The NEWSLETTER

International Hydrofoil Society

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

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FORTY YEARS ON

By Juanita Kalerghi Rothman (IHS Life Member)

(From Fast Ferry International, October 2001)

[In October 1961, the first issue of Hovering Craft & Hydrofoil was published. During the intervening 40 years, the title of the magazine has changed twice, and over 400 issues have appeared. Much else has changed, the magazine has had four publishers, production has moved from galleys and paste to electronic desktop publishing, and the printing process has evolved from hot metal to offset litho.

In one area there has been relative stability however. In 40 years, the magazine has had just two editors. Between 1961 and 1983, it was edited, and for most of that time published, by Juanita Kalerghi, who also contributed a monthly editorial. To mark the 40th anniversary of the first issue, it seemed appropriate to ask her to reprise that role...]

The most challenging and exciting years of my life were those of my involvement with the high speed surface craft industry, and now your Editor has graciously offered me the freedom of this page to com-

See Juanita Kalerghi, Page 3

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.

2002 DUES ARE DUE

IHS Membership is still only US$20 per calendar year (US$2.50 for students). Please remit 2002 dues as soon as possible. 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

I am pleased to report that your Society is growing in numbers and adding more features for the benefit of its members.

All members are alerted to the addition of the Membership List on the IHS Web Site. It is located in the Membership Section on the first page. The information accessible to IHS members only and is password protected. The password has been sent to those members having e-mail by Barney Black, who from time to time, will issue an updated list.

You can see in the Dues Notice block on page 1 that the IHS has adopted PAYPAL. IHS has traditionally accepted dues payment by personal check, bank check, money order or cash (all in US dollars only). These means are still available, but IHS has now arranged for dues payment by credit card for regular memberships (not student memberships, at this time). This system is simple, fast and inexpensive, and we hope to see it become the payment system of choice for IHS members in the near future. To pay by credit card please go to the IHS website membership page at <http://www.foils.org/member.htm> then scroll to the section marked "How to Start Your Membership." Read this paragraph, then click on the credit card logos at the end and follow the directions. IMPORTANT NOTE: Credit card transactions are handled for IHS by PayPal, Inc., an online payment service. THESE TRANSACTIONS CAN ONLY BE CONDUCTED VIA THE WEB SITE, AS DESCRIBED ABOVE. DO NOT SEND YOUR CREDIT CARD INFORMATION DIRECTLY TO IHS, AS WE HAVE NO INTERNAL MEANS OF PROCESSING IT.

Between Steve Chorney and myself, we have "manufactured" and sent out over 115 AMV CDs. See the Autumn 2001 Newsletter. Recipients include individuals, Universities, and Human Powered Vehicle organizations/individuals from all over the world. Bill White was very kind and thoughtful to summarize the contents of the AMV CD. It contains: 32 AMV Design Papers; 14 AMV Design Criteria and Specifications; 13 AMV Concept Evaluation Papers; 25 Foils Design, Performance and Materials Papers; 4 Foil Test experiment Papers; 8 Propulsion Papers; 4 Structures Papers; 4 Cost estimating Papers; 2 SES Papers; 8 SWATH Papers, plus many Historic papers on Individual Hydrofoils.

I wish to inform all members that Mike Perschbacher has decided to relinquish the remainder of his term as IHS Board Member. He has stated: "MAPC and DARPA keep me more busy than I could have ever expected, but the work is extremely rewarding and keeps me from saying "no" way too often." John Monk, a long-term IHS member and hydrofoil enthusiast who previously served as a Board member in the early 1990s, has agreed to serve the remainder of Mike's term.

John R. Meyer, President

WELCOME NEW MEMBERS

Dana Fiege - Dana has lived in the Chesapeake bay area all his life, and is an avid boater, and likes water skiing. He stumbled into Volgas and found them to be an excellent ski boat design. Then in a search for info he hit the IHS web site. He runs a small family business, a machine shop specializing in electronic enclosures, and a coating company called Rhino Linings of Maryland.

Eje Flodstrom – Eje joins us from Sweden. Although not involved with hydrofoils professionally, he has a strong spare time interest in them. Eje is researching and compiling early fast ferry history with an extra soft spot for hydrofoils. Present project is the documentation of Aqauvion history. He is interested in the preservation of historical hydrofoils and is looking for reasonable objects in Northern Europe. Broader subjects include almost anything on historical ships and aircraft.

Sasha Jovanovic - Sasa is a PhD candidate at the Poletechnical University of Catalonia, Barcelona, Spain, and is working on a doctorate thesis on the subject of hydrofoils operating in shallow water.

Joseph Kubinec – Joe is the general manager of Maritime Dynamics, a company specializing in marine motion control systems. He has degrees in naval architecture and electrical engineering. Maritime Dynamics recently expanded its product offerings by successfully fielding an integrated ride control and lifting foil system for a 250MT trimaran.

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Juanita Kalerghi
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memorate the fortieth anniversary of this journal, which became *High-Speed Surface Craft,* and is now *Fast Ferry International.*

Sadly, this coincides with the aftermath of those horrendous events in the United States, a country where the essential liberties and insuppressible values of nation and individuals have always been safeguarded. President Bush has made his stark and uncompromising address to Congress, and the world is holding its breath.

Forty years ago, at this time of year, 500,000 people were fleeing their homes along the coastline of Texas and Louisiana, in the wake of Hurricane Carla. An attempt had been made on the life of General dc Gaulle, and the Soviet Union had announced its formal rejection of the British and American atomic-test ban proposal. Dag Hammarskjod, the Secretary General of the United Nations, had been killed in a DC-6 aircraft crash. Diplomatic relations between Afghanistan and Pakistan had been broken off. The United States was funding a large civil airport at Kandahar, and development credits and technical assistance were being given for the Kabul to Kandahar highway.

I had been editing an educational journal for a small publishing firm which had just been sold - with me, as well - to a large publishing company, and it was then that I decided to start my own publishing venture.

Fixing on a subject was easy. I dismissed the ideas of food, clothing and shelter, because these were already abundantly covered in specialist journals of their own. However, the national press had recently carried small items of information about hovercraft and hydrofoils and these had captured my interest and imagination. Besides, I did not want any competition!

The rules of specialisation require one to keep one's mouth shut on subjects on which one is not a trained expert. However, I risked defying them when I set out to publish and edit Hovering Craft and Hydrofoil.

There followed six months of intensive preparation during which I had unstinted and invaluable help from Christopher Cockerell, Christopher Hook, Baron von Schertel and the Rodriquez family - to name but a few of the pioneers - all of them imbued with tremendous enthusiasm.

They became staunch supporters, mentors and friends. Also, for the first two years of the journal's existence I was lucky enough to be able to enlist the part-time help of Roy McLeavy, who was then working for an aviation journal. He later went on to edit *Jane's Surface Skimmers*.

My first office was in a basement equipped with a desk, two chairs and a telephone. It was given to me rent-free for six months by the landlord (who ran his own advertising business in the upper floors of the building). "Because," he said, "I don't reckon you'll last much longer than that."

My first appeal to potential subscribers went out in five hundred three penny-stamped letters. A typewriter and secretary came much later. The first print run of fifteen hundred copies cost three hundred pounds. Fortunately affordable thanks to the extended credit kindness of both the printer and the block maker. Publishing was not such a cut-throat industry in those days!

Once the finances of the business had become more secure, I decided to publish books and hold international conferences and exhibitions, and so it was that *A History of Air Cushion Vehicles* by Leslie Hayward; *An Introduction to Hovercraft and Hoverports* by Professor O'Flaherty and Ian Cross; and *Hydrofoil Sailing* by James Grugono, Alan Alexander and Donald Nigg appeared in 1963, 1972 and 1975. In 1969 and 1970 the International Air Cushion Vehicles and International Hydrofoil societies were formed.

Since my retirement I have avidly followed the developments within the industries, and my most enduring memories are centred on those visionaries who came in at the start and laid the foundations for the high performance craft around the world today.

I am extremely proud, (and envious!) of my successor, Alan Blunden, who having surpassed the high expectations I had of him, continues so ably in his role of mouthpiece for these industries.

VIDEO OF HELMUT KOCK

By Bob Miller

I had the good fortune to make a videotape when I interviewed Helmut Kock at some length last year. I have sent it to Barney Black who plans to excerpt a short clip from it to put on the website. In the meantime please see the website for Helmut Kock's hydrofoil autobiography and photos of his hydrofoils.

FOIL ASSISTED CATAMARANS FROM NEW ZEALAND

(Excerpts From Fast Ferry International, December 2001)

Fast ferry activities in Australia may have attracted most of the headlines during the past few years but there have also been developments elsewhere in the southern hemisphere with the appearance of locally designed and built foil assisted catamarans in New Zealand.

Three have been designed in Auckland by Teknicraft Design and built at theWanganui yard of Q-West for domestic customers, and a fourth has been delivered to an operator in Fuji.

Teknicraft Design has been based in New Zealand since founder and managing director Nic de Waal (IHS Member) moved there from South Africa in 1996. In addition to working with domestic yards, the company has licensed All American Marine to build its designs for the United States market and is currently acting as technical advisor and designer for several projects in Europe.

The four catamarans produced by Teknicraft Design and Q-West also share another New Zealand connection, they all have Hamilton waterjets installed. The manufacturer notes, "The wide range of impellers available with each waterjet model means Teknicraft designed vessels normally do not have to be fitted with gearboxes."

The latest collaboration between Teknicraft Design and Q-West involved a 19.2m foil assisted catamaran, *Lagilagi,* delivered earlier this year to Beachcomber Tours and Cruises, a Fijian company that operates a fleet of ferries on feeder services to its island resort and on tourist excursions.

Lagilagi is the fourth foil assisted catmaran from Teknicraft Design and Q-West

Built to Maritime Safety Association of New Zealand Coastal and Fiji Marine Board requirements, the twin deck *Lagilagi* is equipped for 150 passengers in two saloons and on an open upper deck. Four MAN D2848 LE 405 diesels, rated at 478 kW at 2, 100 rpm, directly driving Hamilton 362 waterjets give the vessel a service speed of 33 knots.

The project that brought Teknicraft Design and Q-West together was an 18m foil assisted catamaran, *Discovery IV,* delivered to Dolphin Discoveries in Paiha, North Island, at the end of 1998.

This was built to MSANZ Coastal survey, using Lloyd's Register Special Craft Rules for the structural design. According to QWest, "The intent was to construct a vessel that not only provided a platform to view dolphins, but also had an impressive look to attract customers."

Teknicraft Design 18m foil *assisted catamaran Discovery IV was delivered to Dolphin*

As Dolphin Discoveries operates in a nature reserve in the Bay of Islands, wash was a very important consideration. When *Discovery IV* was delivered, Teknicraft reported that wake remains virtually constant over a 20-40 knot range, with an average significant height of less than 200mm.

Two Caterpillar 3406E diesels, rated at 515 kW at 2,000 rpm, and Hamilton 362 waterjets were installed to give the catamaran a full load service speed of 32 knots, although Teknicraft Design reports that the vessel achieved a lightship speed of over 40 knots during pre-delivery trials. Maximum service speed on dolphin excursions is normally limited to 28 knots.

CHILKAT EXPRESS

(ExcerptsFrom Speed at Sea, October 2001)

by Dag Pike

Teknicraft is a pioneering designer of foil assisted catamarans and has produced several designs for construction in New Zealand. Now this design team has gained international recognition with the 63- passenger *Chilkat Express,* a 19m fast vessel for operations in Alaska. With a top speed of 48 knots, this new design is one of the fastest passenger boats in the US, and is also considered to be one of the most efficient.

The design brief from the owner, Chilkat Cruises & Tours, was for a vessel that could operate at speeds in the 42-45 knots range that would enable it to compete against scheduled

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CHILKAT EXPRESS

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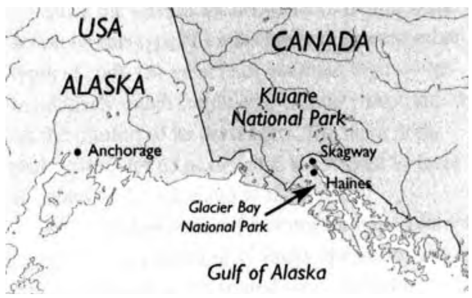
seaplane flights between Skagway and Haines in Alaska. The vessel would not only have to take a similar or faster time than the aircraft, but also be able to take many more passengers, and have more reliable scheduling - being less affected by weather, at much lower cost.



Glacier Bay National Park Gulf of Alaska

The competition on the Skagway to Haines route is provided by six seaplanes that operate between the two points. The 63-passenger *Chilkat Express* operates four round-trips per day over the 28-mile route, and accomplishes this while providing a smooth ride for passengers accustomed to cruiseship luxury. An additional benefit of this hull design is its low-wash characteristics.

Chilkat Cruises & Tours estimates that over 12,000 visitors will take its Glacier Point wilderness safari in 2001. The 40-minute one-way journey is mainly for the passengers of the cruise ships that regularly stop in Skagway. Upon arrival at the north end of the Lynn Canal at Glacier Point, the boat's asymmetrical hulls permit convenient bow beach landings. From there, tourists are taken by fourwheel-drive bus to a short trail leading through the forest to a lake filled with floating icebergs, where they can experience the glaciers up close.

The new catamaran's design was innovative enough to earn a copyright. Now All American Marine of Bellingham, Washington, which built the prototype, has exclusive rights to build it on the West Coast of North America. The US$1.5 million custom-designed catamaran was ready for operation in April 2001 and it has maintained a rigorous schedule that has replaced the seaplanes, which had created controversy with their high noise levels.

Chilkat Express

Chilkat Express is 19m long and has a beam of 6.7m. The operating draft is just 0.85m at rest, which is a considerable benefit for beaching, and the waterjet propulsion is a benefit here as well. When running at speed it is estimated that the draft is a mere 0.2m.

Teknicraft proposed a quadruple-engined water jet-propelled boat, with hydrofoil support. The Teknicraft hull-shape has a semi-round bilge for rough water performance but this shape, with its lack of planing surface, is generally not regarded as good for a high speed performance. By introducing a hydrofoil between the hulls to create the necessary lift and reduce the hull resistance, the required high speed could be achieved.

The boat has a quadruple-engine installation which enabled the necessary power to be installed in the relatively small engine rooms of the catamaran hulls, while also reducing the weight and cost, compared with twin engines of similar total power.

The power units are four 3406E Caterpillar diesels each producing 590kW (800hp). The Hamilton HJ362 waterjets, make *Chilkat Express* the most efficient boat in Chilkat Cruises & Tours' fleet. The fuel consumption at cruising speed is 120 US gallons per hour

Speeds of over 48 knots were obtained during sea trials in lightship condition. Operational speed of 42 to 43 knots at full load could be maintained using only 87 per cent power.

Since the vertical accelerations caused by wave action on this type of hull is lower than most other types of craft, the vessel can maintain high speeds in relatively rough conditions without compromising on the comfort of its passengers.

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The vessel is fitted with a hydrofoil spanning the tunnel at approximately midship position. Unlike conventional hydrofoils, which lift the hull completely out water, this foil is designed to only partly reduced draft, thereby reducing resistance, but still maintaining good seakeeping by having the hull still partly submerged.

The foils need no maintenance whatsoever, apart from the occasional cleaning when the hull gets cleaned. The foil is fabricated from aluminum and is permanently fixed to the hull above the keels of the sponsons and is therefore no more vulnerable to damage than the hull itself. This was an important consideration in the area of operation where floating logs are a common source of damage to vessels.

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HYDROFOILS IN THE POST SOVIET ERA

By Oeksandr Gavrylyuk

(Excerpts From Fast Ferry International, October 2001)

Since they were invented more than 40 years ago by Russian designer Rostislav Alekseyev, over 1,000 hydrofoils have been built for operators in the former Soviet Union and 31 overseas countries by ten shipyards in Russia, Ukraine, Belarus and Georgia. Some 40% of all the hydrofoils built to date, throughout the world, have been produced in Ukraine by the Feodosia Shipbuilding Association.

[*Ed Note: Although Alekseyev designed many hydrofoils and made major contributions to hydrofoil development in Russia, hydrofoils were really "invented" in the late 1800s.]*

Comfort was far from the strong point of Soviet Era hydrofoils. High speed and moderate fares determined popularity with passengers on numerous sea and river routes. By 1991, the huge network of USSR hydrofoil services covered not only the main tourist routes (from the Black Sea port of Odessa to several Crimean and Caucasian resorts) and the most popular river routes, but also provided transport links, sometimes the only ones available, for numerous remote settlements along various inland waterways.

There were also more specific applications of hydrofoils in the former USSR. For example, during the seven months following the Chernobyl catastrophe in April 1986, Voskhods and Raketas made 1,270 shuttle journeys between Kyiv and Zeleny Mys, 476 between Kyiv and Chernobyl, and 268 between Zeleny Mys and Chernobyl, entering a 30 kilometre radioactive 'Estrangement Zone'.

Decline

With the collapse of the USSR in 1991 came a decline in hydrofoil operations. Ten years ago, up to nine hydrofoils serving different destinations would simultaneously enter the Kaniv dam lock downstream from Kyiv.

Today, Kaniv is the only destination available from Kyiv. Barely 800 ships, of all types, passed through Kaniv lock in 1999, compared to ten times that number in 1991, and three years ago, all traffic was suspended due to urgent repairs needed to the lock gates.

Elsewhere, the formerly heavily used Black Sea-Dnieper line, between Kherson, Ochakiv and Odessa, is now usually served by two, and sometimes only one, Meteor hydrofoil.

Meteor hydrofoils were extensively operated on rivers and lakes in the USSR

Referring to a general decline in the region, in an article published in *Ukrainian Ports* magazine, Oleksandr Schiptsov said, "Shipping on the Dnieper, one of the greatest European rivers, has reduced to indecency. The Dnieper river ports and ship repair yards are out of work and drag out a miserable existence."

In the good old summer days there used to be 11 voyages a day by Raketa hydrofoils from lzmail to Kyliya and Vylkove, four to Reni, and three by Kometa hydrofoils to Odessa.

Today, hydrofoil operators have no funds for repairing ships. "Hydrofoils tend to break often, but repairing and rebuilding them costs the shipping companies dear," comments Russian Maritime Technical Company chief designer Viktor Sokolov.

On the other hand, passengers can no longer afford river voyages, choosing stuffy but cheap buses instead of the river breeze. Businesses in the post Soviet era have been gripped by overall crisis, and waterborne services have not been excluded.

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POST SOVIET ERA

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Thus, dozens of Kometa, Meteor and Voskhod vessels were sold to operators overseas. Ukrrichflot, for instance, sold 25 hydrofoils in one year. Greece was a particularly good market. Operators there imported more than 40 vessels from Eastern Europe during the 1990s.

Fast Flying Ferries operates three Voskhod hydrofoils in the Netherlands on commuter services to Amsterdam

According to Feodosia Morye marketing manager Gregory Klebanov, "Having sold their hydrofoils at dumping prices close to those of the scrap value, the operators created a huge market for second hand ships and practically blocked the manufacturers' efforts to get new orders".

The Zelenodolsk Gorky yard in Tatarstan, Russian Federation, delivered two Meteor hydrofoils to the Chinese National Export-Import Transport Equipment Corporation in 1998-99 and has recently started construction of two more for service on the River Yangtze.

New Services

Recently, however, Russian operators have begun to realize the benefits of tourist operations and have began transforming the vessels left after the 'great sell-off' of the mid 1990s. Comfortable three and four deck classical steamers appear to be excellent floating hotels for foreign tourists, and relatively new hydrofoils have become high speed excursion vessels.

On Europe's second largest lake, Onega, there are presently five Kometa hydrofoils in service.

To the west, traffic between the Estonian capital of Tallinn and Helsinki, Finland, continues to grow. Hydrofoils have been operated on the route for more than ten years and the fleet of ferries and fast ferries currently in service includes Linda Line's two Morye Olympia hydrofoils, *Laura* and *Jaanika.*

Generally, the whole Baltic area seems to be keen on establishing international hydrofoil services that were not available in Soviet times.

Elsewhere, hydrofoil operators of the East Siberian republic of Yakutia claim to have Russia's longest fast ferry services. Their vessels run from Yakutsk to Olekminsk and Khandyga, a distance of around 600 kilometres.

Future Prospects

According to Morye's Gregory Klebanov, rumours of the death of the hydrofoil have been exaggerated, he is sure that services will return to the Black Sea-Azov area once the coastal economies have overcome the present crisis and passengers can again afford to travel. He not only predicts a revival of services connecting the former Soviet republics, but also the appearance of new routes to neighbouring Bulgaria, Romania, and Turkey.

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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.

30 YEARS AGO

(Excerpts From Fast Ferry International, December 2001)

If the December 1971 issue of *Hovering Craft & Hydrofoil is* any guide, the high speed marine world was concentrating on military hydrofoils as that year drew to a close. On the cover was an artist's impression of a Supramar MT 250 Patrol Hydrofoil Medium Craft, which the magazine described as, "The Supramar concept of a PHM for all-weather operation in the western Baltic Sea, the Skagerak or areas with similar operational conditions."

Referring to the armament fitted on the 39m fully submerged hydrofoil design, *H&H* noted, "The Exocet missiles are formidable weapons against even large ships. The OTO-Melara 76 mm gun gives a self defence capability against aircraft."

In the United States, another defence programme had moved closer to reality, "A contract that will lead to the construction of at least two hydro-

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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

30 YEARS AGO

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foils has been awarded to The Boeing Company by the US Naval Ship Systems Command. Boeing will begin immediately the design phase of the PHM, an advanced missile-carrying, high-speed hydrofoil. The program will be carried out in several stages and will extend over several years.

"PHM, which stands for Patrol Hydrofoil Guided Missile Ship, will have a service speed in excess of 40 knots and a crew of 20. It will provide improved high speed, all-weather surface offensive capability. The $5.6 million contract will begin with a design effort that will lead into a later contract for the construction of at least two lead ships - forerunners of a class of PHM ships."

In an introductory speech to the winter meeting of the International Hydrofoil Society, Baron von Schertel also made reference to naval designs. He said, "Today Professor Schuster will give a lecture on 'Research on Hydrofoil Craft', which deals with towing tank and development work for fast hydrofoil vessels.

"Professor Schuster is particularly competent in this field, because he played a leading role in the research, development and design of the very first naval hydrofoils ever built. In World War 11 these craft were produced at the Sachsenberg Shipyard in Germany.

"We know that France is developing her own craft and that Germany is setting up a building program for the Baltic Sea. We also know that Italy acquired the Boeing concept and that in Japan a boat is under test as a forerunner for armed vessels.

"Moreover, we must not disregard the fact that the communistic countries recognised at an early stage the suitability of hydrofoils for military tasks. The Russian foil-borne fleet is already many years in existence. The Chinese followed on a smaller scale with craft which are, however, still behind the standard of modern techniques.

"One of our Vice-presidents, Mr. Gonella of the Boeing Company, is involved in the introduction of the most advanced existing military vessel. The *Tucumcari* and its successful sea-going performance is well known. Grumman's *Flagstaff* has been operating with success in Vietnam and was recently fitted with a 6-inch gun. "The military hydrofoil still presents technical problems, among which the most troubling is seen in the propulsion area, where a fully satisfactory solution has still to be found. Propulsion systems for fast craft are very complex and efficiency is unacceptably low for an economically minded engineer. No really promising solution is yet in sight, but we are awaiting with interest what the future may bring."

AUSTRALIAN RESEARCH SUGGESTS DIFFERENT TYPE OF SEASICKNESS

(Excerpts From Fast Ferry International, December 2001)

Research carried out by Australia's Defence Science and Technology Organisation on board Incat Tasmania 86m wavepiercing catamaran *HMAS Jervis* Bay suggests that the different vessel motions of multi- hulls, compared to those of monohulls, may affect passengers who have previously been immune to seasickness.

Reporting on its work, DSTO says, "High-speed catamarans are known to roll and pitch in a way that is quite different from a monohull, but there has been little research on the effects this may have on the passengers. The first real opportunity to study the effects of ship motion on military personnel arose when the Royal Australian Navy chartered a vessel to assist the RAN in transporting troops and equipment to and from East Timor.

"Darren Sanford, of DSTO's Maritime Platforms Division, went on board *HMAS Jervis Bay* to carry out interviews with various navy personnel. He discovered that in rough weather the roll was very small, but when the catamaran did roll, it did not have the gently rolling action associated with a monohull. Instead, the vessel moved in a 'stiffer' way and in beam seas the roll was enough to cause discomfort, particularly as the stiffness of the roll increases at high speed.

"Pitch was also significant in rough seas. It was also found that in high seas the slamming of the centre hull, became an important factor, as it tended to cause significant longitudinal accelerations. Following seas in rough conditions were not a problem.

"Mr. Sanford said that one officer observed that although the catamaran may or may not cause an increased incidence of seasickness, it sometimes did affect individuals who did not normally suffer seasickness. The requirements for research in this area are now more obvious."

Detailing the methodology, DSTO says, "To undertake research on motion sickness in the form of a sea trial,

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SEASICKNESS

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a large contingent of troops or other personnel needed to be on board, so that a statistically significant amount of information could be collected through a questionnaire. It was preferred that the trip be several hours duration. It was also desirable for the ship to experience rough seas.

“An opportunity to carry out a trial with a significant number of personnel arose in April 2001, with the battalion changeover in East Timor. This involved transporting fresh troops to Dili and bringing others back to Darwin after six months service. The sea trial was conducted over two days. The ship made an 11 hour trip from Darwin, followed by a 5 hour period in port, before returning to Darwin.

“The trial consisted of a questionnaire to enable collection of data regarding how many and how badly troops were affected by ship motion. All troops on board were requested to fill out the questionnaire on a voluntary basis. The second part consisted of instrumenting the ship to measure the ship’s motions and the sea conditions, to permit correlation between the statistical data and the actual motions.

PHMs FLYING IN FORMATION

By Jon Coile, Formerly, LT USN,
Chief Engineer, USS Gemini
(PHM 6)

[Editor’s Note: The following is a message from Jon Coile in response to a query from Eliot James re a PHM video. See Winter NL, p 9.]

Beyond 2000 did make an episode about the PHMs so if you can track that down that would be a good piece. It was kind of basic as it’s designed for the average viewer of television. If you want more involved stuff, Boeing made some great marketing videos to sell the Navies of the world on the PHM concept. From Boeing Marine Systems in Seattle. I would think that the Boeing Museum folks out there might be able to dig deep in their archives and possibly come up with something for you.

Final suggestion is to look into NAVSEA videos. We had a helicopter hover over us with a NAVSEA camera crew in it while three PHM’s flew in line abreast at 45 Kts, 100 yard separation and did a Search Turn! Now if you don’t know what a search turn is, that might not sound too crazy but let me try and explain. You line the ships up, side by side, and lets imagine the ships are numbered: 1 - 2 - 3 And lets imagine that the top of this page is due north, so the ships are heading up the page at 45 knots like this:

1 2 3

The turn starts when ship number 1 turns HARD to the right, directly toward ship number 2. Since ship numbers 2 and 3 are still heading due north at 45 knots, the theory is that by the time ship 1 completes her turn to the east, 2 & 3 have moved up the page and ship 1 is directly in the wake of ship 2. It should look like this

2 3
1

At that point ship 2 turns HARD into ship 3 and since ship three keeps heading north she clears out and 2 ends up in her wake, when ship three throws the helm hard right turns east to parallel the others and the formation ends up line abreast again, heading due east toward the right side of the page. The formation now looks like this:

3

2

1

Got it? It’s actually a maneuver for destroyers to use to clear their baffles of submarines sneaking up from behind in the blind spot of their sonar. No tactical use for PHMs except to look cool. And destroyers normally do it at 15 knots with 1,000 yard separation between ships line abreast.

PHMs In Formation, circa 1983

Anyway, in 1987 somebody at NAVSEA wanted to make a video of us doing a search turn at 45 knots and 100 yard separation. They hovered over us in a helo while we got ready to do it. It is an intimidating maneuver because at the beginning you are turning right into the side of the next ship over,before relative motion takes effect and she pulls ahead. When we lined up, my ship, the USS Gemini

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SAILOR'S PAGE

THE ULTIMATE RAVE STORY

By Brian Douglas, Edited by: Eric Arens

[This is Part I of a 2 Part Series]

This is a remarkable tale of a nine day ocean passage, in a WindRider Rave hydrofoil sailboat, from Key West, Florida across to Isla Mujeras, Mexico and then south along the coast to Xcalak, Belize. The entire voyage spanning over 45 days.

The following was condensed from the original account by Brian Douglas a professional musician/delivery captain describing his incredible journey:

Brian Douglas

Jerry and Trina Lugert, the owners of a 16 foot WindRider Rave sailing hydrofoil trimaran (hull number 5 delivered in late 1998), showed up with their craft in Key West, Florida having completed an initial leg from Pine Is. also in Florida.

After a while, they decided they wanted to go south with their boat, and were starting to look at the cost of shipping it. I said, "why not just sail down?" They said they weren't sailors enough for that kind of an open water trip. I said that I could sail it down, and the next day, they asked me if I would. I weighed up the logistics and told them if the dulcimer (an American folk instrument with three or four strings stretched over an elongate fretted sound box that is held on the lap and played by plucking or strumming) would fit in their boat, and they stayed and took care of my cat, my car, and my boats, I'd go. "How wide is the dulcimer?" they asked, "17 inches" I replied. "The cockpit is 18!"

It was a nine-day trip from Key West to Isla Mujeras, Mexico. Key West to the Dry Tortugas, where I slept out the night, then 7 days at sea to Isla Contoy, my first landfall on the Mexican coast, and a day to Isla Mujeras, my port of entry. It was a bit of everything; a day and a half becalmed, several days of open water sailing in pretty good wind and seas, finally running into some bad storms that lengthened the trip by a few days. This open water passage was still the best part of the whole trip, the days alone with the sea. There was a night with phosphorescence greater than any I'd ever seen, not just the normal small sparks, but great globes several feet in diameter and everything in between.

RAVE 1

I was mostly impressed by the stability of the craft in heavy conditions. I don't know if it was part of the concept in the design, but the foils act like "flopper-stoppers" (fins suspended from booms on port and starboard side of boats, usually trawlers, to damp rolling motions) and create an incredibly stable craft when they are deployed in displacement

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ULTIMATE RAVE

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mode. I would "hove to" under bare poles quite comfortable in major storms at sea and go to sleep below, hardly ever having water slip over the rear coaming even though the cowling didn't extend closer than 8"-10" from the rear of the cockpit. I ran through some pretty serious conditions, and never felt out of control or overwhelmed. *[Editor's comments: Hove to in a storm, in the middle of the ocean, in a 16 foot open foiler, and he would go "below" to sleep!? Where is below in a Rave? Remember he is carrying stores for an ocean passage AND a dulcimer!]*

I "surfed" for hours in large (8'-10') breaking waves. Technically, I wasn't "surfing" since I wasn't riding down the face of the waves. The foils would lift the nose so it didn't plunge, the stern foil would anchor in the back of the wave, and the crest would be breaking beneath the crossbar, the boat balanced on top. I did little but keep the boat pointed 90 degrees to the wave direction, and once a wave grabbed the boat, it was stable without my help.

Small things like being able to barely beach the boat and lift it up on the foils above the water, stable on the sand beneath, were just odd but realistic benefits *[Editors note: Brian is referring to the ability to run the Rave up into the shallows and then stand it up on its foils. Its easy to do by just walk around the boat and lift each corner allowing each foil to drop all the way to its down and locked position. The hulls will sit well above the water]*. Or anchoring to sleep with the boat's motion subdued and steady even in the chop behind a reef perhaps that was one of the biggest points, that the foils stabilized a ultra light craft that otherwise would have tended to be thrown around in heavy wind and seas, and the Rave was easily controllable in conditions that might have had me working harder in another boat.

Everybody seems to think I'm either some sort of great sailor, or have extraordinary courage, or I'm just crazy. I'm not sure why everybody thinks its such a big deal, though I guess it must be. Personally, it's just something I did, like a lot of things I've done. It doesn't seem like a big deal, even if it is pushing the envelope a bit.

I watched over a hundred small porpoises come directly at me from the horizon, pass around and under and circle me, before disappearing onward. 50 miles from Isla Mujeras I got clobbered by a storm.

I was treated great when I reached Isla Mujeras. I spent some of the extra time giving rides to all the people who had helped me, and though the wind wasn't really strong enough, I was able to get everyone up on the foils at least once.

Whenever I couldn't work on the boat, I played the dulcimer. I wandered the town, playing for anyone and everyone, in the cafes and markets and in the street. It was really fine, in those narrow cobbled streets not meant for cars, lined with small shops, the smells of coffee, chocolate, fresh bread and pastry mixing with fresh fruit and the crowded aromas from restaurants. Here it was no problem to sit and play wherever I happened to be. Soon people would see me coming and wave me over to play.

I sailed down to the beach and played there, balancing the dulci atop the boat while people sat in the water around me, drinking cold pitchers of iced mango juice.

Finally, one afternoon, I pulled out and headed south camping on the beach a few miles north of Puerto Morales (get out your atlases, folks), where I stopped the next morning for bread and chocolate. I made good time down the coast

About mid-day, I passed Playa del Carmen. Though I cruised the beach a couple times while considering pulling in, I decided I had no time left to explore and pushed on, even though the weather was deteriorating. I continued on, quickly running into heavy seas and lines of storms moving in from offshore. Cruising fast in occasional heavy rains and winds, there was some rough and hard sailing as I headed for the closest safety I could find on a bad coast of solid reef with a strong wind building, the storms coming in, and the sun setting. My chart showed a lighthouse at Xel-Ha with a narrow opening into a caleta, a lagoon made where a freshwater underground river rises before entering the sea. It was unmistakable, with the lighthouse right on the point of the entrance. So I went for it, even though it turned out to be a narrow opening, full of thundering breakers and foam, water geysering up into the air off the reef on either side, all white and black in the deep dusk. I knew I was totally committed, no turning back, once I headed in. I surfed in running under full sail, was buried in a great wave, but kept it together and made it inside. Later, people told me they were amazed I had made it in.

[To be continued in the Summer 2002 NL.]

PHMs

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(PHM 6) was ship number 1. The OOD (I wasn't driving so it wasn't me!) had gotten in a little close to ship number two and we were only about 80 yards off when the command to execute came over the radio. Not having ever done this at foilborne speeds, or at these insanely close distances, the OOD ordered the standard command of "Right 3 degrees per second". We slewed over toward ship number 2, the Aquila (as I remember it), and it became clear we weren't turning fast enough to clear her stern. The OOD quickly yelled "Left full rudder!" and we banked hard away from a certain collision. We backed out to the full 100 yards and tried it again using full rudder this time, which gave us 6 degrees per second of turn and it worked slick.

Anyway, the NAVSEA guys got both the first aborted attempt and the final perfectly executed foilborne search turn on video, if you can find those anywhere.

WELCOME NEW MEMBERS

(Continued From Page 2)

EJ Potter – EJ was born in Michigan and moved to Florida as soon as possible, after a career in drag racing and sundry motor sports and accumulating numerous aircraft and turbine engines, having studied and tested most of them for his own instruction and enjoyment. He is a dealer in turbine engines, and currently has on hand a Russian engine that would be a substitute for the LM2500 as in the PHM.

Claudio M. P. Sampaio – Dr. Sampaio is an Associate Professor at the Naval Architecture and Ocean Engineering Department of the University of Sao Paulo, Brazil. He graduated in Naval Architecture and Marine Engineering in 1983 and in 1993 received a Ph.D from the Yokohama National University, Japan. He has been a member of SNAME since 1983.

Benton Schaub – Ben is a Senior Engineering Specialist with Maritime Dynamics, Inc. (MDI) specializing in Naval Architecture and Marine Engineering. He is an expert in the design of motion control systems for high speed vessels including the simulation of seakeeping characteristics, development of simulation software, and the mechanical, structural and hydrodynamic design of control devices. He has used Computational Fluid Dynamics (CFD) for the design of lifting foil systems for high speed ships. MDI has undertaken development of a line of lifting foils that reduce drag and wake wash while controlling vessel motions.

John Schnabel – John is a civil engineer that has been building boats for 39 years and is still learning. He states that with Cajun blood, it is only natural to love boats and the water. Originally from Baton Rouge, he grew up in New Orleans. He built his first boat, a 16' Pioque in 1962, and then a 36' Lafitte Skiff in 1967. He feels that if Jean Lafitte was a live today, he would have built a Hydrofoil Sail Boat.

Christopher Swanton - Chris is a Naval Architect in the simulations group at Maritime Dynamics, Inc. (MDI). A 1998 graduate of Webb Institute of Naval Architecture, his primary responsibilities with MDI include motion simulations of high-speed craft with ride control systems. These include monohulls, catamarans, trimarans, surface effect ships and SWATH vessels. He is also responsible for collecting and analyzing data from seakeeping sea trials and model tests.

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LETTERS TO THE EDITOR

New 12-Meter Hydrofoil Sailing Craft

[17 Feb 02] Take a look at the BDG Marine twin-rig Spitfire12M...It is quite the craft! Tapered foils, vertical dagger on the bottom. Looks like modification of the 1978-80 foils that the Brits used on the big biplane Tornado. Sails look a bit odd when you look at the weather side. I see sort of reaching going on with booms out a ways in these pictures, not really going to weather. Material of construction is not mentioned. Method for deploying and retrieving foils appears to be an old manila rope... I expect that will change! —Dave Carlson (dcarlson@gainesville.usda.ufl.edu); website: http://www.fastsail.com/catcobbler

Speedboat Racing History Question

[10 Feb 02] Do you know anything about a hydrofoil named the MISS U.S.-3? I have two pictures of it in a 1964 book by E.A. Steiner Jr. and Lee Schoenith called Unlimited Incorporated, with a picture of the 1962 record-setting MISS US on the cover. It made an attempt at the world's water speed record in the 1930s. This was supposed to be the first high-speed hydrofoil. E.S. Evans Sr. was involved. (He is the father of Robert B. Evans who had the hydroplane MISS UNITED STATES III and later the STARS AND STRIPES jet hydroplanes.) The craft, nicknamed the "Whale," was powered by aircraft engines of some type. It rode on a type of 3-point suspension on two hydrofoil wings and rudder-wheel system and was designed on a hydrofoil principle. It had two ladder foil structures on each side, with two steps on the inside one and three on the outside one. The craft had three open cockpits at the bow, and it looks like they each held one person. On the bow were the numbers 55-A. There was a red, white, and blue burge type flag that had three stars and was inside a triangle with MISS US-3 in front. I would like any information on this craft you could come up with, if possible. — Michael Prophet (sharonandmike@mindspring.com)

Response...[10 Feb 02] IHS has no information at hand on this; it is not mentioned in the hydrofoil history references that I have seen, such as D.W. Fostle's book Speedboat. Note that MISS US-I, MISS US-II, and MISS US-IV were all "hydroplane" racing boats, and we have done nothing with those on our site. A better reference would be Leslie Fields' Hydroplane History website. We would be interested in a copy of any info you can dig up on the vessel and its designer and builder. As to the first high speed hydrofoil, that would probably be the HD-4 by Alexander Graham Bell and Casey Baldwin, which set a record of 70.86 mph in 1919. This speed was not exceeded until MISS AMERICA VIII achieved 75.28 mph in the Harmsworth Race in 1929. — Barney C. Black (webmaster@foils.org)

Human Power

[6 Feb 02] I have been editor of Human Power since 1984, but have recently handed over the editorship to Theodor Schmidt in Switzerland. Whether the handover is temporary or permanent depends on his experience. I must therefore do what I can to help him. He has a long history of experimental boats of innovative design, and I believe that he once belonged to the British association of hydrofoilers, the name of which I've forgotten. David Owers contributed an article for us on "Foiled Again!", and Steve Shutt and several others on their boats. I like to claim credit for the start of the human-powered-hydrofoil enthusiasm because I used to row (scull?) a shell of my own design and construction on the Charles River here in Cambridge MA early in the morning in the 1970s. I became annoyed by the high-handed tactics of the Harvard Eight, which used to come around the river bends on the wrong side of the river with the coach in a motor boat yelling at me through a megaphone to get out of the way. So I added an entry to my thesis list at MIT: "Design and build a single-person human-powered boat that will be capable of overtaking the Harvard Eight on the Charles." A super student, Brad Brewster, took this on in 1978 and we tried hard together, but the New England winter made it difficult to succeed on the ice-covered river. I wrote our work up in Technology Review in October 1979, and this inspired several other projects. The principal one was organized by my friend Allan Abbott, whose FLYING FISH hydrofoil attracted wide publicity (including a cover article in Scientific American). When, much later, the DAEDALUS group returned to MIT from its triumphant journey of 119 km in a human-powered airplane from Crete to Santorini, some asked me what they should do next, and I suggested winning the Du Pont prize for the fastest HP boat. The DECAVITATOR resulted from that effort, led by Mark Drela who also did much of the design and construction and powered the boat on the Charles. He won the prize at over 18 knots, much faster than the Harvard Eight could achieve. So you can see why I puff my chest out, even though I did almost zero. I thought that I would at least write a review of your amv CD-rom for Human Power and encourage enthusiasts to join your society. Whether or not I join I will decide later. I pedal a very slow boat with my wife and family nowadays at well below Harvard Eight speeds, and I keep well out of their way. — Dave Wilson (dgwilson@mit.edu)

Response... [6 Feb 02] This caught my eye, because David Gordon Wilson is a name that has been filed in my brain for many years. He was (probably still is) an eminent professor at MIT in the Mechanical Engineering Department. I recall seeing articles by him many years ago about human power for mobility, and I also recall seeing him on the first recumbent bike I had ever seen (which he had designed himself and would ride to MIT each

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LETTERS TO THE EDITOR
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day). Anyway, he's a star. — Bill Hockberger (hockberg@erols.com)

Speed at Sea

[5 Feb 02] Note the webpage URL for Speed at Sea, The Journal for Fast Ship Operators: www.speedatsea.com. — Robert Gore, Circulation Manager, Speed at Sea & Offshore Support Journal, Riviera Maritime Media; Tel: +44 (0)20 8364 1441 ext6; Fax: +44 (0)20 8364 1331 (E-Mail Address: robert.gore@j-l-a.com).

Thesis Topic: Hydrofoil Wake Patterns

[5 Feb 02] I did and will review all your comments and suggestions many times, and I think I will closely consider redirecting my thesis towards investigation of wake patterns and their effects in shallow and confined waters, though hydrofoil resistance in these types of waterways still tickles my mind. I believe I have already mentioned the fact that due to lack of capacities at the University my research will have to lean on theoretical assumptions only. The prices for model constructions are sky-high, and towing tanks in Spain are very difficult (better to say: impossible) to reach. Unfortunately any kind of eventual scholarship is reserved for people having "something else" apart from good will and knowledge. Again, sad but true... Also there are no hydrofoil operators in Spain interested in pushing up the R&D project like mine. For some reason unknown to me all hydrofoils that once were the masters of the rivers and channels in Yugoslavia, my country of origin, are withdrawn from the service, so no full scale experiments can be performed there neither. But I am stubborn enough to put my self in those waters and I believe I will be able to contribute to the hydrofoil society even in the most modest way. — Sasha Jovanovic (salespanac@serbiancafe.com)

Responses...[5 Feb 02, updated 17 Feb 02] According to Vordaman Henry VanBibber, theHYPAM program manager at Panama City, Florida, the hydrofoil induced pressure wave trial data will become declassified in 2008. Until then, I will have to temper my comments. As I read Mr. Patterson's and Mr. Hockberger's comments (below), I have to add my two cents worth. All ships will displace water in some manner. As I see it, hydrofoils also displace water when it gets its lift. Since the foil resembles an aircraft wing, although water is not compressible like air, I believe there is a similarity in pattern where the vortices goes down and out. Thus, the wake is not readily visible from the surface, but still exists. I can attest that with foilborne operations in Lake Washington and Sinclair Inlet in Puget Sound, we received calls from floating crane operators and house boat owners of the rocking motion they experienced causing damage to their property. I believe studies of wake patterns and their effects, especially in confined areas, would be of benefit to operators and designers alike. — Sumi Arima (arimas1@juno.com)

[5 Feb 02] One of the selling points for the Boeing [fully submerged foil] JETFOIL was that it would have a much reduced wake for operations in shallow/narrow waters, but I don't know whether this was just "hype", observation, or based on research or tests done by Boeing or others. The concern came up when the Golden Gate Bridge Authority was seeking passenger ferries that could make good speeds in restricted waters around San Francisco Bay, especially in the channel to the Larkspur landing in Marin County. One problem could have been that the take-offs and landings might generate wakes that would be unacceptable, even though passing wakes from a foilborne JETFOIL might be minimal. Sorry I don't have any hard data - just recollections of conversations and comments. — Ralph Patterson (RPatterson3@austin.rr.com)

[5 Feb 02] Like Martin Grimm I have come to think that hydrofoils may provide the best way of enabling fast craft to operate in rivers without causing significant wake-wash problems. My own arrival at this idea was not based on an expected reduction in drag, however, but on the expectation that the disturbance of the water surface would be less than that caused by a hull operating at the surface. My specific design problem has been to determine the maximum combination of speed and size (passenger capacity, really) that a ferry could have before it would start causing damage to the banks of the river. I've read most of the papers written about wake-wash in recent years, hoping to find the solution to this problem based on using conventional monohull or catamaran designs, since ferry operators have shown a general desire to avoid using what they consider to be exotic design features-and they include hydrofoils in that category. Unfortunately, it seems clear that no one has yet discovered any special hull designs that avoid the creation of problem wake-wash. Different combinations of hull characteristics, including shifting from monohull to multihull forms, mainly tend to shift the speed range at which the problems occur or exchange wave height problems for wave frequency problems. It occurred to me that a hydrofoil might solve the problem by taking the energy now expended at the surface in creating waves and expend it mainly underwater, somewhere between the surface and the river bottom. There would be a turbulent underwater stream extending downstream, hopefully without impacting the banks or disturbing other craft on the river. Also, at a given high-enough speed, it seems likely that the power would be less for a hydrofoil than for a surface-supported craft, so the energy going into that underwater turbulence should be less than what would otherwise go into surface waves and wake-wash. One major uncertainty for me has been whether that underwater turbulence would create a problem on the river bed. River beds

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can have a great range of different compositions, from very soft and mushy to hard rock. The softer types might be stirred up too much. It is already recognized that boats tend to deepen river channels by their passage, by stirring up sediments that get redeposited off to the sides of the channel. That could be seen as a problem in some rivers, if the side areas became too shallow for the boats and activities that had been using them. Martin's comments about the effects of shallow water versus deep water on the performance of an underwater foil are interesting - I've wondered whether such effects would occur, and what their characteristics and magnitudes might be, and how they would propagate toward the river banks or the shore. The effects of forward foils on aft foils is another area of uncertainty to me. (The problem of hydrofoils hitting mostly-submerged floating trees and other large debris at high speed is another big one, but that's not pertinent to this discussion.) I've known that a very large number of hydrofoils have been used for many years on rivers in Russia and nearby countries. I was surprised to read that at least one was designed to operate in water as shallow as three feet! I wonder what their environmental effects have been-was there any concern about the environmental effects of wake-wash when those craft were designed, and have they operated despite causing what we now consider problems? Sasha, your idea for this project started on the basis that something analogous to wing-in-surface-effect might occur for a hydrofoil near the channel bottom. I agree with Martin that that effect wouldn't have a useful magnitude unless the foil were dangerously close to the bottom. Also, as he noted, river bottoms tend to vary in depth and underwater topography, so maintaining that closeness would be an impossibly complex task. I think that focusing your research on the potential for improved L/D due to closeness of a foil to the bottom would not be useful. However, I strongly believe that there is important work to be done in determining the effects of shallow water and relatively narrow channels on the performance of hydrofoils. As I've described above, there is reason to think that hydrofoils could change unacceptable fast craft into acceptable fast craft for use on rivers and other shallow waterways, but we really don't know what the shallow water effects may be, or how to design the best hydrofoils for this application. I really hope you will do your research on hydrofoils in shallow/narrow channels so we can learn to what extent hydrofoils may save us from the problems I've described. — William Hockberger (hockberg@erols.com)

[5 Feb 02] In the late 70s I had the opportunity to analyze all the Boeing Jetfoil Hawaii operating data from all their jetfoil ship trip logs. It was very clear that no Wake measurements were ever made. I was able to came up with detailed seakeeping data and statistics for all their Hawaiian inter-island routes on a month by month basis for the several years they operated. For some of the months and certain sections of their routes the jetfoils were operating at the limit or just beyond their foilborne capability. — Bill White (linksout@foils.org)

[5 Feb 02] Thanks to Ralph, Bill and Martin for their contributions on this interesting subject. Ralph has a good point about takeoff and landing, but with care taken by the helmsman (with the throttle), I should think that this disturbance could be minimized to the point of being acceptable for a short duration. — John Meyer (jmeyer@erols.com)

[6 Feb 02] The problem of starting up and getting foilborne seems to me, also, to be something that can be managed by careful attention to the course followed during that period — the waves have a directionality that can usually be accommodated. (Considering the unavoidable hump(s) as the craft gains speed, there will likely be waves of a size that could be of concern, depending on what's in the nearby area.) The fact that waves produced appear to be small and insignificant is something we now know can be deceiving. Only a few years ago it was generally assumed that low wave height translated directly into low wake-wash and minor environmental concern. I think the problem of the fast ferry Chinook in Seattle (and many other ferries) resulted from that error, although they did also attempt to estimate the energy in the waves and use that as a criterion. (The developers of the Chinook were very sensitive to the wake-wash issue and actually carried out an extensive analysis and test program in an effort to diagnose the causes of the problem and build a boat that would not produce it.) Now it's clear that these waves can be very long and energy-intensive, despite low height. Sumi, your comments about the effects of waves produced by hydrofoils in the Seattle area are significant. Certainly the weight of the craft has to be borne up in some manner, and maybe I've been deceiving myself to think that the waves generated on the surface should be small just because the volume of water actually displaced by the craft is small. (I previously said I thought the hydrofoil's effects would consist instead of a turbulent stream behind it, beneath the water's surface.) Maybe the whole pressure field developed by the foils generates large surface waves anyway. I've used basically that argument against the claims of those who believe that just because a planing craft or one sup-

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Letters To the Editor allows hydrofoilers to ask for or provide information, to exchange ideas, and to inform the readership of interesting developments. **More correspondence is published in the Posted Messages and Frequently Asked Questions (FAQ) section of the IHS internet web site at http://www.foils.org.** All are invited to participate. Opinions expressed are those of the authors, not of IHS.

LETTERS TO THE EDITOR
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ported by an air cushion is substantially out of the water, its wake-wash effects must be greatly reduced. We know that those types of craft can produce unacceptable wake-wash. I think you've pointed out a flaw in my thinking up to now. (I'd appreciate the thoughts of others on this, too. For a couple of years I've been saying I think hydrofoils may at last have found their niche in river and channel operations and that a hydrofoil resurgence may lie ahead, in view of the number of such places where ferries could be used. If we can't find a way around this issue, it's another faded opportunity for many potential routes.) Sumi's recollection of floating cranes and house boats being made to rock by hydrofoils reminds me of another situation. A couple of years ago, two "low-wash" "River Runner" catamaran ferries of the type developed in Australia in the early 1990s by Graham Parker (with Lawry Doctors as hydrodynamicist, I think) were put into service on a river in the Netherlands. It was expected that they would be able to do 30 knots without causing any problems at all. Testing of the first craft before they were delivered showed they had more than met the specified wake-wash requirements (based on wave height, of course). But they ended up having to slow to 13 knots in a couple of zones, to avoid causing fuel barges and other floating facilities along the river to surge and rock. They generated very low surface waves, but undesirable effects resulted nevertheless. The report I read actually referred to them as "pressure waves." I have tried without success to find information on wave-wake-wash measurements for hydrofoils. Bill is sure that was never done for the Jetfoils in Hawaii. Anyone have any other clues on this? Hydrofoils have operated in many other areas, and it's hard to think there was never even a perceived problem and therefore an interest in doing some measurements. The terminology here is a mess. I used to think I knew what wake was, and wash, and waves, but they've gotten all mixed up together in recent years. I'm just going with the flow, here (used to know what flow was, too) and hoping we all know what we're talking about. — William Hockberger (hockberg@erols.com)

[11 Feb 02] The 'River Runner' catamaran ferries were an in-house design of NQEA Australia that followed on from the experience they gained from building the earlier 'Rivercat' low wash catamaran ferries for Sydney Harbour. The designer of the 'Rivercat' was indeed Grahame Parker and you are also correct that Associate Professor Lawry Doctors provided hydrodynamics analysis and advice in developing the hullform. The 'Rivercat' design was the subject of one or more technical papers at the time, and I have a copy of at least one of those in case it is of interest. Account was taken of the operation of the 'Rivercats' in the relatively shallow Paramatta River when the hydrodynamic analysis was undertaken. At the time, I believe the target was to minimise wave-making resistance as it was reasonably concluded that this parameter had a direct relationship with the severity of the wash that was generated. — Martin Grimm (seaflite@alphalink.com.au)

Member List

[4 Feb 02] Are there any IHS members from Oklahoma? — Matt Delaney (Mattbdelaney@cs.com)

Response... [4 Feb 02] You are the only one. Note that members have access to the IHS membership list at www.foils.org/IHSMem501.pdf. This file is password protected; members in good standing may request the password by email from the webmaster (me). IHS members are asked whether they want their information to appear on this list to be accessible to other members. Some decline, so the list is not 100% complete. Also, the list is normally not 100% up to date... we normally update it only once or twice per year. — Barney C. Black (webmaster@foils.org)

Buoyant Foil Idea for HPV

[4 Feb 02] I sit here on Cape Cod in the winter, relishing the Patriots going to the Super Bowl, and looking back on what a fun summer we had with this boat. I then realize it is time to say the thank-yous that are long overdue, and get into the next redesign of what is already a very successful boat. It weighs sixty pounds, as can be seen, is nothing more than an old wind surfer, a lawn chair, pedals, and a BIG prop. That is a three-blade 16" dia. with a 17 " pitch from an old Harken Waterbug. The drive gears are from a lawn spreader (aluminum 5 to 1 ratio). The prop shaft is from a string trimmer with a 45 degree geared bend at the bottom. It took us until August to make it reliable. This boat will do six mph all day long out in the open ocean. Two foot waves are fun, but three or more wash right over it. But what the hell, it's summer! We encountered some MAJOR drag here. At eight mph, there is a four inch wake behind it. We even tried to get it to fly, but could not overcome the drag of this hull at speed. No big deal. It is very seaworthy, and we learned alot from it. The biggest problem we have with it is that we can't pedal as hard as we like without the gears skipping. The new design will be fully submerged airplane wing-shaped foils made from old body surfing boards. What I am figuring is this. Why not make my wings as buoyant as possible? Then, I won't need to waste weight building a floating hull. I will use foam "noodles" as outriggers to make up for what the foils won't hold at rest. I can make a hollow tube frame out of aluminum, and a seat from nylon webbing. I've also got a line on some 1/4 inch thick thermoform sheets-you heat them with a heat gun (not a hairdryer) and shape them. The new drive unit will be a figure-eight chain drive with a seven to one ratio. I'll keep you posted better this time. — Brian J. Burgess (treedude2@juno.com)

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EXTRA FOR THE ELECTRONIC EDITION

LETTERS TO THE EDITOR

(Continued From Previous Page)

Foil Design Guidance Needed

[4 Feb 02] I am restoring and optimizing a 1969 Irwin 24. Its keel has an “L” design fin and ballast torpedo. The foil consists of a one inch thick steel plate encased in fiberglass and faired to a section that is similar to NACA 00-series sections through station 6; then tapers to a blunt trailing edge. I have some experience with symmetrical foil optimization; however always with sections in the 8% to 12% thickness range (and no data on less than 6% thickness). I have never implemented a foil less than 7% (even when strength and ballast were not considerations) and I am contemplating taking one of two options: 1.Maintaining the thin section, leaving the foil in tact (excepting minimal fairing) through section 6, tapering the trailing edge to 1/16th inch and squaring off (this may require increasing the span ~3 inches); making the foil a very close approximation of a NACA 00-series section with 4% thickness. 2.Building up the existing foil section to a NACA 0006 or NACA 0008 section (this may require increasing the span ~1 inch and add approximately 100 pounds to the displacement). Option 1 is far less work, but would change the plan form design slightly. I am not particularly worried about moving the center of lift slightly back because I have removed a 6 inch deep skeg that was a retrofit between the keel and rudder. In any event I am keen on cleaning up the trailing edge. Option 2 would be a good deal of work that would require some benefit to justify undertaking. The plan form data on the keel is as follows: Span = 24 inches, Chord = 45 inches, Max thickness = 2 inches, Sweep Angle = 45 degrees. The torpedo height is 12 inches, the torpedo is V shaped where it meets the foil (120 degrees at the foil interface and the at the bottom) and has a total length of 58 inches. Total displacement is 3000 pounds. Thanks for any guidance you can afford me. — Tom Graham (TGraham@entergy.com)

Response... [6 Feb 02] Paul Bogataj had an article in Sailing World a while back concerning keel sections and leading edge shapes. I’d download XFOIL and use it to look at different sections. You can put in your section as it is, NACA sections for comparison, and use it to make modifications to either. — Tom Speer, F-24 AMA DEUS (me@tspeer.com) website: www.tspeer.com

Photogenic Hydrofoils For Ad Campaign

[3 Feb 02] I have been doing some preliminary research to find a working hydrofoil for an advertising photoshoot. I was wondering if you could possibly help me locate a working hydrofoil on the US west coast. It could either be a larger passenger craft, or a small, modern looking individual craft. From what I can tell from your site, the largest variety of boats in service would be in Italy? In fact, my search is not confined to the USA. Even though I would prefer finding something suitable here, we would also consider Italy or Australia. I am a bit worried about doing anything in Russia, even though their boats are among the most photogenic. Maybe there is anyone with a Russian boat outside of Russia? — Volker Dencks (volker@harddriveproduction.com) phone: +1 323 665 6503

Responses... [3 Feb 02] Surface piercing foils seem to be what you have in mind; they do tend to highlight the fact that it is a hydrofoil for the view angle you have in mind for your layout. MANU WAI is still a snappy looking hydrofoil (with its mods) despite its age. Sydney Australia is also a nice backdrop for a photo shoot. Another suggestion is to consider Les Dauphins du St-Laurent based in Montreal, Canada. They have a very smart and clean looking white Voskhod named POLNIA III and four others. You can view a photo in the November 2001 issue of Classic Fast Ferries (free to download from http://classicfast-f.homepage.dk) which features this operator on page 19. Of course, a more extensive article on MANU WAI with several photos is provided in the latest issue of CFF, December 2001. — Martin Grimm (seaflite@alphalink.com.au)

[3 Feb 02] Here are few quick ideas. If anything I suggest “strikes a chord” with you, then I can provide further info 1. As your ad is for an automobile, I am assuming that you want a motor-powered hydrofoil, therefore I am not mentioning sail-powered or human powered hydrofoils. 2. I don’t know of anyone operating a hydrofoil ferry on the west coast of the USA today. There were some Boeing Jetfoils operated in Seattle, but no longer... too bad, as that particular vessel can yield some spectacular photos... take a look at http://www.islandjetfoil.com to get the idea. 3. More recently there were a couple of Jetfoils operating in Florida, Seajets, Inc., but they appear to have ceased operations. There are Jetfoils operating in Japan and other overseas locations. You can locate Jetfoil routes by searching for Jetfoil on the internet. 4. There is a company that operates hydrofoils on Lake Ontario. See http://www.seaflights.com/. These are modern hydrofoils, but are the Russian surface-piercing design. 5. Overseas there are Russian hydrofoils operating in Greece and other areas. There are some links to operators on our site at www.foils.org/linksout.htm. 6. There are are few earlier hydrofoils around. For example, some of Helmut Kock’s hydrofoils are still operating on Lake Titicaca in Peru. 7.Scaling down in size, you might want to look at Steve Gresham’s unique and sleek personal hydrofoil Manta (it’s for sale). See his posting, photos, and film clip on our site at http://www.foils.org/announce.htm#sale. That is all that occurs to me at the moment. — Barney C. Black (webmaster@foils.org)

HYDROFOIL ANNOUNCEMENTS

Meetings, Conferences, Workshops, Seminars, Telecasts

Junkyard Wars

On Feb.13, 2002 a show called Junkyard Wars was broadcast on The Learning Channel. Sunday the 17th at 10pm PST. It was repeated on Saturday the 23rd at 9 pm PST. If you missed the show, keep an eye out on the TV listing; it will surely be shown again.

This is the USA version of Scrapheap Challenge, broadcast in Britain Nov 18, 2001 by Channel 4. See http://www.channel4.com/ scrapheap/ scrapheap.html. As a participant in this breathtaking, already-a-cult series, (I outlined, developed and calculated a weird "scrap-craft") I consulted to the British team "Catalysts" (3 Jaguar engineers) http://rotaryboy.screaming.net/ in their battle against time and to the mighty American team "The Mulewrights". — Claus-C. Plaass, Pickert- 10, 24143 Kiel, West Germany (plaass@foni.net), phone: +49-431-36 800; USA showtime provided by Matt Kirk (matric39@gte.net)

HIPER 2002

The next High-Performance Marine Vehicles conference (HIPER 2002) will be held in Bergen on the following dates: 14-17 September 2002. For details, visit: www.ifs.tu-harburg.de/HIPER/HIPER_02.html. I welcome all hydrofoil activists. We have special funds to waive the fees for young participants (up to 35 years) of EC citizenship or those who have lived the past 5 years in the EC. — Volker Bertram (Bertram@hsva.de)

People In the News

Bob Phillips

New IHS Member Bob Phillips is also the new owner of HIGH POINT PCH-1. He is restoring the vessel and has just started a webpage dedicated to this effort. It (the website) is located at: http://mywebpage.netscape.com/rpstnphi/instant/taz.html.

Meyer and Black

In recognition of stellar service to the Society, the IHS Board of Directors has elevated Mr. John Meyer and Mr. Barney Black to the status of "Meritorious Life Member". The title of Life Member was originally bestowed on the founders of the Society over twenty-five years ago. Its reinstitution reflects the Board's appreciation for the vital services of these two men. As President since 1991, Mr. Meyer has inspired and led the Society in all its activities. As Webmaster since 1996, Mr. Black has created and maintained the widely recognized website that has become the very lifeblood of IHS. Their dedication, unflagging enthusiasm and professional competence have made IHS the focused, productive professional society that it is today.

Ian Wrenford

Ian has just completed a scratch-built model of the PT 50 *FAIRLIGHT* (See photos).

An article and photos will appear in *Classic Fast Ferries* magazine. More photos and Ian's correspondence with IHS during construction is posted on the website at www.foils.org/models.htm. His email is iansharyn@bigpond.com.

Misc. News Blurbs

We Take Plastic

Credit Cards are now accepted for IHS Membership payments from the USA and over 40 countries. Note that if you are paying with a non-US credit card, your bank will convert the $20.00 charge to your own currency and may charge a small service fee for currency conversion (this should be less than postage to the USA for a payment by mail). Hopefully this new service will make it easier for hydrofoilers to join or renew, from inside or outside the USA. IHS publications, including the Advanced Marine Vehicles CD-ROM, may also be purchased by credit card

New Video Page

Films and Videos about or featuring hydrofoils are the subject of a new page on the IHS website. We need more references to build the content of this page, so all members and visitors are urged to contribute to this page, which is at www.foils.org/popvideo.htm.

The NEWSLETTER

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

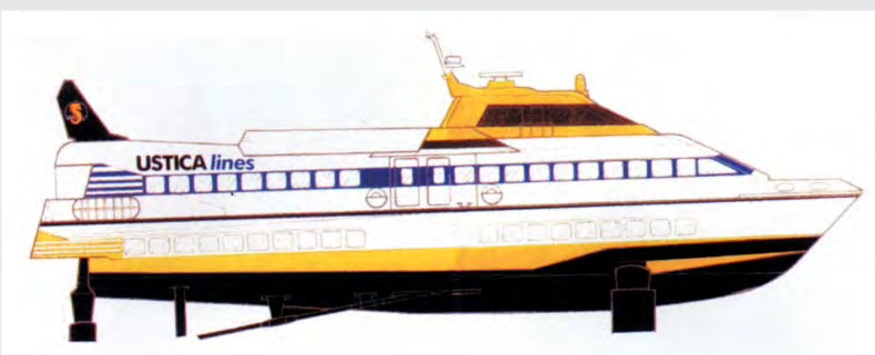
Editor: John R. Meyer | Summer-2002 | Sailing Editor: Martin Grimm

USTICA LINES INTRODUCES THIRD RODRIQUEZ FOILMASTER HYDROFOIL

(From Fast Ferry International, April 2002)

The third Rodriquez Foilmaster hydrofoil ordered by Ustica Lines, *Natalie M,* was delivered to the company at the end of February. The vessel is virtually identical to *Adriana M,* the Foilmaster that entered service three years ago on the operator's route network serving the northwest tip of Sicily.

Two MTU 16V 396 TE74L diesels, rated at 2,000 kW at 2,000 rpm, power fixed pitch propellers via ZF BU 755 gearboxes. Service speed, with a full load of 240 passengers, is 38 knots.



Equipment in the wheelhouse includes a Decca BridgeMaster radar, Sperry Marine ES 500 depth sounder, JRC NWZ 4570 gps, Navionics Geonav 11 Flash plotter, and Sailor vhf/ssb radios and satcom.

Growth at Ustica Lines since the company was formed in 1993 has been impressive. When its first Foilmaster, *Eduardo M,* was delivered in 1996, the fleet totaled four hydrofoils. The arrival of *Adriana M* in 1999 increased the number to five. This summer, the company

See FOILMASTER, Page 3

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.

2002 DUES ARE DUE

IHS Membership is still only US$20 per calendar year (US$2.50 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 www.foils.org/member.htm and follow the instructions.

INSIDE THIS ISSUE

PRESIDENT'S COLUMN

I am pleased to report that the IHS continues to expand and further improve it services to both members and the hydrofoil community.

Since the beginning of the year a total of 25 new members have joined the IHS from various parts of the world including England and Singapore. Membership Chairman, Sumi Arima, through his e-mail solicitations in response to those contacting the IHS in various ways, has been successful recently at bringing in about five new members just this year so far.

Since the last Newsletter, through the efforts of Barney Black and Bill White, your Society has instituted a new IHS Bulletin Board feature on the web site. It has already received substantial traffic, and only about ten percent of the messages posted have required any assistance or editing by Bill White or Barney Black, meaning that their workload has been reduced. Photographs can be included directly in the messages. The service we are using costs under $20 per month, and that includes the software, which is continually being upgraded by the provider. The messages are categorized into twelve subject areas, and it is possible for any IHS member to be designated to receive messages automatically in his choice of subject areas (any or all). The person submitting a message designates the category he thinks is most suitable. Look for a short article on the New Bulletin Board by Bill White in the Autumn Newsletter.

Many weeks ago you should have received a Ballot for the election of the Board of Directors Class of 2002-2005. We hope you have taken the opportunity to become familiar with these people who are willing to serve the IHS, and voted accordingly.

Between Steve Chorney and myself, we have "manufactured" and sent out about 150 AMV CDs. See the Autumn 2001 and Spring 2002 Newsletters. Recipients include individuals, Universities, and Human Powered Vehicle organizations/individuals from all over the world.

The Board of Directors has decided to proceed to scan additional sets of Advanced Marine Vehicle (AMV) documents and produce CD-ROMs 2, 3, and so on. A committee consisting of J. Meyer, W. White and K. Spaulding will review documents for selection. No time table has been established for the next AMV CD at this time. We will keep you posted on progress.

I'd like to remind all readers of the very interesting periodical, "Classic Fast Ferries" that is available as a Adobe file at classicfast-f.home page.dk. Member, Tim Timoleon, does a fantastic job of generating this 16 page document every 2 months and makes it available at no charge. Its all about the heyday of passenger hydrofoils, hovercraft and catamarans, plus relevant news. I encourage all members to download these periodicals which have high quality pictures, well-written text and interesting format.

John Meyer, President

WELCOME NEW MEMBERS

Vincent Browne - I live in Alaska, have a high school education and some college. My work experece is mostly architectural. I have always been interested in objects that float in water, especially ones that can move in it I have experience in hydroplaning but limited to highways. This year I did it about 60 mph. for a short trip on water on ice but ended abruptly in deep snow. I would like to build a small hovercraft and side thrusters for my s.u.v.

Bruce Bryant - Bruce lives in the Seattle area & had worked on the Boeing hydrofoil program for 25 years. He was a test engineer, pilot & manager of the Systems Test Organization & worked on most of the Navy & Commercial hydrofoil programs. Bruce is currently continuing the R & D work on HYCAT (HYdrofoil-CATamaran) started over 20 years ago by the late IHS member Dr. Dale E. Calkins.

Andrew Gibson – Andrew is a "Brit", living in Los Angeles. Although interested in sailing for many years, he has only recently developed an interest in hydrofoils. Currently he is building a relatively fast (non-hydrofoil) 20' trimaran, but is already considering his next project as a sail-powered hydrofoil. Andrew is not content with simply buying and sailing one, but looking forward to learning more on the subject.

Myrel Harner – Myrel is from Georgia, a retired Air Force, B-29 flight Engineer and wound up as Maintenance Superintendent on heavy jets. He acquired a 1958 Grumman Hydrofoil some 11 years ago and has had it in the water four

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FOILMASTER
(Continued From Page 1)

will be operating eight hydrofoils and two catamarans. Since 1996, Ustica Lines has also owned 33% of Rodriquez Cantieri Navali.

The three Foilmasters are the only newbuildings introduced by the company. Ustica Lines has acquired a single RHS 140, two RHS 160s and two RHS 160Fs from other European operators.

RODRIQUEZ *NATALIE M*

Length overall	31.2 m
Length waterline	27.0 m
Beam moulded 6.8 m	
Beam over foils	14.1 m
Depth	3.9 m
Draught	
- On foil	1.7 m
- Off foil	4.0 m
Displacement	
- Full load	124 tonnes
Deadweight	29 tonnes
Capacities	
- Fuel	9,766 litres
- Fresh water	600 litres
Passengers	
- Main deck	132
- Upper deck	108
– Total	240
Crew	6
Speed	
- Lightship	40 knots
- 100% load/90% mcr	38 knots
Range	330 n miles
Main engines	2 x MTU 16V 396 TE74L 2,000 kW at 2,000 rpm

Seven of the company's hydrofoils are based in Trapani and operated either to the Egadi Islands or on longer routes to Naples and Pantelleria. The sole RHS 140 is operated off Sicily's southwest coast, between Linosa and Lampe-dusa.

This summer, Ustica Lines is introducing a new route network in the northern Adriatic linking the Croatian towns of Porec, Pula, Umag, Rovinj and Mali Losinj with Venice and Trieste. First catamaran services were scheduled to be operated on May 1 of this year.

2001 DELIVERIES AND ORDERS

(From January-February 2002 Fast Ferry International)

According to the survey of 2000 deliveries and orders published in Fast Ferry International a year ago, fast ferry builders entered 2001 with outstanding orders for just 29 vessels. Final deliveries by the end of the year were that not much higher, just 40 newbuildings and three stock vessels are included in the 2001 listing.

The situation regarding outstanding orders is far healthier. By the end of 2001, these amounted to 68, the highest figure since the end of 1997. The mix of orders is significantly different from that of four years ago though.

The smaller end of the market is currently attracting most interest, 53 of the outstanding orders are in the 50-199 seat range while only 8 are for vehicle ferries, and just one of these has a capacity of over 100 cars. At the end of 1997, there were only 11 Outstanding orders for 50-199 seat vessels, but 22 for vehicle ferries.

The majority of orders for the 'traditional' 250-450 seat market sector have been placed by operators in the United States and People's Republic of China. The long anticipated fast ferry order boom in the United States may have started. Some 33% of 2001 deliveries and 28% of outstanding orders involve American customers.

Few yards are building ahead of orders at present, there are only half a dozen or so stock vessels available worldwide. Previously unreported deliveries during 2001 include a 30m monohull by Cantiere Navale Foschi; two 28m monohulls and a 32m monohull by Cheoy Lee Shipyards; a 6.2 catamaran by Iris; and a 22m catamaran by Sabre Catamarans International.

Three vessels listed as outstanding orders a year ago are not included. Work has yet to start on a Derecktor NGA 35m catamaran for New York Fast Ferry; design changes specified by the customer reduced the service speed of a Crowther Multihulls 25m catarnaran delivered by FBM Aboitiz Babcock Marine to less than 25 knots; and an FBM TriCat 45m catamaran launched in 1999 by the Pequot River Shipworks has yet to enter service.

Where a contract has involved a vessel not built during 2001 or 2002, the year of construction is listed in brackets. In the 'Changes of ownership and leases' section, vessels appear as having moved directly between operators although some will have passed through intermediaries such as banks or finance houses. For the purposes of this summary, a fast ferry is regarded as a vessel capable of carrying at least 50 passengers, or an equivalent amount of passengers plus cargo, at a minimum service speed of 25 knots.

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ORDERS AND DELIVERIES
(Continued From Page 3)

Deliveries and Orders at December 2001:

	Deliveries	Orders	Total
Catamarans	30	46	76
Foil assisted catamarans	1	6	7
Hovercraft	-	1	1
Hydrofoils	-	4	4
Hydrofoil catamarans	-	-	-
Monohulls	12	9	21
Surface effect ships	-	1	1
SWATHs	-	1	1
Wavepiercing catamarans	-	-	-
Totals	43	68	111
Passenger Ferries			
50-99 seats	6	15	21
100- 149 seats	7	9	16
150-199 seats	5	13	18
200-249 seats	1	2	3
250-299 seats	4	7	11
300-349 seats	2	2	4
350-399 seats	6	4	10
400-449 seats	5	8	13
450 + seats	1	-	1
Totals	37	60	97
Passenger/Vehicle Ferries			
5-49 cars	1	5	6
50-99 cars	-	2	2
100- 149 cars	-	-	-
150-199 cars	2	-	2
200-249 cars	2	1	3
250-299 cars	-	-	-
300-349 cars	-	-	-
350-399 cars	-	-	-
400-449 cars	1	-	1
450-499 cars	-	-	-
Totals	6	8	14

Medium speed versions of fast ferry designs are not included, and it should be borne in mind that as many companies also build other types of vessels, production activity at some yards during 2001 and 2002 will be greater than a listing of only fast ferries would suggest.

HONG KONG MARINE DEPARTMENT ISSUES TWO COLLISION REPORTS

(Excerpts From Fast Ferry International, March 2002)

The Hong Kong Marine Department has published the results of its investigations into two collisions involving Turbojet fast ferries operating night services between Hong Kong and Macau. The accidents occurred within two months of each other in 2000.

On Aug 1, China Shipbuilding PS 30 fully submerged hydrofoil *Praia* struck the chain of a buoy in Victoria Harbour. In the second incident, on Sept 21, FBM Marine TriCat 45m catamaran *Universal MK* 2006 came into contact with a towline between a tug and a barge, causing the tug to capsize and sink with loss of 4 lives.

TurboJet operates a fleet of 16 Boeing Jetfoil hydrofoils, 2 CSSC PS 30s, 2 Kvaerner Fjellstrand FoilCat 35m hydrofoil catamarans and 8 FBM TriCat 45m catamarans between Hong Kong and Macau. The PS 30s were designed and built in Shanghai, but are known locally as Jetfoils.

Detailing the collision between *Praia* and the chain of Government Mooring Buoy B20, the Marine Department says, "The Jetfoil departed Macau Ferry Terminal [Hong Kong] at about 0401 for Macau with 37 passengers on board. It was manned by a Master, Chief Officer, Night Vision Officer, Chief Engineer, three deck crew and two cabin attendants.

"The Jetfoil was steering 280 degreesT. The pump speed of the waterjet system was increased to 2,000 rpm at about 0405 on clearing Macau Ferry Terminal. After attaining a speed of about 27 knots, it became foilborne at about 0407, near Victoria Buoy. The course was then altered to 260 degreesT to steer along the outer limit on the starboard side of the Southern Fairway.

CSSC PS 30 hydrofoil shortly after leaving Hong Kong for Macau

"About this time, the Chief Officer reported sighting a target on the starboard bow crossing from starboard to port. The Master ordered the Chief Engineer to reduce speed to 1,800 rpm. The Master also altered course to starboard to steer 270 degreesT to avoid collision. The jetfoil passed astern of the target at about 0408 and then the Master altered course to port to meet the original track.

"According to the Master, he sighted at 0409 a semi-submerged object about 2030 feet away on the starboard bow. The Master immediately increased the helm to port to pass the object. The Master felt a collision near the starboard quarter on passing the semi-submerged object, and the starboard engine automatically shut down.

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HONG KONG COLLISION
(Continued From Previous Page)

"The Master claimed that he was not aware the vessel had collided with B20. He speculated that the vessel might have collided with the semi-submerged object. Although the port engine was still running, it was stopped by the Chief Engineer in order to stop the vessel.

"The Master ordered announcements to be made for passengers on the public address system that the vessel had experienced an engine breakdown and to check if anyone was injured. Only a cabin attendant had sustained minor injury.

"During an inspection after the collision, no apparent damage was noted on the body of B20, but some new damage on the chain was noted. The position of the new damage, below the sea surface, coincided with the position of the damage on the after strut of the Jetfoil below the waterline. The investigating officer therefore concluded that the starboard after strut of the Jetfoil had collided with the chain of B20.

JETFOIL ACCIDENT

(From Fast Ferry International, March 2002)

Fifty-two passengers and crew were injured in the Canary Islands last month when a Kawasaki Heavy Industries Boeing Jetfoil 929-117 hydrofoil operated by Trasmediterranea suddenly came off foil while travelling at 42 knots.

The incident, on February 10, occurred 10 minutes after *Princess Teguise* had left Las Palmas, Gran Canaria, on a 1700 service to Santa Cruz, Tenerife. The Jetfoil was reportedly running in heavy seas at the time, but initial speculation about the reason for the accident centred on damage to the aft foil resulting from a debris strike.

A rescue vessel and a helicopter ferried medical staff to the Jetfoil, which arrived back in Las Palmas, under tow, at approximately 1900. The most seriously injured were then taken to a hospital.

Trasmediterranea has operated Jetfoils in the Canary Islands since 1980

Princess Teguise was carrying 102 passengers and a crew of five. Most of those injured suffered minor cuts and shock. However, 21 were treated in a hospital, five of whom were admitted with serious spinal injuries or cuts. Passengers who did not have their seat belts fastened were thrown out of their seats. Passengers who did have their seat belts fastened were also injured though.

One of the doctors attending the victims suggested that while a seat belt will stop a body from shifting forward, it will not prevent it from bending, and this movement can be severe enough to cause damage to the spinal cord. He also stressed, however, that if none of the passengers had been wearing seat belts, many of them could have been killed in the accident.

PHM UPDATE

February 22, 2002

By Eliot James (IHS Member)

It is our intention to open the Aries to tours this summer. Our plans are to cruise downstream and are going to be stopping at larger cities that have waterfront festivities. Tours of a docked vessel have a significantly lower risk factor than chartering. How far we go, will depend on the success of the tours to put fuel in the tanks.

We are planning on using the CIC as the main display area where we will have artifacts as well as video, still pictures, and text documenting hydrofoil development.

We have a lot of cleaning up to do. We are also in need of some painting. In my investigations, it seems there are many types of paint that can be used. Could anyone tell me the best to use over the paint that already exists? Am I correct in assuming it is enamel? Is there an "official" color?

We are going to use the 25 hp aft ship hydraulic system to operate the crane we added as well as provide for back up for the steering system. We are going to tap in a 5 hp self contained hydraulic system to power the steering in normal operation. This keeps us from having to have all systems charged when we only need them at small intervals. The 60 hp forward system powers the bow thruster and capstan. We figure on being able to raise and lower the foils with this amount of hydraulic power. (We will have the capability of the 3000 psi but

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PHM UPDATE
(Continued From Previous Page)

not the volume, which will significantly slow the hydraulic response time.) All the pumps are still on the main gearbox supplying foilborne hydraulic power. The oil, I believe, is a synthetic as there are warning signs stating that, it is red in color, can anyone tell me what it is and where to find some more of it?

How much was the Automatic Control System (ACS) used, or more importantly, how effective was it in hullborne travel?

Does anyone know how much power was required for the foil system? Foilborne or hullborne? I am wondering if we have enough to test an ACS in the hullborne mode without the main turbine in operation.

FOIL ASSISTED TRIMARAN

Excerpts from Press Release provided by Bill McFann (IHS Member)

TechMan AS, Norway, and Island Engineering Inc., USA, have now completed first phase of the technology verification program involving sea trials of the 43 feet, 7.7 tons foil assisted trimaran test-craft "Island Flyer". As earlier reported, this is a quarter scale of a 53m foil assisted trimaran capable of carrying 450 passengers and 64 cars at maximum. speed of 50 knots.

The water-jet propelled test craft was launched a year ago outside Lexington Park, Maryland and has since completed several tests including development of a new generation motion controller. The controller is capable of controlling lift fraction, heave, pitch, roll and yaw while fitted with feedbacks displaying the craft's running condition and acceleration levels. It is connected to a Miros microwave altimeter for height control and real time wave height measurements.

Generally the test-craft was run at

conditions corresponding to full-scale speed of 38 knots with displacement up to 460 metric tons. The highest speed was logged at 23 knots on the GPS, corresponding to 46 knots full-scale. Water-jet impeller and engine rpm-restrictions limited testing to 75% deadweight (d.w.) fraction. Towing tests, using a calibrated load cell attached to the towing line from a 25 feet planing boat powered by two 150 hp outboards, indicated full-scale power requirements corresponding to 6500 kW at 38 knots and 127 tons d.w. This represents an amazing 30-50% reduction in power requirements compared to catamarans at similar condition, pending choice of comparative vessels.

Post test analysis indicate that full-scale service speed of 45 knots may be obtained at less than 9000 kW at a displacement allowing 148 tons d.w. This is well below the initial predicted power requirements. The full load power-to-dw ratio of around 45 kW per ton at 38 knots service speed matches the efficiency of the largest fast ferries available. This fact should place TechMan's design concept as the most fuel efficient and environmental friendly fast ferry design currently available; way outside it's actual size range.

With respect to sea-keeping, the test-craft on several occasions ran under conditions corresponding to full-scale significant wave heights of appr. 3.5m (typical JONSWAP spectra) while still maintaining speeds of 34 to 38 knots without any incidents of wet deck and sidehull slamming. The picture below shows the wave conditions.

Under all conditions the sea-keeping was exceptional. Unlike most foil-based concepts, we were able to safely stop and take-off again in 3 to 4m [full-scale equivalent] waves after doing regular dead ship wave-height samplings. The onboard Data Acquisition System recorded LCG accelerations below 0.1 g RMS in all headings, while passengers could easily stand up-right without the need of holding to keep their balance. Runs in quartering and beam sea conditions confirmed that combined effects of hull design and active flap control eliminate roll motions and provide good directional stability. Even in bow waves approaching 4m (full scale), the pitch motions were very low and there was little or no spray generation from the bow. The foils also provides significant passive roll damping during dead-ship conditions in rough waves. The probability of seasickness occurrence in higher sea-states is very low, not to say unlikely. The reason being

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FOIL ASSISTED TRIMARAN

(Continued From Previous Page)

the low motion amplitudes and that the frequency lies above the typical sea-sickness band. One has to look for catamarans and monohulls of approximately double the length fitted with T-foils and trimtabs/ interceptors to find similar low acceleration levels.

The concept, granted US & international patents, is currently available in 15 different design versions ranging from 16 m, 40 pax-only version to 68 m, 570 pax/86 cars version.

TechMan is now seeking contact with fast ferry operators, yards and investors worldwide to introduce the new generation high performance vessel.

For further information please contact; Rune Odegird TechMan as Tel. +47 57 86 66 33 Fax. +47 57 86 66 05 e-mail: techman@vestdata.no

MAN B&W DIESEL ENGINES SLATED FOR IX 515

(From Fast Ferry International, March 2002)

MAN B&W Diesel is to supply four 18VP185 engines rated at 3,700 kW for installation in a Rodriquez Aquastrada TMV 84 monohull that is to be delivered to a Spanish operator in early 2003. The engines will be delivered to the Rodriquez yard in Pietra Ligure, near Genoa, in the Spring.

Two 18VP185s, rated at 4,000 kW at 1,950 rpm, have also been ordered for the US Navy's IX 515 surface effect ship testcraft. Launched in 1978 as a Bell Halter 110 crewboat, the vessel was later purchased by the Navy.

Impression of reconfigured IX 515 foil assisted catamaran

In 1982 it was lengthened by 15m to 48.5m and was redesignated SES-200. Eight years later, the vessel was retrofitted with MTU 16V 396 TB 94 diesels and Kamewa 71 SII waterjets, increasing its maximum speed from approximately 28 knots to over 40 knots, and it was given the pennant number IX 515.

The vessel is now at the Pacific Marine yard in Hawaii, where it is to be converted to a foil assisted catamaran featuring two propulsion pods on the forward foil. Anticipated speed, when carrying 100 deadweight tonnes, is 26 knots.

PROPELLERS STILL THRUSTING TOWARDS PERFECTION

(Excerpts From Speed at Sea, December 2001)
by Doug Woodyard

Propellers are not perfect machines. They might absorb 100 per cent of the shaft power but only something more than half of this power is used for ahead thrust, even under good conditions. Highly loaded propellers with a large power input on a small diameter may have a much lower efficiency; the losses are wasted to waves and heat.

Ideally, says the German specialist Promarin, a propeller should turn as much engine power as possible into thrust with as little noise as possible. The higher the number of blades, typically between 3 and 7, the higher the cost of the propeller and the higher the frequency of the vibrations caused by the propeller. Generally, the higher the power input, the higher the number of blades desirable.

Produced in Germany, the Contur propeller is described as a unique design with blades made from carbon fibre composite. Each blade is individually replaceable, a procedure that can be carried out with the vessel afloat, contributing to economics that help to offset the higher initial cost. Available with up to six blades, the propeller is suitable for both planing and displacement hulls.

Among benefits cited are smoother running and higher efficiency. Efficiency is enhanced by ability of the blades to flex slightly under load; hence, under acceleration, the pitch is slightly reduced to yield better performance. Blade flexibility smooths out propeller vibrations.

Several US boatbuilders offer the Contur propeller as an option, including Lazarra, which builds motor yachts in the 20m-30m range, Carver and Neptunus. A Carver vessel reportedly achieved a speed increase of 2.5 knots using the propeller.

Continued on Next Page

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PROPELLERS

(Continued From Previous Page)

Significant merits are claimed by the developers of the RingProp, a propeller with a circumferential ring connecting the blades, forming a profile constructed from a single die. Advantages are promised in applications ranging from jet ski boats to deepsea ships, including fast vessels.

Originally devised in Australia as the 'Stealth' propeller during the 1980s, the RingProp will now be developed and marketed from the UK's Haslar Marine Technology Park, with manufacturing carried out in Tasmania.

The RingProp configuration reportedly improves thrust and overall performance at all speeds

The RingProp configuration reportedly improves thrust and overall performance at all speeds, underwriting fuel efficiency increases of 8 to 12 per cent over a conventional propeller. Vortex thump is reduced and steering and manoeuvrability enhanced. Furthermore, the ring is said to control much of the blade tip vortices, which in turn fosters less hull resonance and reduced vibration.

According to RingProp UK chairman Johnny Townsend, the propeller can outperform open bladed types in practically every way, including manoeuvrability, sharp angle turns at speed, bollard pull and acceleration from a standing start. At high rpm the radial flow over the ring would virtually eliminate cavitation.

Performance claims from pre-production trials are reportedly supported by tests carried out at MARIN in The Netherlands and at DNV's Trondheim test facility.

Most of the CP propulsion systems supplied by Norwegian specialist Servogear have been installed in high speed monohull or catamaran vessels. The CP propellers form part of a package that commonly embraces reduction gearboxes, sterntubes, shaft brackets and effect rudders; propeller tunnel design is also undertaken. *[Editor's Note: The article continues to describe Servogear and other European propeller developments, including controllable pitch propellers.]*

MARITIME AND COASTGUARD AGENCY PUBLISHES FAST FERRY WASH REPORT

(Excerpts From Fast Ferry International, April 2002)

The United Kingdom's Maritime & Coastguard Agency has published 'Research Project 457, A Physical Study of Fast Ferry Wash Characteristics in Shallow Water. Final Report'. The 115 page document can be accessed on the MCA website at www.mcga.gov.uk/ publications/research/457rep.htm or on the Queen's University Belfast website at:
www.qub.ac.uk/waves/fastferry/ferrywashhp.html

Describing the work as "essentially a follow up study to 'MCA Project 420, Investigation of High Speed Craft on Routes Near to Land or Enclosed Estuaries', the MCA says, "In 1999 the Queen's University of Belfast was awarded a contract to undertake a physical study of fast ferry wash with a view to obtaining a better understanding of the physical characteristics of the long period waves which are generated. Kirk McClure Morton was engaged as sub-contractor to undertake mathematical modeling of the transformation processes which take place as the wash travels from the ship to the shore."

Summarizing the results of the study, Queen's University says, "Based on a combination of physical model tests in a shallow wide towing tank and an extensive range of field measurements, the following has been concluded:

Solitary Waves

"Both conventional ships and fast ferries can produce solitary type waves, which are of very long period and can travel several ship lengths ahead in very shallow open water. Large displacement ships operating in shallow water are particularly prone to generating this type of wave.

"However, with respect to fast ferries, the following should be noted:
- These waves are only generated at subcritical and near-critical depth Froude numbers when the water is very shallow with a small under keel clearance of 1m to 2m. Consequently they occur when there is a high 'blockage'.
- The height is small compared to the main body of the wash and trials with an HSS in Loch Ryan at a depth Froude number of 0.8 and an under

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WASH
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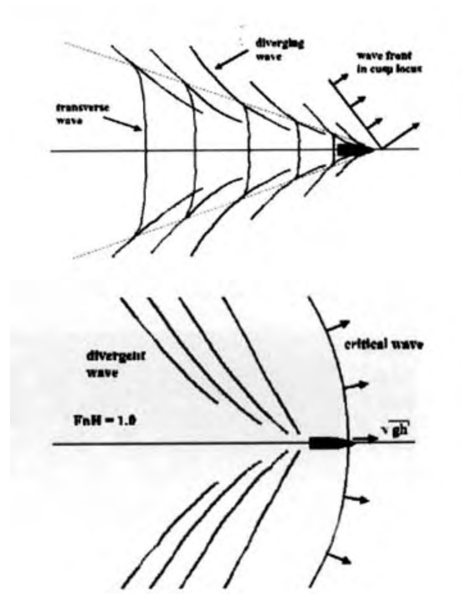
keel clearance of 1.5m has produced a solitary wave height of less than 50mm. -
Solitary waves were not observed at higher tidal levels when the under keel clearance exceeded 2m and the depth Froude number was less than 0.8.
- The height of the solitary wave increases as the critical depth Froude number is approached and subsequently disappears beyond a value of 1.1.
- Vessels operating in the 'hump' speed range at a Froude length number of between 0.4 and 0.6 when operating at depth Froude numbers of between 0.8 and 1.1 are most capable of producing solitary waves.
- Bluff bodies which displace more water at the bow produce larger solitary wave heights and there is a greater tendency to 'bulldoze' the water out of the way.

Super-critical and Critical Wash Waves

"As solitary waves are only generated in very specific circumstances and are very small in height, it is the leading waves produced at super- critical and trans-critical depth Froude numbers in conjunction with the transverse high speed sub-critical waves which are the most significant to users of the coastal environment.

"A mathematical model has been compared to and validated by experimental data. It was found that the model provided a good prediction of the wave patterns, the angle of each wave in the leading group of waves, and the divergence of the wave crests.



Plan view of a typical Kelvin sub-critical wash pattern (top) and critical wave pattern

As a result it was possible to predict the period of the leading waves in the far field and also to calculate the divergence angle between these waves. This angle was shown to be a function of depth Froude number (Fnh) and the x/h (transverse distance/water depth) ratio.

"The length Froude number is an important parameter in intermediate as well as deep water as it influences the point at which a vessel produces its maximum wash when travelling in the critical speed range. A worst case scenario in terms of wash generation occurs when a ship operates at the 'hump speed' (typically between Fri, = 0.4 and 0.6) and the critical depth Froude number simultaneously.

"Catamarans tend to produce wash with distinct wave frequency groups due to phase cancellation of some waves from each hull. This varies with hull length and spacing. In comparison, monohulls generally produce a continuous spread of wave frequencies from the initial waves to the short tall waves. It was observed that catamarans operating in the supercritical regime produce less energetic waves than monohulls of similar length and displacement.

"As the crests of the initial waves in the super-critical wash are continuous, the height of the waves already produced will reduce when the ship slows to sub-critical speed. This is due to the lateral spread of energy along the wave as the crest length increases without further input of energy from the ship." *[Editor's Note: The article continues to summarize other aspects of the study. The reader is advised to refer to the full report referenced at the beginning of the article.]*

ROLLS-ROYCE LAUNCHES MARINE TRENT GAS TURBINE

(From Fast Ferry International, April 2002)

Rolls-Royce is working on a Marine Trent 30 gas turbine for commercial and naval installations. The engine will be available in early 2004. According to the company, "The Marine Trent 30 boasts a power rating of 36 MW (ISO, no loss) and is cost effective, compared to all existing turbines, for all marine applications from 25 MW.

In the commercial sector, it is ideal for cruise liners, fast ferries and LNG craft. The engine has 80% commonality with the Trent 800 aero engine, which has achieved a 99.9% dispatch reliability and more than two million flying hours since it entered service in 1996. The total package, including enclosure and auxiliaries, weighs less than 26,000 kg. Dimensions are 8.9m long, 3.5m wide and 4.3m high."

SAILOR'S PAGE

THE ULTIMATE RAVE STORY

By Brian Douglas, Edited by: Eric Arens

[Part I of this story appeared in the Spring 2002 issue of the IHS NL.]

Part II

I pulled out in the morning as conditions were getting worse. I had a good morning's run down and across Bahai del Espiritu Santo, but as I rounded the point out of the bay the wind died before the storm. When it hits, I almost pitch-poled.

By the time I had raised the sails, the wind had died again. But determination is where I'm at; perseverance. I knew if I could round the point, a mere five miles, I could come back inside the reef again and be able to keep working my way further down the coast, even just hops between storms. I paddled for five hours in light winds almost dead out of the direction I wanted to go, south. But eventually I rounded the point and got inside through a small cut. Of course, at this point the wind picked up. I started to run south inside the reef, but was quickly hemmed in by rock bottomed shallows ashore and coral reaching out from the reef. I squeaked through, but saw the same ahead, and the deep water I was in heading out through a break in the reef, so out I went. The rest of the day I ran outside, making for the only town on the coast, Mayugual, for food.

It was a good run down the coast, actually, though the seas left over from the storm were a thing to see, but I'd had big seas coming in from offshore the whole trip. I headed out with the sun and wind rising together, wanting to get out before it rose too much and trapped me. I made it outside, turned south, and soon sighted Mayugual. I looked at the chart. The final town in Mexico, and my port of destination, Xcalak was within reach.

I am gone the next morning, shooting the reef immediately, and running outside through some of the roughest seas I've seen on the trip. Not the largest, though they were big, but it was a choppy mess with reflected waves from the reef and a deep trench just offshore combining to create huge rogues and gulfs, and breaking seas from four directions. After a few punishing hours, I ran through a narrow cut in the reef marked by a wreck the locals in Xcalak told me about. A beautiful local traditional sailboat comes by just as I'm hove to changing my flags to the Belizean and the Q flag, and I follow it down the coast into San Pedro, the trip near complete. Or so I thought.

FURTHER on the Beach

I headed south out of Xcalak to try and make a narrow channel, the Boca Bacalar Chica, that the Maya had cut through a narrow spot in Ambergris Key into Chetumal Bay. The locals were split in their opinion as to whether it was possible to make it through, but I figured it was worth a try. I made it to the entrance just as another storm blew in, but I doused the main and drove in fast under the jib. It actually worked well, even with the rain, because the strong wind funneled up the twisting channel, letting me sail a good ways inland.

Then I was paddling up a narrow channel against a stiff current, using my canoeing skills to climb up through the eddies behind the curves, and ferry across the current to cross from eddy to eddy. I came to the final cut, only a few feet wider than the boat, with tall mangroves almost meeting overhead and swarms of mosquitoes in the still air. I made it halfway before I was hopelessly hung up, unable to maneuver against the current in such a small place with the current now even stronger and no curves in the channel. But I didn't give up. I took down the upper shrouds (wires that support the

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RAVE
(Continued From Previous Page)

mast) that were causing the worst trouble hanging up in the mangroves, letting the lower shrouds support the mast. Then into the water I went, dragging the boat up the channel ala "African Queen".

So I had it to do and I got it done, walked the road less traveled; in fact, the road untravelled would be more like it. You have time to think, out there, and time to not think. And you ponder the truths that make themselves obvious. "You can sail a track across the sea, but you leave no mark, instead, the sea leaves its mark upon you. Though I have "boldly done", I was actually following in the footsteps of the ancient Mayan canoes. Funny world, sure enough.

A Salute to *FURTHER*

So I did it, and pulled it off. I'm in San Pedro, Belize, Central America; after a 45-day passage sailing this little boat I've named "Further" for duration of the trip.

As for the trip, it was just the sort of thing I do, and really just a favor to some friends, delivering a boat. However, if you've got a spare one sitting around, I'd be glad to take it even further

I'd have been happy to continue on even longer if it had been winter, the off season, so I wasn't watching the summer festival season and the bulk of my annual income slip away, day by day. But there is always another year, and it feels much more important that I was back living the exceptional experiences that had always been such a big part of my life, "flying higher", "further".

I remember the temptation to not come back, to lose myself in the wind and wave and life of the vagabond, with a small boat and my music, and the boundless beauty of nature.

You have a great boat (WindRider), I congratulate you. [This tale was found posted on the Rave Page ("http://www.ravepage.com" www.ravepage.com) maintained by Eric Arens, proprietor of Wind- Rider of the Treasure Coast based in Florida, USA who is a distributor of the Rave hydrofoil sailboat.]

SPITFIRE

(From *Launchings* and Martin Grimm)

Spitfire hydrofoil flew briefly during her first test sail on January 18, 2002, and on later trial, she reached 30 knots. Predicted top speed is 40 knots.

Spitfire was designed by Mark Pivac of BDG Marine, a division of Perth based industrial design and engineering firm, and built by Windrush yachts in Perth, Australia.

The 12 metre (40 feet) catamaran features twin rigs, sleek hulls and most notably, three hydrofoils that lift the hulls completely clear of the water, allowing Spitfire to accelerate to30+kts and more.

It is quite the craft! Tapered foils, vertical dagger on the bottom. The boat has vinylester infusion moulded E-glass/balsa core hulls, vacuum bagged epoxy/carbon fibre beams and prepreg carbon fibre masts and foils. The twin rigs are each free-standing and have a double -luffed-fully battened wing sails. Current plans include a 120 foot cat for the race 2004 to smash all the records. For more information and pictures visit www. bdg.com.au

A similar article also appeared in Issue 56 of Multihull World Magazine regarding the 'Spitfire' sailing hydrofoil Catamaran. Watch this column in the Autumn NL for additional information about this interesting hydrofoil.

NEW MEMBERS

(Continued From Page 2)

times in May of this year. He reports that on his first trip of 20 minutes he almost sank it. Same on the second trip. He finally got foilborne at 28 MPH, but the forward foils stall at 27 MPH and she plowed in. He now thinks he is proficient enough to survive further operation.

Ronald Lamarand - A former "Hydrofoiler", Ron, while serving in the U.S. Navy as an Electronics Technician was a crewman of the Tucumcari PGH-2 Hydrofoil Gunboat. He came onboard in August of 1970, while stationed in San Diego, CA and continued to serve the "Tuc" until his discharge in February of 1973. His experiences included a European cruise where hydrofoil technology was demonstrated to several NATO countries in 1971, and States-side demos the following year. Also, Ron was on board the Tucumcari on that fateful night, when she was "lost forever", after going aground while participating in night maneuvers in Puerto Rico. Ron is currently a senior engineer at General Motors and lives in Sterling Heights, MI.

Miguel Lanzagorta - Miguel is from Mexico City where he is a student in Industrial Engineering at the "Univrsidad Ibero- americana". He wants to design a sail boat with hydrofoils although he has no experience in design and building, but he wants to try some day. One of his favorite subjects is hydrodynamics. Miguel holds a license as private pilot of single engine aircraft. He enjoys water skiing, sailing and boats in general.

Andrew Nicoll – Andrew has been interested in Hydrofoils since the 60's when he saw an article in Popular Science about research being done at Boeing. After College in 1977 he visited the Boeing facility and snagged a guided tour of a Jetfoil being equipped for coastal patrol in SE Asia. The aluminum looked so thin a kid with a .22 rifle could probably sink it! He was assured that wasn't the case. He later spoke to the Coast Guard Command in Seattle about foil equipped rescue boats. They pointed out the obvious "cookie cutter effect". Andrew has done some experimentation over the years but nothing "real". An electronics engineer by trade, he loves the control problems posed by foils.

Paul Sims – Paul is from Mims, FL. He is designing a Hydrofoil Catamaran. Have a small cat now but getting a 20-footer soon for the design to be implemented. Looks very promising and may introduce Semi-Wig effect to attempt span of marketability. Cheap alternatives to traditional styles are behind the concept.

Scott Smith- Scott is a manufacturing and design engineer for Syntheon LLC, a medical device R&D and manufacturing facility. As such he has access to CAD stations as well as computerized manufacturing equipment. His interest in hydrofoils goes back many years, especially in small foil boats and 2-man hydrofoils, and is currently planning to build several test platforms, including a 1-man electric, a 2-man gas engine powered hydrofoil, and a 20' open fisherman based hydrofoil. He recently purchased two Dynafoils (1-man wave-runner type foil) and is building a database for them including part drawings and manuals. He has done a small amount of repair work for people with Russian made hydrofoils, and intends to purchase one eventually.

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LETTERS TO THE EDITOR

What NACA Series is Best?

[15 Mar 02] I am studying in Naval Architecture Department, Ocean Engineering Faculty, Sepuluh Nopember Institut Of Technology, Surabaya Indonesia. Before I complete my studies, I must do experiments as requirement from my college. I want to experiment with about lift and drag for a foil of a Hydrofoil Craft. This experiment is using Computational Fluid Dynamic (CFD) with ANSYS 5.6. But I am confusing about what NACA Foil Series is suitable for Hydrofoil Craft, and what the principal reason for choice this NACA Series. — Hot Pungka Purba (pungka@yahoo.com)

Response...

[15 Mar 02]You haven't said what the requirements are for your section. Since you mention NACA foils, I assume that you are interested in the subcavitating speed range. You need to have some idea of the range of lift coefficients are required of your foil - this is driven by the load the foil has to carry and the variation in angle of attack the foil will experience as it goes through waves. Something like Cl = 0 to 0.6 with a design Cl = 0.3 would be typical. The intended speed range for the vessel is critical - what are the takeoff, cruise, and dash speeds? And you need to know how the craft will be controlled - will the foils be surface piercing or fully submerged, and will they change incidence or have flaps?

I believe there are four key problems in subcavitating hydrofoil section design. First, you want to avoid separation because this invites ventilation as well as causing drag. Second you want to avoid cavitation. Of course, you also want low drag, and fortunately the things you do to get a high cavitation speed and avoid separation are also good ways to minimize the drag. Finally, the section may be operating close to a free surface, and this modifies the velocity distribution about the foil.

Since cavitation begins when the lowest pressure anywhere on the foil drops below the local vapor pressure of water, you want to minimize the maximum velocity. That means no sharp pressure peaks allowed! At the same time, you want the average velocity over the top surface to be as high as possible so as to produce the most lift. This drives the design to shapes which have long, flat pressure distributions - shaped like building with a flat roof.

The NACA sections which have this type of rooftop velocity distribution are the 6-series laminar flow sections and the earlier 1-series (i.e., 16-012, etc). The 1-series sections have a shallow favorable pressure gradient back to 60% chord, but they have a highly convex pressure recovery that is not necessarily a good characteristic if one wants to avoid separation at the trailing edge. So a comparable 6-series section (say, 66-XXX) would probably be a better bet than the corresponding 16-XXX section.

There are other more modern hydrofoil sections, such as the Eppler designs. Try to get his book, "Airfoil Design and Data". It is out of print, but your engineering library should be able to find it. He talks about the philosophy of hydrofoil design and has several sections specifically designed to be hydrofoils.

You can also design your own hydrofoils using XFOIL, which you can download for free. XFOIL is more modern code than the Eppler code, but you can still design sections like Eppler's using XFOIL. This would be a good start to analyzing with ANSYS because ANSYS doesn't have the inverse design capability of XFOIL but it does have a more powerful analysis capability. So you would be able to compare the experimental results, the inviscid+integral boundary layer results, and the Navier-Stokes CFD results, at least for subcavitating flows.

Simulating the two-phase flow that results from cavitation would be a difficult challenge! But it has been done, and this makes a Navier-Stokes method worthwhile. Unfortunately, much of the research has been done using NACA 4-digit sections (like 0012, 0015), and I suspect this is either out of ignorance as to what makes a good hydrofoil, or perhaps because these are bad hydrofoils and cavitate more easily!

Say you are concerned with a fully submerged hydrofoil with flaps to control the height of the vessel. As the boat flies through waves, the orbital velocity of the waves will change the angle of attack on the foil and thus the lift. The control system will try to compensate for this by moving the flap. If the boat is flying along perfectly level, a good approximation of a perfect control system would be one that maintained a constant lift coefficient on the foil as the angle of attack changed. Thus you need to consider three cases: zero angle of attack with the flap at neutral, positive angle of attack with the flap deflected up, and negative angle of attack with the flap deflected down. The larger the flap deflection, the greater the angle of attack change that can be tolerated while still maintaining the same lift coefficient, and the higher the sea-state in which the ship can operate. For each of these three cases, the peak velocity will occur on a different part of the foil. You would want to design the foil so that the value of the peak velocity is the same in each case. This will give you the highest speed without cavitating. But larger flap deflections and a greater angle of attack range means higher maximum velocities and thus a lower operating speed without cavitating, so there's a tradeoff between the ability to operate in rough seas and the vessel's maximum speed. It's an interesting design problem!

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LETTERS TO THE EDITOR
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But one that comes back to knowing the original requirements in order to design (or select) the appropriate section.

Take a look at http://cavity.ce.utexas.edu/kinnas/ http://cavity.ce.utexas.edu/kinnas/cavphotos.html http://cav2001.library.caltech.edu/view-cav.html http://cav2001.library.caltech.edu/documents/disk0/00/00/01/60/00000160-00/final.pdf http://www.tev.ntnu.no/vk/personer/gbdip.pdf http://www.cfd.eng.wayne.edu/research/cavitation.htm http://www.sw.nec.co.jp/hpc/sx-e/sx-world/no26/e6.pdf http://www.ecole-navale.fr/personnel/Astolfi/CAV2001_LerouxAstolfi.html — Tom Speer (me@tspeer.com) website: www.tspeer.com

Just after I pushed the "Send" button for the preceding email, I found a good link about using Fluent to calculate cavitating flows, but I didn't save the link. I can probably find it again if anyone is interested. I've also thought some about why the 16-XXX sections are so popular for hydrofoils over the 6-series, and I think it must be because they have a much thicker and stronger trailing edge. So perhaps I was too hasty in recommending the 6-series because they may not be practical for the very high loadings of hydrofoils. Flexing of the trailing edge can lead to singing, too. By the way, there are some interesting papers at U. Mich. on their large-scale hydrofoil (8' chord!) test. — Tom Speer (me@tspeer.com) website: www.tspeer.com

Foil Design Guidance Needed

[4 Feb 02] I am restoring and optimizing a 1969 Irwin 24. Its keel has an "L" design fin and ballast torpedo. The foil consists of a one inch thick steel plate encased in fiberglass and faired to a section that is similar to NACA 00-series sections through station 6; then tapers to a blunt trailing edge. I have some experience with symmetrical foil optimization; however always with sections in the 8% to 12% thickness range (and no data on less than 6% thickness). I have never implemented a foil less than 7% (even when strength and ballast were not considerations) and I am contemplating taking one of two options:

1.Maintaining the thin section, leaving the foil in tact (excepting minimal fairing) through section 6, tapering the trailing edge to 1/16th inch and squaring off (this may require increasing the span ~3 inches); making the foil a very close approximation of a NACA 00-series section with 4% thickness.

2.Building up the existing foil section to a NACA 0006 or NACA 0008 section (this may require increasing the span ~1 inch and add approximately 100 pounds to the displacement). Option 1 is far less work, but would change the plan form design slightly. I am not particularly worried about moving the center of lift slightly back because I have removed a 6 inch deep skeg that was a retrofit between the keel and rudder. In any event I am keen on cleaning up the trailing edge. Option 2 would be a good deal of work that would require some benefit to justify undertaking. The plan form data on the keel is as follows: Span = 24 inches, Chord = 45 inches, Max thickness = 2 inches, Sweep Angle = 45 degrees. The torpedo height is 12 inches, the torpedo is V shaped where it meets the foil (120 degrees at the foil interface and the at the bottom) and has a total length of 58 inches. Total displacement is 3000 pounds. Thanks for any guidance you can afford me. — Tom Graham (TGraham@entergy.com)

Response...

[6 Feb 02] Paul Bogataj had an article in Sailing World a while back concerning keel sections and leading edge shapes. I'd download XFOIL and use it to look at different sections. You can put in your section as it is, NACA sections for comparison, and use it to make modifications to either. — Tom Speer, F-24 AMA DEUS (me@tspeer.com) website: www.tspeer.com

Rudder Cavitation Design

[3 Feb 02] The rudder cavitation article in the Winter 01-02 Newsletter got my interest. The hydrofoil strut has a similar sea state problem. We tailored the strut section pressure distribution along the strut to reduce its cavitation sensitivity. If you are interested I would be glad to talk with you about the work we did. My comment is based on the ongoing research effort we had at Boeing Marine Services (BMS) relating to hydrofoils. The research combined our hydrofoil experience with the aero capability imported from our airplane organization. The work was reported in Boeing documents and IRAD reports-David Taylor was always on the distribution list. We presented a paper at the 19th Tow Tank Conference giving a brief report on the Jetfoil forward foil. — Bob Dixon (bobdixon@attbi.com)

Responses...

[3 Feb 02] I'd like to hear more about it. I wonder if many strut "cavitation" problems are really ventilation problems, and if what one would do with the pressure distribution would be somewhat different in the two cases. To prevent cavitation, did you try to cap the peak velocity by using a roof-top pressure distribution, carried as far aft as possible? This would also be consistent with natural laminar flow control. — Tom Speer (me@tspeer.com)

[3 Feb 02] Thanks for the info. All of the Boeing reports are in the Advanced Ship Data Bank at NSWCCD (David Taylor). Do you have a copy of the paper from the 19th Towing Tank Conference? That may not be in the Data Bank. If you could send it, I would copy it and send it right back. It may be good to include in the next AMV CD we may

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LETTERS TO THE EDITOR
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be putting out at IHS. — John Meyer (jmeyer@erols.com)

Kometa R/C Model - Help Needed

[24 Mar 02] I inherited an antique fiberglass model of the Kometa Hydrofoil (Made by Mantua, Italy, I believe). The model is almost 5 feet long, and seems to be built for R/C, it also has scale features (white metal window frames, lifesavers, fittings) as it has comes with a sturdy gearbox to drive 2 contra rotating props (Engine size is supposed to be a .90 glow). It comes with all the foils (extruded aluminum and curved), and foil legs (cast metal). The picture of the bare hull is attached. I do not have the plans or instructions for this kit. I was wondering if anyone had come across this, and what were their experiences building/ running this kit? — Ho Sing, Singapore (hos888@pop.singnet.com.sg)

New Sailing Hydrofoil RC Model From MicroSAIL

[14 Apr 02] microSAIL! is about to introduce a new radio controlled model, the aeroSKIFF. The boat has a very fast canting keel (52 degrees/one second) for stability and a dagger board just forward of the keel strut for lateral resistance. This boat is significant because it is the first KEELBOAT, to the best of our knowledge, either full size or models to sail on hydrofoils—and only two foils at that! There is a main hydrofoil on the daggerboard and one on the rudder; altitude is controlled by a slightly modified version of Dr. Sam Bradfield's wand system. We are patenting a version of the aeroSKIFF concept for use on large monohulls such as Open 60's and feel that our system can revolutionize monohull sailing. This type of boat, a MONOFOILER(tm) will never be as fast as a multihull foiler but it can create a unique niche for itself as a very fast single hull sailboat. We would be interested if anyone has heard of or seen — and can document — another ballasted keelboat (full size or model) having sailed on foils. — Doug Lord (lorsail@webtv.net)

Hydrofoils and Whales Don`t Mix

[05/24/02] Interesting brief article on the Greenpeace website: "Due to the rolling of ocean swells, the sonar of a hydrofoil can't see surface objects - even BIG objects - like whales in its path. Compounding this problem, the fast speed of a hydrofoil is typically nothing a whale is accustomed to, and the whale may not be able to avoid a collision even if it hears one coming. Indeed, the whales which spend most time at the surface are the babies, which are nearly invisible even to a boat going a fraction the speed of a hydrofoil..." (submitted by Barney C. Black)

(Martin Grimm) 05/25/02 Collision with whales is not a phenomenon that is unique to hydrofoils. Over the years there have been a number of reports of yachts under sail colliding with whales. It is thought that this may occur when the whales are sleeping. In those cases the yachts have often been significantly damaged or sunk. The reference to "sonar" in the Greenpeace article is presumably referring to the navigation radar that would be fitted to commercial hydrofoils.-- Martin Grimm (seaflite@alphalink.com.au)

[05/27/02] No kidding. Just ask the crew of the USS AQUILA(PHM 4) about a certain night in '91 or '92 going from 40+ knots to zero knots in the length of the ship off the back of a whale. The Skipper left his face impression in a metal door, breaking vertebrae in his neck in the process. Several other crew members were also injured. Diesel motors were ripped from their foundations. The hull was actually wrinkled back by the aft struts. From all accounts, it was a rude awakening in the middle of the night for some sailors. — FCC(SW) Kevin Hufnagle (ret), USS GEMINI (PHM 6) FCC(SW) Kevin Hufnagle (ret) (khufnagle@stonel.com)

Letters To the Editor allows hydrofoilers to ask for or provide information, to exchange ideas, and to inform the readership of interesting developments. **More correspondence is published in the Posted Messages and Frequently Asked Questions (FAQ) section of the IHS internet web site at http://www.foils.org.** All are invited to participate. Opinions expressed are those of the authors, not of IHS.

Log Strike Paper

[05/09/02] I have an Adobe Acrobat PDF version of the paper: "Response of hydrofoil strut-foil systems after impact with 'dead-head' logs" by H.S. Levine and A.P. Misovec. Anybody who wants a copy of the paper please send me an email. Gunther Migeotte (gmigeotte@artanderson.com)

Why Aren`t There More Hydrofoils?

[05/31/02] Hydrofoils are basically a commercial and military failure. I live in south Florida and boat in these waters — the above statement is visually obvious. My interest is in reading any critical analysis as to why. My additional interest is to meet with a current or former Navy or Coast Guard Hydrofoil program development sponsor to ask his/her opinion for this failure. I will be available to meet the experts where ever they currently live. *Gerald Levine*, (GERRYMEGA@AOL.com)

Responses….

06/01/02 There is information related to this question posted on the IHS website in several locations. Please feel free to contact anyone whose email address you find in the correspondence archive and that you think may be a good person to discuss this with. Also, the IHS Board of Directors are listed with bios and contact info on the IHS website. While you are certainly correct that there are not many hydrofoils operating in Florida these days (except sailboats), it is a bit extreme to extrapolate from that "hydrofoils are a commercial and military failure."

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LETTERS TO THE EDITOR
(Continued From Previous Page)

Hydrofoil passenger vessels are common in Russia, for example, and if there are fewer today than yesterday, this may be more a reflection of the Russian economy than of a hydrofoil failure. PHMs were a failure in that only the USA followed through to buy any, but they were a success in counternarcotics and FleetEx activities conducted out of Key West. Yes they were decommissioned with many years of service life remaining. The main reason cited was operating and maintenance costs; however keep in mind that these ships had the highest OPTEMPO of any class in the Navy and were kept ready to scramble on short notice. Their mission is now being accomplished by much larger blue water warships with larger crews and costly weapons suites that have little utility for drug busting The hydrofoils that Helmut Kock assembled on Lake Titicaca in Peru are still carrying tourists today So it is more accurate to say that hydrofoils have successfully found their niches here and there in the past. Likely they will continue to do so. There is still quite a bit of interest around the world in hydrofoils, as evidenced every day by the participation in IHS. *Barney C. Black,*

[06/08/02] In my opinion, the hydrofoils built during the 1970s were still ahead of their time.Consider how enabling technology has advanced since then. Computers have increased in speed, decreased in size, and decreased in cost — this could make flight control systems much more effective at much less cost. Materials have advanced dramatically since then. This could have a huge impact on reducing the cost of struts and foils. The hull structure could be built at much lower weight — a big impact on hydrofoil efficiency.
We've also seen big improvements in hydromechanics. This could result in drag reduction and much less expensive and complex control systems. Machinery has also advanced. The advances, for example, in high power, dense waterjets have made this system more effective and less costly. Gas turbine propulsion is now much more prevalent and power densities have risen at lower cost and improved fuel consumption. Hydrofoils are more sensitive to these factors than are other vehicles. Thus, they have more potential for benefit from them. I believe that hydrofoils designed today would be much more cost-competitive and reliable than those in the past. This is not intended to disparage the work done in the past. As Barney points out, hydrofoils were, and are, effective. They could be even more so, now. I'm just afraid that the environment has been spoiled. It would be very interesting to see both naval and commercial hydrofoil designs using modern technology. Jim King (dominionmaritime@aol.com)

PHM Big "Es"

[15 June 02] Eliot James (PHM owner): You asked the following question in the article for the IHS Newsletter: Can someone explain the markings on the bridge exterior to us? The three big "E" and what the "campaign ribbons" mean?

The answers, as best I can put them together, are as follows: The "Es" are annual awards for efficiency made to ships for outstanding performance during the year. They are competitive award and is based at least in part on performance in certain standardized exercises and inspections. The white E is the overall battle efficiency award and pertains to the whole ship. It is painted on the superstructure and stays there for a year until the next year's award is made. Subsequent awards are indicated by a "hashmark" (small diagonal stripe) under the E. Personnel attached to theship — and the ship itself — are awarded a ribbon signifying the achievement.

The other Es are departmental awards signifying competitive achievements by one or more of the ship's "departments." (Engineering, Operations, Combat Systems, Supply, etc.) These Es are different colors - red for engineering, blue for supply (I think! Memory fails me). There is no corresponding ribbon award. The "campaign ribbons" you mention are actually awards given to the ship for unusual and praisewothy service. Aries holds the following awards (Name of award/Dates of service encompassed by the award):

- Joint Meritorious Unit Award: 6 Apr 92 - 30 Apr 92
- Navy "E" Award: 1 Apr 86 - 31 Sep 86 and 1 Jan 92 - 31 Dec 92 (2 Awards)
- Coast Guard Meritorious Unit Commendation: 1 Nov 85 - 28 Feb 86 and 1 Oct 86 - 30 Jun 87 (2 awards)
- Secretary of the Navy Letter of Commendation: 12 Jun 87- 1 Aug 87
- US Coast Guard SOS Ribbon: 1 Oct 87 - 31 Dec 87 and 1 Jan 90 - 31 Mar 90 (2 awards) (Second and subsequent awards are represented by a small gold star on the basic ribbon).

These awards are shown in the order of their "precedence." The most senior ribbon (JMU) goes on the upper left as you look at it, the most junior (USCG SOS) on the lower right. Hope this helps. George Jenkins (georgejj@aol.com)

New Voskhod-2M

[05/22/02] Check out this link: http://home.wanadoo.nl/~hydrofoils1/fffnews.htm for photos of the first new Voskhod-2M for Fast Flying Ferries. Built by Feodosia shipbuilding association "MORYE". -- (Capt M Van Rijzen)

CLASSIC FAST FERRIES

Classic Fast Ferries "Cyberzine" has gone up on line and is free to the public. To view current and past issues, simply visit the CFF website at http://classicfast-f.homepage.dk/

EXTRA FOR THE ELECTRONIC EDITION

Virus Protection is Essential

The IHS webmaster reports experiencing an order-of-magnitude increase in the number of virus-infected emails arriving at the IHS site. Also, the website's firewall is constantly intercepting and preventing attempts by "worm" programs to gain access and control surreptitiously.

Although the details of IHS's protective anti-virus software, hardware, and procedures cannot be published here for obvious reasons, IHS correspondents should be assured that IHS takes the threat of viruses and worms seriously and is actively and constantly engaged in preventing infection and stopping the spread of computer viruses.

Everyone needs to do his or her part. If you connect to the internet, then please invest in and install antivirus software. Don't forget to keep your virus signatures up to date; it is not unusual for updates to be issued weekly. A software firewall is also recommended, especially to those with cable, dish, or DSL "always on" connections. The firewall will allow you to control access to your computer and to block worm programs that attempt to gain access without your knowledge.

You may have received a virus infected email that appears to have been sent by postmaster@foils.org. The IHS webmaster himself has received such emails. They did not originate with IHS but with someone else whose computer was infected. The headers are forged by a virus that selects email addresses at random from an infected computer. Similarly, anyone may receive complaints from friends who say that you sent them an infected email, when you know that your computer is clean. That is how insidious that these viruses can be.

My Speedsailer

by Peter Jefferson

I. Design Targets

Craft Weight

To maximize the performance factors, the gross weight of the craft should be minimized. However, the craft must be strong enough to withstand the forces on it, and this means the weight cannot be reduced infinitely. There is a trade-off between the weight of the craft and the size of rig it will support.

Included in the gross weight is the weight of the crew, which has been assumed to be 150 lb. Based on the law of diminishing returns, the target weight of the craft itself was set at 150 lb. The target gross weight was thus 300 lb. This turned out to be a good guess as the prototype, which was built as light as possible consistent with reasonable strength, is very close to this weight.

Overall Length

The "Hull Speed" of a craft is approximately proportional to the square root of its waterline length, so longer craft typically sail faster than shorter craft. This is because, when the hull reaches hull speed, the bow wave builds up and creates a large drag. In other words, at hull speed, the craft is trying to sail up its bow wave and is therefore sailing uphill. If the sail provides enough drive to force the craft over the bow wave, then the bow wave disappears, and the craft is the planing, and the hull speed limit no longer applies.

The waterline length of the prototype is only 10 feet. The hull speed works out at about 5 knots, so the performance in light winds will be poor. However, before it reaches this speed, the hydrofoils will be providing some lift so the craft

should start planing before it reaches hull speed and by the time it reaches about 7 knots it should be "flying" on the foils.

The hull is designed as a platform on which to mount the working parts of the craft, and its shape is not considered critical to its high speed performance since the hull will not be in the water when foilborne.

Lateral Factor

The crew, sitting out to windward, can shift his 150 lb. weight about 36" from the craft centreline. If the craft itself weighs 150 lb., then the CG of the craft with crew will be about 18" displaced from the centreline. When foilborne, most of the lift will be provided by the lee foil since the windward foil will be close to the surface. It is estimated that the centre of support will be about 9" to leeward of the centreline. The lateral moment arm is thus 18" + 9" = 27". The centre of pressure of the wing is about 70" above the well floor, and the centre of lateral resistance of the hydrofoil struts is about 20" below the floor so the vertical moment arm is about 70" + 20" = 90". The Lateral Factor is thus 27"/90" = 30%.

It follows that, regardless of the wing area and the wind strength, the lateral force on the wing cannot be greater than 30% of the gross weight of the craft, ie 100 lb. If the wing were sheeted in tighter to try to increase the drive, the heeling moment would be greater than

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the available righting moment and the craft would capsize.

Aerodynamic Factor

The craft is designed specifically to achieve the highest possible sailing speed so it will only perform well in relatively strong winds. The optimum wind strength is a compromise between high winds when the craft speed/wind speed ratio is lower and lower winds when the water surface is smoother. Another consideration is that it is not very practical to design the craft only to sail well in gale force winds.

The outcome of this compromise was that 16 knots was chosen as the design target true wind speed. The target craft speed is three times this speed, ie. 48 knots. This would beat the current world record. Under these conditions, the apparent wind would be about 18° on the bow. If the angle of attack of the wing were no greater than 6° the wing would be set at an effective angle at least 12°. The resulting drive component would be about 20% of the wing lift. The Aerodynamic Factor is thus about 20%.

Drive Factor

Multiplying the Lateral Factor by the Aerodynamic Factor gives the Drive Factor, 30% x 20% = 6%. Thus the drive force would be 6% of the gross weight or 18 lb. It follows that to reach 48 knots, the drag at this speed must not exceed 18 lb. Theoretical calculations indicate that this is not unreasonable, but in practice this may be optimistic, at least for the prototype.

II. My Design

This craft is in many respects similar to any conventional small racing dinghy. The overall length is only 10 feet (3.0 m), so its performance at low speeds will be poor. The hull is very flat in the aft sections to promote planing. The principal difference in this design is the use of hydrofoils which will raise the hull out of the water as it approaches planing speed.

A comparison of various types of sailcraft indicates that the drag of the underwater parts of the craft rises rapidly as it approaches planing speed and then levels off at about 12% to 15% of the gross craft weight. The drag of fully submerged foils is estimated to be less than 5% at high speed provided that the pitch is controlled to give the optimum Lift to Drag ratio. If the gross weight is 300 lb., then the drag force will be less than 15 lb.

As the speed increases the drive force of the sail (or wing) diminishes because the apparent wind shifts forward. This means that the sail pressure has a smaller forward drive component. It could be argued that the apparent wind strength will increase so the sail pressure could be increased to compensate for the reduced forward component, however in practice this is limited by the available righting moment. If the sail is sheeted in too hard the craft will capsize.

The craft is designed to support a pressure of up to 90 lb. on the wing, limited by how far the crew can shift his weight to windward on the seat. When the craft reaches 3 times wind speed, the forward drive component is estimated to have fallen to not less than 20 lb., which is enough to overcome the drag.

III.The Hydrofoils

The port hydrofoil is shown below in the deployed position. The small white lever just above the deck locks the hydrofoil in the down position. The struts on which the foils are mounted provide the lateral resistance normally provided by a centreboard or fin. The tail hydrofoil mounted on the rudder is also visible.

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Notice that the foils when deployed are co-planar. Their surfaces all lie in one plane which is initially pitched about 6° up towards the bow. If the pitching moments are balanced, the craft will rise until the main foils are near the water surface. Their lift will then diminish relative to the tail foil, which is deeper in the water so the craft will tend to pitch forward.

At high speeds the pitch of the foils should be less than 3° and the drag/lift ratio should be less than 5%. These are critical parameters which have yet to be confirmed by towing tests on the prototype.

The port hydrofoil is shown below in retracted position. To retract the foil, the crew releases the locking lever, raises the foil with the hande at the top, and then raises the lever to lock the foil up.

With the foils retracted they are above the lowest point on the hull and do not extend far outside the beam. This greatly simplifies launching and haul out.

IV. The Rudder

The rudder blade slides vertically in the rudder stock to retract or deploy it. It is locked in the down or up position with a lever on the starboard side of the stock similar to those on the main foils. The rudder stock pivots on conventional pintles exept that the upper pintle is inverted so that the stock will not lift off. This is neccessary because the foil on the bottom of the rudder exerts a significant lifting force.

The craft is steered by a conventional tiller. The vertical rod on the left is the tiller stick attached to the tiller by a flexible coupling. This enables the crew to control the rudder when sitting out on the seat. The rudder is shown above right in the retracted position.

V. The Wing Sail

Why a Wing Sail ?

The apparent wind speed will range from as low as 12 knots when the craft is at rest up to perhaps 50 knots at full speed. If the "lift" of the sail is limited to say 100 lb, the "angle of attack" will range from about 30° to less than 3°. A conventional sail will not work at such low angles of attack. Typically, if a sail is pinched too close to the wind, it loses its drive force altogether. The sail cannot be held flat enough and it twists so that the top of the sail has no angle of attack and the bottom of the sail has too great an angle of attack. In either case the drive compontent of the lift force is reduced.

The solution to this problem is to use a rigid wing sail which will hold its shape and will not twist. The difficulty with a wing sail is that it is usually much heavier and not as easy to hoist and lower. Another problem is that unlike a flexible sail, it may not "feather" into the wind when going about from one tack to the other.

The Wing Section

The choice of wing section was a compromise between lift/drag ratio at low and high speeds, and controllability of the wing at low angles of attack. Unlike an aircraft wing, the wing sail must

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work well on both tacks so the section must be symetrical. An aircraft wing is rigidly attached to the airframe whereas the wing sail pivots about a vertical axis some distance behind the leading edge.

The angle of attack of the wing sail is controlled in the usual way by a rope (main sheet) attached to the lower aft corner (clew). For effective control, the lift of the wing must increase as the tension on the main sheet is increased. If the tension is released the lift of the wing should be reduced to zero and the wing should feather into wind like a weather vane with no great force on it. If this does not happen, the craft is unmanageable while tacking or coming to rest.

Initial experiments were made on scale models with elliptical sections as it was believed that these would yield the highest lift/weight ratio. However, these proved to be unstable when allowed to swing freely. Even when the pivot axis was close to the leading edge, the wing settled at a fairly large angle to the wind or else it oscillated wildly from one side to the other.

The controllability of the wing seemed to be the main factor in choosing the section. On a hunch, a model with this section was constructed:

Tests confirmed that the lift and the tension on the main sheet increased continuously as the angle of attack increased. Thus the wing was stable and controllable in all situations. The lift/drag ratio may not be optimum, but is probably good enough.

Wing Area

For yaw stability, the centre of pressure of the wing should not be forward of the centre of lateral resistance of the underwater parts otherwise the craft will suffer from "lee helm" and tend to run off downwind. The wing cannot extend too far aft without interfering with the crew. This limits the length of the foot or "chord" of wing.

The height or "span" of the wing is limited by the neccessity of keeping the centre of pressure of the wing as low as possible to minimize the heeling moment. These restrictions limited the wing area to about 18 sq. ft. This seemed very small. A typical sail for a 10-foot sailboat would be four or five times this area. However, the craft is designed to sail in winds twice as strong as most sailboats, so the pressure on the wing will typically be four time as great. Also a wing is much more efficient at producing forward drive than a typical sail. The wing area therefore may be sufficient.

The wing area is only critical at lift-off when the apparent wind speed is low, and the drag is at its maximum. If the wing area proves to be too small under these conditions it may be possible to add a "topsail" which will provide more drive at lift-off but will feather into the wind at high speed so the it does not add to the heeling moment. Some windsurfer sails achieve this effect by allowing the top of the sail to twist to leeward and spill the excess wind.

VI. Stepping the Wing

The spar which looks like the mast is actually the main spar of the wing (yet to be built). To step the wing, the stepping structure, which for want of a better name I will call the "tabernacle," is tilted backwards to allow the wing to be carried in a horizontal position and mounted on it. The vertical member of the tabernacle is a strong steel tube which extends into lower end of the wing's main spar. The photo below shows the tabernacle tilted backwards.

As shown in the second photo (below), the tabernacle is then tilted forward raising the wing to the vertical position, and the front end is secured with a bolt to the bulkhead.

All the forces on the wing are transmitted to the hull through the three mounting points of the tabernacle. This gives high structural strength for minimum weight.

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VII. Flying the Craft

The craft is sailed or flown in much the same way as any small racing dinghy. Before the craft is launched, the wing is erected as described in the previous section and is allowed to feather freely into the wind. The craft is then launched and when the craft is in water about 2 feet deep or more, the hydrofoils are deployed by pushing them down and locking them.

The crew sits astride the seat and, assuming the wind is on the port side, holds the tiller stick in his right hand and the main sheet (not shown) in his left hand. The clew of the wing is close to him so the main sheet is a quite short lenght of rope. There are no pulleys, fairleads or cleats so he has a very sensitive feel of the pressure on the wing. Because the centre of pressure of the wing is quite close to the axis, the tension on the main sheet will not be excessive.

As he pulls the main sheet to increase the wing pressure he leans out to windward to balance the heeling effect. Toe straps on the well floor allow him to hike out further. The craft is naturally roll stable by virtue of the fact that as it rolls the windward foil approaches the surface and losses some lift. However, the craft will perform at its best when flying level.

The craft weight is distributed so that without any drive force the bow will tend to pitch upwards. The weight of the crew will cause the stern to sink. When the wing is driving the craft forward, the pitching moments will be nearly balanced. The crew can adjust the pitching moment by either trimming the wing or shifting his weight fore or aft slightly.

When flying, the crew must be continuously shifting his weight, trimming the wing with his left hand and steering with his right hand, not only to keep the craft level but also to keep the foils as deep as possible without the hull hitting the wavetops. This will be exciting but probably not as difficult or strenuous as windsurfing.

VIII. Summary

An analysis of sailing theory concluded that the performance of a sailcraft could be determined by calculating two factors: The Lateral Factor and the Aerodynamic Factor. The product of these two factors must exceed the Drag Factor at all speeds up to the maximum.

On this basis, a prototype has been built using the following design targets:

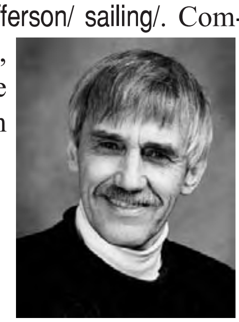
- Gross Weight 300 lb.
- True Wind Speed 16 knots
- Drive factor @ 5 knots 10% (30 lb.)
- Drive factor @ 48 knots 6% (18 lb.)

The critical question is whether, in a 16-knot wind, the wing will produce enough drive for the craft to lift off and fly on the hydrofoils before it reaches the hull speed barrier. If it will, there is little doubt that the craft will accelerate to a high speed.

It is probably unrealistic to claim that the protoytpe will beat the record, but there are numerous refinements that could be made to the hydrofoils and the wing to improve the performance.

The craft would be relatively inexpensive to mass-produce and might become a popular recreational racing sailcraft. They would probably compete against the clock over a 500m course rather than against each other around the buoys. The latter might be too dangerous at 30 knots plus. They would be organised as a "restricted class" rather than a "one-design class." This would give the competitors full scope to improve the basic design.

Email: pjjefferson@igs.net. Web: www.ott.igs.net/~pjjefferson/ sailing/. Comments, questions, and suggestions are welcomed with thanks.



- Peter Jefferson

Connexxion Fast Flying Ferries Buys New Hydrofoils

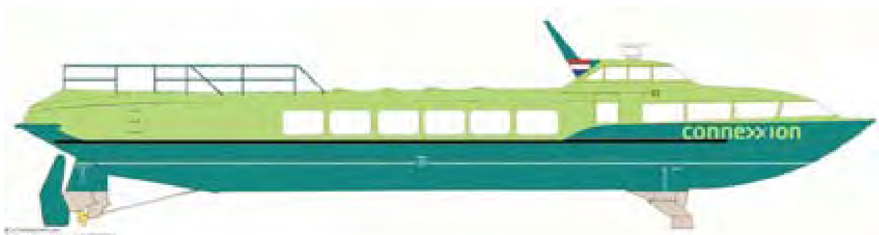
by CAPT Mark van Rijzen

makkiesannie@wanadoo.nl

Last year (2001) FFF decided to replace its old Voskhod-2 hydrofoils. The Voskhod-2 type has proven to be a good sized hydrofoil for the route between IJmuiden and Amsterdam. We wanted the same type, but with better seaworthiness and some other changes. After consultations with the Feodosia Shipbuilding Association “MORYE” situated in the Ukraine, FFF made their choice. FSA had three unfinished hulls of the Voskhod-2M (the “M” stands for marine). The major difference between Voskhod-2 and -2M is that 2M has better seaworthiness due to larger foils (the foils are also more corrosion resistant).

The Dutch regulations will be adjusted in the near future for two captains in the cockpit. With this in mind we redesigned the cockpit suitable for dual control. In the photo below, you see the gap on the right where the radar display will be fitted. In the center you see the controls for

Hull 605 (above) undergoing builders trials prior to shipment to the Netherlands. The vessel will be given a new paint scheme as shown below



(Left) Hull 605 is trucked to the painting facilities of Brasspenning, specialists in large and very large paint jobs.

(Right) Hull 605 arrives with foils in Amsterdam aboard the *EILSUM*

More news and photos are on the internet at www.dutchhydrofoils.com/

HYDROFOIL ANNOUNCEMENTS

Meetings, Conferences, Workshops, Seminars, Telecasts

Flying on Water

The air date for the Canadian premier of the Discovery Channel TV special *Hydrofoils: Flying on Water* was set for 19 July 2002 at 9 pm EDT. It's premier was on Discovery Canada. IHS assisted in locating historical film footage and photos for this documentary. There is no word as this publication goes to press as to when this show may appear in the USA and other countries. Any news in this regard will be posted on the IHS website announcements page.

HIPER 2002

The next High-Performance Marine Vehicles conference (HIPER 2002) will be held in Bergen on the following dates: 14-17 September 2002. For details, visit: www.ifs.tu-harburg.de/HIPER/HIPER_02.html. I welcome all hydrofoil activists. We have special funds to waive the fees for young participants (up to 35 years) of EC citizenship or those who have lived the past 5 years in the EC. — Volker Bertram (Bertram@hsva.de)

People In the News

Joe Sladsky

Joseph F. Sladsky, Jr., President of Kinetics, Inc., PO Box 1071, Mercer Island, WA USA, 98040 died 7 June 2002 from cancer. According to the obituary in the 26 June 2002 *Eastside Journal* of King County Newspaper Publications, "Mr. Sladsky was born March 9, 1941 in Czechoslovakia. He officially immigrated to Canada when he was 11 after living in a refugee camp in Czechoslovakia for two years. He came to the United States when he was in his early 20s to attend graduate school in mechanical engineering at the Naval Academy in Annapolis MD and at the Naval Academy graduate school in Monterey CA. Mr. Sladski later became a professor of mechanical engineering at the University of Washington and later worked for Lockheed. Remembrances may be made to Providence Hospice of Seattle, 425 Pontius Ave. N.; Seattle WA 98019-5452." According to IHS Director Bill Hockberger, "He was a really decent person and one of those very rare engineers who understand every major aspect of engineering, from materials and structures to thermodynamics and the dynamics of bodies in fluids."

Lost Members

We have lost touch with the following members due to email changes and would like to reestablish contact. If you see your name here, please contact us at webmaster@foils.org. If you see the name of someone you know, please let us know the current email address or otherwise let the person know that we are trying to get in touch with them: Bob Boyle, Eugene P. Clement, Derek Chandler, Christopher Edgar, Bradford Gatenby, Dr. Eugene O. Jackim, , Dr. Juergen Heinig, Georges Kokkinos, Mike Koronaios, James Leflar, C. Makohon, Bill O'Neill, Erin Ozsu, Stanislav Pavlov, Andrew Pisani, Johs Presthus (life member), Roy G. Shults, Calvin Stringer, and Jan Zurakowski.

Misc. News Blurbs

We Take Plastic

Credit Cards are now accepted for IHS Membership payments from the USA and over 30 other countries. Note that if you are paying with a non-US credit card, your bank will convert the $20.00 charge to your own currency and may charge a small service fee for currency conversion (this should be less than postage to the USA for a payment by mail). Hopefully this new service will make it easier for hydrofoilers to join or renew, from inside or outside the USA. IHS publications, including the Advanced Marine Vehicles CD-ROM, may also be purchased by credit card

New Video Page

Films and Videos about or featuring hydrofoils are the subject of a new page on the IHS website. We need more references to build the content of this page, so all members and visitors are urged to contribute to this page, which is at www.foils.org/popvideo.htm.

Commercials

The IHS website maintains a reasonably current list of hydrofoil vessels and craft under three categories: For Lease or Sale; Wanted to Buy; and Joint Ventures Proposed to Operate, Manufacture, Market, or Design. The listings are located in the Announcements page. The webmaster notes that email correspondence generated by these listings as increased markedly over the last several months, and several craft has sold. So if you are considering posting a notice, you can be sure that there is likely to be some interest out there in cyberspace.

Note that IHS as an organization does not recommend or endorse products and services. The commercial listings are posted as a service to the hydrofoil community. IHS does not investigate the accuracy and truthfulness of the notices posted, but we will act quickly to remove any ad that generates legitimate complaints (so far there has been only one case of this).

A recent ad for a 36 ft., 15 passenger hydrofoil in Vancouver BC Canada generated especially intense interest, to judge from email volume.

The NEWSLETTER

International Hydrofoil Society

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

Editor: John R. Meyer | Autumn 2002 | Sailing Editor: Martin Grimm

OFFSHORE FERRIES FOR SOUTHERN CALIFORNIA

By Michael Winn, Director of Communications, SCX

It's easy to imagine a fleet of offshore passenger ferries connecting coastal communities between Santa Barbara and Enseñada. The dream is taking a step toward reality as traffic congestion on coastal freeways increases while coastal real estate has become as precious as abalone.

SCX, a San Diego-based company is starting a demonstration service between San Diego and Oceanside. The demonstration, funded by the State of California is expected to start in early December, 2002 using the 149-passenger *WAVERIDER* (Subchapter-T certificated), owned by Pacific Marine in Honolulu.

WAVERIDER on trials off Honolulu

A small, fuel efficient, high-speed passenger ferry offers advantages to drivers facing: the 4- 7 hour drive through traffic between Santa Barbara and San Diego; or the 2-3 hour drive between West Los Angeles (and Los Angeles International Airport) and San Diego; or even the 1-2 hour daily commute during rush hours between Oceanside and San Diego.

See SOCAL, Page 3

TRY THE HYDROFOIL BBS

Individuals can now interact directly with the hydrofoil community by using the new Bulletin Board (BBS), which can be accessed from the IHS main page at www.foils.org. No more waiting for the webmaster to post your message. Helpful hydrofoilers are encouraged to visit often and field some of the questions. More about the BBS in the President's Column on page 2.

2002 DUES ARE DUE

IHS Membership is still only US$20 per calendar year (US$2.50 for students). You can now pay by credit card from nearly 40 countries. Go to the page at www.foils.org/member.htm and follow the instructions. IHS also accepts dues payment by personal check, bank check, money order or cash (in US dollars only).

INSIDE THIS ISSUE

PRESIDENT'S COLUMN

IHS Board of Directors election in the Spring resulted in the Class of 2002 – 2005 consisting of Jerry Gore, James H. King, John Monk, and Kenneth Spaulding. At the July meeting of the Board of Directors, the following Officers were elected for the 2002 – 2003 term: John Meyer, President, Mark Bebar, Vice President, George Jenkins, Treasurer and Ken Spaulding, Secretary.

IHS and some of its members can be proud to have contributed to a new Discovery Canada video called "Hydrofoils: Flying on Water". See the article on page 9 for more details and ordering information. It is highly recommended that IHS members get a chance to see this interesting and highly professional production.

In September my wife and I were fortunate to vacation at the Lakes Region of Northern Italy. As you may know, it was Enrico Forlanini, an Italian engineer whose interests included airships, aircraft and helicopters, who experimented with hydrofoils on Lake Maggiore. His hydrofoil developments started in 1898 with a series of model tests from which he arrived at several simple mathematical relationships that allowed him to proceed with the design and construction of a full scale craft characterized by a "ladder" foil system. The craft weighed about 2,650 pounds, had a 60 hp engine driving contra-rotating air screws, and in 1906 a speed of 42.5 mph was obtained. I thought it was appropriate, as a representative of the IHS, to salute this gentleman as I stood on the balcony of our hotel facing this magnificent lake. It was indeed appropriate that, at the same time, an RHS-160 flew by on it way to Stresa on the western shore of the lake. Later, during our five days at Lake Garda – some 100 miles east of Lake Maggiore - we had occasion to ride an RHS-160 (named Goethe) from Moderno to Limone and experience the difference in ride quality between surface piercing and fully-submerged foil systems. Incidentally, Lake Como is also blessed with frequent hydrofoil service. All in all, the Northern Lakes Region of Italy is "Hydrofoil Country".

The new IHS Bulletin Board, accessible from the main page on the website, has taken off. There have been over 5,000 visits to the BBS, with over 100 individuals having posted at least one message. A full range of hydrofoil issues in 12 categories is now being discussed in real time by members and visitors in on-going threads... no more waiting on the webmaster to post your message for you. We are grateful to those IHS members who are actively pitching in to answer questions and participate in the discussions. Hats off to Bill White, who, along with Barney Black, conceived the BBS, did the ground work to get it started, and now monitors, archives, and troubleshoots the page.

I am pleased to report that we continue to see our Membership grow. As a result of Membership Chairman, Sumi Arima's efforts, new members this year as of the end of September total 33.

John Meyer, President

WELCOME NEW MEMBERS

Richard Akers – Richard is both a naval architect and an electrical engineer, having two degrees from the University of Michigan. Prior to U of M, he received an MS in EE/CS from the University of California, Berkeley, and a BSEE from the University of Cincinnati. Richard worked as an electrical engineer, software engineer and engineering manager in Silicon Valley for 18 years before deciding on a second career in naval architecture in 1992. He founded Ship Motion Associates in Portland, Maine, in 1995.

Arthur Hagar III-Arthur is a seasoned inventor, became interested in hydrofoils early in 1998, after the purchase of a boat for his family, a 28' Bayliner Cierra. The newly renamed "What's That?" is featured on his Company's website, www.nwhydrofoils.com. Arthur was interested in innovation and improvement of boat's performance. He began his search for a way to make the boat more efficient and increase the speed which led him to the IHS web site. Turning the family boat into a hydrofoil became an obsession. In the spring of 2000, he could not believe how much his fuel consumption dropped, and how much less stress he was putting on the engine - and his family was also having more fun!

John Ilett-John has been a keen sailor and boatbuilder mostly within the Australian International Moth Class. Having built approximately 20 moths, has led him to pursue his interest in composites. In 1997 he had some involvement with composite construction of Formula One race cars and also with a builder of large carbon yacht spars in the UK. John has a small business in Perth manufacturing mostly custom and molded composite parts, the majority being regular foils and hydrofoils for sailing craft.

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SOCAL
(Continued From Page 1)

WAVERIDER is well suited for the Southern California market. At 85 feet in length, it fits easily into small coastal harbors, has a remarkably low wake, and it promises to make the 46 mile journey from Oceanside to San Diego in about an hour. The comfortable ride will provide a more uplifting and stress-free experience for commuters than they would have in freeway traffic.

Offshore, marine passenger service has not been seen in California since the gold rush brought thousands of entrepreneurs to the west coast during the 19th century. Around the turn of the century coastal railroads put the passenger boats out of business. The federal interstate highway system did the same for passenger railways by the late 1950s. As the 21st century begins, freeways are grinding to a slow, irritating, stop-and-go crawl and the State of California Transportation Commission has responded with multi-billion dollar investments in Amtrak intrastate rail improvements, expanded ferry service in the San Francisco Bay and, in the southern part of the state, in the ambitious and highly innovative San Diego – Oceanside High Speed Ferry Demonstration Program first proposed by SCX in 1999.

In the view of SCX CEO, Stan Siegel (IHS Member), the challenge of his pioneering enterprise is changing the habits of drivers. "We need a boat design that produces the comfort, speed and fuel efficiency that make for reliable schedules and costs." WAVERIDER flies at 17 knots, stops gently from 35 knots in 2-3 boat lengths and turns on a dime. Ride quality is good in the 4 to 6 foot seas that are prevalent in our offshore environment. There is no doubt in Stan Siegel's mind that a modern hydrofoil can deliver a more enjoyable experience than sitting in traffic.

For instance, SCX has contracted with San Diego's leading ground shuttle provider to bring passengers to the ferry docks from a number of locations, and to take them close to their final destinations. Passenger service reps on board will radio ahead so that the right number of vans and routes are ready to fit the daily customer profile. Coordination is underway with local bus companies and with major employers who already provide their own van shuttles for employees and contract out to others. North Island Naval Station, for instance, located on Coronado Island has asked if the boat might make a stop at their dock.

SCX is contracting with veteran high-speed craft operator, Hornblower Marine Services (HMS), to operate and maintain the boat. John Waggoner, President of HMS is as excited about the venture as Mr. Siegel.

Marketing, Mr. Siegel acknowledges, is a key to success, and in his eyes, the most important aspect of marketing happens with the passengers' experience, from reservation to arrival at their destination. Pacific Marine's Navatek division has engineered WAVERIDER for ride quality and reliable performance; a new MJP waterjet propulsion system is installed; a new incidence-control forward foil and stern-mounted interceptor system provide for coordinated ride control. Low accelerations and low wake have been demonstrated. Cabin amenities include a wet bar with refrigeration and food services. HMS crew, together with SCX customer relations staff will work to ensure that every customer feels well-served, has fun and will want to return.

The state funded program covers the costs for a one year demonstration. SCX will have a morning commuter trip daily from Oceanside to San Diego, returning in the evening on weekdays; one-way fare will be $10. The operator has work underway to supplement this with additional near-term routes to Marina del Rey (LAX) and into Mexico.

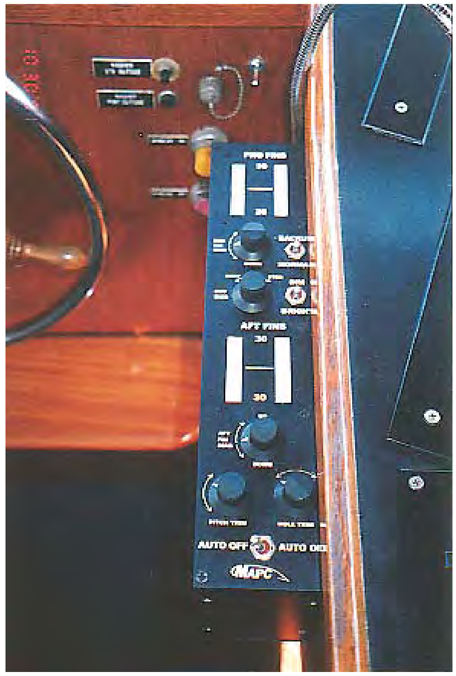
MAPC MOTION CONTROL SYSTEM

By Danny Jordan, MAPC, IHS Member

Maritime Applied Physics Corp. (MAPC) delivered a motion control system for the San Diego Bay Pilots Association vessel *Betsy* in August 2001. The 20m SWATH includes four inboard facing stabilizer and canard foils used by the computerized automatic control system to maintain static pitch and roll trim, and reduce pitch and roll motions. *Betsy* has been operated or maintained by SWATH Ocean Systems (Chula Vista, CA) since its launch in 1979, and San Diego Pilots currently operate the vessel to deliver pilots to ships.

Pilot Boat, *Betsy*

Originally fitted with hand wheels located in the pilot house to manually position the foils, operators quickly realized that some sort of automatic control system was required to prevent slamming in heavy seas. In 1980 Dr. Donald Higdon developed and installed an analog motion control system. Dr. Higdon's control system used aircraft grade vertical gyros to measure ship motions, and his control system was found to be very effective at reducing ship motions. After more than 20 years of operation, rising control system maintenance and repair costs, and the desire to add functionality to the analog control system prompted Captain Ed Silva of the San Diego Bay Pilots Association to request SWATH Ocean for a new motion control system for the vessel.



MAPC Motion Control Panel

SWATH Ocean responded to Captain Silva's request by turning to MAPC to supply a computerized motion control system. The required system would have to meet the demanding reliability requirements of a ship used for more than 300 days per year, and provide some of the conveniences found in modern control systems. The system uses solid state sensors to replace the high maintenance vertical gyros, and provides the operator with a display to review control system measurements. SWATH Ocean also wanted to provide the operator with joystick control of the vessel pitch and roll trim to give the operator more control of the ship's attitude during delivery to or retrieval of a pilot from an adjacent ship.

MAPC is an engineering company located in Hanover, MD (near BWI airport). The company specializes in developing engineering prototypes. One such prototype that lead to the SWATH motion control system was the design and development of the 27' HYSWAS (HYdrofoil Small Waterplane Area Ship) *QUEST* for the U.S. Navy in 1995. MAPC built the flight control system for the highly successful experimental craft, demonstrating the benefits of a vessel that combines the high speed/ low drag of a hydrofoil with the payload carrying capability and high sea stabilization of a SWATH. *QUEST's* flight control system maintained vessel pitch, roll, and heading, as well as vessel depth, using four horizontal foils and one vertical rudder in an aircraft foil system configuration.

MAPC Motion Control Display

MAPC uses a highly integrated, cross-discipline engineering approach to efficiently develop innovative solutions for both commercial and military customers.

MAPC has developed and tested robotic vehicles for both land and marine applications. The robotic vehicles include MAPC developed GPS and inertial navigation systems for autonomous path following and high bandwidth communications. While the marine applications require environmental protection from salt water, the unmanned land vehicles require much more attention to thermal

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MAPC CONTROL SYSTEM

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and shock considerations. The same control components used for motion control systems are installed on the land and marine robotic vehicles.

MAPC has computer modeling tools to simulate the motion of monohull, catamaran, HYSWAS and SWATH vessels in waves, with and without an active motion control system. The output of the simulations are then used to develop computer animations depicting the expected motion of the vessel in waves, with both controlled and uncontrolled vessels shown side-by- side.

MAPC has performed motion predictions for various commercial and military vessels, and validated its simulations with both model scale and full scale vessel motion measurement data. The company has fabricated more than a dozen models used in tow-tank tests, and developed/delivered motion control systems for monohulls and catamarans as well as HYSWAS and SWATH vessels in the U.S. and abroad. They have delivered foils ranging in size from less than $1m^2$ to greater than $22m^2$.

EXPLORING UNMANNED SURFACE VEHICLES

(Excerpts from Wavelengths, Naval Surface Warfare Center Carderock Division, June 2002)

Synopsis by Leslie Spaulding

[The following article is a synopsis of a paper written by Seth Cooper and Matthew Norton titled, "New Paradigms in Boat Design: An Exploration into Unmanned Surface Vehicles. " The paper was presented at the Association for Unmanned Vehicles Systems International's annual symposium in July, 2002]

Unmanned vehicles are critical components of the future naval forces. Significant research and development has been performed on unmanned underwater vehicles (UUV) and unmanned aerial vehicles (UAV), yet little effort has gone into examining unmanned surface vehicles (USV).

With future conflicts taking place primarily in the littoral regions around the globe against adversaries who possess increasingly more effective weapon systems, placing people in harm's way may no longer be a viable option. Unmanned systems-air, ground, underwater, and surface, present an effective and low cost alternative to risking the life of a highly trained soldier or sailor.

A USV offers many benefits to the Fleet. The first, and most obvious, is no risk to sailors' lives. A USV can be deployed in waters where it's unacceptable to send a manned vessel, including high threat environments or areas contaminated by nuclear, biological, or chemical agents. A USV could also remain on station for extremely long periods of time (up to several weeks) without resupply or human intervention. Such a capability could allow for long-term anti-submarine warfare (ASW) or mine countermeasure (MCM) operations in areas of the world where future conflicts are expected. Additionally, a USV squadron could be deployed in advance of a carrier battle group or amphibious ready group to sanitize the area of potential threats and assure access for troops. Furthermore, USVs have large payload capacity, allowing for a multi-function mission package to be deployed with each USV. A single USV could simultaneously conduct many operations.

By operating on the water's surface, a USV could operate on conventional power sources, such as diesel, gas turbine, etc., rather than relying on more exotic and limiting power supplies, such as batteries or fuel cells. Additionally, a USV could communicate in all three mediums of interest-undersea, air., and space, relaying information from submerged assets (submarines, UUVs, etc.) to any combination of surface vessels, aircraft, or satellites and vice versa. No other unmanned system has this capability.

USVs could range from small, "floating log" intelligence missions to a large (10,000+ ton) UAV/USV mobile base. In consultations with the Navy's future strategists-the Navy Warfare Development Command (NWDC), the Naval War College (NWC), and the Strategic Studies Group (SSG)-and based on studies published by NWDC, Office of Naval Research, and the SSG, the missions deemed most critical to the future Fleet were ASW and MCM.

A Paradigm Shift in Design

A boat designed to operate as an unmanned vehicle, however, has a completely different set of requirements than a manned one. This new set of requirements leads to a paradigm shift in hull design over a traditional manned vessel; the old requirements need to be reworked from the ground up to arrive at the optimal design for an unmanned surface vehicle. USVs may call for either completely new

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USVs

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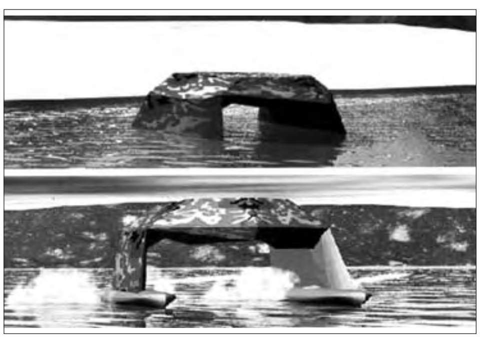
hull forms or modified versions of existing hulls. Several point designs or "solutions" were explored by the authors.

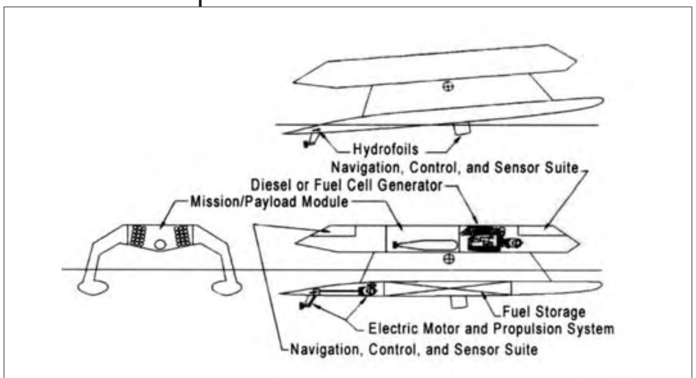
Point Solutions

The main point solution identified in the paper is the Planing Hydrofoil Assisted SWATH (Small Waterplane Area Twin Hull) Transport or PHAST. The concept for this hullform is to behave as a SWATH at lower speeds, obtaining the efficiency, seakeeping, and stealth advantages of a SWATH, and at higher speeds operate in a dynamic planing mode to allow for the efficiency gains at higher speeds.



PHAST (Planing Hydrofoil Assisted SWATH Transport) Operational Modes: (top) Low Speed SWATH and (bottom) High Speed Planing

Since the craft will perform in two modes it creates a difficult task for the designer of having to converge the design for optimal performance in both modes. At lower speeds, the hull was modeled as a SWATH with extra drag to account for the added surface area and the foil. At higher speeds, it was modeled as a planing catamaran with the addition of lift and drag from the foils, and an iterative solver was used to ensure that all the forces and moments were balanced.



Notional general arrangement of PHAST

FLAGSTAFF AND HIGH POINT

(By Barney Black, IHS Member)

Here is some recently uncovered history of two hydrofoils evaluated by the US Coast Guard. The Flagstaff photo is from the time when the ship was in active service out of Woods Hole. I also have an earlier, B&W photo of the ship in USCG paint scheme that dates from the initial 1974-75 evaluation period... that photo shows the Vietnam era weaponry still in place.

FLAGSTAFF was WPGH-1*

Both vessels were initially evaluated over a short term "on loan" from the US Navy in 1974-75, and both vessels were painted in USCG colors and temporarily commissioned for that evaluation period, after which they were turned back to the Navy. FLAGSTAFF was later brought back for further evaluation and was again commissioned in the USCG fleet.

HIGH POINT was WMEH-1

I have compiled a few dates for HIGH POINT and FLAGSTAFF in the USCG.

HIGH POINT dates: 25 Oct 74 - USCG/Navy Memorandum of Agreement for USCG's evaluation; 04 Apr 75 - commissioned into USCG as WMEH-1; 05 May 75 - decommissioned after evaluation, turned back to Navy

FLAGSTAFF dates: 08 Nov 74 thru 18 Feb 75 - initial evaluation as USCG cutter (can't confirm the exact dates... months are good, but exact days uncertain) ; 29 or 30 Sep 76 - decommissioned by Navy in San Diego; custody transferred to USCG (variously referred to as 29th or 30th Sep 76. Maybe Navy records can pinpoint this exactly); Oct 76 - arrived in Boston, Massachusetts; 02 Mar 77 - commissioned as USCG cutter commanded by LT Terry Hart, ceremony was in Boston; 26 May 77 - arrived in Woods Hole, MA; 17 Jul 77 - placed into active status, operating from Woods Hole, MA; 30 Sep 78 - decommissioned.

* *WPBH-1 in some documents.*

NEW VOSKHOD-2M

By Mark van Rijzen, IHS Member

Shown here is a photo I made on one of the last test runs of our new voskhod-2M. If you have any questions I will try to answer them all. - Mark van Rijzen
web: http://www.dutchhydrofoils.com
email: dutchhydrofoils@wanadoo.nl

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LÜRSSEN PROTOTYPE

In writing to Christof Schramm, Martin Grimm reports: I was delighted to receive your message with attachment showing that the Lürssen Werft experimental hydrofoil is still in existence and in apparently quite good condition. Just as interesting were the additional photos you included of the 'Bremer Pioneer' test model and the fully submerged hydrofoil design by Schiffbau-Ingenieur F.H. Wendel. I had recognized the shape of that craft and knew I had seen it before in a book.

Some details of Ing. Wendel's designs appear in: Fock, Harald, Fast Fighting Boats, 1870 to 1945, Their Design, Construction, and Use, first English edition, 1978 (originally in German 1973), Naval Institute Press, Maryland USA. See IHS website for more details. Part four of the book covers the war years and includes hydrofoil developments.

Shown here is a photo of Ing. Wendel's craft now preserved in Bremerhaven.

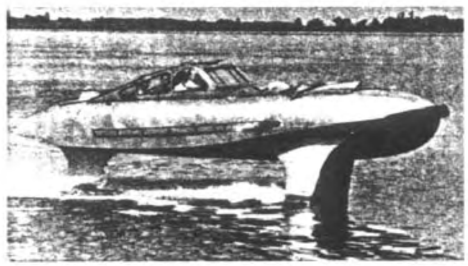

Photo 199: Wendel's hydrofoil system could not be tested until 1952.

GORDON BAKER STORY

By Charles Thompson

I served as Advertising-Publicity Manager at Baker Manufacturing Company in the mid 50's, and was closely associated with Gordon Baker in promoting the MONITOR line of products, which included both water pumps and Baker hydrofoils

The photo appearing here shows Phil Roberts, an engineer who worked on both farm water systems and hydrofoil projects, and Neil Lien at the helm (who early on was hired as a water system engineer, but easily evolved into the hydrofoil project because of his sailing experience.) The photo was one of a series shot by Edwin Stein, a freelance photographer in Madison, WI, who had ties to a number of national publications. (Ed was later employed by Life Magazine after his popular photos of the Monitor appeared worldwide almost overnight).

The subject photo was captioned, The Flying Sailboat Monitor and is one in a series sent out with my press release, to a lengthy list of publications bearing a release date of "Tuesday Noon CST September 27, 1956." Two weeks to the day from the time Gordon applied for the patent – Hydrofoil Systems for Boats!

The flying sailboat was named after the company's product brand name, MONITOR – water systems, pump jacks and windmills. As Advertising-Publicity Manager, I had a great appreciation of the product brand name, MONITOR. The Monitor logo is silk screened on the stern of the flying sailboat. The name was derived from the USS Monitor, which symbolized a watercraft. The Baker product line was clearly water related. Gordon and his brother (who died in a boating accident) were both sailing enthusiasts, whether on ice or water.

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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.

GORDON BAKER STORY

(Continued From Previous Page)

Having been an U. S. Air Force pilot, I coined the phrase (not original) the flying sailboat because the foils of both airplanes and water foils perform similar aerodynamic functions. The caption to the photos appealed to Gordon. However, Sports Illustrated called the Monitor a “waterbug.”

Mr. Baker was adamant that both sides of the sail display, in large letters that could be read from a distance, the company name – Baker Mfg. Co.— and — U S NAVY – to add some class and prestige to the Baker enterprise (and I think to infer a nautical link between its historical namesake, the USS Monitor, and the, new, modern United States Navy.)

The mail blitz was followed by news coverage on the national evening TV news program, ABC’s John Daly and the News which showed the MONITOR ripping across Lake Mendota in Madison, along with a live interview with Gordon.

John Broadwater, who manages the Monitor Marine Sanctuary off Cape Hatteras, NC, is quoted as saying, regarding the sunken USS Monitor, “This one little strange ship catapulted one almost laughable navy to world prominence.”* To paraphrase his quotation, “Another little strange flying sailboat catapulted the advancement of hydrofoils to world prominence.

“The USS Monitor’s crown jewel – its revolving gun turret, is scheduled to be raised later this summer (2002), after sinking 140 years ago. And what is so ironic is that it will go to the Mariners’ Museum in Newport News, VA, which also houses Gordon’s 47 year old flying sailboat Monitor – a fitting legacy.

The question remains, why would a proud native of the state of Wisconsin want to name their product line after something that resembles a “cheese box on a raft?” **

I have preserved copies of several publications which featured the Monitor, including a reprint from the Milwaukee Journal, Armco Steel Corporation in-house publication and Electromet Review in-house publication, Sports Illustrated and Life magazine. Also, B/W glossy photos of myself with models in the 14’ Dunphy runabouts as well as glossy photos of the Monitor.

Gordon Baker and his wife Betty had two daughters. Mary is married and lives in Delmar, CA and Ann just retired from the University of Wisconsin Physics Dept. in Madison and lives in the Madison area. Betty remarried and her husband’s name is Harry Roderick Jr.

* US News and World Report, July 29,2002, P.40,"Up from the Sea"

**To those not familiar, the State of Wisconsin once boasted to be the Cheese Capital of the World.

USS AQUILA (PHM-4)

Ronald Swart has built a beautiful radio controlled model of the *USS AQUILA* (PHM-4) pictured here. The hydrofoil is one of six in the PHM Class used by the U.S. Navy for over 10 years from the late 1970s to the early 1990s at which time they were all decommissioned.

The model is built to a scale of 1:30 which makes it 135 cm long with a

beam of 48 cm; the model weight is 14 kg. Built over a twelve year period, he followed drawings from the Boeing Company. Notice that since waterjets were not readily available for this size model, propeller propulsion was substituted. Also, the foil design has been altered from the real ship, presumably to enhance control authority.

Additional pictures can be found at: http://home.wanadoo.nl/~hydrofoils1/phm.htm

HYDROFOIL RUNABOUT

By Myrel Harner, IHS Member

I acquired a 1958 Grumman Hydrofoil some 11 years ago and have had it in the water four times in May of this year.

First trip: 20 minutes and almost sank it. Second trip: 20 minutes and almost sank it—again. Third trip: 35 minutes, about scared my wife out of her wits and ruined her camera. Fourth trip: 45 minutes at Lake Lanier, Georgia. Twenty-two knot wind, foot to foot and a half chop. Got foil-borne at 28 MPH, forward foils stall at 27 MPH and she plows in. I think I am proficient enough to survive further operation.

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HYDROFOIL RUNABOUT

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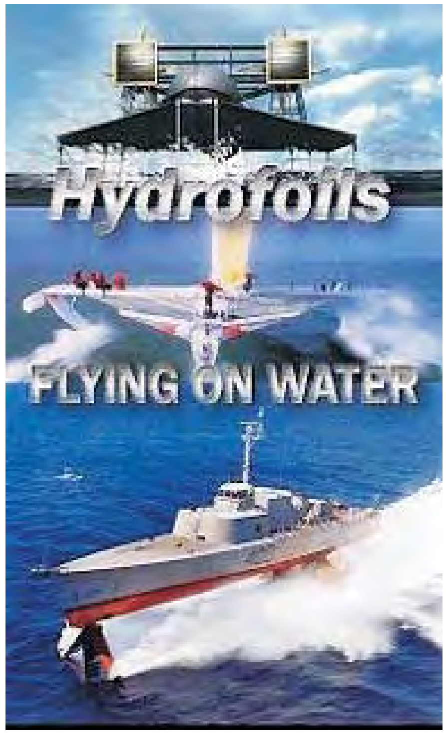
Sure is interesting. I have been in contact with William P. Carl who designed and manufactured the foils for Grumman. Grumman later acquired his company, Dynamic Developments, Inc.

Also, I have been in contact with Robert C. Muncie who prepared the report: "Development and Testing of Fully Submerged Hydrofoils With Drag Vane Control 15' Runabouts." I have the manual for operation of model A70 Sea Wings for 16' boats. The information in the above has the only clues of operation which is like **No Other** boat I know. Hydrofoil pilots are different!

HYDROFOIL VIDEO AVAILABLE

An Arcadia Entertainment production, "Hydrofoils - Flying on Water", is a story of Hydrofoil watercraft from Alexander Graham Bell's earliest experiments with the basic principles to modern computer controlled high speed military attack craft, as well as lots of fun and interesting developments such as human powered and sail powered hydrofoils. The producers say it's a wild paced ride, chasing the exciting story of the world's fastest and most complex extreme watercraft. Competition, science, power and adventure mingle with a bit of mad inventor spirit.



The new Discovery Canada video Hydrofoils, "Flying on Water" is available in VHS format for $29.95, including shipping and handling within the U.S. and Canada. IHS assisted in compiling historical photos and video clips for this production. More details and a description of the video are on the Internet at http://www.hydrofoil.ca/ To purchase a copy of the VHS tape, send a cheque or money order to: Lucy Decoutere; 1657 Barrington St., Suite 138; Halifax, Nova Scotia; Canada B3J 2A1; Tel: 902.446.3414; Email: lucy@thesea.ca

A QUOTE TO REMEMBER!

(Contributed by Ken Spaulding)

Sea fighting is pure common sense, the first of all its necessities is **SPEED**, so as to be able to fight **when** you like; **where** you like, and **how** you like. By Lord Fisher of Kilverstone (In a letter to Winston Churchill, 1st Lord of the Admiralty) 16 January 1912.

INVENTOR OF THE HYDROFOIL

(Contributed by Barney Black, IHS Member)

Many different people have been named as "Inventor of the Hydrofoil". Perhaps this article will clarify the situation and give credit where credit is due.

An excellent source for early hydrofoil history is the out-of-print book *Aeromarine Origins* by H. F. King. Putnam London was the English publisher, and it was published in the USA by Aero Publishers, Inc. of Fallbrook CA, copyright 1966. Library of Congress catalog card number 66-20105.

Following is an excerpt from the chapter "Flying in Water": "The study of aerodynamic problems, using water as the medium, was undertaken in the early 1860s by Thomas Moy, an inventor and latterly patent agent, whose 'Aerial Steamer' lifted 2-6 in. off the ground in 1875... He deserves a loftier eminence, in that, while experimenting in his 'water flying' (as he himself called it) he invented the hydrofoil boat."

From the Chapter "Hydrofoil Boats":

"I nail the British flag to the masthead of this chapter by expressing the plain belief that a boat was first lifted out of the water by means of hydrofoil surfaces on an English canal in 1861. At that time Thomas Moy was experimenting with the technique of flying in the water... He was trying out a boat, towed by means unknown to me, on the Surrey Canal, which in the

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SPITFIRE 12 SAILING HYDROFOIL CATAMARAN

(By Martin Grimm, IHS Member, and Mark Pivac, BDG Marine)

A stylish new sailing hydrofoil catamaran has been designed and constructed in Western Australia in recent months. The hydrofoil takes its name *Spitfire* from the legendary Supermarine fighter aircraft of World War 2 vintage.

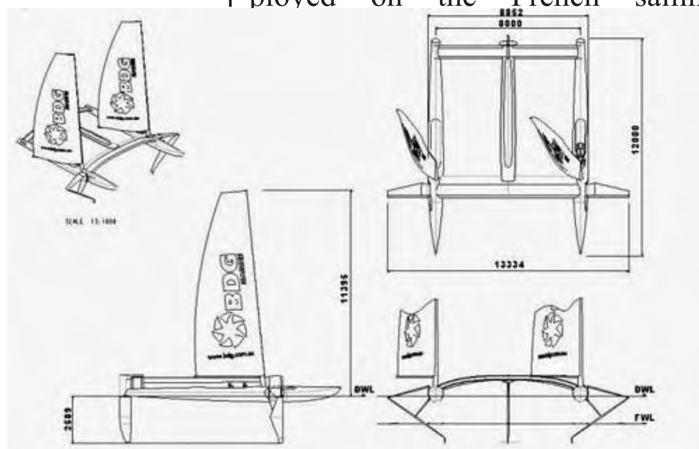
Designed by Aeronautical Engineer Mark Pivac and the team of BDG Marine, and constructed by Windrush yachts in Perth, this impressive 12m (40 feet) long craft was assembled at the Fremantle Sailing Club on 16-17th January and launched on January 18th 2002.

BDG Marine is a division of By Design Group Pty Ltd (BDG), which undertakes a diversity of industrial design work while Windrush yachts have built thousands of Windrush 14 sailing catamarans over a number of decades.

Design Overview:

The origins of *Spitfire* can be traced back to a set of hydrofoils designed by Mark Pivac for an International Moth class dingy owned by Brett Burvill, manager of Windrush Yachts. The Moth *Windrush* sailed with considerable success at the International Moth World Championships held in Perth in 2000, winning two heats in the event. The experience gained with *Windrush* spurred the collaboration on design and construction of the significantly larger hydrofoil supported *Spitfire*. Several articles with further details of *Windrush* are provided in the Spring 2000 issue of the IHS Newsletter.

Spitfire is of catamaran configuration with a pair of aerodynamic crossbeams connecting the widely spaced hulls. These also support a raised cockpit and storage area on the centreline of the craft. Three retractable hydrofoils are fitted, comprising a pair of surface piercing units outboard of the demihulls and somewhat forward of the centre of gravity, and a combined rudder and fully submerged hydrofoil mounted in an inverted 'T' configuration on the centreline aft. Twin masts mounted on the demi-hulls support a pair of 'soft wing' sails. The overall configuration is somewhat similar to that employed on the French sailing



hydrofoil *Techniques Avancees*, though that craft has its main foils mounted inboard of the demihulls.

Spitfire's Performance:

Mathematical modeling of *Spitfire's* performance was undertaken at BDG well before construction had begun. Some sailing performance predictions for *Spitfire* are provided in figures 1 and 2. Figure 1 indicates that maximum boat speed is achieved while reaching at about 110 degrees to the true wind. For this heading, a speed of around 32 knots was predicted for 15 knots of wind.

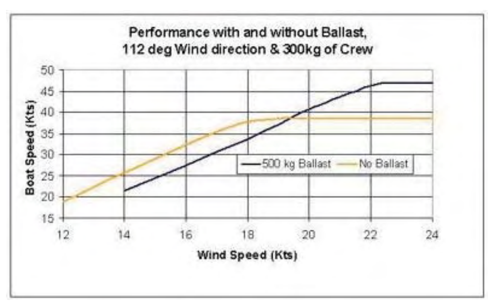


Figure 1.

Although still undergoing trials, *Spitfire* is approaching its performance

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SPITFIRE

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estimates. Take-off to foilborne operation occurs at around 10 to 12 knots, which can be achieve in 10 knots of wind. Once on the foils, *Spitfire* will accelerate to approximately 25 knots in 14 knots of wind. In only its third outing off the coast of Perth on February 2nd this year, the hydrofoil catamaran lifted its top speed to 30 knots, on a day with only 18-25 knot winds.

Mark Pivac expects *Spitfire* to reach a maximum speed (without ballast) of approximately 35 knots in 25 knots of wind or less. With water ballast tanks fitted, the estimated top speed is above 40 knots as indicated in figure 2.

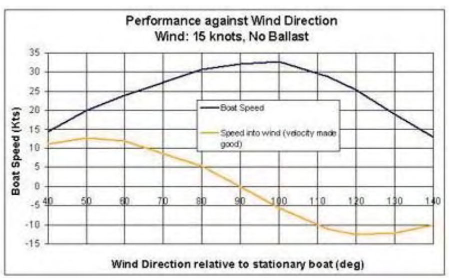

Figure 2

Hydrofoils:

As with other hydrofoil sailing vessels, the use of hydrofoils is considered to be the key to *Spitfire's* performance. Once the hulls are out of the water, drag is considerably reduced allowing the boat to accelerate to a much higher speed than would otherwise be possible in the same conditions without foils.

The three hydrofoils are placed in such a way that the two main foils support most of the weight of the boat, and the rear foil mainly provides balance and trim adjustment. Surface-piercing main foils are used as they offer several advantages. Firstly, as the boat's speed increases more lift is generated on the submerged portions of the foils and this in turn causes the foils to lift themselves and the boat further out of the water thus maintaining equilibrium between the weight and lift forces on the boat. This leaves less drag-producing foil surface area in the water, which is perfect for good performance. Secondly, the foils are inherently stable. If the boat rides too high, there will be less foil area in the water and hence less lift generated and the boat's weight will force it back down. Conversely, if the boat is riding too low, the additional submerged foil area will generate lift and raise the boat. The hydrofoil profiles used on *Spitfire* were developed at BDG Marine. Fluid dynamic modeling software was used to design and analyse the critically important foil shapes.

Spitfire's foils are able to be retracted to enable shallow water operation and beaching

The hydrofoils were optimised for minimum drag, but with good resistance to ventilation and cavitation. No fences were used on the hydrofoils, and to date there has been no ventilation or cavitation observed.

The foils and rudder skins and shear webs are predominantly constructed of unidirectional and double bias carbon fibre prepreg. The shear webs were formed over foam and plywood and are bonded between the two skins.

[To be continued as Part II in the Winter IHS NL issue.]

THE SCAT STORY

By Sam Bradfield, IHS Member

The Arcadia Entertainment tape (See Page 9) pretty much tells where we are at present with the SCAT schedule.

We launched SCAT July 10, 2002. After flying one day at 24.5 kts off Key West in a 10 to 15 knot breeze, Tom Haman and Mike McGarry sailed her to Port Canaveral in light air (6.5 kts average boat speed)

SCAT now has a temporary home at the Cocoa Beach Yacht Club Tdock in Port Canaveral. We've done 20 hrs of sailing since her arrival including 3 days of flying in light air...9 to12 kts wind speed (1.8 to 2.0 Vb/Vt ratio)

As of this writing, the boat is hauled out for minor modifications, repairs and bottom paint, but will be back in the water in October. The next CBYC phase will be time trials, racing, & photography off Port Canaveral with activity peaking with the Lauderdale to Key West race in January 2003. In May 2003, we leave the CBYC Tdock and move the boat to the Newport RI area for final development before the ocean racing in OSTAR 2004. We'll be back in Port Canaveral next fall for the winter. Philip Steggall is our experienced single handed ocean racing pilot for that final testing phase starting in June 2004.

[More to this story in the next issue of the NL.]

Welcome New Members
(Continued From Page 2)

John McDonald – John joined the IHS because he is serving on a group in Chattanooga, TN that is researching the possibility of purchasing a high-speed vessel which would transport visitors and locals from downtown Tennessee Aquarium to a beautifully scenic area known as the Tennessee River Gorge. Present thoughts are a vessel with a capacity of about 50 passengers, and would welcome suggestions from IHS members for hydrofoils or foil-assisted vessels.

Mark Ott – Mark is the founder and president of HydroWing Hawaii. HydroWing is engaged in the development and production of hydrofoil-assisted trimarans with manned and unmanned capabilities for government and DoD use. The vessels are primarily wind driven enabling long range and mission duration. Uses include but are not limited to Range Clearance, Homeland Defense/Shoreline surveillance, mine warfare, and marine mammal surveillance.

Dingo Tweedie – Dingo is an Aussie living in Washington state in the USA. He has a degree in aeronautical engineering and a Masters in Naval Architecture from Stellenbosch University in South Africa where he was involved in the design and testing of various craft, including the HYSUCAT (Hydrofoil Supported Catamaran). He works for a naval architecture/marine engineering firm in Bremerton near Seattle, and is involved in an experimental hydrofoil craft as well as various Stolkrafts which he intends to redesign with foils to improve top-end speed.

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INVENTOR OF THE HYDROFOIL
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last century linked Rotherhithe and Camberwell. His apparent preoccupation was aerodynamics, and not hydrodynamics; but recognizing that water was the easier (and the safer) medium, he conducted his investigations into what he himself termed 'water flight.' His boat had on its underside three planes, rounded above and slightly hollow underneath, and Moy, I find, has left record of how, with the boat under tow, it was raised 'quite out of the water.' The planes were 'self acting as to angle of incidence' and 'assumed finer angles as speed increased.' Moy noted that the front edges of the 'planes' threw up water; 'a kind of vacuum was created on the after part and thrust was reduced as speed increased.'"

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

IN MEMORY OF JOSEPH SLADKY, JR.

IHS Member, Joseph Sladky, Jr. of Mercer Island, Washington, died of cancer June 7, 2002 at his home. He was 61.

Mr. Sladky was born March 9, 1941 in Czechoslovakia. He immigrated to Canada when he was 11 years old after living in a refugee camp in Czechoslovakia for two years.

He came to the United States when he was in his early 20s to attend graduate school in mechanical engineering at the University of West Virginia. He later taught mechanical engineering at the US Naval Academy in Annapolis, MD, and the Naval Post Graduate School in Monterey, CA.

Mr. Sladky later became a professor of mechanical engineering at the University of Washington and later worked for Lockheed. At the time of his death he had his own engineering consulting firm.

He is survived by his wife of 31 years, Marilyn Shirley.

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LETTERS TO THE EDITOR

Happy Golden Anniversary Supramar

[July 5, 2002] I have just realised that this year is the 50th anniversary of the formation of the hydrofoil design and development company Supramar AG based in Switzerland. The company was formed by hydrofoil pioneers Baron Hans von Schertel and Gotthard Sachsenberg who had already earlier in 1936/37 formed the Schertel-Sachsenberg Schnellboats-Konsortium (speed boat consortium).

Another significant milestone in the not too distant future will be the 50th anniversary of the date that PT 10 Freccia D'Oro (Golden Arrow) opened the first regular passenger service in the world. This service was started on 16 May 1953 on Lake Maggiore between Switzerland and Italy. A bit further down the track, in 2005, we can celebrate the centenary of Enrico Forlanini conducting successful trials of his hydrofoil craft on that same lake. It would perhaps be a suitable gesture if IHS celebrated that event in some special way? Martin Grimm, seaflite@alphalink.com.au

Science Fiction/Fact

[August 30, 2002] I have written a science-fiction novel on an imaginary watery planet and have included hydrofoil vessels. I'd like to know if my fictional use and description of hydrofoils seems possible and accurate. Float planes with hydrofoil struts: These planes are about the size and speed of a Piper Cub although lighter due to use of carbon fiber components. It can also fly as a glider. The hydrofoil struts fold while the craft is in air flight. The wing fold when the craft operates as a boat. A propulsion device, which runs off of a hydrogen fuel cell delivers periodic burst of power. The cadence of the burst can be adjusted to coordinate with air and water conditions. This planet has no fossil fuels and so energy efficiency is of utmost importance, thus the importance of a engine that can be turned off when not needed. Sail hydrofoils: I imagine them as small and lightweight for carrying two people with no cargo. They have aux power provided by the same propulsion device that is on the aircraft. The propulsor is used get onto step quickly.

I'd like to know about how tacking works with hydrofoils. How close to the wind do you need to be to stay on step? A friend of my thought it would only work on a reach. My story includes a scene with a battle between a guy in the aircraft and a bunch of guys in the sail hydrofoils. The guys in the sail hydrofoils mounted howitzers onto their crafts (they were not designed for this usage). If they shoot in the wrong direction, while healed over, the boat capsizes. The guy in the aircraft has a laser cutter which doesn't do much unless he strikes sensitive parts of the hydrogen tanks. (His craft can't carry the batteries or other power source for a big laser.) Does this sound reasonable? Lizzie Newell, lizzie-n@gci.net

Responses…
[September 3, 2002] All sounds well, with a few small points. Sailboats rely on momentum to carry them through a tack. The same momentum keeps the boat foilborne. Some hydrofoil sailboats like the Windrider have trouble staying up while tacking, but that is because of the control system, not the foils. The Hobie Tri-foiler tacks while foilborne with no trouble. Also, recoil from a gun would not cause the boat to capsize. Foils can pull down on one side of the boat as well as push up on the other, which also means that a well designed hydrofoil sailboat doesn't heel. Plus the recoil is so short lived it would be absorbed by the mass of the hull and the foils wouldn't even need to react. However, such a recoil would likely damage the structure of the boat. Fire a large caliber rifle, it doesn't have time to push you off your feet, but it will hurt like hell if it's not tight to your shoulder. A more troublesome device for a hydrofoil would be something that induce prolonged thrust, like a mini-gun (electric Gatling gun). A high power rifle will not knock you over, but a 9mm machine gun (much lower power) will certainly push you off your feet if you are not braced for it. Fired forward it would produce a reaction thrust that would slow a boat down. Backwards it would add to the thrust of the boat (not a problem for a foil). Sideways would be like being on a reach in a strong wind. The foils would have to adjust, and the extra angle of attack would induce drag. But if the direction of fire is slightly to the rear, the pressure on the hull would increase it's speed, just as the pressure on the sail in a reach adds to the hull speed. You might want to look up something called a gyro jet . It was a pistol cartridge invented a while back that used a sort of spin-stabilized rocket propulsion. Artillery is too heavy for a hydrofoil sailboat. Simply put, twice the weight, four times the drag. The Gyro jet was almost recoilless, required a much lighter gun, and I believe is the technique used by many hand-held flare guns today. As far as how close to the wind you can sail a hydrofoil boat, wind direction is only a problem as it relates to hull speed. If a sailboat can achieve 20 knots 15 degrees into the wind, so can a foilborne sailboat. The most likely problem would be going downwind. A sailboat is always slower than the wind going downwind. A 10mph wind would not be likely to keep any hydrofoil sailboat up on it's foils, no matter how efficient it is. Scott Smith, ssmith@syntheon.com

[Sept 24, 2002] Some additional sailing hydrofoil information: there is a whole new type of sailing hydrofoil (though Monitor was actually the first) being developed around the world: the monofoiler. These boats are stabilized (generally ,but not always) by the crew; they are basically monohulls not multihulls such as the Rave and Trifoiler. You can see an overview of some of these boats at: http://www.monofoiler.com These boats can sail on as few as two foils

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Letters To The Editor
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and are a new wave in sailing hydrofoils. Sailing hydrofoils most certainly can sail downwind at speeds substantially higher than wind speed: they do it by tacking downwind (actually and technically-gybing) .A well designed foiler can point as well as normal sailboat and at any rate it's VMG (speed made good to windward) will be better. At least one new monofoiler, the Dancer, has been designed to jump: the flying system is controlled by the skipper and, at will, he can twist the hiking stick, pull the trigger and jump clear of the water!—just for the fun of it! Doug Lord, lorsail@webtv.net

Supercavitation

[Sept 2, 2002] I'm developing a television program for a new series on emerging technology for PBS in the States. It's on Supercavitation; its history, and how it can effect transportation. While there is a lot of information on the military's supercavitation experiments with torpedoes, and various stories on experimental vehicles which have used supercavitation in the past, I'm now trying to find information on the current use of supercavitating techniques for foils/boats, and where experts think supercavitation will take us in the next 5 or so years (both in terms of speed and wide-spread usage for public transportation). Can anyone help me? It would be enormously appreciated. Lucy McDowell, lucycmcdowell@aol.com

Response…

[Sept 3, 2002] Lucy, You have described a fairly specific subject matter, its not what I am used to seeing on TV but it sure sounds interesting! As I understand it, not having ever worked in that specific field, the main reason for adopting supercavitating foils for hydrofoil craft is so that they can operate at high speed without the problems of cavitation erosion of the foil surface and also so that the lift generated by the foils remains stable and controllable. With a supercavitating foil, the vapour cavity (effectively this is steam created at normal water temperature but very low pressure) that is formed on the low pressure side of the foil does not collapse until well downstream of the foil itself. It is the collapse of the cavity that is usually associated with cavitation damage to such items as propeller blades and other hydrofoil surfaces including ships rudders. The down side of adopting a supercavitating foil profile is that these foils typically would have a lower lift to drag ratio than subcavitating (conventional) hydrofoils. This means that they are less efficient.

Regardless of the efficiency of the foils, the sorts of speeds at which supercavitating foils would be necessary are also speeds at which any type of marine craft requires a substantial amount of propulsion power to drive it along. Hydrofoils such as the Boeing Jetfoil passenger ferry and the military PHM also built by Boeing can travel at 45 to 50 knots and yet could still get away with using sub-cavitating foils. Only very few fast ferries travel at speeds greater than that, the old SR.N4 cross channel hovercraft were examples. Some of the more recent catamaran designs with very high installed power levels for their size are also claimed to achieve speeds in excess of 50 knots.

The question that needs to be asked is: will any significant number of operators want to travel at 50+ knots and pay the price in terms of fuel consumption?

It seems to me that research on supercavitating hydrofoils for hydrofoil craft applications was mainly undertaken in the 60s and 70s when the US Navy was seriously considering the application of higher speed hydrofoil boats and ships. The main focus on use of supercavitation these days would probably be in the areas of offshore powerboat and unlimited hydroplane racing where propellers would typically either be of surface piercing or supercavitating type. One of the companies to ask about such matters would be Rolla SP Propellers SA (www.rolla-propellers.ch).

The only more recent work I am aware of that is somewhat related to application of supercavitating foils to hydrofoil vessels is in fact aimed at inducing ventilation to avoid supercavitation. That research was undertaken by one of the pioneering hydrofoil design firms, Supramar AG (www.supramar.ch). You can read about their controlled air-fed profiles at their website, and contact details are also provided for personnel in the firm. An extract from their website is as follows, but the website contains more complete info about the rationale for the foil profile.

Out of the experimental development in the IMHEF high speed cavitation tunnel of the Swiss Federal Institute of Technology Lausanne for controlled air-fed profiles a surprising new concept was proven. By a special groove on the surface of practically any profile it is possible to avoid cavitation or supercavitation at high speed and low sigma operation. I don't know whether there have been any recent developments with the concept as the work appears to have been undertaken some years back.

I hope one or both of these leads is fruitful in obtaining more information to prepare the TV program. I wish you well with the project. Martin Grimm, seaflite@alphalink.com.au

Hydrofoils in Reverse?

[Sept 11,2002] We are working on a project using hydrofoils. I want to know if a hydrofoil can be made so that it will create lift when the water flow is turned around (so you have lift if you go backwards). Peter Tijssen, p.tijssen@student.tue.nl

Responses…

[Sept 11, 2002] The answer to your question is yes, a hydrofoil operating in reverse (the sharp trailing edge now becoming the leading edge) can generate lift provided that it has

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Letters To The Editor

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sufficient angle of attack to the oncoming water flow. The only problem is that the lift to drag ratio would be far worse than if the hydrofoil operated in its intended direction of travel relative to the flow. I imagine the hydrofoil operating in reverse would also stall at a far lower angle of attack than if operating in the ahead direction.

I suspect that test data would be available for aerofoils operating in the reverse direction if you looked through some of the more comprehensive references on that subject, and hydrofoils would behave in a similar manner. A good example of where this has been assessed, is for determining the thrust produced by ships propellers when operating in the reverse direction of rotation. The blades of propellers are in fact one form of hydrofoil. A few decades ago, the Netherlands Ship Model Basin (NSMB), now Maritime Research Institute Netherlands (MARIN), had performed a series of tests on model fixed pitch propellers to determine their performance under the full range of operating conditions. The results were presented in the form of four quadrant charts which allowed the determination of thrust (both ahead and astern) and torque (both positive and negative) for cases of either the ship moving ahead or astern and the shaft turning ahead or astern. I hope this helps. Martin Grimm, seaflite@alphalink.com.au

[Sept 11, 2002] Absolutely a hydrofoil can be made to work in reverse, and it can be done without any loss of performance from the forward direction, as long as you keep one thing in mind. Most designers are seeking to use the most efficient foil they can, so they usually end up with a foil section similar to an airplane wing. That means fat up front and skinny in the back. However, not all foils are designed that way. Many smaller Russian foil boats use a very simple geometry that is completely symmetrical from front to back. These foils are only slightly less efficient than an airfoil shape. The trade off is this: 1) Use an airfoil shape and the foil works very efficiently forward, but marginally in reverse. Boat props work this way because you don't spend much time going backward. 2) Use a symmetrical foil shape and the forward efficiency is only marginally reduced, but backwards efficiency is the same as forward efficiency.

I have seen this type of foil on a Volga 70, and in plans from an old Popular Science article on building your own foil boat. In the plans the foils are oak, they are flat on the bottom, and the top is an arc that is a section of a perfect circle. The dimensions of the cross section were as follows: The flat bottom was 7 in. wide, with a 1/32 in. blunt edge on both the leading and trailing edges, and the arc had a radius of 10 , making the middle of the foil about 5/8 thick. If you like I can send you a copy of the plans. If you don't mind, I would also like to hear what you are planning, it sounds unusual and interesting. Scott Smith

[Sept 11, 2002] You can make sections that are symmetric with respect to the mid-chord so that they work equally well in both directions. There are basically two approaches: sharp edges or rounded edges. The sharp-edged approach is the traditional solution. A good example is ogival foils, in which the upper surface is an arc of a circle and the lower surface is flat. Easy to make, since you can put blanks with a rectangular section on a polygonal drum and turn the drum in a lathe to form the hydrofoils. Perhaps a better shape would be one based on the NACA a=1 camber line.

My personal view is that, despite being used in many hydrofoils, sharp edged sections are not a good choice for sub-cavitating hydrofoils. The reason is that flow separation at the leading edge is unavoidable for all but a very narrow range of angles of attack. For modest angles, the separated region reattaches, forming a separation bubble that effectively makes the leading edge more rounded. At larger angles, the section simply stalls at the leading edge. Hoerner's *Fluid Dynamic Drag and Fluid Dynamic Lift* has test data for these sections.

The problem with subcavitating hydrofoils is that the leading edge separation promotes ventilation. And ventilation has been the bane of many hydrofoil projects. The hydrofoil will be working fine until the angle of attack goes outside the ideal range. Then the leading edge flow separates, the foil suddenly ventilates, and the lift drops by 75% or so, causing wild behavior in the craft. That leaves the alternate approach, which is to use rounded leading edges. This means that the trailing edge is also rounded, which means there will be a small separated region there. If the trailing edge separated zone ventilates, it doesn't affect the rest of the foil. The rounded trailing edge also allows the pressure side flow to come partway around the trailing edge before it separates, effectively reducing the camber and the lift. However, it still appears that it is possible to design fore-aft symmetric sections with rounded edges that will still have performance comparable to a conventional foil. I've designed sections of this type, and you can find them, along with XFOIL predicted performance. These have not been tested experimentally, so I would be very interested in seeing the results if you were to test them in a wind tunnel or tow tank. Tom Speer, me@tspeer.com

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Letters To the Editor allows hydrofoilers to ask for or provide information, to exchange ideas, and to inform the readership of interesting developments. **More correspondence is published in the Posted Messages and Frequently Asked Questions (FAQ) section of the IHS Internet web site at http://www.foils.org.** All are invited to participate. Opinions expressed are those of the authors, not of IHS.

Letters To The Editor
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MEC Hydrostatic Drive

[Sept 14, 2002] Way back in, I believe, the summer of 1969, Carlo Rodriquez, one of his design engineers and I were having a meal on the terrace of a small restaurant just outside Messina. When I drove Carlo back to his house in Messina, he mentioned that they were breaking their heads over a new drive system, wanted for further development of their Aliscafi, but had not come up with a satisfactory solution. He also mentioned that they would have loved to incorporate it in the GP 40, that, at that time, was being converted from a test bed into a luxury yacht (later to be sold to a man nicknamed signore Mezzo Milliardo by a newspaper for having paid 500 million lire for it).

Later that year, back in Belgium, I drew up some sketches and took them to Roelof Laan's engineering bureau in Dordrecht, Holland, to discuss them. A couple of months later or so I sent Carlo an outline of my idea to use a hydrostatic drive: pumps coupled to the engines, hydromotor/props mounted on the rear foil. That would certainly have done away with the shaft vibration and other problems that we had discussed. Carlo sent me a polite letter saying that my idea was totally unfeasible and not worth pursuing.

This afternoon, by coincidence, I came across your web page at and, reminiscing about these bygone days, started to read and was quite surprised to read the following:

On the ground of the experience and exciting results with the RHS series, the technical department of Rodriquez Shipyard undertakes a series of studies on research and development which lead to the definition of a new product. The MEC (Maximum Efficiency Craft) series which adds the hydrostatic drive to the hydrofoil idea. This revolutionary propulsion system consisting of a set of hydraulic pumps coupled to a conventional diesel engine and a block of hydraulic motors placed on the foil in turn coupled to a propeller. Takeo De Meter, 133759@in.pandora.be

Responses…

[Sept 14, 2002] Thank you for a layered and fascinating remembrance stimulated by Leopoldo Rodriquez's history (which is becoming a bit dated) of Rodriquez Cantieri Navali. This history is on our site at http:/www.foils.org/navali.htm. There is more info on the Rodriquez MEC vessel in our photo gallery at http:/www.foils.org/gallery/mec.htm. I would like to console you with the news that the MEC design was not a technical or commercial success, but from your point of view, news of success or news of failure would be equally disappointing! Barney C Black, webmaster@foils.org

[Sept 14, 2002] Disappointment ? Not really. It is all so long ago, more than 30 years now. But now I also remember a few other things of anecdotic value. The country house in Musolino, in the hills, was rather a small palazzo than a house, with a large flat terrace roof on which his children (and I) put our beds to sleep during the warm summer nights. It was a very pleasant place to stay. When I rode with Carlo in his Lancia to his house in Messina, coming from the Molo Norimberga, he invariably drove up a one-way street in the wrong direction and I often saw policemen saluting him and holding up traffic for him so he got through. There was also a small (5 or 6 metre) craft at the Cantieri that was used to test scaled-down foil set-ups. The GP 40 was featured in a French girlie magazine called Lui and the article was titled Un poisson volant qui nous vient d'Italie (A flying fish that comes towards us from Italy). Carlo was kind of proud of that article - there are not many pictures of the GP 40-. It would fly at some 120 Km/h in force 5 seas with no hull movement exceeding 2 degrees in any direction, at one time she had 2 Maybach (MTU) 750 HP V-12 diesel engines, but the early electronics that steered the automatic stability array were very troublesome. Takeo De Meter , 133759@in.pandora.be

[Sept 15, 2002] I was looking at the Rodriquez website () trying to figure out what the GP 40 was but I couldn't find any indication of it on their construction listing. The nearest I could come to it was a small experimental craft they called the ST-1 (see photo below from Rodriquez website), the reference on the website to 70-passenger capacity is apparently an error. The photo shows a boat with Supramar AG titles on its side. I am wondering whether the 'small craft of 5-6 metres' is one and the same as the 'GP 40'? Placing two 750 HP engines into such a small boat seems difficult to me. Martin Grimm, seaflite@alphalink.com.au

[Sept 17, 2002] The GP40 is the original name of the Aliyacht later converted to a passenger RHS110 for Aerobarcos do Brasil and named Flecha de Angra. The Rodriquez site lists it under the last name. The full story was in Classic Fast Ferries #6 which is no longer available for download but a mail to Tim could help. Eje Flodstrom, eje.flodstrom@yahoo.com

[Sept 17, 2002] Eje, Thanks for that explanation. I have a copy of CFF #6 from 2000 and so it was worth reading the article on the RHS 110 series once again. I didn't make the connection with the Aliyacht since Takeo had made reference to a small 5-6 metre craft. The Aliyacht was around 24.5m long. Jane's Surface Skimmers indicates the Aliyacht was powered by two (2) supercharged MTU/Maybach MB 12V 439 TY 71 Diesels rated at 1350 hp... similar to Takeo's recollections except that the installed power is greater. It may be that the craft was re-powered at some point to achieve greater performance. Martin Grimm, seaflite@alphalink.com.au

[21 Jun 02] re: that old question "whatever happened to the Yamaha OU-32 personal hydrofoil I saw on *Beyond 2000* many years back?" see www.yamaha-motor.co.jp/cp/challenge/expansion/ou32/ou32.html. There are photos and a RealMedia movie on that site! Aaron Sakovich, aaron@alphant.com

EXTRA FOR THE ELECTRONIC EDITION

Remembering “The Carl Boat”

By John R. Meyer, Jr.

The US Navy, in its early hydrofoil development work, evaluated a hydrofoil configuration having ladder foils on the XCH-4 (Experimental Carl Hydrofoil number 4). This 16,500 pound, 53-foot craft was known as “The Carl Boat” after its principal designer, William P. Carl. It had a seaplane-type hull supported by two sets of foils forward and a single strut and foil aft. Two 450 hp Pratt and Whitney R-985 aircraft engines with two-blaeded controllable pitch propellers 8-feet in diameter provided the thrust to carry this craft to the highest speeds since those achieved by Alexander Graham Bell’s HD-4.

During trials of the XCH-4 in 1953, its design speed of 65 mph was exceeded in three- to four-foot waves. It is interesting to note that many of the tests were run on the Great South Bay between Sayville and Patchogue, Long Island, and also in the open sea off Montauk Pint, Long Island. The US Coast Guard furnished an escort boat for each of the tests. A humorous aspect of XCH-4 testing occured one day when an innocent bystander, after observing the craft running back and forth for several days, called the Coast Guard to report that a seaplane had been trying unsuccessfully to take of, and undoubtedly needed some assistance. I suppose this error was understandable in view of the craft’s appearance.

Later, a maximum speed of 74.4 mph was recorded, which in 1954 was a speed record for hydrofoils, exceeding Bell’s 1919 record of 70.85 mph. The good performance, stability, and favorable seakeeping characteristics of the XCH-4 encouraged US Navy officials to continue hydrofoil development.

Above: September 18, 1955. The Carl Boat at Little Creek Amphibious Base VA submitted by Jake McAndrew, which he received from “Bill Clemente, a buddy who started out as a white hat and ended up as commander of BJU2.” The photogropher is known only as “J.E.Q. QMSN"

Above: The Carl Boat in Flight

After the “Carl Boat”

Shortly after final tests of the XCH-4, Bill Carl left J.H. Carl and Sons to form his own company, Dynamic Developments, Inc. His partner in this venture was Robert Gilruth, who was also a hydrofoil enthusiast. They initially developed and sold a hydrofoil kit for conversion of small runabouts. Grumman Aircraft Engineering Corp. purchased an interest in the company and later acquired it as a base for their entry into the hydrofoil market.

Right: Christopher McAndrew provided this detail of The Carl Boat, which he expertly extracted from all the clutter in the Little Creek photo (above, top).

NEWS DIGEST
(Continued From Page 12)

BLADE AND HYDROFOIL SECTION DESIGN

The Society of Naval Architects and Marine Engineers has published the technical bulletin *Blade and Hydrofoil Section Design*.

This bulletin includes the Blade and Hydrofoil Section Design Codes with a 29-page Owner's Guide, and a 184 page Technical Report. It updates and complements T&R Bulletin 1-17.

The Design Codes and Owner's Guide provide tools for the design and performance evaluation of blade and hydrofoil sections. The programs are provided in both DOS and Mac formats and will run on most personal computers.

The Technical Report provides analytical background information and is of interest primarily to those who wish to adapt or enhance the programs.

This new publication is identified as Technical and Research Bulletin 1-45. It is being issued as a CD, and may be ordered by contacting cpujols@sname.org or by calling +1-201-798-4800. It is priced at USD50 ($USD5 for SNAME members).

Patent Research

Those who are interested in researching patents may want to visit the following web pages:

USA Patents Since 1790
http://www.uspto.gov/patft/index.html

Canadian Patents
http://patents1.ic.gc.ca/intro-e.html

EC Patents (Since 1978)
http://library.dialog.com/bluesheets/html/bl0348.html

METEOR 2000

IHS Member Konstantin Matveev reports that Zelenodolsk shipyard is producing a new version of Meteor, called Meteor-2000 (pictured above).

Principal characteristics are the following:

- Length overall 34.6 m
- Beam overall 9.5 m
- Draught hullborne 2.35 m
- Draught foilborne 1.20 m
- Displacement Light 43.82 t
- Displacement fully-loaded 57.24 t
- Main engines: DEUTZ AG (Germany) - 2 ´ TBD616V16. Each engine with the power of continuous rating in tropical conditions about 936 kW (1272 h.p.) at 2165 r.p.m.
- Diesel-generator - 1 ´ 44 kW
- Passenger capacity 104-116 prs.
- Crew 3 prs.
- DAIKIN Marine Type package air conditioners (warm/cool) 3
- Cruising speed in calm water, at fully loaded displacement, is not less than 75 km/h
- Range without refueling 600 km

First Halloween Hydrobowl

Human Powered Boat aficianados in California attended the first Halloween Hydrobowl, 26 Oct 2002 at the Long Beach Marine Stadium, site of the 1933 Olympic rowing events. Events included 100m Flying Start speed trials, Static Thrust, 2000 m closed course, and a mass start race. Spectators came out to see some of the world's fastest Human powered boat designs. Bill Gaines was the Halloween Hydrobowl Chairman.

MUSEUM PIECE FOR SALE

IHS member Myrel Harner is offering for sale an icon of sport hydrofoil history: his 14'- 8" Sea Wing Hydrofoil manufactured byGrumman in 1958. It has a new Mercury 40 HP, Trailer, the original 35 HP Evenrude Lark (stuck), and Morse Controls. According to Myrel, it runs great. He is in Georgia USA and is willing to deliver in Southeast USA. $27,350.00. Contact: Myrel Harner (ireneharner@juno.com)

NEWS DIGEST
(Continued From Previous Page)

POPULAR MAGAZINES

We have added photos and citations on the Popular Magazines page at www.foils.org/popmags.htm. It is worth a look, and if you can provide additional citations and cover scans, please send to webmaster@foils.org. Several citations are reprinted here as samples.

"Hook's Hydrofin - Boat Rides on Stilts," *Mechanix Illustrated*, Apr 1952, pp. 84-85. "The basic elements are a fuselage (completely out of the water while the boat is in motion), three fins or hydrofoils (under the surface) which are connected to the fuselage by supporting struts or hydropeds, and of course, a power plant. Then, there are two forward projecting stilts, called jockeys, which predict the water surface in front of the foils... Standard Hydrofin production models are 12-1/2, 18-1/2, and 24-1/2 feet long, carrying 2, 5, and 10 people... The manufacturers -- Atlantic Hydrofin" Corporation of Miami FL... "

Fitz-Gerald, Wm. G., "To Cross Atlantic in Thirty Hours," *Technical World Magazine*, Oct 1907, The Technical World Co., Chicago IL, pp 139 -142. Includes three tinted photos. "Peter Cooper Hewitt of New York is a scientist and inventor of high reputation and proved achievement. He is not given to idle and boastful talk. consequently, when he announces that by the invention of a boat supported above the water by gliding planes he has made possible the building of ocean liners which may easily reach a speed of one hundred miles an hours, even conservative men are ready to believe the statement. To cross the Atlantic in thirty hours is the goal at which Mr. Hewitt is aiming... with the added marvel that seasickness also will be relegated to the limbo of forgotten horrors, because no longer possible! ...the only problem that remains at present is that of the propeller... yet the idea is not new... forty years ago the British Government was experimenting with a device that showed how a craft would lift if it had inclined planes made fast to its hull. So wonderful were the possibilities that private inventors speedily took a hand, among the Raoul Pictet, whose water 'flying machine' amazed the Swiss about the classic shores of Lac Leman."

Carl, William P., "The Fantastic Hydrofoil Runabout - Its Development and Future," *The Rudder*, Aug 1958 - How *SEA WINGS* hydrofoils developed from bathtub hobby to commercial reality. "This story begins in 1938, in Bob Gilruth's bathroom... he started with 6-inch models...from the model tests, a full scale, 12-foot sailing catamaran with hydrofoils, *CATAFOIL I* was built and operated in the Chesapeake for several years." The author started a collaboration with Bob Gilruth in 1943 that led to to world's fastest open sea waterborne vehicle -- the XCH-4. But the US Navy turned down the idea of an 80-knot patrol boat, so the author turned to commercial products. In October 1955 he tested *SYNOTROPUSS*, an 8-foot rowboat with fiberglass foils and 7 hp outboard that made speeds over 30 mph. The next test craft was a 16-ft Goodyear family runabout fitted with foils that could do 34-mph. In August 1956, the author associated himself with Grumann Aircraft engineering Corp. After months of testing a foil-equipped 15-ft aluminum runabout in Florida, the Grumman boat was placed on the market at the New York Boat Show, January 1957. Unfortunately, "there were so many man-hours of labor involved in production it put the cost out of reach of the mass market."

The NEWSLETTER

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

Editor: John R. Meyer | Winter-2002-2003 | Sailing Editor: Martin Grimm

FAST FERRY SUPERFOIL 40

The Superfoil 40 was built by Almaz Marine Yard in St. Petersburg, Russia and designed by the St. Petersburg branch of the British company Marine Technology Development (MTD). It is billed as the "world's fastest passenger ferry" with a speed of 55 knots (more than 100 km/hour), and designed to operate in up to Sea State 5 without speed restriction. Now it will take 50 minutes to travel from Tallinn to Helsinki rather than about 2 hours by conventional ferry.

Speed and comfort were the basic requirements for the vessel. The catamaran type hull provides the ferry with good seaworthiness, while the applied patented hydrofoil system and after interceptors ensure that the vessel will develop high speed from reduce water resistance. These features consist of two retractable foils up forward and two hydraulically controlled transom interceptors made of high-quality titanium alloy on the stern.

SUPERFOIL 40

Continued... See Superfoil 40, Page 3

"NEW" FOIL KIT PUBLICATION

David Keiper's files on foil kits for small catamaran sailboats are now available on CD-ROM at a reduced price. Formerly the files were available only in hard copy. Details are on the IHS website at http://www.foils.org/ihspubs.htm#dakfiles

2003 DUES ARE DUE

IHS Membership is still only US$20 per calendar year (US$2.50 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. It is preferable to pay by credit card. Please go to the IHS membership page at http://www.foils.org/member.htm

INSIDE THIS ISSUE

PRESIDENT'S COLUMN

I want to take this opportunity to wish all IHS members a successful and fruitful New Year. We look forward to even greater progress for the Society in 2003.

I regretfully report that one of our long standing IHS members, Erich H. Ashburn, passed away in October of 2002. He participated in the development of the U.S. Navy Hydrofoil program aboard the USS Pegasus, and was the ship's Commanding Officer during Operational Evaluation. After serving as the officer in charge of fleet introduction team at Bath, Maine, he retired with the rank of commander in August 1983. See page 12 for more details.

Martin Grimm reports that he has been looking through a copy of the Amateur Yacht Research Society Publication No.74 "Sailing Hydrofoils" and it has reminded him of how many historical hydrofoil photos they managed to capture in this booklet which appears to have been published in about October 1970. He suggests that it would be a good 'goal' for the IHS to eventually compile details of every significant hydrofoil type that has ever been built. Martin suggests asking the IHS membership to send in copies or scans of any old hydrofoil photos so that the databank of images held by IHS can be built up. Upon following up on this suggestion, John Monk (marymonk@msn.com) has agreed to take on the task as focal point for collection of pictures and short descriptions. More to follow on this subject.

Bill White reports that the IHS Bulletin Board has had 7700 visitors this year since it's inception in March, and the IHS web site counter is up to 63,500. Not bad for a small Society with a quote: "narrow focus on hydrofoils and by default other advanced marine vessels". I think end-of- year congratulations are in order to all the volunteers that have made and continue to make it happen.

I am pleased to report that the total new members for the year 2002 is 41. Hats off to Sumi Arima, the IHS Membership Chairman, for his continue effort to contact potential members, and Barney Black who catches many new members in his fine web.

The IHS Newsletter Index has recently been updated by Martin Grimm. Check the website to download a copy or scan it for items of interest. Martin has done a very painstaking job of putting this together for us and we owe him a round of applause.

Total AMV CDs delivered to date is now up to just over 200. Again many thanks to Steve Chorney who has labored to copy these many CDs and send them all over the world. At the same time "Optimized Office Solutions for the 21st Century" has been scanning thousands of pages for the IHS. The subject matter in these reports covers a broad range of advanced Marine Vehicles. So, early in 2003, the IHS will be coming out with a new CD: AMV-II. So stay tuned for the announcement and ordering instructions.

John R. Meyer, President

WELCOME NEW MEMBERS

George Curtis - George flies an EMB-135 (Embraer regional Jet) for Executive Jet. He has been interested in hydrofoils since his parents started a Hydrofoil Charter business in Juneau, Alaska. It was during 1978-79. They did rather well. The business got into a contract supporting a hydroelectric power plant construction project. The business was sold in late 79. Based in Portland, OR, they started with two Ludwig Honold boats powered with Cummins diesels (Juneau Flyer and Skagway Flyer). The service around Southeast Alaska included Glacier Bay and Tracy Arm. They also provided scheduled service between Haines and Juneau. One of the most memorable charters was a whistle stop tour for US Senator Ted Steven's and US Representative Don Young. This tour traveled to a great number of cities, towns, and settlements around Southeast Alaska.

Dwight Filley - Dwight's profession is real estate, but is a former Marine helo pilot and self educated quasi engineer who loves to build things. He is part of a group in San Diego developing a human powered hydrofoil. The first model has flown briefly. The second prototype is about half constructed and should go faster and farther than the first.

Christopher J. Hart - Chris has always been interested in advanced marine vehicles, working at the David Taylor Model Basin from 1978-1991 in the area of seakeeping and maneuvering of various AMV's (mostly swath, but some hydrofoil,

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SUPERFOIL 40

(Continued From Page 1)

Superfoil 40 has a deadweight of 122 tons, a length overall of 40 m, a beam overall of11.7 m, and a foilborne draft of only 1.2 m. The main engines (4) MTU 12V 4000 M70 type, producing 1740 kW MCR each at 1900-2000 RPM, drive 4 MJP Waterjets (Mercedes).

The vessel has a crew of 5, a passenger capacity of almost 300 with 266 in budget class, and 28 in business class. The vessel is reported to be environmentally friendly with extremely low wash up to max speed, and has low noise. It fulfills IMO emission regulations of Year 2000. Wide doors arranged on both sides reduce the time for landing and disembarkation of passengers. The estimated time assigned for this operation is about half an hour including cleaning of cabins and refueling.

During the12 months from signing of the contract, the shipbuilders have applied up-to-date technologies in the construction and equipment installation. For the first time, the shipyard used polymer materials for mounting power plant and propulsive units and all technical documentation was forwarded from the designers via E-Mail.

Superfoil 40 has been constructed completely of Russian marine aluminum alloy under the rules and regulations of Det Norske Veritas (DNV) international classification society. At the same time, the welders from Almaz Marine Yard have passed the qualification tests and obtained DNV certificates of conformity to the international standard ISO 9606-2.

Mr. Enn Rohula, director for Linda Lines Express, said that the new ferry would become popular both in Tallinn and in Helsinki and would be able to meet competition not only with other ships operated on this line, but could also s helicopters on the market for passenger conveyance. Future prospects for Superfoil-40 appear to be optimistic.

[Editor's Note: More pictures and information about Superfoil 40 are available on the Almaz website: http://www.shipconstruction.ru/Projects/linda_e.htm. *Also, look for operational information about Superfoil 40 to appear in future IHS Newsletters.]*

WATERJET REFINEMENTS TARGET WIDER MARKET

(From Speed at Sea, June 2002)

by Doug Woodyard

Meeting the current market's full spectrum of requirements, with power input ratings ranging from 100kW to 25MW, Rolls-Royce offers the Kamewa portfolio of FF, A and SII series waterjets. A significantly higher powered series is under development for large fast vessel projects.

With a power range from 100kW to 1,000kW the FF-series is typically specified for naval craft, search and rescue vessels, work boats and leisure craft. Only the impeller, shaft and steering/reversing rods are made of stainless steel, all other components (including the inlet duct) being of aluminium construction based on strength calculations to minimise weight. A special rubber-like material lines the interior surface of the impeller housing to minimise wear and noise. A single-stage axial-flow design pump is said to provide a high volume flow with good pulling thrust at lower speeds; reduction gears are not normally required.

Hundreds of FF-series installations have been logged in the high speed aluminium Combat Boat 90 craft built by Dockstavarvet in Sweden for Swedish and export customers. The standard design, with a displacement of 16-17 tonnes, is capable of carrying 21 fully-equipped troops or up to 45 tonnes of cargo. Twin FF-410 jets, driven by high speed diesel engines, secure a maximum continuous speed of 45-50 knots and excellent manoeuvrability. The craft specification can be tailored to specialised roles, such as border surveillance, anti-drugs operations and Coast Guard duties.

Kamewa A-series waterjets, which cover a power range from 500KW to 2,800KW, are claimed to be the first and only aluminium units with mixed-flow pump technology. Along with a hydrodynamically optimized design, this feature reportedly yields a 5 to 10 % higher efficiency than rival aluminum designs. The higher efficiency can be exploited for a higher vessel speed and/or lower fuel consumption.

Higher input demands are satisfied by the Kamewa stainless steel SII-series whose capability was underlined last year by an installation serving NEL Lines' 140m Corsaire 14000-class monohull fast ferry *Aeolos Kenteris*. A pair of 200 SII units with inlet diameters of 2m - the world's largest steerable waterjets - are driven by GE Marine LM2500+ gas turbines developing 25MW.

Fast vessel projects now on the drawing board or seeking financial backing call for substantially larger waterjets, capable of absorbing up to 50MW. Rolls Royce studies of technical solutions for ultra-large waterjets were stimulated by the design contract from Fastship Inc. to develop units suitable for propelling the US-based company's proposed high speed transatlantic cargo carriers.

Kamewa SII series units have proved efficient and reliable propulsors for fast ferries but when the input power is doubled, and impeller diameters may exceed 2m, a different approach to waterjet construction is dictated, says Rolls-Royce. Its new waterjet family will thus exploit a modular configuration rather than the existing plug-in assembly of components. Initially, representing the largest unit in this family, will be the 325 model, five of which are specified to propel each FastShip freight liner; the waterjet shipset - with inlet diameters of 3.25m - would absorb some 49MW at 200 rpm. Smaller units in the new programme, with inlet diameters from 2.2m but applying the same technology, will satisfy lower power demands and extend the existing SII range.

Also under the Rolls-Royce development umbrella is an advanced waterjet (AWJ) capable of handling 25.75MW, the aim of an R&D project by the Bird-Johnson Company (part of Rolls-Royce's naval marine business) under the partial sponsorship of the US Government's Maritech programme. Bird-Johnson initially reviewed the US Navy's performance objectives for future naval combatants and considered 13 propulsor configurations, including shaft-driven propellers and podded and internal propulsors. The study concluded that none satisfied the objectives.

Rolls-Royce R&D includes an advanced waterjet (AWJ) capable of handling 25.75MW

Conventional waterjets were not originally considered because of the ship signature problems associated with the jet discharge. But Bird-Johnson realised that it could be attractive to take the AWJ pump and combine it

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WATERJET REFINEMENTS
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with underwater discharge in a new configuration.

A 9,000-ton destroyer hullform was used in an initial case study featuring two AWJ units, each absorbing 37MW. For this application the inlet diameter would be 2.74m; and, because the impeller would run at around twice the rotational speed of a conventional propeller, transmission torques would be much lower.

The largest unit ordered to date from another major contender in the waterjet arena - John Crane Lips, which is now part of Wartsila's Marine Division and called Wartsila Propulsion - features an impeller with a diameter of 2.8m. in tailoring solutions to the specific application the Dutch specialist has a choice of two different pump designs - with three-bladed or six-bladed impellers - incorporated in a heavy-duty assembly.

Wartsela Propulsion is delivering the world's largest reversible waterjets; each Lips LJ210E reversible booster features an impeller with a diameter of 2.8 meters

A six-bladed pump (for Lips type-E series waterjets) is said to combine high efficiency with an excellent cavitation margin, the latter characteristic facilitating the creation of compact and lightweight installations for relatively high ship speeds. Alternatively, the well-established three- bladed pump design (for type-D series waterjets) reportedly yields the highest possible efficiency at relatively low ship speeds. The cavitation margin characteristics of this more axial-flow design of pump result in a slightly larger unit. Vessel speeds, displacements and mission profiles vary so widely that it is in the customer's interest to allow the waterjet designer to select the solution that best suits the project, Wartsila Propulsion advises.

A 96m Incat wave piercer now on charter to the us military as the *'HSV-Xl' Joint Venture is* powered by four LJ 150D jets driven via gearing by 7,200kW Caterpillar 3618 medium speed engines.

The U.S. Army contract requires the vessel to carry up to 450 tonnes of cargo including armoured personnel carriers, light armoured vehicles and trucks - plus 325 fully equipped troops over 1,110 nautical miles at an average speed of 35 knots in sea state 3. A maximum speed of over 45 knots is available.

[Ed Note: The original article continues for several pages to describe a number of smaller waterjet projects and applications that are not provided here.]

ARIES UPDATE

By Eliot James, IHS Member

This is a PHM update but can also be the first USS Aries Hydrofoil Memorial Newsletter.

The USS Aries Hydrofoil Memorial Inc. is finally officially open for business. The memorial has received it's 501(c) (3) tax exempt status from the IRS and can now accept tax deductible donations. An overview of the project can be found at our web site, http://www.ussaries.org.

We opened for tours the weekend of Oct. 4th '02 during the Brunswick, MO Pecan festival. We had in excess of 130 visitors that weekend and consider it a great success. Especially since we did very little advertising and the ship was several blocks from the main street where the festival was being held.

Diana James is the President of the Memorial and was mainly responsible in getting the whole thing off the ground. The tax exempt status was no easy task but with the help of the Historic Naval Ship Association's Channing Zucker and Kurt Wagemann with the USS Forest Sherman project, Diana managed to get the task accomplished.

Our emphasis for the past few years has been in making the ship ready to cruise. Opening for tours was just what we needed to redirect our priorities to cleaning and tiding the ship up. She is as clean and dry as when the Navy sold her and a lot neater. We removed "demilled" equipment and put

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ARIES

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covers on most boxes and empty panel openings.

We added two staircases, one down the gun turret opening where the tour starts, and one down the aft of the 01 deck behind the bridge where the tour of the inside of the ship ends. This vastly increases the accessibility of the ship to visitors.

One thing the ship really needs is painting. We are looking for a source for paint, and would like to know what color the ship should be, i.e. dove gray, haze gray, etc.

Since Brunswick is such a small town, we know that the traditional approach of being open 6 days a week from 9 to 5 just won't be feasible with our memorial. We will be instead organizing tours by reservation along with being open for walk in business 2 days a week during good weather. This approach gives us more flexibility such as staying open much later on what ever days that work for groups of 10 people or more. Schools, children's homes, scout troops, retirement centers or any groups that want to organize a tour will have the ability to set the time and day that works best for them.

We have nearly finished the documentation requirements for the Coast Guard including admeasuments by ABS which issued an International Tonnage Certificate showing us to have 288 gross tonnage and 86 net tonnage. This was the last requirement before we made application to the USCG for recreational documentation.

As soon as we have reliable systems restored for cruising (some of the systems that got us home were temporary and others not reliable enough) we will be heading south in search of waterfront festivities where we can offer tours. We are very interested in volunteers that may want to spend some time cruising with us, working on fixing the ship up, and sharing the knowledge they have of hydrofoils with tourists and young potential hydrofoilers. If all goes right, we would like to end up in the Keys where we could host a PHM Reunion. We are attempting to secure more spare parts, especially of critical or one-of-a-kind items exclusive to these ships. We are in need of information about the cost of construction of any of these systems. For example, the foilborne gearbox, propulsor assembly, or hydraulic actuation cylinders or the hullborne propulsors. A potential donor of those parts has to be able to document their value. If anyone knows what some of that equipment cost, from documentation or memory, please let us know.

The final obstacle to overcome is achieving status as an eligible donee for state surplus property. This status will allow us to acquire equipment that we could not possibly hope to be able to acquire without significant cash donations.

HIGH POINT TODAY

By Sumi Arima, IHS Member

HIGH POINT (PCH-1) was put up for sealed bid on 28 February 1990 at 9:00 A. M. by the Department of Defense, Defense Reutilization and Marketing Service sale number 16-0003. The ship went through the normal procedure of allowing the Navy, Defense organizations, and governments to strip equipment before the sale. Items removed were most of the navigation, communications, and control electronics; diesel generators; crane and windlass; water maker; various pumps, and other equipment. Most of the equipment was removed by hacksaw and bolt cutters.

The winning bidder was Chesapeake Commodities of New Jersey. At the time of announcement of the successful bidder, Captain Ronald Fraser approached the winning bidder and asked what their intentions were for the ship. The successful bidder was only interested in the propulsion gas turbines, thus negotiations took place and Captain Fraser became the owner of HIGH POINT with Chesapeake Commodities owning the two turbines. Captain Fraser initially moored the ship in Tacoma and started to obtain surplus equipment to restore the ship into hullborne operational condition. Captain Fraser was working on the ship in Tacoma when he suffered a heart attack, and underwent an open heart surgery. He decided to move the HIGH POINT closer to his home in Astoria, Oregon, but wanting to be in fresh water, he had it towed to Portland, Oregon in 1993. His progress was slow due to other functions that took his time. He did get replacement heads, windlass, and diesel generators for the ship. Captain Ronald Fraser died of a stroke on 1 April 1988. The executor of his estate put up the HIGH POINT for sale. During this period, the executor decided to relocate the HIGH POINT to Astoria, to reduce the cost of moorage fees. The ship was moored with very little monitoring, and suffered damages to the hull. Additional equipment was either stolen

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HIGH POINT
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or removed and sold, as the ship remained moored to a pier that literally was falling down.

In November 2001, Ron Ihle (IHS Member) negotiated with the executor for the purchase of HIGH POINT. He had planned to relocate the ship to San Francisco Bay and restore it to fully operational condition. He started to prepare papers for registering the HIGH POINT in the National Register of Historical Ship. Shortly after agreement, the economy took a down turn, and thus Mr. Ihle was no longer able to complete the purchase.

Photo Courtesy of Colleen Arima

Meanwhile, the Port of Astoria was dredging near the pier that HIGH POINT was moored, and demanded to the executor that the ship be moved to another location. About the same time, Bob and Shirley Phillips were making an inquiry at the port, when they learned of the availability of the HIGH POINT. They negotiated with the executor and agreed to terms in February 2002. After making a search in the Astoria area for moorage space, the Phillips had moved the ship to Tongue point, a former Navy seaplane base. The ship is moored to a pier with no shore services. Bob and Shirley have been working on the ship in their spare time. Much of the electrical cables left hanging have been removed. Garbage that was stored on the ship has been disposed. Electrical power is available through the original switchboard powered by an air cooled diesel generator mounted on the main deck just aft of the superstructure. A diesel generator has been installed on a modified foundation where the Detroit Diesel generator set formerly was located.

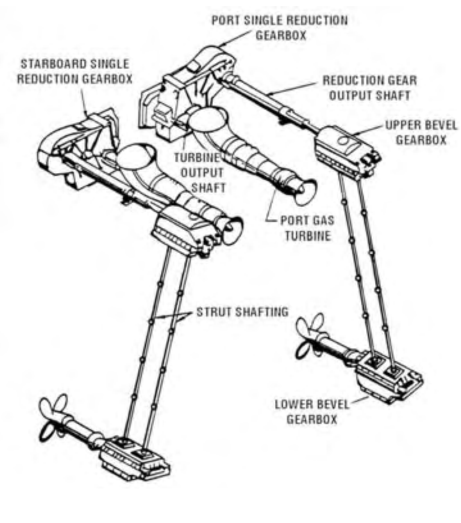
Other work has been progressing to be able to get the ship underway under its own power, which will allow the ship to be moored in a more cost effective location. Effort put into the HIGH POINT by the Phillips is noticeable for the short duration of their ownership. It is reassuring that the "Old Gal" is once again in capable hands.

PLAINVIEW UPDATE

By Sumi Arima, IHS Member

Prompted by some questions posed by Steve Battaglia about PLAINVIEW, here is some information on this hydrofoil that may be of interest to a lot of our readers.

The PLAINVIEW is moored in the Columbia River on the Washington side across the river from Astoria, Oregon in the town of Chinook. The owner of the PLAINVIEW is Lowell Stambaugh who lives across the road from where the ship presently is moored. As noted under the PLAINVIEW letters section on the IHS web site, Gusty Stambaugh has requested that all contact about the PLAINVIEW be through him rather than his father. You will need permission from him to go aboard. The original drawings for the ship were turned over by the Navy to a naval architect in Portland, Oregon. I don't know if Mr. Stambaugh knows of their location, I do not. There is very little left on the ship as far as the propulsion systems go to see anything other than maybe a foundation or two.



As shown above, the propulsion system, the foilborne system consisted of General Electric LM1500 turbines to a reduction box which also drove the hydraulic pumps, then to the upper bevel gearbox that was mounted

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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

PLAINVIEW

(Continued From Previous Page)

on the top of the strut, down the strut with two drive shafts to the lower bevel gearbox, and to the super-cavitating propellers. The gear boxes were designed by Paul Diehl who was the project engineer for GE, and built by GE. The foilborne propulsion gearboxes were retained by the Navy at the time of sale of the ship.

The hullborne system consisted of Detroit Diesel 12V71 shafted to outdrives on each side of the ship. The outdrives were of Boeing design, same as the one on HIGH POINT. An extension was inserted to lengthen the strut and the gear ratio was changed slightly to meet the needs of PLAINVIEW. I believe the outdrive was manufactured by Lawrence Machine in Seattle where the one for the HIGH POINT was built. I also believe the outdrives were retained by the Navy before sale of the ship. Many photos of the installation were taken, but are boxed and stored at the Navy facility in Carderock MD.

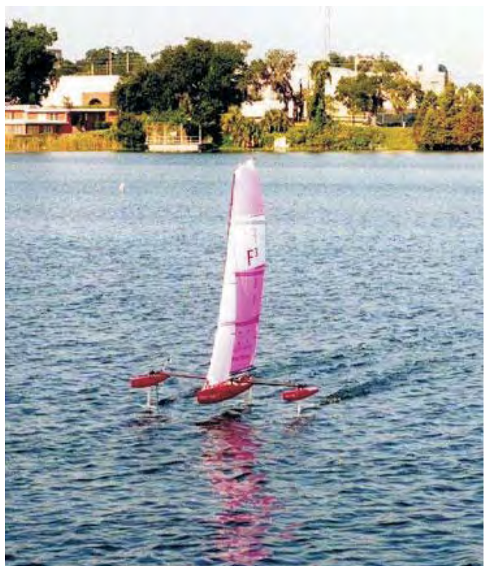
MICROFOILER

Excerpts from www.microsail.com

The MicroFoiler F3 is capable of flying on the foils in as little as FIVE mph of wind! The boat is exception- ally maneuverable while on the foils, yet still sails well off the foils. No complex set up is required and no special knowledge of hydrofoil sailing is necessary to enjoy this boat. She assembles and disassembles quickly and has a convenient transport stand available as an option.

This boat is being produced as a Strict One Design Class and the manufacturer will control weight and dimensions within strict tolerances. The boat, foils and rig were designed by Doug Lord with lots of help from Dr. Sam Bradfield (designer of the full size Rave hydrofoil built by WindRider) and his team.

Dr. Bradfield invented and pioneered the use of the altitude sensing "wand" that controls flight height on the Rave and F3.



Dr. Bradfield has worked over 30 years in developing successful full size hydrofoils such as the Rave. He pioneered the basic foiler configuration used on the Rave and F3 and it is only with his help and encouragement that we were able to produce the F3. The F3 is NOT a scale model of the Rave or any other full size foiler; it is designed to be an excellent MODEL and thanks to work done over all this time by Dr. Bradfield and his willingness to share with us, we think it fits the bill.

Dr. Bradfield and his assistant Tom Haman, did extensive experimental work on our Flyer 3, converting it to hydrofoils in 1999; while they experimented they allowed me to watch and learn; the F3 was designed to utilize the best of what was learned on the Flyer project as well as incorporating all the ideas, input and expertise of Dr. Bradfield and his team to create a truly remarkable RC sailboat! Because the hydrofoils produce righting moment as well as lift this boat is very, very difficult to capsize or pitch pole; in fact the foil equipped experimental Flyer 3 in 4 months of exhaustive sailing in winds up to 22mph NEVER pitch poled or capsized!!! The Flyer 3 served as a test bed for a similar foil system as used on this boat.

No other radio controlled multihull is as resistant to capsize or pitch pole as this boat is. This boat is a blast to sail especially on the foils. It has to be really, really calm for the MicroFoiler F3 not to fly!!!! A video is available for $12; it shows about five minutes of flying footage plus some close-ups of the boat. http://www.microsail.com.

BI-FOIL MOTH SAILING HYDROFOIL

By Dr Ian Ward, Sydney, Australia.

In recent years, there has been a resurgence of interest in hydrofoil sailing craft. Since the late 90's a number of Moth class sailing boats in Australia have been the basis of experimentation with alternative hydrofoil configurations (see the Spring 2000 Newsletter). The more recent developments of such craft feature a fairly radical layout in which only two fully submerged hydrofoils support the craft weight, one mounted on the centreboard near midships, the other attached to the aft rudder. This configuration, referred to as a bi-foiler, now featured

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BI-FOILER MOTH SAILING HYDROFOIL (Continued from Previous Page)

on a number of different sailing hydrofoil craft. In this issue, perhaps the first such bi-foiler sailing hydrofoil is described by its designer, Ian Ward. The following is adapted from a September 2002 item on the Australian Moth Association website: http://www.moth.asn.au/development.html

I have been following the Western Australian foiler developments with interest and quietly participating with some of my own. I thought I should share the latest developments.

About five years ago I started my first foiler development with a copy of the Ketterman Trifoiler principle. This consisted of 3 Tee foils. The two outer foils on the wing tips being controlled by surface ski sensors. The mechanism allowed non-linear control of the foil angle whilst sailing. The experimental hull had a waterline beam of only 250mm so it was rather extreme even by Moth standard. In this boat, but without hydrofoils, I came in 12th in the 1994 World Moth championships in Miazu Japan, easily winning the last heat in choppy conditions. On a reach at Balmoral, Sydney Harbour, in 12 knots I was able to go just a little faster than the Australian champion, but it was not good upwind and completely impractical to manage on the beach.

I then decided to try for a much simpler bi-foiler design with T foils on just the centreboard and rudder. The main foil on the centreboard also had a very small integrated trailing control sensor which maintained a constant level when foiling. This worked well enough to get me going and to get me hooked on this idea.

The craft flies on reaches in anything over 6 knots of wind, is far easier to balance laterally than when acting as a displacement hull and at times shows very good speed. While I can take it on long sustained flights on a single tack, it is not perfectly stable longitudinally due to the sensor being behind the centreboard. It would be far better to have the sensor at the bow, which I see some more recent developers have done. I have still not been particularly successful upwind at this stage.

Some interesting and unexpected things happen when you get foilborne. The noise of slapping waves is replaced with a silent, smooth ride and a small swishing hiss as you glide above the water. It is also amazing when you race into a lull, the boat actually accelerates and lifts higher as all of the forces pushing it down are reduced. It then glides ever so sweetly back into the water. Tacking is also incredible as there is no resistance to pivoting, you can actually turn 90deg in less than a second...hang on tight as it can be a handful to stay onboard. Here is a photo of my first bi-foiler, from some

3 years ago, which I am pretty sure was the first sailing dinghy to ever sail on rudder and centreboard foils alone! You may also note the experimental rig, which is a real winner too.

My major disappointment with all of the current foiler developments are that they still appear to be "contraptions" with huge foils creating a nightmare to rig and launch. I have therefore begun a project to build simple retractable foils in a standard centre case. A new tall narrow aero rig is now completed and will also be a feature.

It would also be good to hear of some real details on how the current foilers are really performing. Top speed is of interest, but more importantly, how do they compare with a Hungry Tiger on all points of sailing? Foilers will not be proven until they pass the ultimate test of beating a skiff in all conditions. This will not be easy; I remember it took at least 15 years before a Skiff finally beat a Scow convincingly in a breeze to win the 1986 Worlds in Adelaide. I expect it to take much longer before a foiler can really beat a current skiff in all conditions.

The Moth is the ideal craft for testing foils while comparing with the most advanced monohull designs available today.

SPITFIRE 12 SAILING HYDROFOIL CATAMARAN - PART 2

[This is a continuation of the article that appeared in the Autumn 2002 Newsletter]

Hull Structure:

The maximum speed of any sailing boat is limited by its ability to remain upright against the side force generated on the sails. The higher the wind speed and faster the boat travels, the more severe this side force becomes relative to the propelling force. As a consequence, the centrelines of *Spitfire's* demihulls are located 8 metres apart, giving the boat excellent heeling stability both on and off foils. Through mathematical modeling, BDG Marine predicted that with 500kg of ballast and crew, a maximum foilborne speed greater than 45 knots should be reached before *Spitfire* heels over excessively.

In order to meet Australian Yachting Federation (AYF) regulations, the cockpit floor had to be at least 240mm above the waterline. The cockpit was therefore positioned well above the waterline, in a central 'pod'. This pod also has covered storage space aft. The position of the cockpit, with a floor level around 2.5m above water level when foiling and with no forward obstructions such as masts, provides the pilot a clear view of the water in front, while the location also remains relatively dry. During sea-trials, this has become the most popular area for the crew to sit! Despite traveling at high speed the ride is reported by the crew to be smooth and quiet, even in relatively choppy 1.2m seas.

The demi-hulls are of GRP sandwich construction with low-density balsa core and E-glass skins. Bulkheads are of 50mm PVC foam core, with a combination of glass and carbon fibre skins. For each of the demi-hulls, the two hull halves were constructed in a mould and then glassed together. The laminate was wet out with vinyl ester resin using a vacuum bag infusion process allowing this task to be completed in less than an hour for each hull half.

The crossbeam are built up with low-density polystyrene foam formers and finished with carbon fibre skins and internal webs. Stainless steel pins connect the cross-beams to hull bulkheads. Spitfire can be disassembled and transported in a standard 40ft shipping container.

Aerodynamic Design:

Apart from reducing hydrodynamic drag, attention has also been paid to minimising the aerodynamic drag. Hence, the cross-beams are aerofoil shaped, the number of cables in the airstream has been minimised and the hulls have been kept streamlined and uncluttered wherever possible. There is an added benefit to giving the cross-beams an aerofoil shape; the front beam produces some lift, which in turn lowers the loading on the hydrofoils and hence their drag. This translated to a little extra speed.

'Soft Wing' Sails and Twin Free Standing Masts:

BDG Marine, in conjunction with Windrush Yachts developed a double-sided sail for *Spitfire*. These sails have been provisionally patented. The design aim was to provide maximum forward force with the available sail area, while minimising the heeling moment on the boat. To achieve this, as well as the wide hull and foil spacing, the design employs twin sails giving *Spitfire* significant sail area while keeping the sail's centre of pressure as low as possible.

The sail system comprises of a pair of masts of circular cross-section with the double surfaced fully battened sails attached to each side of the masts to create a streamlined aerofoil shape with a round leading edge. The flexible battens help to provide the required camber in the sails for an efficient aerodynamic shape with good lift to drag ratio.

The boat had been found to tack easily while hullborne, and Mark advises it has almost been possible to tack while remaining foilborne. He feels the crew will master this eventually.

The masts were designed to be un-stayed thus eliminating the drag associated with rigging. They are constructed from carbon fibre, formed over a stainless steel sheet-metal mould. Despite their length of 12m, they weigh only 45kg each.

Plans for the Future:

Following the completion of the first *Spitfire*, BDG is prepared to take more orders for the design. Price is anticipated to start at about US$199,000.

Spitfire's crew is planning an attempt to gaining the 24-hour sailing speed record set by Steve Fossett with the catamaran *Playstation* in 2001.

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SPITFIRE
(Continued From Previous Page)

BDG Marine also has plans for a larger, 24 to 36 metre (80 to 120 feet) version of the *Spitfire*, which could be capable of breaking long distance ocean racing records such as the transatlantic record currently also held by *Maiden (ex Club Med)*. Such a craft may also be a candidate for competing in The Race 2004. BDG Marine is seeking sponsors for this project to proceed.

Further Information:

This item was largely based on information provided on the BDG Marine website with thanks to Mark Pivac. For further information and illustrations of the *Spitfire* or other projects of BDG Marine, visit their website at www.bdg.com.au or contact:

Mark Pivac, BDG Marine, Unit 7/108 Welshpool Road, Welshpool WA 6106, Australia Postal Address: PO Box 377, Welshpool DC WA 6986, Australia Phone: +61 8 9258 7700 Fax:+61 8 9258 7711 website: http://www.bdg.com.au All arrangement drawings and photos are acknowledged as being by BDG.

SCAT UPDATE

By Sam Bradfield & Martin Grimm, IHS Members

Sam Bradfield and his team at HydroSail Inc, Tom Haman and Mike McGarry, have been quietly working on the design and testing of the sailing hydrofoil SCAT over the last three years. Progress with the craft was reported in the last newsletter.

The SCAT project is aimed at applying hydrofoils to true offshore sailing conditions. Preliminary design discussions with Nigel Irens started in the summer of 2000. Matrix Composites subsequently manufactured the foils, while Multihull Technologies in Florida constructed the hull. Sails were purchased from Randy Smythe as well as Dave Calvert. The craft was launched in July 2002.

The overall configuration of SCAT is similar to the RAVE sailing hydrofoil (refer to Autumn 2001 NL), except that SCAT is a considerably larger craft. By way of comparison, a RAVE has a waterline length of 16 ft while that of SCAT is 37 ft. The main foil struts of SCAT stand some two and a half times the height of an average adult. Both the hull and foils are of carbon fibre construction to minimise weight while retaining strength and stiffness. Speeds achieved to date have been up to about 25 knots though this depends on sailing conditions and the performance is still quite variable as modifications continue to be made. SCAT has also been flying on beam reaches in seas of three to four feet.

The stability of SCAT while foilborne is controlled by surface sensing control wands linked to flaps on the pair of forward main foils. This arrangement is similar to that on the RAVE. However there are conditions where this straightforward surface sensing approach does not result in optimal boat speed. Consequently, Mike and Tom have since installed an arrangement for manual control of flap incidence. Mike has been experimenting with this system (in which the auto-control wands are free of the water) during takeoff and flight in light air and has found a significant speed increases (up to 35%) to windward. This technique has already been well demonstrated by him in winning 'round the buoys' races in the RAVE. The manual over-ride is advantageous since a significant proportion of the time on the water for any sailing foiler is still spent either hullborne or just skimming the surface.

The first event in which SCAT is likely to participate is the Lauderdale to Key West race in mid January 2003. Development and testing of SCAT is planned to continue through into 2004 when the boat will be ready for the OSTAR 2004 ocean race. For more information and images of SCAT visit:

- http://www.multihulltechnologies.com
- http://www.nigelirens.demon.co.uk
- http://www.multihullboatbuilder.com/scat

The HydroSail website at http://members.aol.com/HYDROSAIL includes images of the earlier EIFO and RAVE designs but not SCAT as yet.

In Memory of Erich H. Ashburn [Courtesy of Blethen Maine Newspapers Inc.]

Erich H. Ashburn, of Orrs Island, Maine, passed away after a courageous battle with prostate cancer, with his wife and sister by his side, Saturday, Oct. 12, 2002. He was 61. Born in Kearney, Neb., Oct. 19, 1940. He grew up in Gibbon and North Platte, Neb., and joined the Navy after graduation in 1958. He served as an enlisted electronics technician before being accepted in the NESEP program. He then attended the University of Colorado, earning his Bachelor's Degree in EE and MS in June 1965.

After graduating from Officer Candidate School, he was commissioned as an Ensign in the Navy. He proudly served his country in Vietnam aboard the USS Mansfield DD-728 and taught at the U.S. Naval Academy. He also participated in the development of the Navy Hydrofoil program aboard the USS Pegasus, and was the ship's Commanding Officer during Operational Evaluation. After serving as the officer in charge of fleet introduction team at Bath, he retired with the rank of commander in August 1983. Erich worked as office director at Technical Management and Analysis in Bath until September 2002. Erich's humor, intelligence, practicality and friendliness are what endeared him to his family, friends and co-workers.

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WELCOME NEW MEMBERS

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SES, ACV and planing boat projects). He went to private industry working the next 10 years on commercial SWATH designs, at SWATH International, Ltd, culminating in the delivery of a 28kt, 37m SWATH ferry, Cloud X. He has recently joined Navatek, Ltd. as east coast regional director, and is working on some exciting hydrofoil and "lifting body" design projects including prototype vessel testing on the U.S. east coast.

Kristoffer Jakobsen - Kristoffer is a Norwegian student studying for a Master of Engineering in Marine Technics at the Norwegian University of Science and Technology, NTNU, in Trondheim. He is halfway through his 3rd year (of 5 years in total). He has chosen Hydrodynamics as his major. Having always lived close to the sea, he's been fascinated by boats, especially fast ones. Kristoffer has built model boats, enjoyed boat rides, and served one year in the Norwegian navy on a "Missile Torpedo Boat" (a fast attack boat).

Wade McGruder - Wade is a salesman for Claypool Pump & Machinery Co, Inc. St. Louis, Missouri. He has built several personal watercraft over the years and is now interested in working with hydrofoils. Wade has an extensive background in building with foam and fiberglass. His latest project will marry foils with a PWC engine and propulsion system. The reason he joined the Hydrofoil Society is to gain a working knowledge of what will work (and what won't). Any help would be welcomed: clapl@swbell.net

Robert Phillips – Bob lives in S.W. Washington State. His college major was non-nuclear physics, specializing in electronics. He joined IHS to help support the effort to keep people apprized in this technology, and support the website (only fair since I have derived a great deal of information and contacts regarding the High Point from it.). He has his own website; address: rpstander.tripod.com

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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LETTERS TO THE EDITOR

Hydrofoil Questions

[Oct 11 2002] Thank you very much for the index list received from you. If I want to order a paper how do I proceed? I wonder whether you can inform/advice me regarding following?

With reference to the enormous amount of articles, materials etc available in the subject Hydrofoils, I got 16 thousand hits with the search-engine, following questions come to my mind:

A. Are there today any sort of updated standard bible or various such bibles (books for designers, producers, students, etc) that summarizes what is acknowledged know-how (R&D, field experiences, trues & myths, designs, developments, costs, performance, bench marking comparisons etc)? If so, where can I order these?

B. Has the hydrofoil concept never been any success within the market sector of smaller to mid-size of boats (23 -35 ft)?

C. Why is it so that speed is always focused when reading about hydrofoils? Consider the following:

1. Today in Sweden (Scandinavia, EU) the price/US gallon of diesel is about 3.9-4 US $) due to tax 2.95 % of all running time of pleasure boats takes place in smooth weather with moderate wave sizes (in fact the waves that causes irritation, not problems, are those generated by other boats, not the weather/wind. This is due to the large protected water areas by the archipelagoes surrounding Scandinavia and also due to rather low statistic average wind (force 2-3, Baltic coast areas).

2. The trend for pleasure boats is not always increased sizes but more towards comfort and luxury etc which makes the boats heavier. A 25 ft powerboat (2002) cost almost double that compared to the price a few years ago (including correction for inflation).

3. The average cruising speed is 22-26 knots even if top speed is 32 -40 knots. In fact the average speed very seldom surpasses 22-26 knots. Rather often you see powerboats in the size 25 to 40 ft rather cruise at 12 to 17 knots albeit they are built for higher cruising speeds.

When I ask people why the are running their boat this way frequent answers are for comfort and/or economy/mileage reasons. The comfort factor is important (i.e not to have to reduce speed frequently when meeting waves from other boats/ferries etc which in fact now is the case. It is not due to poor performance of the boat it is for better comfort, sometimes noise factor, compared to cars.

Having these aspects in mind, the relatively simpler design task of hydrofoils for smaller boats compared to ferries may be could open up opportunities if comfort, noise and mileage are more focused than only the high speed performance. Now the true question is: Is a hydrofoil based boat in the size of 27 ft more comfortable (cut trough larger waves with better comfort, movements, splashes) at 25 knot than a surface planning boat of the same size and speed?

Thank you in advance for your time and possible comments, information and/or advice. Regards, Tomas Jarnmark, Electrum Foundation ASTE

Response…The extent of your questions is rather more than I can take the time to answer as webmaster. Primarily I am concerned with design and maintenance of the website itself, along with correcting any technical difficulties that may arise. The proper forum for receiving information and advice from our volunteers and other interested parties is to post your inquiries on our BBS bulletin board, which can be accessed from our main page at www.foils.org. I have taken the liberty of posting your questions for you this time. Hopefully you will receive some interesting responses. I broke your inquiry up into smaller separate postings because usually the briefer and more focused your question, the better the quality of the responses you will receive. As to your first question about hydrofoil bibles, I can recommend the Advanced Marine Vehicle CD-ROM sold by IHS (see notice on the main page). We are also close to offering two more CD-ROMs of like material. This is a treasure trove of information. The website lists technical and popular references (but IHS is not a source of most of them). Also, if you will look in the correspondence archives dating back before the BBS, you will find an archive page devoted to references and texts... I recall that a few of the letters asked the same question and were well answered. Barney Black

Bras D`Or Propulsion Question

[10/20/02] Only recently I visited the Maritime Bernier Museum, and it was closed at the time. I visited the exterior of the ship le Bras d’Or . The only information that I lack is what type of motors drove the propellers?

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LETTERS TO THE EDITOR
(Continued From Previous Page)

The two uppers and the two lower motors? Why supercavitating propellers for the two lower ones? J. P. Carole jpcarole@aol.com

Response …A source of information about Bras D'Or is Thomas G. Lynch's Book *The Flying 400: Canada's Hydrofoil Project*. According to this book, the fixed-pitch supercavitating lower props were driven by an FT4A-2 gas turbine engine purchased from United Aircraft of Canada. The 48 inch diameter props were developed jointly by DeHavilland and the Ship Division of the National Physical Laboratory London, and were manufactured by Ladish company of Milwaukee of Inconel 718 stainless steel. The foilborne gearbox was built by GE. The hullborne propulsion system was powered by a Paxman Ventura 16YJM diesel engine. Barney C. Black webmaster@foils.org

Source of Builder Locations

[10/20/02] Would you happen to know where I could find information on hydrofoil builders' distribution in the world? For example, I would like to know if there are any in Canada, or are they mostly located in the USA? Francois Simard; simard.fr@videotron.ca

Response … I am not sure what type of hydrofoils you are interested in... military or commercial? engine power, human power, or sail? The premier sources of info for military and commercial hydrofoils are Jane's Publications (http://www.janes.com) and Fast Ferry International magazine (http://www.fastferryinfo.com/). The IHS website has a section on designers and builders in the links page (http://www.foils.org/linksout.htm), however this accumulation of links cannot be considered complete. There are many shipbuilders capable of building hydrofoil craft to print and a few that offer standardized hydrofoil designs... many of the latter are in the IHS links. If, on the other hand, you are talking about small personal sailing craft, there are some links on the IHS site related to this area of hydrofoil manufacture. There are also some links related to human powered hydrofoils, although the Human Powered Boats website (http://www.humanpoweredboats.com/) is a more complete source. Barney C. Black webmaster@foils.org

Info Source for Foil Profiles

[10/21/02] I am a mechanical engineering student at the University of Nottingham, England. As part of my course I have been given the task of designing a human-powered hydrofoil designed to carry two people. The craft needs to travel at a speed of 5m/s and be small enough to fit on a trailer. I have decided that a two-hull design would be best with a fan-powered propulsion system using simple gears and chains to transmit power. The problem I am having is finding information on foil designs, and in particular, foil profiles with information on how much lift and drag each profile generates with information on how these values are determined. I would be extremely grateful if you could send me any information you have on foil profiles or any links for me to follow up. Also if you have any information on human- powered hydrofoils and how I should approach my design. Ben Jones emyubdj@gwmail.nottingham.ac.uk

Responses … There is very little literature on hydrofoil sections, but all the equations and software available for aeroplane wings works for hydrofoils. One of the standard works is Fundamentals of Aerodynamics by John D Anderson. The latest edition is quite expensive, but if you can find a previous edition they are a lot cheaper. There are various software applications that can calculate the lift and drag coefficients for any foil section and angle of attack. I have used an application called Panda from Desktop Aeronautics Inc for this. I think that these applications use 2-dimension finite element analysis to work out the flow patterns and pressure at each point on the foil. The actual lift and drag can be calculated from the coefficients and the liquid density, speed and dimensions, with suitable adjustments for the aspect ratio. All the equations are in Fundamentals of Aerodynamics. They are quite complicated. Malin Dixon; gallery@foils.org

In addition to Malin's excellent suggestions, here are a few additional resources you may find helpful:

- http://www.humanpoweredboats.com/Links/L_Research.htm - Various links to research articles and informational web-sites. Not all hydrofoil specific, but some will be helpful to you.

- http://www.amazon.com/exec/obidos/ASIN/0873228278/o/qid=947990877/sr=8-1/104-9565347-4271660 - Human Powered Vehicles Book by Abbott & Wilson. This has a very detailed chapter on human powered hydrofoils, written by Dr. Allan Abbott, co-builder of the Flying Fish series of boats. You will find just about all the calcs needed for human powered hydrofoils in this book.

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LETTERS TO THE EDITOR
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- http://www.humanpoweredboats.com/Photos/HydrofoilHPBs/HydrofoilHPBs.htm Photo gallery of successful human powered hydrofoils.

- http://lancet.mit.edu/decavitator/Decavitator.html - Web-site for MIT's Decavitator , which won the DuPont prize for fastest human powered hydrofoil in 1991.

- http://www.orange.or.jp/jsha/ - Japanese Solar and Human Powered Boat Association

Ron Drynan; Ron@humanpoweredboats.com

The Society of Naval Architects and Marine Engineers (SNAME) has published the technical bulletin Blade and Hydrofoil Section Design. This bulletin includes the Blade and Hydrofoil Section Design Codes with a 29-page Owner's Guide, and a 184 page Technical Report. It updates and complements T&R Bulletin 1-17. The Design Codes and Owner's Guide provide tools for the design and performance evaluation of blade and hydrofoil sections. The programs are provided in both DOS and Mac formats and will run on most personal computers.

The Technical Report provides analytical background information and is of interest primarily to those who wish to adapt or enhance the programs. This new publication is identified as Technical and Research Bulletin 1-45. It is being issued as a CD-ROM, and may be ordered by contacting cpujols@sname.org or by calling +1-201-798-4800. It is priced at USD50 (USD25 for SNAME members). Barney C Black

PHM / Jetfoil Model Plans

[11/2/02] I'm the person with the Jetfoil mouldings, of HMS Speedy 929-320 and the commercial 929-115-100. I've been working on the Jetfoil model for many years, and I will soon be able to have a model fully working with ACS (My models of Jetfoil and PHM are 4ft / 1.2 m long). I worked with Martin Seymour on his model back in 1985. Jetfoil or PHM require the same type of system for automatic control. I have now sourced the outlets for Jetfoil control and hope soon to be testing. Back in 1985, there was a lack of knowledge of the systems for control, but these systems are now available. I expect to have some positive news in the spring of 2003 so watch this space. Also available will be mouldings for PT50, PT75, RHS 150/160/200 + PHM, complete and ready to run. I can confirm that I have all of the workshop manuals of Boeing Jetfoil and drawings. The ACS has been in my blood for years, and I have had a major breakthrough in the past few days. I am able to give advice on all aspects of Jetfoil and PHM for modeling. Peter Cahill; struts@talk21.com

Historical Market for Hydrofoil Boats

[11/4/02] There are good economical reasons why small hydrofoils especially water propelled types have remained mostly a curiosity. For small speed superiority better ride they have usually cost at least two to three times as much as comparable planing monohulls. The added cost of the Hydrofoils is actually the smallest added cost. To that you have to add the Foils control system. This includes the: foils lift/Trim/Roll control mechanisms, boat attitude and motion sensors, and a controller feedback computer (even if it a simple analog device). The foil stowing/deployment system. Finally, the Propulsion system becomes very complicated and inefficient because it has to operate in two modes (Hullborne and Foilborne). Propeller driven systems often have 30 to 45 degree shaft angles. These angles can reduce efficiency by 50% from conventional boats. as a result, Waterjet pump propulsors are often used with waterjet inlets that tunnel the water up to the pumps in the hulls. This simplifies the mechanical installation. Bill White; whitewn@speakeasy.net

Letters To the Editor allows hydrofoilers to ask for or provide information, to exchange ideas, and to inform the readership of interesting developments. **More correspondence is published in the Posted Messages and Frequently Asked Questions (FAQ) section of the IHS Internet web site at http://www.foils.org.** All are invited to participate. Opinions expressed are those of the authors, not of IHS.

First Sailing Bi-foiler

[11/11/02] Just thought I should set the record straight about the first ever monofoiler...(well I call it a bi-foiler) Here are some details http://www.moth.asn.au/development/development_ward_2002.html We should also not forget the amazing development by Rich Miller of the first true and only monofoiler , a high performance sailboard with just one foil in the water, like a unicycle! Ian Ward ianward@ozemail.com.au

Response …Dr. Ward, it looks like you have done a tremendous job! Check out monofoiler.com for other monofoiler's such as Brett Burvill's

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LETTERS TO THE EDITOR
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Moth sailing on just two foil, (one on the daggerboard and one on the rudder). And recently, John Ilett's monofoiler sailing the same way but with an addition of a wand based altitude control system. Also included on the site are pictures of David Lugg's International 14 sailing on just two foils with manual control. If you would like I'll be more than happy to add your boat to the others on http://www.monofoiler.com When did you first sail your boat on two foils? Congratulations on a great job! Doug Lord; lorsail@webtv.net

Asymmetrical Leeboards for Sailing Canoe

[11/22/02] I have been sailing/racing a sail canoe for several years. Most sail canoe skippers use a single leeboard. I'm curious as to how much my canoe's windward performance could be improved by using a pair of asymmetrical leeboards, one at a time on each tack. Given a top speed of 4 knots to windward, and leeboard underwater dimensions of about 3 ft long by about 8 inches wide, what asymmetrical cross-section would be best: i.e. what max thickness, what front-to-back location of the max chord height, and is blunt entry better than sharp entry for the leading edge? Does anyone have any sketches showing optimum cross-section for selected velocities thru the water at the 1-6 knot range? Would cavitation cause problems at this low a velocity? Dan Reiber danreiber@adelphia.net

Response …I learned to sail by rigging our canoe for sail and making my own leeboards. I never got around to making a rudder - just steered with the paddle. My leeboards were asymmetrical, carved by eye. Today I'd use XFOIL to design a custom section and make templates to accurately profile the shape. Still, my canoe literally sailed circles around the Sunflower from which I got the sail rig. ...what asymmetrical cross-section would be best? ...is blunt entry better than sharp entry for the leading edge? You want to shape the leading edge as accurately as possible to the coordinates of your chosen section. The right leading edge shape is neither blunt nor sharp. It's one of those Goldilocks things. It's better to be just right. You might want to try one of Selig's model glider airfoils, like the S7012. http:// www.nasg.com/afdb/show-airfoil-e.phtml?id=1055 or the S7075 http://www.nasg.com/afdb/show-airfoil-e.phtml?id=1057. They are intended to work well at low speeds. Don't forget that the deeper you make your boards, the better. Tom Speer; me@tspeer.com

Testing a Drag Reduction System

[11/26/02] I found John Meyer's post at http://www.foils.org/students.htm regarding the Georgia Tech Aerospace Engineering student project. I am currently working on the same project and was wondering if you had any suggestions for drag measurements. The purpose of the project is to design an experiment to test the drag on a hydrofoil equipped with a drag reduction system. The drag reduction system works by employing an electric field that interacts with the ions in seawater and changes the boundary layer. The only idea I have come up with so far is to use a water tunnel along with a force balance for measuring drag and an LDV system for examining the boundary layer. I found some information about water tunnels that use seawater, but I think you mentioned something about open water testing. What measurement techniques are available for measuring drag and boundary layers in open water? If you have any information or suggestions for me, I would really appreciate it. Thanks! Becky Massey specky28@yahoo.com

Ideas on Where to Get Foils

[11/27/02] I was just looking over the IHS site and was intrigued by your ideas. I would like to develop a kit that can be bolted onto an averaged size boat for the recreational hydrofoiler. After reading the information that Tom Lang had posted a couple years ago, I've been thinking about different ways to accomplish this. I see a lot of inquiries from people that want plans or a kit of some kind. One option would be to make a surface piercing hydrofoil. A person could pay to get an extrusion die made, then have a number of 20' lengths extruded as bar stock. This stock could then be cut to length, and bent to whatever configuration desired. There's an initial outlay, but the sales could offset this. A submerged hydrofoil would take a rather sophisticated control package, but the foils themselves would be much easier to make. Ultimately, this is the direction I'd rather take. I am a mechanical engineer working in manufacturing. I have a background in controls and a lot of desire, but don't feel confident enough to tackle this. The submerged version would require a gyroscope for attitude reference. It may be possible to use a gyroscope that is now available in the R/C helicopters. I have a 16' trihull 120hp I/O that I plan on using for this experiment, but as of yet do not have the necessary parts or intellectual fortitude. Jeff Mikkelsen; mikki@softcom.net