A high model scale ratio raises the risk in extrapolating the model results to full scale. This problem is more critical for fixed pitch propellers than for CP propellers.

Applying CFD methods for calculating the thrust and torque coefficients at full scale has the advantage that the flow behaviour on the propeller blades (including the tip and hub vortices) can be considered, which is not the case when applying the standard ITTC Method.



Pressure distribution on the tunnel walls

Using CFD methods for predicting propulsion system performance takes, more effort than potential flow-based methods, which is why their application is still limited to important projects. The following requirements or problems must be satisfied or solved if a CFD method is to be applied for predictions in routine projects:

1. An accurate geometrical description of the propulsion system is needed, especially at the locations of high gradients of the velocity and pressure fields (for example, leading, trailing and tip edge).

2. A numerical grid is required in high quality resolution for the space surrounding the propulsion system. It is also important to meet certain requirements in the critical regions concerning angles between the grid lines, aspect ratio and untwisted control volumes.

3. Computation time is too long to be integrated in the design process. The overall time from generation of the geometrical data to obtaining the numerical results depends on the quality of parallelisation of the applied numerical method, the speed of the computer processors and mini-

Continued on Next Page

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IHS chooses articles and photos for potential interest to IHS members, but does not endorse products or necessarily agree with the authors' opinions or claims.

CFD EASES PROPULSION SYSTEM DESIGN

(Continued From Previous Page)

misation of the manual work by exchanging data between the different numerical tools.

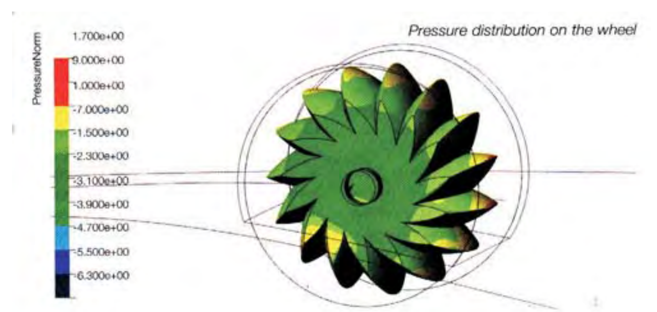
Many strategies can be adopted to overcome the time problem for carrying out CFD calculations. Calculating the viscous flow around a ship with real propeller geometry is a complex matter. The reasons are not only the solution of the continuity and Reynolds-averaged Navier Stokes equations (RANSE) in different co-ordinate systems, and consideration of the unsteady interface between the rotating propeller region and the stationary ship region, but also the different time scales of the problem. The required time step to calculate the flow around a propeller is much smaller than for a ship.

Applying the body force method to consider the propeller effect on the flow around the ship and to calculate the effective wake behind the hull can be very helpful in reducing the computational time because the time step for the ship case only has to be considered. The method considers the thrust and torque of the propeller as a 3D field of forces which can be added to the source terms in the body force in the RANS-equations. The application of the body force method is a very economical way to reduce the computation time by estimating the inflow to the propeller, which is required for the propeller design.

An additional reduction in computation time can be achieved by combining the capabilities of potential flow-based methods and CFD methods. An optimisation method is important in meeting the highly sophisticated requirements for designing a propulsion system.

In this case, the short computation time of potential flow-based design methods is a big advantage, especially when the number of parameters to be optimised is high. Reaching an optimum calls for many hundreds of variations in the design parameters, and the quality of each design has to be evaluated. For this stage of the design process, the potential flow-based methods are an ideal solution.

In the final stage of design, the key parameters are mainly fixed and only small, albeit very important, modifications will be required. Here, it will be useful to apply CFD methods to evaluate the results of the local geometrical modification.



Pressure distribution on the wheel

The results of a propeller design using a potential flow-based method will be in the form of tables containing the co-ordinates of a propeller blade at a certain number of cylindrical sections. The next step in applying a CFD method is to have an effective tool to generate 3D propeller geometry.

A program package developed by the Institute of Ship Technology & Transport Systems at the University of Duisburg-Essen generates the propeller geometry based on the Open Cascade software library. Special attention is paid to the tip and hub regions. The program includes a grid generation method for complicated propeller geometries, which generates a block- structured grid around one blade in considering the hub form, the geometry of the propeller shaft and the periodical surfaces between the propeller blades.

At the beginning of the grid generation the main parameters of the propeller grid-have to be defined. In practice, only very little modification of these parameters from one propeller geometry to another is required. Grid generation takes only a few minutes on a PC. The boundary conditions file is then generated and the CFD calculation can be started in batch modes. Investigations are carried out to test the effectiveness of coupling a genetic optimisation algorithm to modify the local geometrical parameters.

Numerical results of CFD methods are very useful in developing new propulsion systems. The detailed information derived on the velocity and pressure distribution is required to improve the working principle of a system. The flexibility of CFD methods allows an investigation of the flow around complicated geometries without carrying out any modification of the numerical method.

Mr Abdel-Maksoud asserts that CFD methods have become an effective tool in developing, designing and evaluating propulsion systems. Considerable effort is nevertheless needed to integrate the tool in the routine work of system designers but the implemented cavitation models will increase interest in applying CFD during the different stages of design.

NON-MAGNETIC PITCH AND HEAVE STABILIZING T-FOIL

By Bruno von Sicard, Masters Thesis, 2002; Division of Naval Systems, Department of Aeronautics, Royal Institute of Technology, Sweden

[IHS is grateful to Dr. Von Sicard for providing an electronic copy of his thesis.]

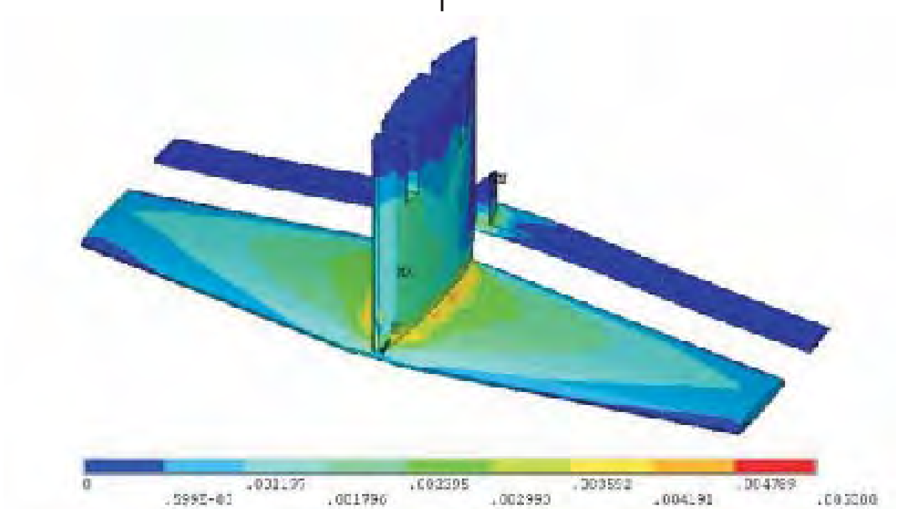
The objective of the project was to investigate if it is possible to design a non-magnetic T-foil for vessels such as the Visby Class corvette. Also, it was required to examine if a non-magnetic design could carry the loads acting on the structure. Approximate laminate thickness and other parameters were to be established for a potential solution. Furthermore, the increase of drag regarding such an installation was to be investigated.

Pitch and heave are limiting motions when operating at high speed in rough water. The installation of a T-foil is an effective solution that reduces these motions. Commercial T-foils are available, but today none of them are non-magnetic. This thesis studies the possibility to design a non-magnetic (material) T-foil that can carry the considerable loads that such a construction experiences. The T-foil is designed for vessels such as the Visby Class corvette.

Vortex lattice theory was used to calculate the pressure distribution acting on the construction at different load cases. Required laminate thickness was determined by iteration using a linear finite element model of the foil.

The conclusion was that it is possible to manufacture a non-magnetic T-foil of the required size.

A critical area in the construction is the T-joint between the vertical strut and the horizontal foil. Future investigations should include laboratory tests of the T-joint as well as more detailed hydrodynamic analysis for more accurate input parameters of the T-foil.



The T-foil geometry illustrated here shows a strain scale at the bottom. See Note at end of article.

Note: The significance of the strain scale at the bottom of the figure can be better understood if the reader had the complete 43-page copy of the thesis. This can be obtained in pdf format by contacting: editor@foils.org

UNIQUE SAILBOARD

By Kotaro Horiuchi, IHS Member

The sailboard I have designed has a swivel free fore strut with sensor and hinged canard. The swivel strut and twin fins keeps helm of the sail boarding. This board becomes foilborne in lower wind speeds than a conventional sailboard and has a dramatically low resistance under 18 knots. But over 24 knots, the resistance curve is higher than that of a conventional sailboard according to my calculations. This board is still undergoing development. The fore strut is too short for rough water operation and twin fins are not so efficient. Now I am making new struts for stable and high-speed operation in rough water.

I developed this sailboard last year. This past February I displayed my sailboard at the Tokyo Boat Show. For further information please contact: horiuchi@ta2.so-net.ne.jp If you have an interest in this board I think I can send you a movie.

SAILOR'S PAGE

ROHAN VEAL TAKES OUT 2005 MOTH WORLD CHAMPIONSHIPS WITH FOILER 'OUTLAW' By Rohan Veal
[This is a continuation of the article appearing in the Summer 2005 NL.]

I watched boat after boat sail straight past me and there was nothing I could do. It is really important in a foiler when not foilborne to keep the boat dead flat. Bow down will induce negative angle of attack on the foils and create drag and suck the hull down to the water more. Sail with the bow up slightly, and the transom drags. You basically just have to grin and bear it until the wind picks up. It didn't pick up in this race at all, but it did in at least two races in the European and is the reason I won that regatta. So this just goes to show it can go either way for a foiler (which is what I have been saying all along) but it still sounds like there are some that prefer to point out all the negative points about sailing a foiler or a low-rider.

Anyway, apart from that heat, I won all other races in both the Worlds and Nationals from anywhere between 2 to 17 minutes (usually from GBR foiler Simon Payne). The 17 minute win was a light to moderate wind race where it was crucial to stay on the foils as long as possible. I was able to do this downwind all the time as my gybing on the foils was a lot more refined than the other guys, hence the boat never touched the water and slowed down. Upwind it was just a matter of tacking only in pressure and sticking in shore where the wind was more concentrated. I ended up lapping the leading non-foiler in both races after three laps. During the championships I also began to refine tacking on the foils. This doesn't mean you can stay completely airborne the whole time as is possible when gybing, but more a case of keeping airborne all the way head to wind and just letting the transom touch slightly for a second or so before getting underway on the new tack and becoming fully airborne again. The trick is to keep the boat flat and tack in flat water. I am still working on this, and hope to have it sorted by mid-year for the European championships in Italy.

From the cover of the March 2005 issue of Australian Sailing

Race starting was interesting as early on I was getting excellent starts, that means on the line with speed and air. Towards the end I was getting hungry for the perfect start on the line at the favoured end and forgot about boat speed and clear air. Sometimes it paid off, but it is not worth the risk as I later found out after the last race when I was accused of barging.

I have been asked repeatedly "what were the main reasons you won the Worlds?" so I am listing them in order:

1. A good boat, foils, mast, and sail (note that all boats up to 4th place were using exactly the same gear, apart from Adam May (GBR) who used a Mistress hull but also 'Fastacraft' foils).

2. Two years of foiling and non-foiling, sailing in all winds and sea conditions.

3. Sailing at the Europeans against the GBR foilers, as well racing against 14' skiffs and A class cats as often as possible leading up to the event.

More specifically, my top five most important factors when foil racing, in order of importance are:

1. Remain foiling as often as possible around the course.

2. Avoid pitch-polling at all costs (it is better to go slower than to risk cavitation at speed and height).

3. Have a well set up KA MSAL9 sail, using good leech tension and downhaul upwind and backing them both off downwind enough in the light/moderate airs to sail as low as possible.

4. Gybing on the foils as often and quickly as possible.

5. Good start on the line with boat speed and getting air as soon as possible (favoured end does not matter and nor does tacking to the favoured side of the course).

Continued on Next Page

MOTH WORLD CHAMPIONSHIPS

(Continued From Previous Page)

I certainly am not looking to sail any other class at this stage, and why would I when the only classes that are faster than a modern foiler are anywhere between $50,000 and $100,000 (i.e. Tornado and 18' skiff). I would still like to race against an 18' skiff or a Tornado on a good flat, 15-20 knot day, as I know I would be close to them. I also want to be the first to crack 25 knots!

JUST A FEW THINGS

By Rohan Veal

I won the moth world championships in January sailing on John Ilett's (Fastacraft in WA) fully submerged T-foils in every race (more info: www.rohanveal.com/news.html or www.moth-sailing.org).

There was a show on national geographic channel on Saturday night called 'marine machines' which is an update on the 'hydrofoils - flying on water' video release a years ago

Unfortunately National Geographic did not show any moth footage after I sent them all of our video footage for inclusion at their request. The first half was still interesting though.

I bought an A class catamaran recently and am interested in putting surfacing piercing foils on it with John Ilett and read that 'David Smith' in Sydney is looking to do the same.

SCAT UPDATE

By Sam Bradfield, IHS Member

We have tried to race with SCAT this year under what we thought would be more winning conditions but we were disappointed. We got less than 1-1/2 hr of flight conditions out of the nearly 30 hr of racing 175nm from Miami to Nassau (Mar 19 & 20) with our approximately 7500 to 8000 lbs sailing wt (4 crew plus racing provisions & equipment). Based on our three ocean racing experiences, we find that the ambient wind must average 12 to 18 kts for SCAT to take off and fly continuously when beam reaching under 1800 sqft of sail. We got that for the first 1/2 hour in the first leg of the Miami-Nassau race while crossing the Gulf Stream. After a bad start at 9 AM (last boat crossing the start line) SCAT overtook and passed all the other multi-hulls during the first 11 miles. It took only ½ hour to do that first 11 miles…an average of 22 kts boatspeed! At the end of that interval Mike McGarry's deck log records SCAT Vbave = 16 to 19 kts. Apparently the windspeed was dropping between the start and the first waypoint 11 miles offshore. After that, windspeed continued to drop until the boat speed had dropped to 8 to 9 kts by 10:30 AM. Beyond that point the wind continued light, and there was no flight the rest of the race! SCAT finished fourth 3-½ hrs behind the Formula 40 catamaran winner.

The 242 nm trip home (Nassau to Ft Pierce) the next day was pretty good for a downwind run. The wind was southerly at 12 to 15 knots most of the way and SCAT was able to skim and/or fly much of the time on a very deep spinnaker reach. During one 3 ½ hour flying period she averaged 17kts. I think she would have held her own among the multi-hulls of the previous days race to Nassau so far as boat speed is concerned. We are happy with that performance.

We will be moving SCAT to Port Canaveral the last week of July. We'll be doing some ocean sailing from there the rest of the summer. She is for sale now...listed in the multihull brokerage: www.themultihullsource.com. Please check it if you're interested in seeing some more pictures of her. The listed price is an "asking price"...about what one would have to pay currently for a production trimaran of equal size. I'm closing on my 87th year now and I'm anxious to retire from the active boat business to spend some vacation time with my wife… so I'll be glad to see SCAT go to a responsible owner.

For more info on the National Geographic's Marine Machines show, please go to:
www.nationalgeographic.com.au/front_new/watch/default.asp?mode=program&pgmdscid=00000217896)

WELCOME NEW MEMBERS
(Continued From Page2)

and correctly predicted the victory of the NZ boats in the first Auckland races. He owns and races an Olson 40 sloop out of San Diego and has been designing foils for application thereto. He holds a US patent on hydrofoils for monohull keelboats, and is presently studying application of its principles to major USN ships driven by advanced electric power systems.

Giorgio Fossati – Giorgio was born in Monza (province of Milano), Italy. He graduated in 1980 in Mechanical Engineering specializing in car manufacturing at the Polytechnic of Milano. At Otis Elevators he was a specialist technician in the hydraulic field, and developed new and patented control systems for hydraulic elevators serving as technical manager. Later, he started working as production manager for Monitor spa, a small Italian company manufacturing elevators. At the same time he had the opportunity to know more about the nautical field. For almost a year he has taken a real interest in hydrofoils, concentrating on their technical features. At the moment he is working on a project aimed at setting up a shipyard that would manufacture a pleasure hydrofoil to be put on the market.

Kurt Peterson - Kurt is founder and CEO of ATLAS Hovercraft Inc. in Green Cove Springs, Florida. As a third generation boat designer and builder, along with an aviation background designing and building Flying Boats, it was natural for him to be attracted to hovercraft, hydrofoils, and other various types of marine craft. His team is constructing the largest ACV or "Hovercrafts" ever built in the western hemisphere. The ATLAS AH-100 Hovercraft are 120 feet long and 62 feet in beam with an 8 foot hover height. Each boat has a passenger capacity of 149 people and a Crew of 3 to 6. The first three AH-100 will enter passenger service in the USA in 2006. Kurt's reason for joining IHS was to keep informed and support the technology in every respect.

Bruce Sommers - Bruce graduated from Purdue University with a Bachelors in Electrical Engineering in 1987. He worked as a licensed Marine Engineer for several years, and is now a licensed P.E. in the state of Maryland and employed by Island Engineering Inc. as a Systems Engineer. Island Engineering is located in Piney Point, Maryland, and designs, manufactures and provides field support for T-Foil, Trim Tab, and Interceptor Ride Control Systems for commercial, military and private vessels.

Philip Wasinger – Phil is Managing Director of MTU Detroit Diesel Washington Office in Washington, DC. During 25 years with MTU, he has worked on providing power for ships of all types and sizes. Among the advanced types these have included PHM, SES 200, AAAV, Mark V SOC, and X-Craft, plus two trans-Atlantic speed record holders and high-speed mega- yachts.

David Woods – David is new to the hydrofoil arena but not new to boats. He has never learned to sail - to him it is a basic function like breathing and walking. He has spent 5 years cruising the Atlantic Ocean and Caribbean Sea on a 65' motor sailer. He is now a civil engineer living on a small lake. His goal is to produce a production fun hydrofoil for the masses at an affordable price. He is looking for business associates.

NEW BENEFIT

IHS provides a free link from the IHS website to members' personal and/or corporate site. To request your link, contact Barney C. Black, IHS Home Page Editor at webmaster@foils.org

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The NEWSLETTER

International Hydrofoil Society

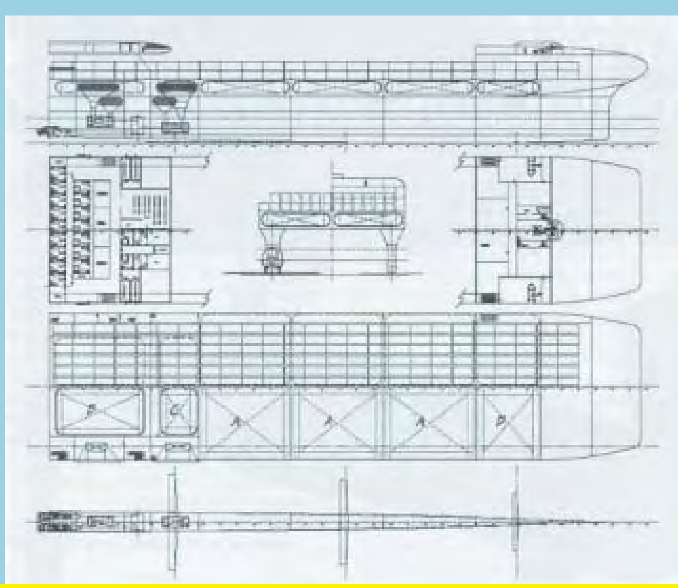
P. O. Box 51, Cabin John MD 20818 USA

Editor: John R. Meyer | Winter 2005-2006 | Sailing Editor: Martin Grimm

HYDROGEN-FUELED GAS TURBINE-POWERED HIGH-SPEED CONTAINER SHIP: A TECHNICAL AND ECONOMIC INVESTIGATION

Extracted, with permission, from "The Naval Architect" September 2005, RINA, Page 108 – 116

At the recent international conference on Fast Sea Transportation, FAST 2005 (held on 27-30 June 2005 in St Petersburg, Russia), I J S Veldhuis from the ship science department, and R N Richardson and H B J Stone from the low-temperature engineering group, Southampton University, UK, presented a paper on a study conducted into the technical and economic feasibility of a hydrogen-fueled long-haul feeder container ship. The properties of hydrogen offer the potential for increased payload, particularly in long-haul operation, which in turn improves economics. The research focuses on the design and operation of a liquid hydrogen-fueled, 64- knot, foil- assisted catamaran (FAC) container feeder ship (600 Twenty-foot Equivalent Unit (TEU) and the associated port/terminal facilities.



General Arrangement of Hydrogen-Fueled FAC

The combination of hydrogen fuel and high-speed catamaran technologies provides an interesting oppor-

See Hydrogen Fueled FAC, Page 3

2006 DUES ARE DUE

IHS Membership is still only US$20 per calendar year (US$10 for students). For payment of regular membership dues by credit card using PAYPAL., please go to the IHS membership page at <http://www.foils.org/member.htm> and follow the instructions.

INSIDE THIS ISSUE

PRESIDENT'S COLUMN

Greetings to All IHS Members

I want to express sincere hopes that you all enjoyed the Holiday Season in good health and look forward to a happy and productive New Year.

Those of us in the Washington DC area had the opportunity to enjoy another Joint Dinner Meeting of IHS and SNAME SD-5 members in December. Jenny Speirs, Naval Architect and Program Manager, Naval Surface Warfare Center, Carderock Division (NSWCCD) Combatant Craft Division, gave a talk on SEALION: A Technology Demonstrator for the US Navy. She related that recent gains in hullform design can enhance the seakeeping capability of future small combatant craft. The Combatant Craft Division of NSWCCD, working with Oregon Iron Works, Inc., has integrated this new knowledge into the design and construction of a 71-foot technology demonstrator craft, the SEALION. She forecasted that the SEALION's improved seakeeping will reduce fatigue and injury experienced by onboard personnel during training and operations. In addition to enhanced seakeeping, the SEA- LION is outfitted with the latest advancements in command and control, video monitoring, and overall systems design. The ultimate objective is improved overall mission effectiveness of small combatant craft. The SEALION also has great logistical flexibility, as it can be carried by C-17 and C-5 aircraft as well as aboard a wide range of conventional MSC and USN vessels. The craft was delivered in January 2003 and is currently undergoing operational experimentation by the US Navy. Ms. Speirs' presentation provided an overview of the program including the design approach, technology insertion, construction methodology, US Navy experimentation, and areas for future work. Her presentation was well received by all.

Please note MAPC's logo on the front page of this NL, and a short description of Maritime Applied Physics Corporation's capabilities appears on page 6. We welcome this very creative and capable company as a Sustaining Member of the IHS.

I am encouraged to report the Society's continued growth with a total of 45 new members added to the IHS Membership roles during 2005. By the way, you can view the Membership List by logging onto the IHS website and put in the proper password. All IHS members have been informed of this password. If you have been missed, please contact the webmaster (webmaster@foils.org). It is advisable for all to check the information on the List. If it is incorrect, please send changes to: Steve Chorney: schorney@comcast.net

As your President and Newsletter Editor I continue my plea for volunteers to provide articles that may be of interest to our Members and readers. Please send material to me (jr8meyer@comcast.net), William Hockberger (w.hockberger@verizon.net), and Ken Spaulding (kbs3131@erols.com). We will be pleased to hear from you.

John R. Meyer, President

WELCOME NEW MEMBERS

Larry Dunbar – Larry Dunbar, PhD, is a Professional Engineer providing services for over 20 years in mechanical, structural and civil engineering. He has been employed by several aerospace and defense companies providing engineering systems analysis. He has performed research on off-road vehicles and consulted on many engineering projects. He has a PhD in Aerospace and Mechanical Engineering specializing in vehicle dynamics and an MS in Engineering Science, both from the University of Notre Dame. His undergraduate degree is in Mathematics from California Polytechnic University. Larry is currently performing research in dynamics of hydrofoils and planning boats and is interested in contacting anyone that would provide design data for computer modeling and analysis.

Gregory Dunn – Gregory is a graduate of University of Maryland Baltimore with a B.S.E. degree in Mechanical Engineering obtained in May 1999. He is currently employed as an Engineer with Maritime Applied Physics Corp, but previously was with REM Automation working as a Mechanical Design Engineer. He worked on various mechanical design projects including automated assembly machinery, automated testing equipment, automatic storage and retrieval systems, and laser welding systems. Prior to that Gregory was employed by Bay Design Incorporated where he worked on various material handling design projects including automated assembly machines, conveyor systems, and labor assist devices.

Sam Galpin – Sam holds a BS in Earth Science from MIT and presently develops software embedded in process control systems. In the 1970s he owned a company that made many of the whitewater kayaks

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HYDROGEN FUELED FAC
(Continued From Page 1)

tunity to significantly increase the transport efficiency of container ships, allowing such ships to transport economically sized payloads, at fast speeds, non-stop on current oceanic sea routes. The research presented in the paper describes the potential for a high-speed container feeder ship capable of storing and utilising liquid hydrogen (LH_2, boiling point 20.3K) to fuel aero-derivative gas turbines for propulsion.

The research builds upon the conceptual design presented previously and includes a number of improvements. Research into hydrogen fueling of gas turbines was conducted as early as 1943.

The high-speed sea container transport system described envisages delivery of a time-sensitive product of the type currently subject to just-in-time (JIT) supply chain management by multi-nationals on long- haul oceanic trade routes for both the Pacific and the Atlantic oceans.

Design of the high-speed FAC container feeder ship utilised here commenced in 1997. A summary of the design evolution and revised layout, suitable for LH_2 storage and utilisation, is presented in the paper. This design is the subject of on-going research at the ship science department of the University of Southampton.

The high-speed LH_2 container feeder ship concept is based upon a foil-assisted catamaran design. Such ship types show reduced resistance characteristics at high Froude displacement numbers via reduction of the wetted surface facilitated by a vertical ship elevation. Such resistance characteristics are preferable for high-speed ship operation, in which frictional resistance dominates. The vertical elevation, 2.95m in this ship design, is generated by six hydrofoil pairs, located at the underside of each demi-hull.

The ship dimensions and layout are governed by the aspect ratio of the 600 TEU dual layer container arrangement on the watertight deck of 25 by 12 TEU containers. The catamaran cross-body structure carrying the 600 TEU payload allows space for the cryogenic fuel storage. It is known from cryogenic aviation design that fuel volume is a primary design factor in establishing overall vehicle dimensions.

Liquid hydrogen has a high gravimetric energy density but, because of its low density, a relatively low energy content per unit volume. This has implications for fuel storage requirements, thus influencing dimensions such as the cross-body height. For Pacific Ocean crossings an LH_2 fuel capacity of $14,656.5m^3$ distributed over 12 cryogenic tanks is needed. This gives a total fuel mass load of just over 1000 tonnes.

The ship's service speed dynamic equilibrium, as indicated by Andrewartha for FAC ships, has a significant overall design importance. Hydrofoil lift and catamaran hull buoyancy/dynamic lift combined with waterjet propulsion thrust must form a force equilibrium with the ship's mass at this dynamic condition.

Hydrofoil longitudinal placement, hull buoyancy distribution, fuel tank, superstructure and engine room placements are thus interrelated, complicating the design process. Additionally, the reduction of LH_2 fuel mass during oceanic crossings will influence mass distribution and thus the dynamic equilibrium.

Resistance and Propulsion

The resistance characteristics of this high-speed container feeder ship remain as outlined previously. The frictional (56%) and foil (35%) resistance components are the dominant resistance components, while the wave resistance component is relatively small due to the high length-over-beam ratio (27.2) of the catamaran demi-hulls. The ship requires an installed power of 185.2MW to sustain the 64 knots with the aid of four 2.5m diameter waterjets, located in the demi-hull transoms.

The overall propulsive efficiency assumed is 73.4%. This is higher than used previously but it is supported by data for large waterjet propulsion systems currently in service on high-speed ferries.

The propulsive power is provided by four gas turbines modified for LH_2 fueling located in separate engine rooms inside the demi-hulls. The turbines envisaged are based on the LM6000 Sprint turbine by General Electric with a rating of 49.2 MW each. Turbine inlet air is drawn via air ducts located on the outside of the cross-body structure, while turbine exhaust is ducted via the demi-hull side shell underneath the cross-body structure.

The paper goes on to describe hydrogen storage facilities and other aspects of the ship design. **A complete copy of the paper can be obtained by sending an email requesting one tot: editor@foils.org**

COOPERATION HELPS WING THE WAY TO SUCCESS

Extract from Marin Report, September 2005, No. 86, pages 10-11.

In a fascinating project, MARIN has been asked to determine the resistance, seakeeping and manoeuvring characteristics of blended wing body technology which involved one of the most complex models MARIN has ever tested.

By John Hackett & Jessica Calix (NGSS), Mare Levadou

Given the current trend in mission requirements for high speed vessels, there is a growing demand to reduce hydrodynamic resistance and expand maximum speeds in a seaway on large displacement vessels. To this end, Navatek Ltd., a leader in design and construction of innovative, advanced ship hull systems, patented a design to enhance the lift of a vessel. The design incorporates blended wing body systems forward and aft. Each blended wing body system consists of two lifting bodies connected by a hydrofoil. While the hydrofoil provides lift, the large underwater lifting bodies provide motion damping to increase seakeeping capabilities.

In order to prove the hydrodynamic advantages of the blended wing body system, the United States Office of Naval Research (ONR) sponsored computational studies and hydrodynamic model testing on a vessel containing the Navatek patented design. The research group for this project included Northrop Grumman Ship Systems (NGSS), Navatek Ltd., and MARIN, and the project goal was to quantitatively determine, and compare, the resistance, seakeeping and manoeuvring characteristics of a monohull outfitted with the blended wing body technology (identified as CHSV or Composite High Speed Vessel) to an equivalent conventional monohull (identified as HSV or High Speed Vessel).

Optimisation Through CFD

Prior to model fabrication both hulls were optimised using Computational Fluid Dynamics (CFD) tools. Using MARIN's potential flow code RAPID and viscous flow code PARNASSOS, the HSV hull form was optimised for wave making characteristics and chine alignment. The optimisation of the CHSV proceeded using the computational tools and expertise of NAVATEK. For both the vessels 3D non linear time domain seakeeping calculations were performed using MARIN's PANSHIP code. This code, which is specifically developed for high speed vessels, assisted in the optimisation of the ride control systems and gave an early indication of the seakeeping performance of both vessels.

Complex Models A Challenge

Models of the CHSV and HSV manufactured to a scale of 1:18 were used for seakeeping, manoeuvring and powering tests. The HSV model was a relatively simple model with a double chine hull form propelled by two water jets and equipped with active trim flaps and fin stabilisers.

Model of Monohull Under Test

The more complex CHSV model consisted of a centre hull form with outriggers (amas) on the side. It was equipped with three water jets and two blended wing body systems, one fore and one aft. The cross foils of the blended wing body systems were equipped with two flaps, port and starboard, for motion control. In addition to these control surfaces, the aft struts of the blended wing body system also had a vertical flap for directional control. In total the model was equipped with six servo actuated flaps.

Blended Wing-Body Model

During the free running model tests all the flaps and water jets were active. With the active flaps and jets and the need to measure midship bending moment and loads in each blended wing body, the CHSV model was one of the most complex models ever tested at MARIN.

Model Tests

For both vessels free sailing seakeeping and manoeuvring, resistance, powering and captive manoeuvring tests were performed. The purpose of the model tests

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BLENDED WING-BODY TESTS
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was threefold: to obtain data to quantify the hydrodynamic performance of both vessels in calm water and motions in a seaway, to obtain engineering data to quantify such things as loads in the struts and midship bending moments, and to use the obtained model test results to fine tune the designs.

The test program started with seakeeping and manoeuvring tests where issues that could not be calculated were investigated in the tank. Waterjet inlet ventilation was one such issue. Using under water cameras, it was possible to detect if and how air bubbles were entering the water jets. Using these observations the forward strut/ama and spray rail configurations were optimised to give the lowest possible disturbances (air bubbles) in the water. In addition, the effect of spray on the vessel performance was quantified, leading to design changes that proved to significantly improve the spray associated with vessel operations.

Cooperation A Key To Success

A comparison was made between the two optimised concepts using the model test data. The results of the seakeeping tests show that CHSV (lifting body concept vessel) performed equal to or better than the monohull (HSV) design. In calm water a small increase in resistance was found over the HSV design. The results suggest that an improvement can be achieved by further optimising the position of the cross foil with respect to the hull, as interference phenomena were observed between the hull and the two blended wing body systems. The manoeuvring characteristics between the two vessels are quite different. This is due to the large vertical struts on the CHSV which make it more course stable than the HSV, but also increase the turning circles over HSV.

The cooperation between all parties involved resulted in a very successful project. The use of CFD in the initial phase together with model tests in the later phase helped reduce development time and costs while producing valuable engineering information for the final design. Once again, this approach has proven indispensable in the development of new concept designs.

AMERICAN NORWEGIAN TEAM RESTORES CLASSIC RUSSIAN VOLGAS

By Scott Steel, Courtesy of Kurt Stahl

St. Petersburg, Russia – Throughout the Cold War, Russian scientists toiled behind the Iron Curtain on the high technology weapons of war that fueled the Soviet Union's drive to maintain its place as a military superpower. Russian technology put the first man in space, built the first nuclear submarines and designed the infamous MIG fighter jet that was immortalized as the 'enemy fighter plane' in numerous Hollywood hits like 'Top Gun'. But when the Cold War ended and the Soviet Union broke apart, the remnants of the Russian military juggernaut fell into disrepair, abandoned and scattered far and wide across the world's largest country. At this moment, American scientists, together with their Russian counterparts, face the arduous task of securing and 'disposing' of hundreds of ICBMs that were the product of this drive for military technology.

But in the former military capital of the Soviet Union, an American entrepreneur and a Norwegian Certified Ship's Master have found a way to capitalize on some of the technology left behind by Russia's shift in focus from military might to capitalism. They are buying and restoring discarded Russian hydrofoils originally developed and manufactured in the Soviet Union's largest naval shipyard. These two boat enthusiasts have founded Jet Technologies, a company dedicated to turning battle-worn hydrofoils, Volgas, into modern, hand-crafted speedboats.

The Volga was the first export-quality version of the Molnia, a six-seat speedboat hydrofoil that was popular throughout the Soviet Union. The Molnia was derived directly from the original test craft designed by Dr. Rostilav Yergenievich Alexeyev in 1945 for the Russian Navy. Hundreds of

A Restored Volga

Volgas are still available for hire on rivers and lakes, or sitting idle in shipyards, backyards and empty lots across Russia.

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RESTORED RUSSIAN VOLGA

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The Volga's hydrofoil system consists of a bow foil with stabilizing sub foil and a rear foil assembly all constructed of stainless steel. The hull is built of sheet dual aluminum and extruded light dual aluminum. The Volga's dimensions are: overall length 27 feet 11 inches or 8.5 meters, beam 6 feet 11 inches or 2.1 meters and draft 2 feet 9 ½ inches or 0.85 meters. The draft when the Volga is foilborne is 1 foot 8 inches or 0.5 meters. It is the hull and the hydrofoil system that are of interest to Jet Technologies. The entire Volga is gutted down to the hull and hydrofoil system and completely rebuilt by hand in a relatively simple process, transforming into the new "Jet". The Russian engine is replaced with a Mercruiser 5.7 liter engine and new hydraulic steering. (This upgrade takes the engine from the 90 horsepower of the original Russian engine to 260 horsepower. All details and fittings on the deck are replaced with new chrome-plated brass.

As the price of oil sets new highs, the Volga's fuel efficient hydrofoil system may have come of age. The Volga can achieve its top speed, approximately 50 knots on only 0.6 liters of gasoline per nautical mile thanks to its foils. At cruising altitude, when the hydrofoils have raised the hull almost entirely out of the water, the engine runs on 20-25% of maximum output. Fuel efficiency isn't the only advantage of having foils. In choppy waters, when other boats are taking a pounding, the Volga's hydrofoils function like shock absorbers. At full speed, the bulk of the hull is literally lifted off the surface of the water and the effect is like cruising on glass. "On rough days, I just soar past boats where everyone is hunkered down like they're in an earthquake. I'm at full throttle with a beverage in my hand," said Kurt Stahl, the American half of Jet Technologies.

Jet Technologies was born when Kurt, his partner, and a visitor from Denmark jumped aboard a dreary gray Volga outfitted with six old school bus seats for a tour of the canals and rivers of Russia's "Venice of the North." Within moments, the Volga gathered speed and launched out of the water and into the air on its hydrofoils. It literally flew over the choppy Neva River, gliding past boats whose occupants were being pounded by the rough waters.

When they landed thirty minutes later, their Danish guest, was so impressed by the speed, power, and comfort of the ride that he purchased the boat on the spot and convinced Kurt and his partner to completely rebuild it for him. From that moment on, this Norwegian-American team has accepted the mission of transforming these Russian wartime relics into modern speedboats.

Within two weeks of commencing the project, word of mouth had resulted in deposits on three more Jets. In a country where customs and taxes push the price tag of any imported boat to upwards of $100,000 US Dollars, a completely rebuilt Russian classic looks like a steal at only $49,000 US Dollars. As Kurt says, "That's a great price for your own Jet." Jet Technologies can be reached at: jettechnologies@hotmail.com

MAPC - SUSTAINING MEMBER

Maritime Applied Physics Corporation (MAPC) is a closely held 40-person engineering services group that offers general mechanical, electrical, and naval engineering services with a concentration on proof-of-concept prototype development of advanced hull forms, robotic vehicles, and energy systems. Since its founding in 1987, the company has designed and developed dozens of prototypes ranging from the HYSWAS demonstration vehicle "QUEST" (1992), designed and built under US Navy Small Business Innovation Research (SBIR) funding, to two Unmanned Sea Surface Vehicles (USSV) recently developed under contracts with the Office of Naval Research (ONR) and NSWCCD. The USSV's – a high-tow-force planning craft and a high-speed hydrofoil - are currently undergoing Test and Evaluation sea trials.

The company's headquarters is a waterfront facility in Baltimore, Maryland proximate to the Baltimore Washington International Airport. The 40,000 ft^2 facility includes a modern CNC machine/fabrication shop, an electronics shop, and specialized equipment for vehicle development. MAPC also has small field offices in Maine and Virginia. Under DARPA robotics programs, personnel have worked extensively at USMC and USA bases throughout the US.

Current projects include contracts with General Dynamics, Northrop Grumman, and the Defense Advanced Research Project Agency (DARPA). MAPC has responsibility

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MAPC
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for the design, construction and testing of an innovative watercraft launch and recovery system that will be installed onboard the General Dynamics variant of the LCS and also the co-design of a High Speed Sealift Ship.

The company has been the recipient of 19 Phase I/Phase II SIBR awards. Current projects under that program include the design and fabrication of two hybrid electric power systems for unmanned boats, the design of a Unmanned Air Vehicle (UAV) launch and recovery system for an Unmanned Surface Vehicle (USV); the design of a 300-foot Dynamically Positioned Shuttle Ship (DPSS) and the design of a high transit speed Aggregated Air Capable Ship.

ENCAPSULATED PROPELLERS

Reproduced by permission from the Naval Surface Warfare Center, Carderock Division publication, *Sea Frames*, Summer 2005, by William Palmer

In 1997, researchers perfected a way to encapsulate submarine propulsors within a polyurea coating, using molding and bonding procedures to duplicate exacting tolerances without machining or hand finishing. Signatures, Silencing Systems, and Susceptibility and Structures and Materials.

Core Equities were among the initial group that researched, tested, and perfected the encapsulation process. The process worked well and sponsors required rigorous testing prior to use on U.S. submarines. The latest iteration of this testing is the installation of encapsulated propellers on a 110-foot yard patrol craft (YP 677) stationed at Annapolis Naval Station.

Current encapsulation practices established by this research group use a structural "core" with dimensions loose enough for fast and inexpensive production. The core is processed to ensure bonding and then placed in a mold. The space between the propulsor and the mold is filled with polyurea, which, when cured, results in the outside propulsor blade dimensions conforming to design tolerances without hand finishing. The polyurea can also be easily reworked, if required, due to in-service damage. This saves manufacturing time and cost because the polyurea surface does not require precision machining. The precise hydrodynamic contour is molded in the coating. A second cost-saving and performance possibility this coating offers is that the traditional alloys used in propulsor components, which are exposed long-term to sea water, could conceivably be replaced with a higher strength, ferrous-based "core," which would reduce the cost of manufacturing the propulsor.

Propeller Blade During Encapsulation Process.

Impact damage to the coating was a major question during development. Researchers determined that impact damage resulted in less deformation than nickel aluminum bronze and that, in the case of severe impact, the encapsulation would remain in place despite removal of material from the leading edge, which would expose the core.

Port Encapsulated Propeller On YP 677

The current demonstration of two encapsulated YP propellers consists of both American Bureau of Shipping approved stainless steel and bronze base blades. The personnel from the Structures and Materials Core Equity are developing an appropriate test plan, and collecting test data.

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Interested in hydrofoil history, pioneers, photographs? Visit the history and photo gallery pages of the IHS website. http://www.foils.org

TOOL FOR PREDICTING HYDROFOIL SYSTEM PERFORMANCE

A Review by Steve Chorney, IHS Member

This paper, entitled: Development of the Tool for Predicting Hydrofoil System Performance and Simulating Motion of Hydrofoil-Assisted Boats, was presented by Dr. Konstantin Matveev and Ralph Duncan at the July 2005 ASNE Symposium on High Speed/High Performance Ships and Craft.

I have to compliment the authors for undertaking such a challenging task. Development of tools for accurately predicting performance of ships and their system can be a daunting and sometimes a complex task. As a member of the ASSET design tool team for the US Navy, I can attest that creating ship design synthesis and computer simulations can be a challenge.

This Paper introduces a project in the development of a set of programs that will improve design of hydrofoils and hydrofoil-assisted ship systems. Additionally, this tool can be used as a motion simulator that can predict stability and maneuverability of hydrofoil-assisted ships and their motions in waves.

The set of tools to be developed is very similar to the Hydrofoil Analysis and Design (HANDE) program already developed by the US Navy in the 1980's and the Navy's current ASSET (Automated Ship System Evaluation Tool)/HYDROFOIL program. The basic hydrodynamic theory and data analysis are very similar to the algorithms contained in the ASSET/HYDROFOIL program modules. One thing this paper's proposed programs has that the ASSET/HYDROFOIL doesn't, is the capability of predicting performance and motion of surface-piercing Hydrofoil Craft systems. Also, adding boat dynamics to these proposed programs will give this tool one more dimension in assisting the designer in developing good hydrofoil-assisted ship designs.

(Editor's Note: **A complete copy of this paper can be obtained sending an email to request one from editor@ foils.org.** Also, the document mentioned above is available on AMV CD#2 (0125 Asset Hydrofoil Ship Evaluation Tool - User Manual) at a cost of only $15.00 from the IHS website.)

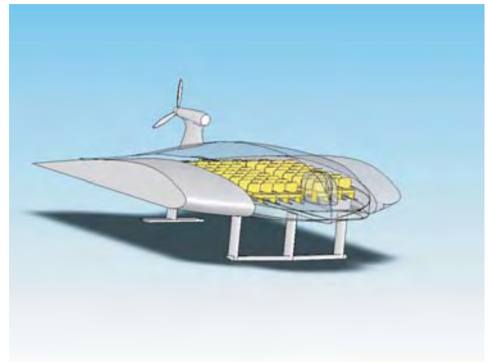
PASSENGER FERRIES TO SAIL FROM BALTIMORE TO EASTERN SHORE AGAIN

(Extracted , by permission, from Univ. of Maryland press release, dated December 21, 2005.)

COLLEGE PARK, Md. — Maryland's far Eastern Shore may soon be a quick trip from Baltimore, thanks to a speedy, futuristic ferry being developed by Maritime Applied Physics Corporation and A. James Clark School of Engineering researchers through the Maryland Industrial Partnerships Program.

The plane-like boat will fly passengers 18 miles over the water from Rock Hall to Baltimore or back for potential shopping trips, coastal touring, evening dinners, Orioles games, cultural events, and commuting to work.

"Since the steamship days the Eastern Shore has held a certain allure for Baltimoreans," said P.A.M. Schaller, Director of Economic Development for Kent County. It's like stepping back in time." The trip by car is 80 miles, requiring a drive either north into Delaware, or south to the Chesapeake Bay Bridge.



WIG-H Concept

The new, 80-passenger ferry will be part plane—flying close to the water, lifted into the air by its aerodynamic hull and will be part hydrofoil. The boat's hull design, unlike any other vessel. That's where Jewel Barlow, director of the University's Glenn L. Martin Wind Tunnel, comes in.

"The hull we're creating is shaped like a wing to create lift at low clearances above the water," Jewel explained. "This lift, occurring as the boat reaches high speeds, will support a portion of the weight of the boat and reduce drag."

No other commercial hydrofoil-based ferry on the market produces this kind of lift, according to Mark Rice, president of MAPC. Less drag, he explained, means less fuel consumption, which means lower trip costs, and higher speed. The ferry could go as fast as 68 miles-per-hour.

"We're trying to get the fuel-used-per-passenger-mile ratio down," Rice explained. "We'd like the ferry to perform at least 25 percent better than

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MAPC
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the Boeing JETFOIL, the most technically advanced passenger hydrofoil ever built."

That efficiency would make MAPC a world-leading innovator in hydrofoil ferries. "The intent is to find products made in the U.S. with a performance advantage that allow you to sell overseas," said Rice. "You can't go head-to-head with Asian builders on a product that can be built there for less. You have to add enough technical value to make up for the difference in purchase cost."

MAPC plans to build the first ten ferries, selling each for approximately $2 million.

Future high-speed ferry routes could include trips from Baltimore to Annapolis, St. Michaels to both Baltimore and Annapolis, and Cambridge to Annapolis. Similar routes in the U.S. are in Boston (to Martha's Vineyard), Seattle's Puget Sound, San Francisco Bay, Long Island Sound, and Nova Scotia. Many European and Asian ports also feature passenger ferry services.

NEW PROPULSION CONCEPTS DRIVE EFFICIENT DESIGN

From Ferry Technology, October 2005

by Dag Pike

New propulsion systems are expanding the capabilities of marine craft, and in particular new propeller and waterjet concepts enable designers to re-think conventional solutions to hull design.
We have seen a large number of new surface drives for fast craft but virtually none of these have found their way into the fast ferry market. Generally speaking, where a conventional propeller system does not work for a ferry then a waterjet does..
Propellers tend to have a small hub in the middle with the blades as long as possible around the outside. Now a Swedish inventor is building a boat where the propulsion consists of propellers with a large hub at the centre and small blades around the outside. Rather than just a few blades, this new 'propeller' has about 12 small blades and these have a variable pitch mechanism to change their angle.


Stormfageln's hull design accommodates a revolutionary new propeller

Stormfageln's Hull Design Showing New Propeller

Such a system is not likely to work with a conventional hull but Torbjorn Eriksson has designed a special hull to accommodate this revolutionary propeller. The craft is being built by the Eriksson Maritime Construction Company and the project is called the Stormfageln. With its hull, the lines from the bow separate into two underwater bulges that grow in size until they reach the propeller. At this point the bulges are semi-circular and the propeller hub is sized to match this semi-circle.

This means that the numerous small blades projecting from the edge of the hub extend out into the water that is flowing past the hull and it is here that they can do useful work. The blades are designed to operate in the surface -piercing mode because the top half of the propeller is out of the water but hidden inside the slot in the hull in which it rotates. Behind the propeller the hull extends a little further aft and rises before terminating in a transom.

The hull is now at an advanced stage of construction, and the concept should be put to the test within the year. The company has received its initial patents and is now looking for partners.

Stormfageln's design features virtually all curved surfaces rather than the flat surfaces and hard angles normally found on a planing hull. The hull is almost catamaran-like in form at the aft end but the 'tunnel' between the two bulges is not above water. The shaft driving the propeller is supported at both sides of the slot and the hub is big enough to allow generous sized and reliable components for the variable pitch mechanism.

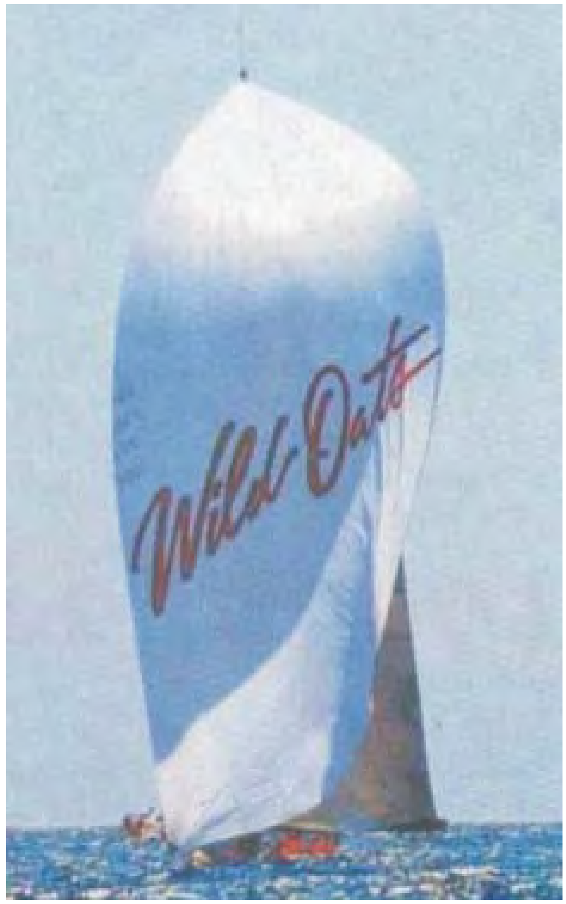
The prototype craft is 14.5m in length with a beam of 3.2m. The all-up weight of the craft will be 7,000kg of which only 1,850kg will be the hull weight. The power units are twin Scania 12-liter diesels each producing 500kW (675 hp) and the projected speed is 80 knots. The designers claim that this high speed is the result of the much higher efficiency of the new propulsion system where transmission losses have been greatly reduced.

SAILOR'S PAGE

CANTING KEEL YACHT WINS SYDNEY-HOBART RACE

By Martin Grimm, IHS Member

The 61st annual Sydney to Hobart ocean yacht race down the East coast of Australia to Tasmania, that commenced in Sydney harbour on 26 December, has been won in a race record time by the yacht 'Wild Oats XI'. Owned by Bob Oatley, the yacht is one of a new breed of high performance super maxi yachts that feature canting keels. Along with good race tactics, this keel arrangement undoubtedly provided a race winning edge. The second and third yacht across the line, 'Alfa Romeo' and 'Skandia' likewise featured canting keels.



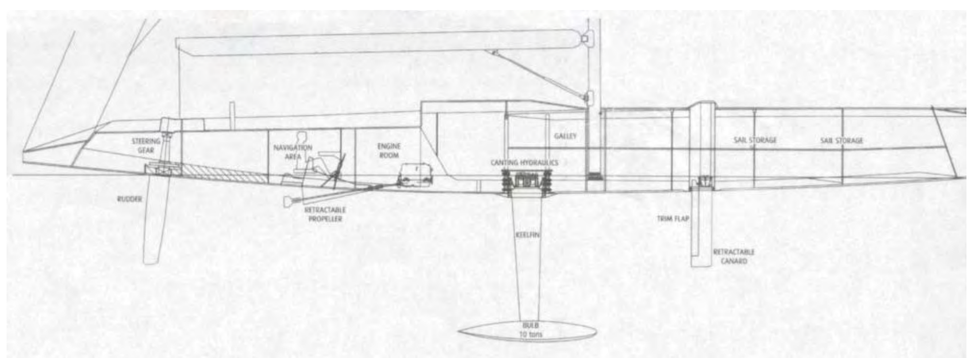
The 30m 'Wild Oats XI' completed the race in 42 hours 40 minutes and 10 seconds averaging 14.7 knots to gain a new race record time, line honours, and also the overall race win on handicap. Such a trifecta has not been achieved since the first Sydney-Hobart race in 1945. The previous time record had been set by 'Nokia' in 1999 which covered the 628 nautical mile (1163 km) distance in a time of 43 hours 48 minutes and 2 seconds giving an average speed of about 14.3 knots. By comparison, the first race in 1945 was won by a wooden hulled conventional keel yacht 'Rani' in 6 days, 14 hours and 22 minutes averaging only 4 knots.

Sailing close to the New South Wales coastline in an effort to find better wind conditions on the first night proved to be a race winning move for 'Wild Oats XI' skippered by Mark Richards with navigator Adrienne Cahalan. North easterly winds of up to 40 knots had been encountered on the second night.

The nearly identical New Zealand super maxi 'Alfa Romeo' completed the race in second place about 76 minutes behind 'Wild Oats XI' after having lead the race into the first evening. Its finish time was 43 hours 56 minutes and 31 seconds, averaging 14.3 knots. Owner Neville Crichton conceded that their decision to sail further off-shore than 'Wild Oats XI' had cost them the race.

Relaxation of the Sydney-Hobart race rules allowed yachts with water ballasting or canting keels to compete amongst the 85 boats that commenced the race.

Water ballasting and canting keels are a development stemming from solo and two crew yacht races that became popular in the 80's. In the case of water ballasting, sea water is scooped or pumped up into ballast tanks on the windward side of the hull to counteract the wind heeling moment acting on the sails thereby keeping the yacht relatively upright and allowing the sail to develop maximum driving power. Canting keel yachts tilt their ballasted keels to windward to achieve the same result.



Side View of Alfa Romeo With Canted Keels

'Alfa Romeo' has a 12.5 tonne canting keel powered by hydraulics that are able to tilt it through 180 degrees

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CANTING KEEL *(Continued From Previous Page)*

in 30 seconds should the need arise. In practice however, the keel would remain at a relatively steady angle to windward. In addition to the high aspect ratio canting keel with its solid ballast bulb of about 10 tonnes, the yachts are also fitted with a high aspect ratio rudder and a retractable canard fin forward of the canting keel. When the canting keel is tilted to a large angle to windward, the rudder and canard fin, which is fitted with a trim tab, provide the necessary hydrodynamic sideforce to counteract the lateral wind force on the sails. It appears not to be feasible to utilise the canted keel foil to generate lift as this would produce a heeling moment that would counteract the desirable righting moment from the off-centre ballast bulb.

Both 'Wild Oates XI' and 'Alpha Romeo' were designed by John Reichel and Jim Pugh and cost on the order of AUS$10 million to construct. Built in Sydney and fitted out in New Zealand, 'Alpha Romeo' was launched six months ago while 'Wild Oats XI' was completed with only four weeks to prepare for the race.

The 30m long carbon fibre hulled 'Alpha Romeo' is fitted with 800 square metres of sail on a 44m high mast, also constructed of carbon fibre. Prior to competing in the race, it crossed the Tasman Sea achieving a maximum speed of 32.5 knots and an average of 22 knots on the last day of the voyage.

'Skandia', which completed the race in 3rd place this year had been forced to withdraw in the 2004 race after its canting keel broke away. Other boats in the race that featured canting keels were 'AAPT 2' (which was the 2004 line honours winner under its previous name 'Nicorette') and 'Wild Joe'.

TETRAFOILER

By Gerard Tisserand

I worked on hydrofoils since the sixties, either on real boats or models. A few years ago I had an idea that was worthy and to save time and money, I worked on a model shown in the photo below.

This catamaran turned out to be outstanding because: no excess strain due to use of inverted T foils; superb stability because four foils are exactly on the four corners of the boat; sensors are of a new type: they take their information not from the surface of water but from below the surface, and regulate the height over water. They also provide extra lateral stability due to differential angle of attack of the front foils. Their righting action is proportional to the banking action. Expense is minimized because one doesn't need to build a new boat; just take a second hand catamaran and fit it with the foils and controls. Also, the sensors are self dampened and are not affected by small waves.

TETRAFOILER Model

I hope somebody will help me to realize a prototype of this very promising Tetrafoiler.

Gerard Tisserand can be reached at: francoise.tisserand92@wanadoo.fr

BRUCE NUMBER DEFINED

[Editor's Note: One of our new members, Sam Galpin, (see page2) makes reference to "Bruce Number" in his biographical sketch. For the sake of sailors and non-sailors, I thought it useful to define it here.]

The Bruce number is a size independent figure of merit for sailing craft developed by Edmund Bruce. It is the square root of the working sail area divided by the cube root of the total sailing displacement. If the units are square feet and pounds fast displacement yachts are about 1.0, planing dinghies are around 1.5. The domain above 1.6 is mostly fast multi-hulls, but includes recent Moths, Australian 18 foot skiffs and related designs. Bruce numbers much above 2.0 are hard to realize.

Edmund Bruce did a great deal of both experimental and theoretical work on the performance of sailboats. He reported most of it in Amateur Yacht Research Society (AYRS) publications. The most important contributions are collected in AYRS publication number 82 "Design for Fast Sailing" by Edmund Bruce and Harry Morss. AYRS can be reached at: www.AYRS.org

WELCOME NEW MEMBERS
(Continued From Page 2)

and canoes used by U.S. national teams in international competition. He first went sailing as a baby in a basket and has been pursuing speed under sail ever since in a variety of craft including 505s, Tornados, and two trimarans. He would like his next boat to be smaller but faster than the Corsair F31R he recently sold. The most exciting approach is to fly the boat on foils. He estimates that a trimaran with a Bruce Number near 2, L/D in the water >= 10, L/D in the air >= 5, either a magically stable geometry and/or suitable feedback control should be able to fly at true wind speeds near 7 knots and reach boat speeds near 2 times wind speed up to perhaps 30 knots in a 15 knot breeze. See Note on page 10 for a definition of Bruce Number. It is this dream that brings Sam to the IHS. He has a notebook full of sketches and calculations. In a few years he will be retiring, and is hoping that by then he will have a real design worth building.

Max Jenny - Max is a 2001 graduate of the US Coast Guard Academy with a BS in electrical engineering. He served a two year tour as a student engineer on a 378' CG Cutter, GALLATIN in Charleston, SC between 2001-2003. Since 2003, he was assigned as the Life Cycle Type Support Manager for the CG's River Tender & Construction Tender Class Cutters. Max is a part time student in the John's Hopkins Engineering for Professionals Program working on an MS in Systems Engineering. He is currently halfway through his one-year tenure as the Secretary of the Baltimore Coast Guard Officer's Association.

Alexander Karas – Alexander is a man of many talents and interests including: artist, sculptor, international photographer, interior designer and engineer. He has a Master of Fine Arts Degree from Leonardo DaVinci, in Florence Italy and has been an instructor/lecturer /consultant at Fanshawe College, London, and University of Baltimore to name a few. As an entrepreneur he founded the Alexander Companies in 1971, an organization which today, (Alexander Ltd.com) is diverse in DNA forensics, fine art, and broadcast television production/ replication. Alex has many interests in both automotive and marine fields. He's successfully re-engineered a 650 hp Corvette powered Bentley (sleeper) and is currently making extensive modifications to a Russian hydrofoil, replacing its ailing outdated gas engine with a rotary Wankel engine, thereby almost doubling maximum rpm, horsepower and dependability.

Drew Mutch - Drew received a Bachelor of Science in Ocean Engineering from M.I.T. In 1998, followed by studies at the Surface Warfare Officer's School (US Navy) in 1999. Drew has 8 years of experience in the design, construction, and maintenance of advanced commercial and military surface ships. Throughout this period, he has been intimately involved with the operational details of the equipment, the hydrodynamics of the hull, and the electrical/electronics systems of large and small Naval vessels. He is currently employed as an Engineer with the Maritime Applied Physics Corp, Baltimore, Maryland.

Robert L. Stevenson – Mr. Stevenson is originally from Los Angeles, California. He graduated from Rogue River High School, Rogue River, Oregon, June 1950 and spent 4 years in the United States Air Force during the Korean conflict. Later he graduated from Hollywood College of Chiropractic 1955. Invented, patented, manufactured and marketed the first wood stove with a glass viewing window in 1969, and has 5 patents relating to home and commercial solid fuel heating. More recently he designed and built 2 aluminum trimaran power boats. Presently he is experimenting with hydrofoil assist devices for installation on 2 aluminum trimarans.

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MAJOR BENEFIT

IHS provides a free link from the IHS website to members' personal and/or corporate site. To request your link, contact William White, IHS Home Page Editor at webmaster@foils.org

EXTRA FOR THE WEBSITE EDITION

Ray Vellinga:

One-Person Who Likes One-Person Hydrofoils

The photos show Ray piloting hydrofoils of his own design and construction, with the earliest shown SABREFOIL model dating back to 1968 (bottom of page). A much more recent model HIFYBE is shown in two configurations.

Ray can be contacted via the IHS bulletin board (BBS), which is accessible from the IHS main page: www.foils.org.

The IHS website has a page dedicated to personal hydrofoils but content is lacking! It is www.foils.org/gallery/personal.htm. Other hobbyists like Ray are invited to submit photos and text to gallery@foils.org

Above and right: HIFYBE in different configurations

Below: SABREFOIL circa 1968