The NEWSLETTER

International Hydrofoil Society

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

Editor: John R. Meyer

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SEABUS-HYDAER: WING ASSISTED HYDROFOIL

Today there is a general need to transport passengers, cars and cargo by sea using methods that are safe, fast and cost-effective. European research is developing new types of ship to fulfill this demand. A European project, SEABUS-HYDAER, is developing a completely new concept in marine transport: a hybrid between a plane and a ship. Although Seabus never leaves the water, most of its lift power is provided by its wings. This gives it the capacity to travel very fast. Ferries currently in use have top speed of about 40 knots; Seabus beats this with a projected speed of about 120 knots (220 km/h) while using 20% less fuel.

Shown here are several renderings of the HYDAER concept.

Rendering of the Seabus-Hydaer Concept

The aim of the European project Seabus-Hydaer is the development of a new generation of Fast Ferries (>100 knots). Supramar is providing the help through the investigation of specific hydrofoils for stabilisation and

See Seabus-Hydaer, Page 3

2006 DUES ARE DUE

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

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PRESIDENT'S COLUMN

To All IHS Members

I am encouraged to report the Society's continued growth with a total of 8 new members added to the IHS Membership roles during the first three months of 2006. By the way, you can view the Membership List by logging onto the IHS website and put in the proper password. All IHS members have been informed of this password. If you have been missed, please contact the webmaster (webmaster@foils.org). It is advisable for all to check the information on the List. If it is incorrect, please send changes to: Steve Chorney: schorney@comcast.net

A recent report of fast ferry deliveries and orders indicates that the total number for 2005 was 97. Catamarans led the list with 76, five of which were foil-assisted designs. This was followed by monohulls at 9; and hydrofoils at 8. See page 4 for an update on Ustica Lines and their Foilmasters. The remaining 4 were hovercraft (2) trimarans (1) and wavepiercers (1).

IHS Board member and Publicity Chairman, Joel Billingsley, has been in contact with the American Society of Marine Engineers in connection with ASNE Day (see page 9) to be held in June in the Washington D.C. area. As a result, the IHS has been offered a booth at no cost so we can set up a display to make attendees aware of the Society and publicize hydrofoils. The Board of Directors has been thinking about this possibility and all that it entails. The Society has several DVDs containing videos of US Navy hydrofoils and others of interest. These, together with many wall mounted pictures, and several handouts about the Society and hydrofoil questions and answers could constitute an attractive booth display. However, due to the short time available, the Board is not certain it can do a credible job of assembling all the material and equipment. We are therefore seriously considering participation in ASNE Day in 2007.

Those of us in the Washington D.C. area were fortunate to be able to attend a Joint Meeting of the IHS and the SNAME SD-5 Panel in March. The subject was: Unmanned Sea Surface Vessel Program-A Congressionally Initiated Program. The ONR Unmanned Sea Surface Vessel (USSV) team has designed and built two vessels, one of which is a semi-planing boat and the other a hydrofoil. The presentation reviewed the program development work under the auspices of the Maritime Technology Alliance, summarized the design and construction of the semi-planing, high-tow-force boat, and provided an overview of the design, fabrication and initial testing of the hydrofoil.

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

John R. Meyer
President

WELCOME NEW MEMBERS

William H. Buckley – Bill graduated in 1948 from MIT with a BS in Aeronautical Engineering and a BS in Business Administration. For 20 years Bell Aerospace Co. employed him as a structural engineer where he was responsible for design loads of a VTOL research airplane and for the US Navy's first large air cushion vehicles and Surface Effect Ships. In 1971 he joined the David Taylor Research Center where he held positions related to various advanced marine vehicles including hydrofoils. He specialized in loads research incorporating analyses of casualties, statistics of non-linear waves, extreme waves and spectra for long-term design loadings. In 1982 he received a Masters degree in Ocean and Marine Engineering from the George Washington University. He is also a member of SNAME and Sigma Xi.

James Chafe – James is a Principal Engineer and Vice President of Maritime Applied Physics Corporation, Baltimore MD. He has specialized in the fields of Thermodyna -mics, Cryogenics, Naval Power Applications, System Design, Project and Corporate Management. In 1988 he joined Naval Surface Warfare Center as a member of the Electrical Machinery Technology Branch where he worked on a number of advanced technology programs. In 1998 he co-founded Chesapeake Cryogenics to develop and market small cryogenic refrigeration systems. In 1999 he joined MAPC and shortly after was appointed to the position of Vice-

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Seabus-Hydaer
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aerodynamic wings, using surface effect, for lifting purposes and drag reduction.

The main objective of the present Supramar technical support work is the validation of the stabilising capabilities of Air-fed foil profiles through an experimental investigation of a set of hydrofoils at reduced scale. Two control foils, a strut and take-oft foils have been tested. Air injection is provided on the suction and pressure sides as well as in the leading and trailing edges. Tests are carried out in the LMH high-speed cavitation tunnel.

Four different control and take-off Airfed profiles have been successfully tested in the LMH high-speed cavitation tunnel of the Swiss Federal Institute of Technology. Lift and drag coefficients as well as flow visualisations have been carried out to study the effect of injected air on hydrodynamic and cavitation performance of these hydrofoils. In general, for air and/or vapor cavities extending beyond the trailing edge, injecting air in the suction side leads to a decrease of the lift coefficient while air injection in the pressure side is responsible of an increase of the lift coefficient.

Flow analysis, using experimental and computation results, shows that air injection causes a change in the pressure field over both pressure and suction sides. The pressure upstream to the air-feed slot increases due to a stagnation point while the pressure on the pressure side decreases in a uniform way along the chord length.

To improve the mixing layer between air, vapor and water, a modified geometry of the NACA control foil has been tested. A significant improvement has been obtained by enlarging the injection slot. This improvement, which has been reached at low velocities, should be more pronounced for full-scale conditions. Furthermore, the relationship between flow-rates of injected air and the lift coefficient was found similar to the results already reported in 1998 with the original geometry.

[Editor's Note: Investigations of air-fed stabilization by Supramar goes back many years with only limited application at that time, but has now risen to the surface again.]

Rendering of a Very Large Seabus-Hydaer Transport

"Aerodynamic Investigation of a Wing in Ground Effect" a technical report (NLR-TP-2002-506) published by NLR (the National Aerospace Laboratory of the Nether- lands) in 2002 and was written by W. B. de Wolf. This report highlights the activities of NLR in the **Seabus-Hydaer** program, performed under a contract awarded by the European Commission.

This program was to evaluate the feasibility of a large wing-in-ground-effect vehicle to be used for fast transport over sea, cruising at a speed of at least 100 kts and carrying 800 passengers plus 100 cars over a distance of 850 kms. The project was led by Intermarine, a shipbuilding yard in Italy. The concept features hydrodynamic control by hydrofoils rather than aerodynamic control. These control hydrofoils are connected to the wing by vertical water surface piercing struts. Separate V-shaped hydrofoils are used to generate hydrodynamic lift forces to assist in take-off to get the hull out of the water before the air speed is reached for the wing to fully carry the weight of the vehicle. As one of the eleven partners in the project, NLR was responsible for the aerodynamic analysis and the verification by wind tunnel tests. NLR also participated in the overall design activities as member of the Design Review Board that was formed during the project. The report describes the aerodynamic evolution starting with the initial design provided by Intermarine, some results of the aerodynamic calculations, the wind tunnel test and the main results obtained for take-off and cruise conditions. [Taken from abstract]. The full text is available as a PDF file from: editor@foils.org

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PRINCE ANDREW HONORS U.S. NAVY CAPTAIN

Story Number: NNS060131-10; Release Date: 1/31/2006 By Photographer's Mate 2nd Class (AW/SW) Carolla Bennett, Commander, U.S. Naval Forces Central Command/Commander, U.S. 5th Fleet Public Affairs MANAMA, Bahrain (NNS)

England's Prince Andrew awarded Capt. John Peterson (IHS Member) the Honorary Order of the British Empire (OBE) during an investiture ceremony January 25 at the British Embassy in Manama, Bahrain.

Peterson, chief of staff for Commander, U.S. Naval Forces Central Command, was given the prestigious award for his leadership of coalition forces, which included a large number of Royal Navy sailors and marines, in the campaign to secure Iraqi oil assets during the onset of Operation Iraqi Freedom in 2003.

Prince Andrew, who is the Duke of York, knight commander and aide-de-camp to Queen Elizabeth II, congratulated Peterson when he presented the award. "Congratulations and well-done for all the hard work you did on behalf of the navy," Prince Andrew said to Peterson. "Wear the award with pride."

The Order, established by King George V in 1917, recognizes chivalry. It is limited to 100 knights and dames grand cross, 845 knights and dames commander, and 8,960 commanders. Military appointments are made on the advice of the governments of the United Kingdom and some Commonwealth realms, and are based on extraordinary valor and dedication to duty.

"This is an outstanding award, and it means a lot to me," said Peterson, who can now officially put 'OBE' after his name. "It's an honor [to wear it on behalf of] the many fine Royal Navy sailors and marines that I served with."

[Editor's Note: We are very proud of Captain Peterson and congratulate him on his well-deserved award . All should note that he served as Commander of USS Hercules, PHM-2, and I, personally, was fortunate to be aboard her on several trials in the early 1990s.]

USTICA LINES ORDERS MORE FOILMASTERS

It has been reported that Ustica Lines will be taking delivery on two more Rodriquez *Foilmaster* hydrofoils in April 2006 and 2007. See IHS Summer 2003 Newsletter feature article describing the *Foilmaster*. The company's fleet of 13 hydrofoils, five catamarans and a single monohull based in Sicily already includes 4 *Foilmasters* delivered during the 1996-2003 time frame.

Foilmaster

Ustica Lines will be operating six Rodriquez *Foilmaster* hydrofoils in 2007.

Lorenzo Bonasera (IHS Member), has provided us with several pictures taken on last December in Messina, (Alijumbo Zibibbo) in the USTICA LINES attractive livery, and a picture of the Rodriquez Yard (same period, a Antonio Donato photo) showing the Siremar's new Foilmasters.

Alijumbo Zibibbo

Foilmasters in Rodriquez Yard

ADVANCING THE CASE FOR AXIAL FLOW PUMPS

(From Marine Propulsion, October/November 2005)

Ship speeds of 35 knots and higher call for both slender hull forms to reduce the vessel's drag and efficient but compact Propulsion systems to minimise the total installed power and installation space required.

Waterjets are well favoured for such applications because they have no appendage drag (thanks to a flush-

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AXIAL FLOW PUMPS

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mounted inlet) and have high efficiency (recovering part of the ship's frictional drag by ingesting the low momentum boundary layer at the waterjet inlet).

Today's larger commercial waterjets with ratings above 7,000kW typically feature mixed-flow pumps, for which the installation flange diameter is 70-85 per cent larger than the diameter of the inlet flow duct. Such a large flange diameter is often incompatible with the slender hulls required for high-speed vessels, according to John Purnell, senior engineer at US-based CDI Marine Systems.

Increasing the hull beam to accommodate the size and number of mixed-flow waterjets required could result in significant increases in drag, leading to a spiraling rise in ship displacement and the power that must be installed.

With installation diameters only about 15-20 per cent larger than the inlet duct, axial-flow pumps arc considered by CDI Marine Systems a potential solution to the problem and are also much lighter in weight than contemporary commercially available mixed-flow designs.

In 2002 the company started a four-year program examining the technology options and development of compact axial-flow pumps, with funding from the Center for the Commercial Deployment of Transportation Technologies and more recent oversight by the US Office of Naval Research.

The aim of the four-phase project is to develop and validate the attributes of a preferred waterjet propulsor suitable for high-speed applications where waterjet propulsion is the only realistic choice.

Phase 1, completed in August 2002, studied the options for compact units, including: pumps with counter-rotating blade rows, pumps with inlet pre-swirl vanes, ventilated pumps, supercavitating pumps, and axial- flow pumps.

US Navy Destroyer Demonstrator to Test Advanced Waterjet

The latter option was selected for further work. Completed in September 2003, Phase 2 developed the conceptual design of a waterjet propelled 50 knot/197m-long slender monohull RORO ship for commercial short-sea traffic.

A complete hydrodynamic design for a 42MW axial-flow waterjet pump for the projected ship was also developed using computational fluid dynamics (CFD), which would form the basis for further model-scale analysis in Phase 3.

Scheduled for completion in May this year, Phase 3 dictated additional CFD model-scale analysis, manufacture and water tunnel testing of a model waterjet pump, which were necessary to adequately define the pump's critical performance characteristics and cavitation limits.

Phase 4 involves constructing and testing in a towing tank a suitable high speed ship model to determine the critical interaction effects between hull and waterjet inlet. The work also defines the pump's powering characteristics at design point and off-design operating conditions. Data developed will cover the full range of ship operating conditions anticipated for the Primary full-scale waterjet propulsor.

The whole-ship and ship interaction data, combined with that from the pump model tests in Phase 3, will provide the critical information necessary to validate the design process and the CFD modeling results. CDI Marine Systems aims to achieve the realistic design and prediction of overall full-scale performance of large (>20MW) axial-flow pumps in a high speed ship application using appropriate model testing and data scaling procedures.

Summarizing the potential advantages of axial-type waterjets for high speed commercial and military sealift vessels, the company cites:

- significant volume and weight savings for the same duty compared with conventional mixed flow designs

- easier installation in slender hull forms

- higher rotational speeds, thus providing a better power density for both the Pump and the power transmission, whose performance is also less limited by cavitation.

FLYAK

(Excerpts from: www.foilkayak.com)

On the 12th and 13th of Nov 05, a team from the Australian TV-program "Beyond Tomorrow" visited Oslo, Norway to do a story on the Flyak. The story was to be shown on Channel 7 in Australia in March 06, and on Discovery Channel in May-June. On Sunday 13th of Nov 05, the "Beyond Tomorrow" team and *Foil Kayak* organised a 200m race between Andreas Gjersøe in a Flyak and a K4 (4-man kayak). The K4 crew was made up of Norwegian National Team members. The K4 was leading half way, but Andreas in the Flyak was more than a boat length in front at the finish.

FLYAK, A Foilborne Kayak

The Flyak has two T-foils: a main and a front foil. The front foil is also a rudder. The craft has no flaps or other mechanisms that "sense" the surface to keep the Flyak level. About one chord length under the surface the lifting ability of a hydrofoil decreases. This effect makes it possible to simply "lean" the foils up against the surface to keep the kayak level.

The front foil lifts first, until it is just under the surface. Then the main foil lifts the hull out of the water. The kayaker can easily control how high he will fly by increasing or decreasing the speed. When paddling faster, the main foil lifts the hull higher and at the same time tilts the hull forward. This reduces the angle of attack, which in turn allows the kayaker to paddle faster.

The cruising speed is about 15% higher than the take-off speed, and the top speed is about 30% higher than the take-off speed.

To increase the lift and to make the Flyak go straight, winglet plates are used on the wingtips. The total weight of the kayaker and hull, and the desired speed, dictate the area of the foil pair. If one wants to go 5 % faster, simply make the foils 10 % shorter.

The designers report that there is no reason why a pair of foils with a lift/drag ratio of 25 or more cannot be made. The builder's first foils were NACA's - same as the Moths's. To avoid interference between the turbulence from the paddle stroke and the wing tips, they use foils with shorter spans. Their front foil lifts 30%, and the main foil 70% of total foil lift.

ISLAND ENGINEERING UPDATE

Island Engineering's most advanced motion stabilization system, fielded jointly with Quantum Marine Engineering of Florida, has now been operating on the U.S. Navy's LSC(X) 'Sea Fighter' for approximately one year. The system consists of two actively controlled titanium 'T' foils mounted near the bow, two active transom interceptors, and two actively controlled flapped skegs of titanium and stainless for yaw control.

The vessel achieved a trial speed in excess of 50 Knots. System components are linked via an EMI resistant fiber optic LAN. System performance has been remarkable- we have recorded the highest gains ever for a control system of this type due to the cleanliness of the digital signal and low EMI of the fiber optic Ethernet system. The ActiveSkeg™ has proven to help reduce vessel course deviation by roughly an order of magnitude.

Currently, again fielded jointly with Quantum, Island Engineering Inc (IEI) is providing a stabilizer system for the Egyptian Navy FMC (Fast Missile Craft), being built by VT Halter Marine. IEI also continues to support R&D and model test efforts for several promising new technologies for various clients.

IEI, located on Piney Point, Southern Maryland, was formed in 1999, and is dedicated to design and engineering support of high performance marine vehicles - primarily for the development of advanced ride control systems.

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DRIVING HARDER FOR **EFFICIENCY GAINS**

(Ferry Technology, December ‘05)
By Dag Pike

Attempts to transfer truck and trailer traffic off congested roads and on to short-sea routes have in the past been hindered by the relatively low speed and efficiency of freight- orientated RO-RO designs. A recent study in the US has, however, come up with a new concept that promises higher levels of efficiency, which could enhance the viability of sea transport of trucks and trailers.

Two innovative design concepts from the US promise higher levels of operational efficiency for ferries

This new concept, called a ‘high speed trimaran trailership’ (HSTT) has been developed around a study that was carried out to transport trailers between Port Canaveral in Florida and Wilmington in Delaware in the US. The study team has opted for a trimaran design because it can operate efficiently at various speeds between 25 and 40 knots, while the trimaran’s long thin hulls also reduce wave impact loading at speed and provide for high levels of stability, allowing the vessel to maintain schedules even in adverse weather conditions. The wide beam further allows for a generous amount of space for trailer stowage.

In developing the design, the team has opted for a trimaran that uses SWATH hulls for the two side hulls. This is a new idea that is intended to reduce the sensitivity of the design to waves, while still maintaining the long thin hull format that gives the design its efficiency in power terms. A waterjet propulsion system is proposed, with jets installed in both the center and the side hulls.

The machinery arrangement comprises a mix of gas turbines and diesel engines. The main power source would be two Rolls-Royce 36MW turbines that drive Kamewa 250VLWJ jets installed side by side in the center hull. A CODAG (Combined Diesel and Gas Turbine) gearbox would allow two MTU diesels from the 8000 range to drive the same waterjets. Two more of these 8,000kW diesels would be installed in the side hulls and drive through Kamewa 140SH waterjets.

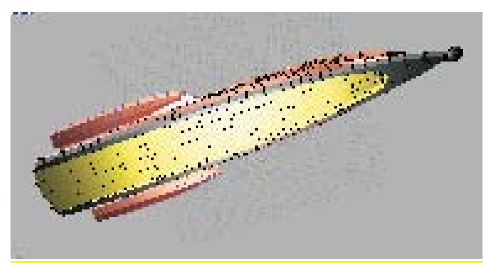
This combination would generate speeds of 26 knots using just the diesel power, but with the turbines in use the speed would rise to 40 knots. The fuel capacity and consumption could be optimised for a particular route and the design’s flexibility in terms of speed means that range and performance can be adapted to specific requirements.

In its current design form, the HSTT has a length of 181 m and a capacity of 90 trailers over a two-deck layout. There may also be scope to apply the concept to passenger ferries, especially on open sea routes.

Another interesting design concept from the US has been produced by Miami-based Don Burg in Miami, who has come up with a number of innovative designs in the past. Now he has turned his attention to propulsion systems with the development of the SWEEP (‘ship with wave energy engulfing propulsors’) concept. This attempts to harness the water flow around the bulbous bow of a displacement ship form to reduce the wave energy drag and at the same time to create a more efficient propulsion system.

Artist’s Rendering of SWEEP

Significant efficiency gains have been achieved by using a form of waterjet propulsion that is installed in the bow of the ship. in studies of the water flow around a bulbous bow, it was found that the water is first parted to allow the shape to move through the water, and then the water



Typical SWEEP Hull

flow closes in again after the initial part of the bow has passed. In this

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

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

DRIVING HARDER FOR **EFFICIENCY GAINS**

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way, the water flow follows the shape of the hull.

Burg's concept is to position the intake of a waterjet propulsor at the point where the water flow turns inwards. There is, as a result, a positive flow into the intake of the waterjet which makes the jet more efficient, as the water is already accelerating as it enters the intake. Efficiency is also enhanced by taking much of the water flow into the jet intake, so less of the water has to be diverted outwards by the hull, reducing energy consumption

Initial trials and calculations have shown that at a 20 knot hull speed, the drag can be reduced by between 15 to 20 per cent. At higher speeds of 45 knots, a 45 per cent reduction in drag can be achieved.

Burg's concept does not stop there. These increased efficiency figures are based on the forward waterjet exiting into a chamber developed under the hull that is kept pressurized by air in the manner of a hovercraft. Apart from the efficiency of this air lubrication, the concept allows the waterjet to exit into a void rather than create turbulence as it exits under the hull. In this type of hull configuration, Burg is predicting a power reduction of up to 60 per cent when used at a speed of 45 knots and 35 per cent at a speed of 35 knots.

Further hydrodynamic analysis and computer studies arc planned to optimize the bulbous bow shape for this application. Then funding will be sought to build a 15-m prototype, featuring the SWEEP technology.

TWISTED COMPOSITE RUDDERS ORDERED

(Extracted from "Warship Technology", RINA, October 2005, Pages 3-4)

Structural Composites of Melbourne, Florida has been awarded a US$904,000 contract by the Office of Naval Research (ONR) in the US to build and test composite twisted rudders for the US Navy's DDG-51 destroyers.

The demonstration technology will test the improved survivability and resistance to environmental degradation of the composite rudders.

Prototype steel twisted rudders have already been demonstrated to have improved survivability when tested on *USS Bulkeley*. When fully-optioned, the contract value will be US$3.5million to provide a ship-set of rudders for a two-year at-sea evaluation period.

A hybrid steel/composite design that was developed by Structural Composites and Bath Iron Works will be built by Structural Composites, with technical assistance from the Naval Sea Systems Command.

Structural Composites' Director of Naval Projects Eric Greene believes that the composite rudders may offer a much more survivable solution for surface combatants. "The design is being optimised and tested for underwater blast resistance. Also, the non-corrosive structure will not deteriorate when subject to the aggressive environment downstream of the propellers," he explained.

FERRIES OF THE FUTURE TO BE POWERED BY SEAWATER

(From Ferry Technology, October 2005)

Australian Marine researcher and designer Tony Lane of Thirroul, New South Wales, has recently predicted that the ships of the future powered by electric motor-driven waterjets, with the electrical power derived directly from the sea. He has discovered a practical and totally environmentally safe process that has been calculated to provide sufficient electrical energy to drive waterjets economically from this low-grade energy source.

Mr. Lane explained that fuel cells or internal combustion engines will use the hydrogen gas by-product from the process to add to the energy produced. A bank of submarine-type lead acid storage batteries will act as an accumulator. This conclusion was reached while researching the state of development and practicality of all possible methods of propulsion for the new generation of high-speed catamaran ships that he is currently designing.

Mr. Lane said that the ship design allows for long range, high speed, open ocean voyages with exceptional seaworthiness, and economy. The capabilities of this design have been calculated to allow competitive low cost fares for an overnight (32-hour) ferry service for vehicles and passengers between Australia and New Zealand.

The significant advantages of the design for more profitable long range operation, compare with the hundreds of large ferries operating in Europe and elsewhere.

American Society of Naval Engineers

ASNE Day 2006

ACQUIRING THE FUTURE SEA FORCE - BALANCING CAPABILITY AND AFFORDABILITY

June 19-20, 2006 at the Hyatt Regency, Crystal City, Arlington, Virginia

For Registration and Other Information, Go to:http://www.asne-tw.org/asne/asneday2006

ASNE Day 2006 Paper Presentation Topics

- Naval Bridge Design in the 21st Century
- Quantitative Assessment of Manned Damage Control Performance
- Navy Human Factors Engineering/Safety Ship Design Lessons Learned
- Four Levels of Ship Survivability
- Assessing Seabase Architectures Utilizing Parametric And Probabilistic Design Methods
- Reconfigurability and Transient Sensitivity of a Notional Destroyer Integrated Power System
- SHIPMAIN Entitled Process for Fleet Modernization
- Enhancing Survivability of All-Electric Warships through Implementation of Effective Topologies into the Integrated Power System
- Protecting the Sea Base
- Seabasing Logistics Analysis
- A Summary of Cruiser Roles and Missions
- Economic Influences in Acquiring Advanced Technologies for Future Surface Combatants
- Maintenance Figure of Merit (MFOM)
- Is it Time for a New Maintenance Philosophy for Rotational Crewing?
- Linking Ship Concept Design to Future Force Formulation
- Missile Operations & Support Simulation Models (MOSS)
- Modeling And Simulation For Ship Design, Building And Fabrication In The New Millennium
- An Approach for Integrated Power Management and Control in the DD(X) Warship
- Underwater Ship Husbandry
- Architecting Complex Systems – Balancing Capability And Affordability
- Modular Approach to Weapons Integration
- SAFESHIP Hull Maintenance: A Computer Based Life Cycle Structural Maintenance Planning Tool
- Design Development and Evaluation of an Affordable High Speed Cutter for Offshore Service
- A Novel Missile Launcher for Submarine

BASILISCUS

(From Tom Speer's website: www.basiliscus.com)

In Medieval mythology, the basilisk was called the king of the serpents. In confirmation of his royalty, he was said to be endowed with a crest, or comb upon the head, constituting a crown. The basilisk could kill at a distance with a glance, and was endowed with wings as well.

The basilisk is also called the "Jesus Christ lizard" because of its ability to walk on water. It supporting itself by the unsteady hydrodynamics as it strokes its rear feet through the water, opening up a ventilation pocket so that it can extract its foot without dragging it through the water

So, why *Basiliscus*? What better mascot for a hydrofoil than a lizard that can run on top of the water? What better racing persona than the King of Serpents, from whom all others flee at the sound of his hiss, and who can fly and vanquish his adversaries at a distance? And since the common basilisk is named Basiliscus, it's the perfect name for both the boat and its class!

"*Basiliscus* is currently in preliminary design, and as the design proceeds I will be publishing her development in this case study. The case study will include the methods and design tools as well as the results for this particular design.

Basiliscus will be a cruising, hydrofoil trimaran, only the second of its type, since none have been built since David Keiper's *Williwaw*. *Williwaw* proved out all of the essential elements of the cruising hydrofoil sailboat. These included:

- trimaran configuration, which lets the boat heel, as opposed to a catamaran which heels very little. A multihull configuration is essential for a large sailing hydrofoil, in order to avoid lifting the weight of ballast and to allow the boat to reach a take-off speed which does not require excessively large hydrofoils to lift off. The trimaran configuration works in concert with the foil arrangement, which was a Keiper invention.

Rendering of Basiliscus

- "diamond" foil arrangement consisting of a bow foil, stern foil, and two lateral foils, which lets the windward foil come completely out of the water. The bow and stern foils balance the boat in pitch, with the bow foil acting like a sensor to adjust the angle of attack of the lateral foil. The lateral foil carries most of the weight of the boat as it resists the side force and heeling moment of the rig. Since the lateral foil is near the center of gravity of the boat, its loading can change significantly without disturbing the pitch trim of the boat.

- surface piercing ladder foils for simplicity, strength, and robustness in the demanding offshore environment. Other foil types may be feasible, and will be investigated during the design effort.

- the ability of the hydrofoils to improve the seaworthiness of the boat in extreme conditions, even when operating hull borne.

Why has *Williwaw* remained unique for 30 years? *Williwaw* was built in 1969, which makes it a contemporary of the Brown *Searunner* series of designs. It was destroyed at anchor in 1977, having cruised 20,000 miles in the Pacific, from San Francisco to New Zealand, in conditions ranging from calms to storms. Unfortunately, Keiper was not able to develop his design further because he had been unable to sell *Williwaw* so that he could afford to build a second-generation boat, and it was not insured when it was destroyed. These were the pioneering days of multihulls - both Keiper and Brown were Piver devotees - and one can only wonder where the state of the art of sailing craft would be today had hydrofoils become popular. But at a time when the very idea of

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BASILISCUS

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multihull sailboats was a radical concept, the idea of hydrofoils offshore was too great a leap for general acceptance. Hydrofoils also require careful engineering using aeronautical technology which was unfamiliar to most sailboat designers of the day. Had Keiper been able to afford to develop the concept through a series of boats, as Brown was able to do, we might have many more hydrofoils sailing today.

The advent of the personal computer has given the individual designer capabilities which in the days of *Williwaw* only existed in the biggest aerospace and naval architecture firms. The purpose of this project is to apply the principles of modern marine engineering and flight dynamics to the design of the sailing hydrofoil, to capitalize on the advances in materials and operational experience with multihulls gained over the last three decades, and build a boat that I can enjoy and take pride in having created."

Tom Speer reports that since his work on Basiliscus 5 years ago there is not much new. He was working on adapting SMP (Stability and Maneuvering Program) to handle sea- keeping of multihulls and hydrofoils. Tom submitted an abstract to the CSYS, but it was turned down and he backed off. Then it was accepted at the last minute but too late to get the paper done. However, he has simplified the foil configuration considerably, but hasn't done any analysis on the new configuration. Tom's only other news is that Fastacraft has put his H105 foil section into production. (See www. fastacraft.com).

TRIAK

(From Triak Website: www.triaksports.com)

The unique design of the TRIAK is like no other boat on the water, exhilarating performance for sailing and kayaking enthusiasts alike. Its patented wing and dual outrigger design make it an incredibly stable craft. The foldable sail rig let's you switch between sailing and paddling in seconds from the cockpit for amazing versatility. A high performance sail plan combined with hydrofoils attached to the outriggers make the TRIAK a true performer in the wind.

TRIAK Under Sail

SAILING

TRIAK's innovative design featuring its wing, dual outriggers, hydrofoils, and retractable 25" centerboard makes it a true performance sailing craft.

The stability of the TRIAK converts the pressure from the 39 sq.ft. main, the 40 sq.ft spinnaker and 25 sq.ft jib into boat speed.

The unique dual-blade hydrofoil system mounted outboard of the outriggers delivers exceptional performance from its lift and provides stability in rough water. The TRIAK can reach speeds of 10 knots or more sailing in up to 25 knots of wind.

PADDLING

Unlike sailing conversions for kayaks, the TRIAK was designed from the ground up to be a performance sailing machine that still paddles as well as a traditional sea kayak.

The TRIAK paddles at a steady 4 to 5 knot pace and reaches 6 knots in a sprint. Under paddle over an extended period one can average 2.5 knots in the TRIAK.

The position and design of the wing and floats accommodates a full, unobstructed paddle stroke, so you can paddle the TRIAK like any other kayak.

The raised seat provides a more natural sitting position for enhanced paddling performance and comfortable excursions.

With its narrow and hydrodynamic hull and little drag from the outriggers, the TRIAK glides through the water quickly and tracks amazingly well.

STABILITY

TRIAK's patented wing and dual-outrigger design give it extraordinary stability. The wing, outriggers and hydrofoils counter the pressure of the sails. It is easy to board and simple to sail and paddle making the TRIAK safe and fun for people of all ages and experience levels.

WELCOME NEW MEMBERS

(Continued From Page 2)

President. James has published extensively, and has a strong interest in manufacturing technology and advanced fabrication processes. He has a strong interest and talent in modeling and numerical simulation of various types of systems.

Tien-Seng Chiu – Tien-Sing graduated from the University of Maryland, College Park campus with a degree in Aerospace Engineering in 1991. He is presently employed at BAI Aerosystems, a division of L-3 communications in Easton, Maryland building Unmanned Aerial Vehicles (UAVs), and holds a Private Pilot certificate and amateur radio call sign KB3ETQ. His interest in hydrofoils presently includes learning about them as an application of fluid dynamics in a non-compressible fluid, although his long-term goals include a boat able to get to the Gulf Stream in less than an hour from Ocean City, Maryland for tuna fishing. Other interests include command and control systems, computers, external ballistics, and gourmet cooking.

Richard Croome - Richard has recently entered the world of hydrofoil design and construction, and even more so since he discovered the IHS website. As a result, he has learned a lot about hydrofoils and wants to build his own hydrofoil runabout one of these days. Although from Australia, he is living in Padang, Sumatra where he and his wife have recently started a Kindergarten and Primary School teaching the Australian curriculum. At the same time, Richard is writing up his PhD thesis in Marketing and hopes to have it finished this year.

Charles Engstrom – Charles earned a BSME from Johns Hopkins University in 1992. He is a mechanical engineer who is experienced in the design and construction of novel drive trains and HVAC systems. He joined MAPC in August of 2001, and has been involved with the design and prototyping of an electric drive train for the Daimler Chrysler SMART vehicle, and performed detailed structural analysis of the struts and flight surfaces for a Navy hydrofoil. Prior to this he was a project engineer for SFA - Frederick Manufacturing Division, Frederick Maryland. He was formerly employed as a mechanical engineer with the Climate Control Branch of the Naval Surface Warfare Center, Carderock Division, Annapolis Detachment.

Allen Ford – Allen attended Loyola U. (BS in Physics), MIT (MS, Aeronautical Engineering), Oak Ridge School of Reactor Technology (Certificate), and Temple U. (completed PhD course work in Physics). In October 1960 he initiated a Foundation Research Program, and a patent process, on the "Captured Air Bubble " vehicle, which was later to become the Surface Effect Ship (SES). He participated in the implementation of the SES concept in the form of the XR-1, XR-3, and XR-5 test craft. He was a member of the "Surface Effect Ship for Ocean Commerce Committee" in the mid 1960s, resulting in a USN-MARAD agreement to form the "Joint SES Project Office" (JSESPO) to implement SES development. Allen remained with the David Taylor Model Basin [present Naval Surface Warfare Center, Carderock Division (NSWCCD)] where he headed a SES team that ran an SES dedicated towing tank at NSWCCD where many SES models were run over several years. Allen, presently retired from the US Navy, is the author of more than 20 papers,

NEW BENEFIT

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

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The NEWSLETTER

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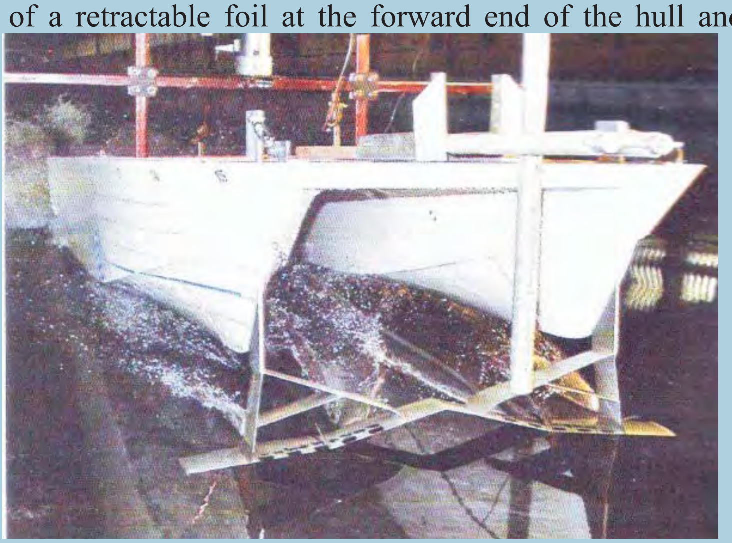
RUSSIAN TECHNOLOGY BEGINS TO MAKE ITS MARK

From Ferry Technology, April 2006

By Dag Pike

Military-based fast ferry technology from Russia seems set to filter down into the west over the next few years

Russian designers and shipyards have been the source of many innovative concepts for the fast ferry market, much of it based on experience with military projects. Several of these projects are now starting to filter down into the mainstream commercial sector and the design team of Marine Technology Development (MTD) for example has two fast ferry contracts pending that will be built in western shipyards. The St Petersburg-based company has also developed an innovative water taxi concept. Called the Superfoil, these fast ferry designs use a combination of a retractable foil at the forward end of the hull and interceptors mounted on the transom. The Superfoil has a passing resemblance to the Boeing Jetfoil of old, but modern technology allows this new generation of foil ferries to be powered by



Tank Testing of MTD's 'Water Taxi' Design

See Russian Technology, Page 3

2006 DUES ARE DUE

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

INSIDE THIS ISSUE

PRESIDENT'S COLUMN

To All IHS Members

At the June Board of Directors meeting Ballots had been received for election of the Board of Directors Class 2006-2009. Unanimously elected were: Mark Bebar, Dennis Clark, William Hockberger, and George Jenkins. Election of officers for the next year (2006-2007) was then held. Current officers: John Meyer – President, Mark Bebar – Vice President, George Jenkins – Treasurer, and Ken Spaulding – Secretary were nominated and seconded. These four candidates were unanimously elected by members present,

Those of us in the Washington D.C. area were fortunate to be able to attend a Joint Meeting of the IHS and the SNAME SD-5 Panel in June. The subject was: SEA FIGHTER (FSF-1); Myth and Reality, by James Harrison, Naval Sea Systems Command. SEA FIGHTER (FSF-1), previously called X-Craft, is a high-speed catamaran designed to test both a unique littoral warfare ship hull form and an innovative way of installing warfare systems for that mission. The presentation is on the website at: http://www.foils.org/mtg papers.htm July 1, 2006 was the first anniversary of the US Navy's acceptance of the SEA FIGHTER. During that time the ship has performed various sea trials and experiments, been through a major post-delivery availability, set performance records, and needed an unscheduled repair docking. James Harrison presented highlights of the first year's experience including accomplishments, difficulties and the preliminary trial results.

A third AMV CD (CD#3) has been generated by the Society and is available for all to order thru the IHS website: (http://www.foils.org/ihs pubs.htm#AMV). As usual, the cost is a nominal $12 for IHS members and $15 for non-members.

Bill White, the IHS Webmaster, has made a major update to our IHS Web site. The major change has been in organizing the major subject categories and their sub-categories into easy to read tables for navigation, while keeping the simplicity and speed that Barney Black insisted on from the beginning. A Main Directory Subject Table now appears at the Top of each Page for easy navigation. There are now FOUR major Categories for technical information.

1. Library: This is the largest area that has fourteen major subcategories and is where the meat of our website's data is now collected. 2. Subject Archives: This area contains all the data contributed by members and visitors to our bulletin boards divided into pre 2002 and 2003 to-date sections. There is also a huge amount of information here divided into a dozen plus sub-categories. 3. IHS Photo Gallery, an extensive collection by Malin Dixon. 4. Discussion Forums, On-Line BBS: containing currently active discussions.

Plus Three IHS Information areas: 1. Announcements and Current Events 2. IHS Specific Information 3. Membership And Finally there is the IHS Store section.

WELCOME NEW MEMBERS

V. Frank Colangelo – Frank's marine experience extends 27 years of designing both dry and wet cargo commercial vessels and naval concept designs. Prior to joining Northrop Grumman Ship Systems (NGSS) as a Senior Engineer in 1993, he was an Assistant Naval Architect in the New Construction Division of Lykes Bros. Steamship company He is currently in the R&D Group at NGSS's Avondale Operations facility. His most recent contributions have supported the NGSS-Navatek's Blended Wing-Body research project and the USCG's Deepwater's "Fast Response Cutter." His interest in hydrofoil technology is developed from his flying experience as a Phantom RF-4C aviator during the Vietnam War era and the view that hydrodynamics is a natural sibling to aerodynamics. He holds a Bachelor's Degree from the University of New Orleans, where he studied at the School of Naval Architecture and Marine Engineering, and holds a post-graduate business degree of Master of Business Administration in International Management, from the American Graduate School of International Management in Phoenix, Arizona. He is a member of SNAME and ASNE's Gulf Sections.

Douglas Halsey - Doug grew up living on the water in Florida and learned to sail at an early age. For many years he was an avid competitor and won state & local titles in a variety of classes. He was the U.S. National Champion in the Moth Class 3 times (1966, 1968 & 1969) and finished 3rd in the Windsurfer Class World Championships once (1975). His interest in the technical aspects of sailing led him to study aeronautical engineering in college and he subsequently spent 25 years working in aerodynamics research & technology development groups at McDonnell Douglas Corporation. He has been interested in hy-

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RUSSIAN TECHNOLOGY

(Continued From Page 1)

diesel engines and still be capable of high performance. In addition, there is no foil support at the stern, but the performance possible with this modern technology allows the Superfoil to have a speed that is compatible with that of the Jetfoil.

The forward foil in the Superfoil concept has no control surfaces and is constructed from solid titanium. It is raised and lowered under hydraulic control and has a built-in shock absorbing system that allows the foil to retract if it should hit a submerged object without causing hull damage. The hydraulic system allows the foil angle to be adjusted at speed, so that the angle of incidence can be changed and this adjustment forms part of a ride control system.

The transom interceptors are also constructed from titanium and have been specially developed for this application. There are three of these fast-acting units mounted on the transom, which can be used to control the roll and pitch of the ferry. The ride control system that combines the forward foils and these aft interceptors is fed from a height and motion sensor package, and is claimed to generate a very level ride.

One of the projects to use the Superfoil is a recently completed design package for a 30m-long 47-knot fast passenger ferry, called the SF305. This is based on a catamaran hull with a beam of 9.6m and an operating draft of 1 meter at speed, which increases, to 2.8m at rest with the foils down. This design will be powered by twin MTU diesels of 1,850kW, each coupled to MJP waterjets. The ferry will have ZF reversing gearboxes fitted between the engine and the waterjct to enable jet flushing to be carried out.

Although the hull and superstructure will be constructed from aluminium, the jet intakes will feature GRP sections to reduce the possibility of cracks and corrosion. While steering would normally be through water jet nozzle deflection, auxiliary rudders are fitted to improve manoeuvrability and course keeping at high speed, especially in heavy following seas.

The SF305 project has a passenger capacity varying between 150 and 200 persons and the designers are now in the process of negotiating with a Swedish shipyard for the construction of a prototype vessel. This will be built for an operator in the Indian Ocean Islands of the Maldives, Maldivian Fast Ferries.

An unusual aspect of the patented foil and interceptor system developed by MTD is that it can be applied to both monohulls and catamaran hulls. Indeed, another Superfoil design project that is making progress is for a 200-passenger, 35m passenger monohull ferry - designated the MF35 Project - which is being developed for a Singaporean operator. This monohull will be powered by three MTU diesels from the 2000 kW range, each one producing 1,080 kW and coupled to MJP waterjets. The speed of this vessel will be up to 46 knots depending on load.

The design team has also completed towed model tests of a small 12m 'simple and cheap' fast low-wash passenger ferry. The Ecofoil 12 Project is based on a catamaran hull and uses a surface-piercing forward foil that can be fixed or retractable, while the hull has very low power requirements. A 25passenger version could have a 40-knot service speed and yet only require two 206kW engines to power the vessel. The propulsion system for this craft is expected to be based on the use of Volvo-Penta diesel engines coupled to Duo Prop stern drives.

UNMANNED SEA SURFACE VEHICLE

By William Palmer, Seaframe Publication of the Naval Surface Warfare Center Carderock Division

Program Improves Efficiency By Designing From The Ground Up

The Unmanned Sea Surface Vehicle (USSV) project, begun in spring 2003, is helping transition unmanned technology into the Navy and introducing innovation through a "design-for-purpose" approach. In this program, sponsored by the Office of Naval Research, two vehicles have been designed and built to address their respective mission sets. [Ed Note: See related article in the Autumn 2005 IHS NL, p.1.] Designers supporting the Ships and Ship Systems (S^3) Product Area (PA) increased the effectiveness of the designs in two ways, first by designing the vessels precisely for the missions they are intended to perform, and second by designing two specific boats which can more effectively address the tasks they are to perform. The S^3 PA tie-in focuses on the overall systems integration and specific vehicle performance characteristics such as speed, endurance,

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USSV
(Continued From Previous Page)

payload capacity, and seakeeping. By building in the required performance characteristics, these semi- autonomous vehicles are able to perform the selected missions.

Carrying appropriate payloads, these vehicles can be deployed for surface strike, mine warfare, and anti- submarine warfare (ASW) missions. They introduce efficiency and effectiveness by addressing the reality that no one vehicle can be optimized for all missions. Accordingly, S^3 PA designers combined performance goals set for the vehicles with increased capabilities to meet mission demands. Maritime Applied Physics Corporation in Baltimore, MD, designed and built the craft. One of the craft, capable of 35 knots or greater, employs hydrofoils to lift the craft's hull out of the water, providing a stable platform and eliminating wave slap.

High-Speed USSV Variant

The other design employs fixed, tunneled propellers to propel the craft to a top speed of 20 knots or greater. The pair of vessels will likely save operating costs, since helicopters are currently used to perform some mission areas for which the vessels are designed. Designers collaborated with personnel from the Littoral Warfare Systems and Undersea Weapons and Vehicles Product Areas to identify and refine important vehicle characteristics.

Low-Speed USSV Variant

Images provided by Will Sokol, NSWC, Combatant Craft Division.

Most of the components making up these two vehicles are commercially available - another cost reduction feature - although some components, such as the hydrofoils on the high-speed vehicle, are customized. One of the design challenges addressed in the design of the high-speed craft is the ability to continue operations in sea state 3 and maintain speed. Current small craft of comparable length are unable to accomplish such a feat. Thus, an important driver in this part of the USSV project is to investigate and demonstrate the ability of a small craft to maintain high speed in high sea states.

Both vehicles are designed to accommodate mission requirements associated with the Littoral Combat Ship program, although they are not an integrated component of that effort. The 39-foot, low- speed craft, referred to as a High Tow Force vehicle because of its ability to tow mine warfare and ASW equipment in its wake, has completed in-water testing, while the 35-foot, high-speed craft is in the process of completing its in-water trials.

Future developments and demonstrations will include the launch and recovery of these craft from the host platform. [*See LCS article on p. 6 of this NL.*] The USSV project is a means by which the Navy will gain experience with the capabilities of unmanned surface vehicles to execute ever- expanding missions while saving costs through design efficiency and operational effectiveness.

GAETANO ARTURO CROCCO (1877 - 1968)

Contribution by Lorenzo Bonasera, IHS Member

Last year the IHS Newsletter recalled the achievements of hydrofoil pioneer Enrico Forlanini to mark the centenary of his experiments in Italy with model and manned hydrofoils. At the same time and in the same country, other Italian engineers were also investigating the potential of hydrofoils.

Gaetano Arturo Crocco was an Italian engineer born in Naples on 26 Octo-

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CROCCO
(Continued From Previous Page)

ber 1877. Since 1900, when, after attending University and the Army Artillery Academy, he became Lieutenant of the Italian Army Engineers, he started experiments and studies in many different fields. [Ed. Note: A short article entitled: "A Bit of History – Crocco's Hydrofoil" appeared in the Spring 2004 IHS Newsletter.]

Crocco was nicknamed the "Airship-Man" when, in 1906-08, with his colleague Ottavio Ricaldoni, he designed and built the first Italian airship, the "N.1", a 2700 cubic metre airship with a new semi rigid structure.

He can be considered as an aviation pioneer and the father of aerodynamics studies in Italy. In 1908, with the support of Vito Volterra, he founded the Italian Central Aeronautical Institute to teach aerodynamics. Later, in 1912, he established the first Italian experimental wind tunnel, soon followed by a second facility, and finally one specially intended for high speed testing (up to 200 km/h) which was operated until the Second World War.

During his long university career (1926-1952), Crocco published more than 170 scientific studies, was awarded 30 patents and invented 50 different aeronautical instruments, many of them still used today in the field of the aircraft flight stability.

An early cyclic pitch design for helicopter rotors was patented by Crocco in 1906. Crocco recognized that if a helicopter was to work properly when in forward flight, a means of changing the pitch on the blades would be needed to account for the dissymmetry in the aerodynamic loads between the side of the rotor advancing into the relative wind and the side retreating away from the wind.

In 1934, he was named Chief Engineer for the building of the new "aeronautic" city of Guidonia, which was the centre of Italian flight studies, research and experimentation and, at that time, one of the most advanced in Europe.

Crocco Craft - Front View

His natural curiosity brought him to thoroughly investigate the hydrodynamics of the hulls and submerged surfaces of boats. As consequence, during the period from 1905, he built, with Ricaldoni, the experimental boat "Idroplano" or "Barchino Idroscivolante", equipped with fore and aft dihedral steel foils in a canard configuration to lift the boat out of the water and aero propellers to propel it, a true ancestor of the modern hydrofoils.

Crocco Craft - Rear View

Crocco and Ricaldoni had been engaged on hydrofoil development for about ten years. A small boat displacing about 1.5 tons was built in wood by Cantieri Baglietto di Varazze, and is reported to have achieved speeds in excess of 70 km/h (43 mph) powered by a 80HP Clement-Bayard engine (Figure 4). The craft also served the purpose of testing airship engines. The second version of this beautiful experimental boat is perfectly preserved and displayed at the Italian Aviation Museum, located not far from Rome, and alongside the same lake on which the experiments with the hydrofoil boat were carried out. The craft pictures are courtesy of Stefano Dentice – www.Ultraaleggeri.net) can be seen at: Museo Storico Aeronautica Militare, Aeroporto Vigna Di Valle 00062 - BRACCIANO (Roma).

US Patent 1187268, granted to Crocco in 1917, proposed foil systems that are the forerunner of those employed on many present-day hydrofoil craft. Both submerged as well as a surface-piercing systems were proposed. For the surface-piercing system, Crocco proposed a complete monoplane V bow and an incomplete V stern foil (see pictures). This configuration has good pitch and roll stability and this was the first craft to employ inclined single surface-piercing hydrofoils bow and stern.

Crocco was the first man to successfully execute a take-off in a hydrofoil-supported seaplane; but the landing was much less successful; the craft nosed over and Crocco almost executed himself.

Gaetano Arturo Crocco died in Rome on 19 January 1968.

AUSTAL USA LAYS KEEL FOR LCS

From *Work Boat World*, March 2006

Following the official opening of their new ship construction facility last November, Austal USA hosted a traditional US Navy keel-laying ceremony on January 19, 2006 to signify the start of construction on the Navy's 127 metre trimaran Littoral Combat Ship (LCS).

US Navy tradition dictates that each new ship for the service be honoured on four historic ceremonial occasions: keel-laying, christening (or launching), commissioning and decommissioning. The object of the ceremony was a component in the modular construction arrangement that will form part of the 127 metre aluminium trimaran capable of providing high speeds, multi-mission capability and aviation operations.

[*Ed Note: Readers should be reminded that the Navy's 127 metre trimaran Littoral Combat Ship (LCS) has a foil system for motion control.]*

The ceremony was attended by in excess of 150 high ranking officials from the Government, Navy, the State of Alabama and City of Mobile who joined the Austal workforce to mark the occasion.

Rear Adm. Charles S. Hamilton, Program Executive Officer for Ships, who attended the ceremony said, "This milestone marks a significant achievement in the LCS program. The LCS brings our Naval forces the speed, flexibility and capability we need to face the asymmetric threats of the future."

MTU Series 8000 engines have been identified as the preferred powering option for the vessels following their successful installation onboard Austal's 127 metre trimaran 'Benchijigua Express'. Four MTU 20V 8000 M70 engines were installed aboard that vessel which is now operating in the Canary Islands. However, the LCS will use two 9,100kW 20V 8000 M71 propulsion engines in conjunction with two gas turbines, to propel the vessel in excess of 40 knots.

The MTU engines will be manufactured, assembled and tested per the requirements of the latest ABS Naval Vessel Rules, including the MTU 8V 396 gensets and auxiliary engines which have also been specified for the vessel. With a potential for over 60 LCS to be delivered, this contract could represent one of the biggest contracts in MTU's history.

SEABUS COMMENTS

By Tom Lang (IHS Member)

Your Editors note in the Seabus article appearing in the Spring 2006 IHS Newsletter reminded me that I had given the original idea of air-fed stabilization to Hans Von Schertel of Supramar at a hydrodynamics meeting in Europe around 1960. I was pleased that he later used this idea on some of his Supramar-designed hydrofoils for controlling hydrofoil lift.

By way of background, I conducted tests in the late 1950s on side vented hydrofoil models (see photos on next page) in the high speed water tunnel at Caltech to explore side venting for controlling hydrofoil lift. These tests showed that lift reduced when air was ejected through one or more holes in the upper surface of a hydrofoil, and that lift increased when air was ejected through one or more holes in the lower surface. I also tested a base vented hydrofoil model in the Free-Surface Water Tunnel at Caltech. I later obtained patents 3,077,173 (1960) and 3,109,495 (1962) on these side vented and base vented hydrofoil ideas.

FIG. 11. Closeup of Model, Q' = 0.12, α = 7.5 deg.

Base Vented Foil Under Test

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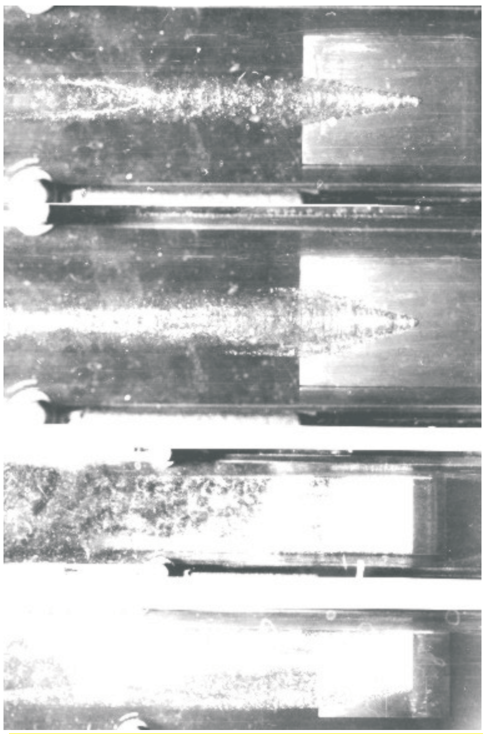
SEABUS COMMENTS
(Continued From Previous Page)

Shown here are top view photos of different versions of side vented hydrofoil models tested in the High Speed Water Tunnel (HSWT) at Caltech from June 1958 to June 1959. Also shown is a photo of a base vented hydrofoil that was tested in about the same time frame in the Free Surface Water Tunnel at



Side Vented Hydrofoil Models

Caltech. The HSWT tests were reported in the December 1961 issue of the Journal of Ship Research, "Water Tunnel Tests of Three Vented Hydrofoils in Two- Dimensional flow" by Thomas G. Lang and Dorothy A. Daybell.

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YOUR EDITOR ALWAYS WELCOMES SUGGESTED ARTICLES FOR THE IHS NEWSLETTER, SO PLEASE KEEP THEM COMING.

COMMENTS ON SPRING 2006 NL ARTICLES

By Hendrick W. Haynes (IHS Member)

It was very interesting reading about CDI Marine Systems work (with the U. S. Navy Destroyer Demonstrator (NDD) to test Advanced Waterjet). However, I am confused by the long list of pump elements and general configuration terms, as often times they are incorporated (in whole or in part) in making portions of those broad groups discussed (such as "axial flow" and "mixed flow"). Some clarification would be helpful.

I found work by Mr. Donald Burg of Miami interesting (his "SWEEP"). I did a bow mounted water jet on a multihull sailing craft about 1980, and this successful experiment was cited in prosecuting my U. S. patent number 4,611,999 (see also Haynes U.S. Patent #5,545,863). My device had a similar intent and description as to what Mr. Burg seems now proposing, but on a much more modest level (in the bow of a 36' Trimaran). The craft's bow mounted propulsion waterjet (and intake) utilized my gaseous boundary layer control around the water jet stream and the hull length. I have developed and sold speed specific intake water pressure boosting systems (with tapered afterbody sections) for my waterjets since the mid-1970's (have test boats from the mid-1970's still out in my yard, and foundry patterns hanging on the wall). Exploiting the speed specific pressure fields around vessels (or cars and aircraft for that matter) for charging intakes of one kind or another seems not new, however CFD (Computerized Fluid Dynamic Software), and the advantages imparted by it, seems to be. I might direct your attention to the work of Mr. David L. Giles, U. S. Patent number 5,231,946 (about August 3, 1993), and his speed specific work with waterjet intake placement and its affect on reducing hull drag.

However, while I may respectfully suggest the fine inventor Mr. Burg appears to want to lift craft above substantial pillows of air based on his Surface Effect Ship interests (into which he seems now to discharge waterjet wakes), my approach is to insert and exploit critical boundary layers and consume much less air charging effort in its establishment. My boundary layers, design dependent, seem contained in channels or runs through the use of minikeels, and chambers. I have created these layers from systems mounted from the bow to the stern, and these systems may be (and have been) pressurized as well as "eductor" types (pressure drop across cavities makes them self feeding. Similarly, my waterjet(s) exit(s) into a tuned void, and carries with it an established boundary layer (first recited in my

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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

COMMENTS ON SPRING 2006 NL ARTICLES *(Continued From Previous Page)*

1979 patent application based on successful vessel test results).

However, Mr. Burg, because of the size of his SES ship design "cavity", may have a different placement and optimization problem than a craft may have using my design principles. I have found that boundary layers tend to mix and also break down, and that substantially affects original properties and utility (advantage can not only go away, but also they can turn against you). It may be interesting to see what happens in Burg's SWEEP concept as pump placement and induced flow problem matures in development.

Please note that the gaseous pressure(s) and flow(s) I create are sufficient to separate the fluid stream(s) from the ship plate, and modify the pressure distribution on the hull as may be appropriate. The goal is to hopefully not to expend any more energy than is required to do the job (reduce Coanda Effect (and plate drag), as well as reduce wave drag). The vessel's waterline, is (of course) affected, but the lift is not great. It may be interesting to someday read more about Mr. Burg's approach to the problem. If you disagree with the aforementioned, please correct me if I am wrong.

I thought the work of Mr. David L. Giles and U. S. Patent number 5,231,946, may be interesting to your readership (see www.USPTO.gov and also references).

HIGH POINT UPDATE

By Sumi Arima (IHS Member)

I now have permission to announce that the HIGH POINT has new owners: Doctor Terrence Orme and his son Terrence (Terry) Orme. Doctor Orme, a dentist, practices in Chattanooga Tennessee. His son is staying in the Astoria Oregon area busy working on the HIGH POINT getting the junk and barrels of waste oil off, and fixing the leaks, etc. He is preparing the ship for a new coat of paint, and getting the electrical generators installed. Terry tells me he will welcome any correspondence about the HIGH POINT. Point of contact is: Terry Orme (son) herrhetzer@hotmail.com

DRIVE CONCEPTS RESURFACE

By Dag Pike, Ferry Technology, February 2006

A number of new surface drive concepts are being developed and these could in time prove attractive for ferry operators

Even for small fast ferries the surface drive has not found favour amongst designers. This is partly because these drives do not offer the load flexibility that a waterjet has, but also because surface drives only tend to become viable once ferries start to operate at speeds in excess of 30 to 35 knots, which tend to be at the top end of the normal ferry operating range.

This situation could be about to change with the arrival of a new type of surface drive that has been developed in Italy. Most surface drives are designed to increase efficiency for high performance craft, but this new design is aimed at craft that operate at up to 35 knots, a speed which is firmly within the passenger vessel and ferry range. This new surface drive is part of a range that has been introduced by the Italian company, Flexitab, which is adopting a new approach to this technology.

Most manufacturers of surface drives offer a single basic design. The concept is then simply enlarged to cope with higher power outputs, and generally no attempt is made to produce different designs of drive for different speeds. However, Flexitab offers three different designs of surface drive: one for low performance, one for medium speeds and a third for high speeds. As a result, the company claims that the drive and propeller design can be optimised for performance at the various speeds.

The FLEXITAB Energy Drive

One unit that could prove particularly attractive to ferry operators is the Flexidrive Energy, which is designed to be efficient primarily at speeds up to 30 knots. This marks a new approach to surface drives and, to achieve this low speed efficiency, Flexitab has produced a drive with a fixed shaft combined with a large propeller aperture. These features are combined with a new surface-pierc-

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FLEXIDRIVE
(Continued From Previous Page)

ing propeller design that uses a highly skewed blade instead of the normal 'cleaver' style.

The relatively large diameter of this propeller should offer good thrust at low speeds and it is designed to operate in the fully ventilated mode, so that it can take advantage of the reduction in drag created by having only the bottom blades of the propeller doing the work. Flexitab thinks that this will result in higher efficiency and lower cost when compared with waterjet propulsion.

These Flexidrive Energy units are bolt-on drive systems, so installation is easy, while the fixed shaft should ensure reliability. The concept still has to be proved on larger designs but Flexitab is currently offering six units that are available to handle power outputs up to 1,545kW (2,100hp).

Another type of propulsion system that is in the development stage is the rim driven propeller. The difficulty with this option is finding a way to efficiently drive the propeller. However, at least three propulsion companies have been working on this technology and have developed electric motors that are mounted within the mounting nozzle, so that the unit, complete with electric drive, comes in the form of a nozzle with the propeller mounted at the centre.

In order to house the electric motor, the nozzle is thicker than a conventional propeller nozzle, but it is still slim enough to be hydro -dynamically efficient. One of the current units of this type manufactured by the Dutch company, Van Der Velden, is being offered as a conventional transverse bow thrusters, whilst the unit being developed by Brunvoll is being offered as an azimuthing thruster.

Logically, the development of these concepts will lead to a full ship propulsion system based on diesel-electric propulsion. Efficiency gains are claimed for such a system as well as lower propeller noise and vibration. Another perceived benefit is that a unit of this type would be less likely to be susceptible to rope entanglement, while there may also be a reduced maintenance requirement, as no lubrication is required in the un-

FOIL DESIGN AND ANALYSIS

By Rick Loheed (IHS Member)

[Rick offers the following advice and information for those hydrofoilers having an interest and need for foil design and analysis.]

I have been working with designs for lower Reynolds number sailing foils, so have been using XFOIL by Mark Drela (raphael.mit.edu/xfoil/index.html), but then I ran into one re-written by a French aero modeler called XFLR5. (Www.geocities.com/xflr5/xflr5.htm) Both programs are distributed under the GNU public license and so are free. I have had some really great correspondence with Tom Speer, whom as you know is definitely an expert on that subject.

XFOIL of course is a command line program borne of the old UNIX days, though written in 1986. XFLR5 is XFOIL re-written in C++ with a Windows interface- brilliantly, I might add, and with a lifting line analysis built in for wing design. It also includes some rudimentary vortex lattice prediction methods, but only for one surface. The beauty is they use the polar results from XFOIL analysis of the section, which includes the viscous effects.

Tom Speer is the one who is the XFOIL expert (probably #2 after Prof. Drela himself, to be honest...), but I guess I would be probably be the XFLR5 expert, given I like that program quite well and have some hours with it. It is actually XFOIL internally, but the 'packaging' is intensely easier to work with- particularly because it has 'projects' which can contain many 2D foil sections and polars being compared and/or combined, or used for the beginning of full inverse design. It also has 'first cut' wing analysis, also capable of many different designs in the same project. The polars can then be compared to optimize things. I use the depth correction factors lifted from NACA TN-4168 to work with the actually '2-1/2D' lifting line analysis, though it also contains vortex lattice methods as a second check and for configurations that are not appropriate for the lifting line theory. It cannot do struts or bodies, nor can it have the biplane simulation of the free surface. After my first cuts, I have also the Multi-Surface Aerodynamics vortex lattice package by Dr. Patrick Hanley. It is inviscid, and also has some other 'issues' but generally it's pretty good. I also use DesignFoil by John Dreese, because it has all the NACA foils and the UIUC database, and VisualFoil, from Hanley again. This is the oldest one in my arsenal. The newest and most interesting is JavaFoil, by Dr. Martin Hepperle, which can do multi-element foils and also has all the NACA foils including the 16 series. www.mh-aerotools.de/airfoils/javafoil.htm

SAILOR'S PAGE

RAPTOR 16 SAILING OUTRIGGER WITH FOIL ASSISTANCE

An interesting application of hydrofoils on sailboats is that of the Hydrovisions Raptor 16 sailing outrigger canoe which is available in both Competition and Expedition versions. Both are light weight, high performance craft that are easily carried on the top of a car, quick and easy to assemble and launch, and have good performance both under sail and when paddled.

The Raptor is similar in size to the Hawaiian one-person paddling outrigger canoe or OC-1. It was inspired by the exceptionally fast and weatherly proas of the Marshall Islands, where John Slattebo, Hydrovisions' President and Chief Executive Officer and lead designer lived for 20 years.

The Marshallese proa is longitudinally symmetrical and is sailed with its ama or outrigger always on the windward side. When it tacks, its bow becomes its stern (and vice versa), and the heel of the single mast is shifted by the crew so that it remains in the forward part of the hull when being sailed, providing a balanced and properly situated center of effort.

By contrast, the Raptor sails with the ama to windward on the starboard tack and to leeward on the port tack. This would not work for a Marshallese proa because for the Marshallese craft stability is provided by the weight of the ama and the weight of the crew on the 'ere', a small platform on the 'iakos' (or outrigger crossarms). With the Raptor, stability is provided primarily by the Dualift Foil™ and secondarily by the weight and floatation of the ama.

The performance of the Raptor to windward and stability under sail are the result of the Dual-lift Foil Truss Assembly™, a single-moving-part, manually controlled hydrofoil. The Foil keeps the boat level on both tacks, in all wind conditions, and at boat speeds from 2 knots to 20+ knots. It also "lifts" the boat to windward regardless of tack. When reaching in moderate to strong wind conditions, it allows the ama (outrigger hull) to be "flown" above the water, greatly reducing drag. Figure 1 illustrates how the hydrofoil functions on both tacks. On the Port tack, the floatation of the ama counteracts the heeling force from the sail. In very strong winds, the sailor can supplement the ama's floatation by adjusting the foil to add lift in an upward direction. On the Starboard tack, the sailor adjusts the angle of attack of the foil to cause it to pull downward, counteracting the heeling force of the sail.

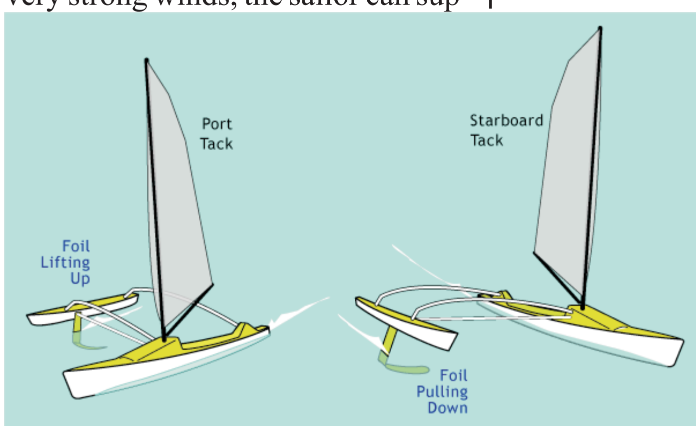

Figure 1 - RAPTOR Tacking

Both the Competition and Expedition models are made from the same moulds and use the same materials so have generally the same specifications. The Expedition model has additional storage hatches in the main hull and ama; a roller furling mast step to allow the sail to be rolled up when not in use and to be reefed in high winds. Its hollow-roach sail with vertical battens is suitable for roller furling. The Raptor Sidecar™ accessory allows both models to carry a passenger or additional gear weighing 135 lbs or less. Main hull length is 16' 9" and beam is 13". Ama length is 12' 9" with a beam of 9". The overall beam of the assembled boat is 8' 0". Total weight of assembled boat without rig or foil is 68-72 lbs and with rig and foil truss assembly is 95-100 lbs while the sidecar accessory adds another 8 lbs. Sail area is 8.4 square metres for Competition model and 8.0 square metres when the roller furling sail of the Expedition model is fully extended.

Raptor's design and construction is a compromise between light weight on the one hand, and strength and durability on the other. Each Raptor is laid up by hand using carbon fiber cloth and epoxy resin on a foam core with extra reinforcement at critical stress points. Vacuum-induced resin infusion techniques are used to ensure resin saturation without excess weight. Kevlar reinforcement in high wear areas is available as an optional extra. While it can be used for paddling in surf, it is not designed for sailing in surf as the dynamic forces

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RAPTOR
(Continued From Previous Page)

of wind and waves could easily result in structural failure of the aluminum iakos.

In the Raptor 16 Expedition model if one doesn't expect to sail right away, one can either roll up the sail on the mast and secure the boom to starboard with a bungee cord or roll up the sail and remove the mast and boom, securing them horizontally in the clips on the iakos.

Dualift Foil™

The Dualift Foil™ opposes the heeling moment imparted to the mast and sail. When the Raptor is sailed on the starboard tack, with the heeling moment attempting to lift the ama or outrigger out of the water, the operator lifts the foil control handle with light finger pressure, and the foil is given a slight downward angle of attack, thereby keeping the ama at or near the surface of the water.

RAPTOR - Competition

When the Raptor is sailed on the port tack, with the heeling moment attempting to submerge the ama, the operator depresses the foil control handle with light finger pressure, and the foil is given a slight upward angle of attack, thereby supplementing the natural floatation of the ama and keeping it high in the water or skimming at the water surface.

RAPTOR - Sailing

Without the foil, the Raptor would capsize when sailed on the starboard tack in all but the lightest wind conditions. When sailed on the port tack without the foil, the ama would be forced low in the water, increasing wetted surface and drag and slowing the boat considerably.

The foil is shaped so that its horizontal lifting surface makes an obtuse angle with its non-lifting vertical surface. It therefore exerts both a vertical "lifting" force that provides stability (the force is downward on the starboard tack and upward on the port tack) and a horizontal "lifting" force that is always to windward regardless of tack.

After about an hour of tacking and reaching on both tacks, proper use of the foil becomes more or less instinctive. Tacking from port to starboard tack in strong winds is a bit tricky and requires coordination of foil position, foot pedal steering, and mainsheet control.

Once the Raptor is making way through the water on either tack, maintaining a foil position that will keep the boat stable while sailing fast and comfortably is quite easy. However, for those sailors interested in match racing, understanding how the foil affects drag and performance on all points of sail in a variety of wind and sea conditions, and skill in making constant minor adjustments to foil position, are critical to winning races.

Sometimes boat speed is increased by "flying" the ama and having only the foil in the water. Also, boat speed is increased by keeping the ama light in the water and not using enough foil pressure to fly it. This unique characteristic of the Raptor makes it a very popular boat with experienced one-design racers because it adds another variable that affects achievable speed for any sailing condition.

The foil is designed to swing aft and up out of the water if it hits a submerged object, or if the Raptor is inadvertently run up on the beach with the foil down. The rudder also kicks up if it hits something. Only the dagger board lacks this kick-up feature. The dagger board is positioned between the helmsman's feet and is easily retracted.

Hydrovisions, Inc. is a California corporation founded in 2002 by John Slattebo (IHS Member) and Dave Higgins. To obtain pricing, more information, and see or sail a Raptor 16, contact Hydrovisions at: dealer_inquiries@hydrovisions.com or raptor16@sbcglobal.net

WELCOME NEW MEMBERS
(Continued From Page 2)

drofoil sailboats almost as long as he has been sailing. After retiring a few years ago, his interest revived and he now sails a small hydrofoil trimaran of his own design & construction (with mast, sails, and several other pieces of the boat from the 1970's).

Don Higdon – Don's interest in hydrofoils began fairly recently with work on the flight control systems for the HYSWAS vessel QUEST and, later, two hydrofoil boats built by Maritime Applied Physics Corp. Prior to that, since 1970, he was involved in the design of ride control and stabilization systems for a number of SWATH vessels, surface effects ships, and fast mono-hull ships. He began working with SWATH ships for the Naval Ocean Systems Center in San Diego in the seventies and worked two years for Maritime Dynamics Inc. in the mid eighties, primarily on surface effects ship ride control. He has worked since 1980 as a private consultant in the area of marine vehicle dynamics and control. He received a BS and MS in aeronautical engineering from the University of Kansas in 1956 and a PhD in Aeronautics and Astronautics from Stanford in 1963. Prior to 1970 he worked in the aerospace industry.

Walter S. Jones - Walter is a Graduate of "The George Washington University" with a B.M.E Degree in Mechanical Engineering obtained in 1958. He is retired. His Engineering career started in the Bureau of Ships Propulsion System Design , where he was involved in Feasibility, Preliminary and Contract Designs for Mine Sweepers, Aircraft Carriers, Submarines and the Tucumcari Hydrofoil . Walter was promoted to the Computer Aided Ship Design Code, then transferred to the Machinery System Coordination Office. He was the Naval Sea System Command Project Coordinator for the PHM, 3K SES and LCAC Machinery Systems during Feasibility, Preliminary, Contract Designs and Construction and Post Delivery. His first encounter with water jet propulsion was as a student in "The George Washington University" class projects. He has not lost his love for hydrofoils or Surface Effect Ships.

Yannis G. Linardakis – Yannis is a retired Commodore of the Hellenic Navy. He is a 1969 Naval Academy class graduate and he retired in 1994. He is also a graduate of the Naval War College for senior Officers, the Hellenic National Defense College, and the Law School of the Athens University, and he speaks fluently English & French. He is a founding member of the Hellenic SOLE (Society of Logistics Engineers) and has served in its B.O.D. He has served in positions such as Director of the Foreign Procurement Directorate of the H.N.S.C., Director of Cost Analysis & Acquisition Logistics for Newbuildings and Weapon Systems in the H.N.G.S. intimately involved in the operational details of ships & their systems & equipment, and other related organizations. As he is an incurable optimist, after his retirement he has made it a goal to help out in the diffusion/circulation of the modern (state of the art) craft knowledge and development, and the enlightenment/update of commercial marine companies for the chances offered to operate with faster but yet more efficient & economical vessels, hoping that he contributes in the understanding and application of constructive solutions."

Alan D. Schnittman – Alan is a Principal Engineer and Systems Analyst with Maritime Applied Physics Corp. He received a B.S. degree in Electrical Engineering in 1989 from The Johns Hopkins University, Baltimore, MD. He has specialized in the design, test and development of advanced electrical/electronic components/systems applied to the control of equipment and communication. Most recently he has provided essential capabilities for the integration of payloads on the Navy's Unmanned Sea Surface Vehicles (USSVs), one of which is a hydrofoil. This includes "terrain" data for control, an important contribution to the implementation of the COGENT system on the USSVs.

NEW BENEFIT

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

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The NEWSLETTER

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

Editor: John R. Meyer | Autumn 2006 | Sailing Editor: Martin Grimm

SUBMERGED SYSTEM RAISES HYDROFOIL EFFICIENCY

From Ferry Technology June 2006

An Italian Government backed research initiative has led to the development of new hydrofoil technology by Rodriquez, and two different prototypes are now being built under the supervision of the classification society RINA.

The Italian Rodriquez shipyard has, for the past two years, been heading a complex research project, intended to develop a new and even more efficient hydrofoil system utilizing fully-submerged foils.

Financed by the Italian Ministry of Research, this project involves research into two full-scale prototypes, and their design and development. Each will have a different propulsion system, and will feature a new type of hydrofoil able to combine all the traditional advantages of this type of craft, including high speed, reduced fuel consumption, and excellent sea-keeping capacity, with an even more efficient craft.

Rendering of Hydrofoil Prototype Being Built by Rodriquez

The design of this innovative vessel has been headed by Alcide Sculati, managing director of Rodriquez Engineering, the group's research and development center. Rodriquez Engineering's efforts have focused on creating a hydrofoil model with foil surfaces that are positioned completely below the water surface to greatly reduce the vessel's sensitivity to-

See Hydrofoil Efficiency, Page 3

SUSTAINING MEMBERS

2007 DUES ARE DUE SOON

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

INSIDE THIS ISSUE

PRESIDENT'S COLUMN

To All IHS Members

I am encouraged to report the Society's continued growth with a total of 22 new members added to the IHS Membership roles since January of 2006. By the way, you can view the Membership List (a new one was generated as of the beginning of July) by logging onto the IHS website and put in the proper password. All IHS members have been informed of this password. If you have been missed, please contact the webmaster (webmaster@foils.org). It is advisable for all to check the information on the List. If it is incorrect, please send changes to: Steve Chorney: schorney@comcast.net

Those of us in the Washington D.C. area were fortunate to be able to attend a Joint Meeting of the IHS and the SNAME SD-5 Panel in September. The subject was "The Joint High Speed Vessel" by LtCol Lawrence Ryder, USMC, JHSV Deputy Project Manager. LtCol Ryder discussed the growing importance of high-speed ships in the transformation efforts of the Navy, Marine Corps, Army and SOCOM. He addressed several areas of particular significance, including: what has been learned from operating *JOINT VENTURE*, *WESTPAC EXPRESS*, *SWIFT* and *SPEARHEAD*; what they can do that conventional ships can't; the value of higher speed and shallower draft; capabilities that must be retained, shortcomings to be remedied; military aspects to be provided or improved upon and other capabilities and features needed for a spectrum of future operations. It is anticipated that a copy of the presentation will be made available on the IHS website soon.

A reminder that the third AMV CD (CD#3) has been generated by the Society and is available for all to order thru the IHS website. As usual, the cost is a nominal $12 for IHS members and $15 for non-members.

Bill White, the IHS Webmaster, has prepared an article appearing on page 9 of this Newsletter in which he summarizes material he presented at a recent Board of Director's Meeting. It was a 7-page summary of recent website activity. All the Board members were very impressed with the number of visits and the vast quantity of information that was being downloaded every day from hydrofoilers all over the world. The IHS indeed has a global reach and I'm sure that the founders of the Society would be pleased with the way we are spreading the word about hydrofoils, their technology and applications. Bill White and Barney Black are to be thanked and congratulated for the boundless energy that they have devoted to the IHS website and to the Society in general.

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

John R. Meyer, President

WELCOME NEW MEMBERS

Adam Grosser - Adam is currently a General Partner at Foundation Capital, one of Silicon Valley's premier venture capital firms. With a primary emphasis on Telecommunications and Data Communications, Adam currently serves on the boards of a number of companies. Before joining Foundation Capital, Adam was President of @Home Network which grew from a 5-person team to 4000 employees and $2 billion in revenue. Prior to @Home, Adam was the President and CEO of Catapult steering the company from inception to IPO; and has worked in technology and management for Sony Pictures, Lucas Film, and Apple Computer. Infused with a love of technology and art, Adam builds boats and planes, bikes avidly if slowly, and adopts rhinos and manatees for unsuspecting friends. Adam holds BAS, MS and MBA degrees from Stanford University, is a lecturer at the UCLA School of Film and Television and contributes to National Public Radio's Marketplace.

Colin Kline - Colin is from Australia. His background is physics and electronics having received a B.Sc in those subjects along with a Diploma in Electrical Engineering. He has a Trained Teacher's Certificate, a 30+yrs Graduate of the Institution of Engineer's, Australia, and is a member of the Institute of Electrical & Electronic Engineers. Colin's experience spans 27 Years as a lecturer in Tertiary Engineering (University, as distinct from sub-professional). He has filled extensive consulting roles in industry, and is currently re-

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HYDROFOIL EFFICIENCY
(Continued From Page 1)

wards adverse sea states, while at the same time increasing the vessel's overall efficiency.

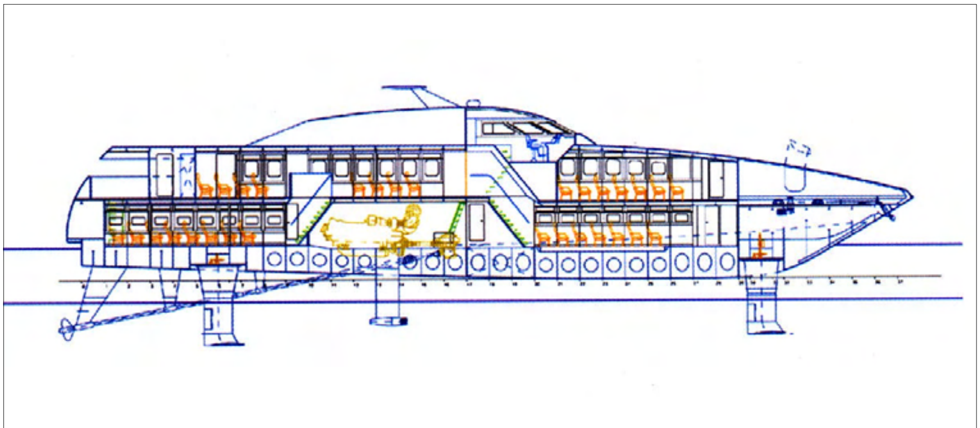
Each of the two prototypes of the fully-submerged foil craft, the construction of which started a few months ago, will have a length of about 37m, a capacity of 280 passengers and a maximum speed of 50 knots, but will have an installed power only slightly above that of the surface-piercing foil craft - about 4,500kW. The craft will be built under the supervision of the Italian classification society, RINA, and will carry the HSC "HYD" notation.

The research work has focused on optimizing the hydrofoil's basic design characteristics. Rodriquez has developed an electronic control system for the foil surfaces, which incorporates the stabilization and directional control equipment, and has also paid a great deal of attention to the shapes and dimensions of the hull appendages and propulsion system.

Stability, which in a vessel of this kind is not intrinsic as it would be with a surface-piercing hydrofoil, will be ensured by trailing edge flaps placed on the foils, and these will also be electronically controlled. The system will furthermore have sufficient redundancy to provide an extremely high level of safety and allow the hydrofoil to maintain its foil-borne mode even in the event of the mechanical failure of a single component.

Rodriquez believes that the fully submerged foil arrangement will offer operational benefits, and create a design suited to medium distance routes and coastal commuter applications.

To optimize the performance of the propulsion system over the vessel's complete operating range, including hull-borne, takeoff and foil-borne modes, the reduction gearboxes installed will be two-speed units. The first gear will allow the vessel to reach the speed required for take-off when the hull emerges from the water, while not overloading the engines. Second gear will allow the engine power and vessel speed to be ideally matched for high-speed performance. The captain will be able to switch gears in less than 0.2 seconds, simply by pressing a button.



Cross-Section of Rodriquez Fully-Submerged Foil Craft

According to the test tank results, the new hydrofoil will have excellent performance even in rough seas. In a parameterized wave, in other words a significant wave height equal to one meter, and with a head-on sea and a speed equal to 40 knots, the accelerations at the center of gravity were less than 0.08g.

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

Rodriquez also believes that this type of hydrofoil with fully-submerged foils will be ideally suited to medium distance routes. Furthermore, because it creates very low waves, the design is considered to be applicable to inshore routes near large coastal cities, in situations where it is desirable to use ferries for commuter transportation, as an alternative to overcrowded roads.

MORE FOILMASTERS

It has been recently reported that six Foilmaster hydrofoils have been delivered in the past 15 months and a seventh is nearing completion. The state owned Siremar and the privately owned Ustica Lines are the two companies that operate all passenger ferry services within Sicily. In 1995 the first of 12 Foilmasters built to date entered service with Siremar. Ustica Lines then became the major operator, introducing four between 1996 and 2003. Since March 2005,

Continued on Next Page

FOILMASTERS
(Continued From Previous Page)

Siremar has taken delivery of five more. Another Foilmaster is due to enter service with Ustica Lines in May 2007 and the company holds options on two more. All the Foilmasters are virtually identical. They are fitted out for 240 passengers and powered by two MTU 16V 396 TE74L diesels, rated at 2,000 kW at 2,000 rpm, driving fixed pitch propellers. Full load service speed at 90% maximum continuous rating is 36 knots. See IHS Summer 2003 NL for a picture of Foilmaster.

HYDROFOIL ASSISTED CATAMARANS

By Gary Vos

Hydrospeed (Pty) Ltd was started in 1994 by myself, to market and supply the HYSUCAT (Hydrofoil Supported Catamaran) hydrofoil system, invented and designed by Prof KG Hoppe of FAST cc (Closed Corporation), to fast catamaran builders, designers and owners around the world. Since 1994 we have supplied the most hydrofoils for catamarans around the world and other than one or two companies that have tried to copy the HYSUCAT system, Hoppe and Hydrospeed (as a team) have been successful in ensuring the foil systems we supply work as predicted.

The foil systems vary in design from catamaran to catamaran, depending on the hull design, speed range, tunnel width, weight, and size of the vessel.

With the high fuel prices of today, and the growing popularity of Fast Catamarans as Fast Ferries, Naval Combat Vessels and as Leisure Catamarans, there is a huge growing market for the foil systems we supply, however they are difficult to market as people do not understand them and are hesitant to try them in some cases.

32-Foot POWERCAT Main Foil and Two Stern Foils

Shown above is an example of the variety of foils built by Hydrospeed for one of their Hydrofoil Assisted Catamarans.

Hydrofoils do all the right things for catamarans. For instance: increase top speed by 20 to 40 %, reduce fuel consumption by around 20 to 40%, increase range by 20 to 40%, improved ride comfort in rough seas (reduced pitch and heave), provide a drier ride, increased load carrying capacity with reduced speed loss (the deeper the foils are submerged the greater the lift they produce), can make catamarans bank inwards in a turn, reduce wake size, reduce engine emissions at comparable speeds, and reduce engine/ gearbox maintenance (reach speed at lower RPM).

In all the installations we have done all over the world from 6m Catamarans to 195 ton, 45m catamarans, there has never been any serious damage caused by hitting floating debris/pieces of wood etc . In most cases the foils do not protrude below the actual hulls themselves.

The foils are mounted at the lowest point in the tunnel water flow. The foils are sufficiently strong to carry about 50% of the entire catamaran's weight that not much will damage them.

One can visit our website at www.hydrospeed.co.za and read some interesting articles. There are two videos on our website that can be down loaded as well, however, they can take around 30 minutes to down load.

It should be noted that Prof Hoppe is the inventor/designer, and Hydrospeed (Pty) Ltd is the International Marketing Agents and Suppliers of the HYSUCAT Hydrofoil System.

SPLASH SWIMS THE CHANNEL

Contributed by Jim King, IHS Member

The Rinspeed concept-car has recently actually set a record for crossing the English Channel. The *Splash*, shown here, is the amphibious concept shown in the charming lake town of Geneva in 2004. The record, set on Wednesday, July 26, 2006, was the fastest ever crossing by a hydrofoil car, which the *Splash* technically qualifies as, taking just 193 minutes and 47 seconds.

Rinspeed's *SPLASH*

Unlike many Rinspeed concepts, the usability of the *Splash* has had folks chatting, from Richard Branson speculating that Splashes could ferry folks from the center of London to the airport, to our editorial crew, which theorized a *Splash* could probably make it home more quickly and with better catering than three-quarters of the American airlines serving Geneva. [See Summer 2004 IHS NL for related article on *SPLASH*.]

MARINA FLYER

Extracted from Ferry Technology, August 2006

US operator Seaplanes has recently taken delivery of a new 149-passenger fast ferry catamaran for operations in California. The 26m (85ft) vessel is the first of a new generation of foil-supported catamarans developed by Kitsap Catamarans, and features a unique combination of new high-strength infused epoxy composite hull and the latest development in foil design, explained Kitsap.

The foil system, named "HYSUWAC" (Hydrofoil Supported Water Craft), is a development from the University of Stellenbosch in Cape Town, South Africa, and incorporates significant improvements jointly developed between Kitsap and the university's original HYSUCAT (Hydrofoil Supported Catamaran) design. It has shown to provide superior ride and fuel economy for this size vessel, said the builder.

The company also announced that it is at present in the process of being taken over by a larger organization to develop the technology and expand capabilities of production to meet market demand. It is negotiating with various European, US and Pacific-based operators to supply vessels and schedule positions in its build program.

The 85ft Kitsap vessel has a tunnel clearance of 3.0m. The builder explained that the purpose of this is to provide adequate wave clearance in 2.5m - Sea State 4 - seas. The vessel is able to achieve this clearance due to the weight/strength ratio of the material, hence it performs like a much larger vessel in bigger seas.

Seaplanes president Ron Hoffman noted the following about *Marina Flyer's* nine-day delivery voyage to Marina Del Rey, California from Tacoma, Washington: "The Pacific Northwest provides some of the most challenging conditions in this hemisphere, and this trip was no exception. A record low pressure formed off the coast of Northern California pumping gale force winds up to 80 knots up the Oregon and Washington coast forcing us to, prudently, hold up at Port Angeles for four days before venturing south into 8ft closely-spaced rollers topped by 4ft to 6ft wind waves on our nose for the first day. While we, of course, reduced speed to about 20 knots, and did take two or three waves over the pilot house, the vessel was quite stable and responsive. By the second day the wind began to shift to a westerly and then, finally to northwesterly more typical of the Washington/Oregon coast. By day three we were in quartering seas surfing at up to 35 knots with a very responsive and stable

***Marina Flyer* is the First of a New Generation of Foil-Supported Catamarans from Kitsap**

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MARINA FLYER

(Continued From Previous Page)

helm. The boat tracked quite well, requiring only the most minor adjustments to hold course without the autopilot.

“The vessel performance is enhanced by two fixed foils with no mechanical parts. The foils extended between the hulls; the forward foil located aft of the bow and providing lift to compensate for a percentage of the forward boat weight; and a rear trim foil provides lift to counter part of the aft boat weight. Once in Los Angeles, we began a series of rear foil adjustments to optimise the angle of the bow under maximum speed conditions. Above about 24 knots the vessel is being essentially carried by the forward foil, and the first 35 per cent of the boat is entirely out of the water. As a consequence, the vessel turns by simply rotating on the forward foil surface, and is completely level in a full tiller, maximum speed turn above 30 knots. Quite amazing!

“As first of class, and built from panels, *Marina Flyer* was overweight, but achieved around 35 knots with 20 tons extra load. When the mould is constructed, which will eliminate joints, the composite thickness is reduced to meet classification requirements, and the main beam sizing is reduced, weight saving will be in the order of 15-20 tonnes.

‘At present, operating at about 88 per cent power load, we are able to achieve between 31 and 34 knots, depending on sea conditions. We believe that once Hamilton Jet replaces the present impellers with slightly coarser ones, we will be able to fully absorb the power that the CAT C32 engines can produce, and our speed will increase by three to five knots.

”Seaplane’s business plan calls for the addition of three passenger ferries over the next three years and we believe that Kitsap Catamarans can achieve at least a 20 per cent additional weight saving through its plans to go to a full molding process, and that this weight improvement will increase boat speed to near 40 knots".

The *Mariner Flyer* has Two Fixed Foils Extended Between the Hulls with no Mechanical Parts

The builder said that a unique aspect of *Marina Flyer’s* design is that it has a wide beam allowed by the structural strength of the material. The wider beam affords greater flexibility in the passenger deck accommodation and, for its size, creation of a vessel with larger internal seating capacity and interior open space than previously seen. The greater demi-hull distance also has improved resistance as the hull interference has been reduced.

The vessel’s 35-knot service speed is maintained by two Caterpillar C32 engines, each with an output of 1,045

HIGH POINT UPDATE

The new owner of *High Point*, Terrance Orme, reports that he is moving the boat to a pier in Portland, Oregon. There, Terry will continue to refurbish her. There is 3-phase shore power at this new place so he is in the process of removing the on-deck generator that the former owner had installed. When the boat gets to Portland, Terry will probably hire some marine specialists to come in and get the Perkins generator hooked up.

Sumi Arima (IHS Member) has been assisting the current owner with vari-

***HIGH POINT* Dockside**

Continued on Next Page

HIGH POINT UPDATE

(Continued From Previous Page)

ous technical aspects of the boat since he spent many years overseeing *High Point* while it was a US Navy asset. Terry's long range plan is to outfit the boat with gas turbines (to replace the Proteus engines that were removed years ago) so *High Point* could fly again! Any help in locating these engines or equivalent will be appreciated. Terry's email is: herrhetzer@hotail.com

DRAG REDUCTION EXPERIMENTS

Extracted from *Sea Frame*, NSWCCD, Winter 2006

The Large Cavitation Channel (LCC) in Memphis, TN, was recently the site of ongoing experiments to establish the effectiveness of high molecular weight polymers in reducing frictional drag between a ship's hull and the water flow. In a work for private parties agreement between the Navy and the University of Michigan, researchers are collaborating under Defense Advanced Research Projects Agency (DARPA) and Office of Naval Research (ONR) sponsorship to establish a database of information and data on the findings of their drag reduction experiments. This database will also assist in computational fluid dynamics (CFD) validation and improvement. The LCC is a facility owned by the Naval Surface Warfare Center, Carderock Division, and operated to support research and experimentation.

The Instrumented Drag Reduction Plate is Lowered into the LCC

Using a 10-foot-wide, 40-foot-long stainless steel plate mounted in the experiment test section of the LCC, a controlled boundary layer flow can be created and studied in a remarkably efficient and effective manner, unmatched by any previous drag reduction data set. This test plate was previously used to examine drag reduction by means of the injection of small air bubbles (microbubbles) through slots across the test plate. Shear-stress sensors quantified frictional drag reduction within the boundary layer between the plate and the water. This is where reduction in drag must occur. The LCC can control the flow speed of the water over the plate, and flow speeds during these drag reduction tests ranged to 20 meters per second, approaching 40 knots.

LCC Technicians Prepare Drag Reduction Experiment Plate for Insertion into Test Section of LCC

Using the same large stainless plate apparatus, personnel evaluated drag reduction through the injection of polymers. Polymer molecules were treated with a dye to visualize their dispersion. A characteristic of the dye is that it fluoresces when exposed to laser light. When polymers with the dye were introduced into the flow above the plate, laser light illuminated the polymers, providing a visual record of polymer concentration

Continued on Next Page

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

DRAG REDUCTION
(Continued From Previous Page)

and dispersion. A progressive cavity pump moved the polymers through manifolds and out of the injection slots to avoid breaking down the long polymer molecular chains responsible for the drag-reducing characteristic. A range of molecular weights, injection rates, and differing concentrations were used in the research.

Dispersion patterns were recorded for flow speeds varying from 6 to 20 meters per second. Persistence, a measure of how fast the microbubbles or polymers lose their drag-reducing capability, was one important characteristic that could be efficiently evaluated by having the long test apparatus and high flow velocities produce conditions much like the flow over a prototype ship hull. Generally, polymers fared better than microbubbles, staying in the boundary layer longer, thus affecting drag reduction for a longer period of time or axial extent from the injection site. Details of the polymer interaction with the turbulent flow were additionally examined using particle imaging velocimetry (PIV) systems installed within the test plate.

The LCC contains 1.4 million gallons of water. Even with this large volume, when the polymers start to build up in the closed-loop system, an undesirable source of background contamination results, necessitating a periodic procedure to remove the polymers. In a typical testing schedule, the polymers were mixed and stored on Saturday and Sunday. Monday through Thursday involved taking data, and on Friday the entire LCC volume was drained and refilled with clean water. This sequence was repeated for several weeks.

In Fall 2005, data from the previous testing were analyzed. Another round of tests using microbubbles was completed in February. Further tests with both polymers and microbubbles may occur later in 2006. The goal of frictional drag reduction on ships is to allow higher speeds, lower power levels, and improve fuel efficiency.

The technical point of contact for the project is: Robert Etter, robert.etter@navy.mil; 301-227-5841

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CAPTAIN JOHN PETERSON HONORED

In the Spring 2006 Newsletter, it was announced that England's Prince Andrew had honored U.S. Navy Captain John Peterson (IHS Member) with the award of the Honorary Order of the British Empire (OBE) during an investiture ceremony Jan. 25 2006 at the British Embassy in Manama, Bahrain. Your editor has recently received a photo of the event shown here.

Again, the IHS joins in congratulating Captain Peterson on this auspicious award. During his wide ranging career, Captain Peterson served as Commanding Officer of the Patrol Combatant Missile Hydrofoil *HERCULES* (PHM 2).

L-R: Cdre Simon Williams OBE, RN (Deputy Combined Forces Maritime Component Commander)RDML John W. "Fozzie" Miller USN (Deputy 5th Fleet Commander/Naval Forces Central Command), Wendy A. Olson (Capt Peterson's wife of 26+ years), CAPT John W. Peterson OBE, USN (Chief of Staff CFMCC/5th Fleet/NavCent), His Royal Highness the Duke of York (Prince Andrew), VADM Patrick W. "Pat" Walsh USN (Combined Forces Maritime Component Commander/5th Fleet Commander/Commander, Naval Forces U.S. Central Command)

IHS WEBSITE – A GLOBAL TREASURE

Bill White, current IHS Webmaster, and his predecessor, Barney Black (who originally set up the website and continues to help out) can take great pride in the activity that they have generated in the hydrofoil world. At the August 2006 Board of Director's meeting, Bill White presented a 7-page summary of recent website activity. All the Board members were very impressed with the number of visits and the vast quantity of information that was being downloaded every day from hydrofoilers all over the world. The IHS indeed has a global reach and I'm sure that the founders of the Society would be pleased with the way we are spreading the word about hydrofoils, their technology and applications. The IHS currently has two major web sites.

One is a Bulletin Board Discussion Forum at:
http://www.bulletinboards/v2.cfm?comcode=foils

Here enthusiasts can conduct discussions and ask questions on all things Hydrofoil. There have been over 32,000 entries since it was opened four years ago in January 2002. We are currently averaging close to a thousand visits per month to this on-line Discussion Forum that has a dozen major discussion areas. This is a twenty percent increase over last year.

The second is our original IHS Web site: http://www.foils.org/index.html which has grown over the years to contain over 850 pages and over 1400 photos. This site has seen 194,000 visits since January 2001. Over the years we have accumulated a number of larger papers within the site that must be downloaded by the visitors to read. Here are some examples of the quantity of visits and papers that have been recently downloaded. A total of 1230 hydrofoil related articles were downloaded during the first week of August 2006 which is typical.

The table below indicates the number of each popular articles electronically downloaded during the first week of August 2006 from the IHS web site.

Nos.	**Document**
115	IHS Newsletters
211	Sailing hydrofoils, Catri, Williwaw, etc.
388	IHS Meeting presentations, LCS, Skjold, etc
158	Ken Spaulding's AMV Bibliography
77	O'Neil Hydrofoil Design
23	IHS 25 Year History
66	Bulletin Board Articles
70	PHM History by G. Jenkins

Please visit and make use of these resources and be encouraged to actively contribute articles, papers, pictures and anything else you think might be of use to the Hydrofoil community.

LT. CDR. DAVID P. PRINCE REMEMBERED

Extracted from a message from Gordon Brunt

I thought that you might be interested in knowing of the loss of another hydrofoil pioneer, Lieutenant Commander David P. Prince, B.A., C.D., R.C.N. (Ret'd), who passed away in April 2006.

David Prince was born in Oxted, Surrey, England, on September 22, 1931, and was educated at Oxted County Grammar School. He matriculated at the University of London in 1948, and joined the Merchant Service at the age of 17 and served in cargo ships and tankers. In 1957 he joined the Royal Naval Reserve, and after basic training he was accepted into the Submarine Service. In January 1959 he joined the Royal Canadian Navy and served briefly in HMCS Gatineau and then HMCS Kootenay. In 1962 he returned on exchange to the Royal Navy for further service in submarines and served in a number of "T", "A" and "P" class submarines.

He returned to Canada in May 1968. After a short period in the Maritime Warfare School, he went to the U.S. Navy for computer programming courses. He was then appointed to the Maritime Tactical Data System in the Maritime Warfare School, which contained the on-board Command and Control System for HMCS Bras D'Or, the Canadian Navy's hydrofoil. This equipment was used to train the future crew of the vessel and to complete the software development for the system.

When the hydrofoil project was cancelled, he was instrumental in using the computer equipment to commence development of a rudimentary computerized command-and- control system for the Maritime Command Operations Room in the Dockyard. He retired from the Provincial government in 1993. He was a longtime and best friend of Michael Eames who presented a paper "A Review of Hydrofoil Development in Canada" at the first International Hydrofoil Society Conference in Ingonish Beach, Nova Scotia on July 27-30, 1982.

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SAILOR'S PAGE

A MESSAGE FROM THE SAILORS PAGE EDITOR

A number of years ago, I contributed an item for the IHS Newsletter concerning speed sailing. The design of these craft appealed to me as I knew good performance was dependent on a combination of high aerodynamic and hydrodynamic efficiency along with light but robust construction… and of course a strong steady wind and calm water.

At that time, a well-known speed sailor, Sam Bradfield, had been the Sailors Page editor, but he wished to pull back from that commitment. Little did I know that John Meyer would 'rope me in' to continue to seek out Sailors Page items for the Newsletter. Even though my sailing experience is limited to windsurfing, it has been a task I have enjoyed except the 'pressure' of the quarterly reminder from John that material would soon again be required for the next Newsletter!

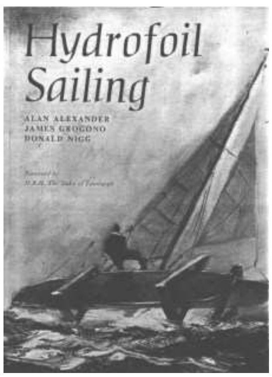
While there is no end of hydrofoil sailing information available on the internet and in books and magazines, it takes time to prepare items suitable for inclusion in our Newsletter. These days, I find I have little time to spare. As John has requested in his editorial in past newsletters, I also make a plea to all the hydrofoil sailors out there to consider contributing items to this column. Of particular interest would be hydrofoil sailboat projects readers are working on. The more print ready such items are for the NL, the better. Photos and illustrations are also desirable.

This issue, I have taken the easy route by extracting information already contained on the IHS website for the Sailors Page.

Sailing Hydrofoil Book Review

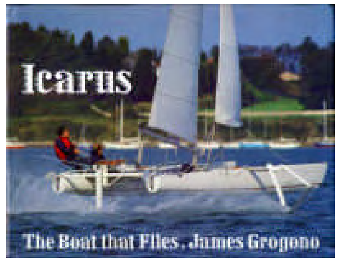
IHS often receives requests via the Bulletin Board Service from keen sailors who are interested to explore the potential of hydrofoils applied to sailboats. IHS can't promise they will receive prompt or detailed responses as there would be few of us with hands-on experience of having built or sailed hydrofoil sailboats. There have however been quite a number of books written on high speed sailing, and more specifically hydrofoil sailboats. These books are essential reading for any budding hydrofoil sailor. The "Popular Books About Hydrofoils" page under the "Hydrofoil Bibliography" of the IHS website: (http://www.foils.org/popbook.htm) gives good abstracts of some of these including publication details. A summary is provided below:

Hydrofoil Sailing, by Alan Alexander, James Grogono, and Donald Nigg.



Covers the full range of design considerations for hydrofoil sailboats in an easy-to -read format. The authors have pooled their technical knowledge to provide details of the relevant theory and then shown how to put this theory into practice. They have contacted all those active in the field at the time and received detailed accounts from most. Contents covers: 1. Why Hydrofoils?; 2. Fully Submerged Hydrofoils; 3. Surface-Piercing Hydrofoils; 4. Roll and Yaw Stability; 5. Vertical and Pitching Stability; 6. Practical Foil Design; 7. Canard Configuration; 8. Catamaran Configuration; 9. Aeroplane and Asymmetric Configurations.

Icarus, The Boat that Flies, by James Grogono.



About the 10 year success story of the sailing hydrofoil catamaran *Icarus*, holder of the B Class World Speed Record, including hydrofoil designs and principles from ocean going boats to hydrofoil sailboards. It is also the story of the man behind *Icarus* and how he developed this amazing yacht over 30 years.

Faster! Faster! The Quest for Sailing Speed, by David Pelly.

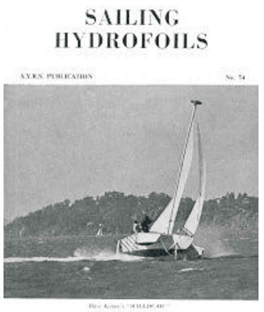
The author traces the history of speed

under sail through the ages before looking in detail at the various specialized speed-sailing craft. It includes the story behind the speed sailing competitions, including *Crossbow*, the first

Continued on Next Page

drofoil record breakers. It provides a list of sailing speed records.

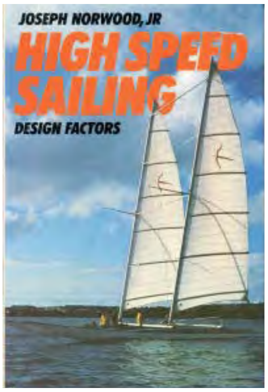
Sailing Hydrofoils, AYRS Publication No. 74, Published for the Amateur Yacht Research Society by John Morwood.



This book covers a large range of sailing hydrofoil designs and related concepts and includes numerous black and white photos, arrangement drawings, sketches and graphs. As indicated in the editorial of the book: "In 1955, when AYRS was formed, the members were given a challenge. They were told that people had sailed their boats off the water, being lifted by underwater 'wings', called hydrofoils. We showed them photographs of the Baker hydrofoils 'flying'. We also told them that it was possible to stabilise a single, narrow hull with hydrofoils and again showed photographs." This book shows how our ingenious members took up this challenge..."

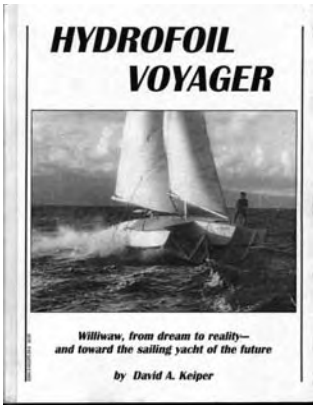
High Speed Sailing - Design Factors, by Joseph Norwood.

The author examines the question of foils, hulls and rigs for larger vessels, discusses safety and seakeeping, hull resistance, materials, leeboards, self steering without vane gear, and performance prediction. There are final chapters on multihulls, proas and specific recommendations.



Chapters include: The Physics of Fast Sailing; Hulls and Outriggers; Structural Design; Sails and Lateral Stability; Lateral Plane and Rudders; Hydrofoil Applications; Safety and Seakeeping; Performance Prediction; Catamarans; Trimarans; Proas.

Hydrofoil Voyager, by David A. Keiper.



The book describes how David Keiper designed and built the 31'-4" sailing yacht *Williwaw*, then logged almost 20,000 miles of cruising around the Pacific to test and fine tune the design. You'll never get closer to boat building, open-ocean sailing, and hydrofoiling without actually doing it yourself. Keiper tells his own story, and the precision of his telling pulls you into the adventure with him. Read, and you are there, thrilled as the hull surges up to sprint on its foils; impatient as the sea goes flat in a dying wind; inventive as some new crisis presents itself for a solution hundreds of miles from land.

Monitor Hydrofoil Sailboat - Design in Review, by Neil C. Lien.

The book details hydrofoil design developments of the Baker Manufacturing Company, with a focus on the *Monitor*, developed with US Navy backing, one of the earliest successful sailing hydrofoil designs. The book also covers the earlier developmental towed hydrofoil boat, hydrofoil runabout, and smaller scale 16-foot hydrofoil sailboat built by the company. This book was reviewed in more detail in a past IHS Newsletter.

The 40-knot Sailboat, by Bernard Smith.

Describes a speed sailing craft concept consisting of two vertical wings, an inverted one in the water joined to an erect one in the air. When coupled in this way the assembly may be likened to a sailboat that has a sail and a centerboard, but no hull; except that the sail is no longer a sail but an airfoil, and the centerboard no longer a centerboard but a hydrofoil. The book is in three parts, (1) History of the Sailboat Problem, (2) History of the Aerohydrofoil, and (3) Technical Summary.

WELCOME NEW MEMBERS
(Continued From Page 2)

tired, but still involved in elective consultancies.

J. Roland Leduc Captain (N) RCN Rtd. & Major USA – Roland was born in Winnipeg Manitoba and later moved with the family to Montreal Canada. He did not finish High School but joined the Royal Canadian Navy at the age of 18 in1940. On completion of training was sent on loan to the Royal British Navy, due to the lack of ships. Spent 5 years at sea doing Convoy duty in the Atlantic, Russian Convoys, D-day participation and various other operations. His Naval career spans 30 years including a Military University degree. He was slated to be part of the crew of Canada's first navy Hydrofoil, the Bras D'Or, that was badly damaged by fire during construction. Instead and due to being fluently bilingual he became the First Military Training Commander of the Integrated Military Training Center in Canada. During his training in England he learned to fly and has been flying all his life. During Expo 67 in Montreal the Russian Government sent a Hydrofoil (The Raketa) to Montreal to demonstrate its transportation values in the St Lawrence River. In 1967 relations were better than ever, however the ship could not navigate in the river unless Roland was on board. This got him interested in advanced marine vehicles. He resigned from the service in 1969 after 30 years and took the Raketa on one of the longest trips ever made by a Hydrofoil - from Montreal to New York to Ft Lauderdale and on to Trinidad. He then opened a Hydrofoil service between Port of Spain to Guairá, Venezuela. Roland was invited by the Russian Government to visit and help test their newest Ocean Going Hydrofoil, the Kometa, being built in the Poti Naval Shipyard. He returned to Montreal and became the 1st Director of Transport for the new Community being formed in Montreal composed of 26 cities. He migrated to the United States and joined the ranks of the United states Air Force Auxiliary Service as a Major and for the next 8 years his squadron was involved in Air Search & Rescue. He involuntarily became involved in Development and Construction and developed large projects in Florida for the French & Norwegians. Now involved in his own project on the isle of Nevis W.I. One may visit Roland at www.narrowsofnevis.net ; and may win a free vacation.

Roger Schaffer – Roger grew up in Renton, Washington and was influenced to pursue a career in engineering through the early hydrofoil research performed by Boeing on Lake Washington. He graduated from the University of Michigan in 1971 with dual degrees in Naval Architecture & Marine Engineering and Aerospace Engineering. He obtained his Masters Degree in Naval Architecture from MIT in 1974. His thesis was the hydrodynamics of the hydrofoil – strut intersection. In the mid 1970's he worked for Boeing Marine Systems on the Jetfoil and PHM Programs. Roger is currently director of Carrier & Amphibious Ship Programs for the Advanced Marine Center of Computer Sciences Corporation in Washington, D.C. He is the author of eight technical papers dealing with the economics, design process and design of high performance ships and craft. In addition to hydrofoils his technical interests include wing in ground effect. He is a licensed Professional Engineer and a member of SNAME and ASNE.

NEW BENEFIT

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

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The NEWSLETTER

International Hydrofoil Society

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

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

BLUE PRINT FOR THE ULTIMATE GREEN SHIP

(From Marine Propulsion, August/September 2006)

An enviable reputation in pursuing environmental protection is already enjoyed by the Scandinavian global car carrying and RoRo shipping specialist Wallenius Wilhelmsen Logistics (WWL). Looking ahead, perhaps to 2025, when fossil fuels become too expensive to extract or are simply not available, the company has conceived a deep sea ship of the future.

Conceptual work resulting in E/S Orcelle began in 2004 and continues with design considerations focusing on using the sun, wind and waves to serve multiple energy generators, including fuel cells; optimizing cargo capacity and lowering energy consumption per transported unit, and wider environmental challenges such as ballast water pollution.

Wallenius Wilhelmsen Logistics' Concept Car Carrier, E/S Orcelle

WWL acknowledges that considerable advances in emerging technologies will be necessary before viable solutions are available for larger commercial tonnage. But the concept offers a valuable insight into the potential of those technologies and how they can be applied in combination.

See Green Ship, Page 3

SUSTAINING MEMBERS

Island Engineering, Inc.

MAPC
Maritime Applied Physics Corporation

2007 DUES ARE DUE

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

INSIDE THIS ISSUE

PRESIDENT'S COLUMN

To All IHS Members

IHS has instituted a new option for the Society's membership dues. Now you can sign up for $20 for 1 year, $38 for 2 years, or $54 for 3 years, thereby saving $6.00. You can do that right now by going to http://www.foils.org/member.htm#pay

An ASNE "Ships and Ship Systems Technology Symposium" was held on 13 and 14 November 2006 at the Naval Surface Warfare Center Carderock Division (NSWCCD) in Bethesda, MD, USA. Joel Billingsley, IHS Public Relations Chairman, had been in contact with Dennis Kruse, American Society of Naval Engineers (ASNE) Technical Director. Joel was successful in making arrangements with ASNE to have a small booth set up during the Symposium for the use of the IHS at no cost to the Society. See story on page 9.

In the Autumn 2006 issue of the NL, I mentioned that those of us in the Washington D.C. area were fortunate to be able to attend a Joint Meeting of the IHS and the SNAME SD-5 Panel in September. The subject was The Joint High Speed Vessel by LtCol Lawrence Ryder, USMC, JHSV Deputy Project Manager. LtCol Ryder discussed the growing importance of high-speed ships in the transformation efforts of the Navy, Marine Corps, Army and SOCOM. I am pleased to announce that the presentation is now available on the IHS website. Scroll down to the section about Recent Presentations.

A reminder that the third AMV CD (CD#3) has been generated by the Society and is available for all to order thru the IHS website. As usual, the cost is a nominal $12 for IHS members and $15 for non-members.

I am encouraged to report the Society's continued growth with a total of 26 new members added to the IHS Membership roles during 2006. By the way, you can view the Membership List by logging onto the IHS website and put in the proper password. All IHS members have been informed of this password. If you have been missed, please contact the webmaster (webmaster@foils.org). It is advisable for all to check the information on the List. If it is incorrect, please send changes to: Steve Chorney: schorney@comcast.net

Terence Orme, new IHS Member, is proud owner of High Point. See short biographical sketch on page 12. He has prepared a Restoration Project Plan containing an outline and objectives. The 3 phases include Hullborne Restoration, Foilborne System Restoration and Acquisition and Installation of Proteus Engines - a truly ambitious plan. There will be more about this in future NLs.

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

John R. Meyer, President

WELCOME NEW MEMBERS

Thomas Edwards - Following graduation from high school Tom attended community college and learned the hard way that engineering was not going to be a career path as calculus was beyond his mathematic ability. Still interested in science & biology he went on to study at Palmer College in Davenport Iowa and continues in private chiropractic practice since 1982. When work and family commitments permit he sails recreationally in an older 18' Chrysler Buccaneer day boat. Now that his youngest child will soon head off to college Tom is turning some of his newfound free time to putting together another one of those experimental hydrofoil daysailers. Still consulting with engineers, who can do the math, he is ironing out the details of a foil assisted trimaran daysailer. Tom's interest in hydrofoils began after moving to Wisconsin in 1986 and seeing iceboats flying across the frozen lakes at several times the speed of the wind. Surfing the Internet led him to the IHS website about ten years ago. He thought he had found the Holy Grail. The voluminous technical articles, tutorials, and links to other related sites provided the much needed educational material and resources to become familiar with marine and hydrofoil technology.

Charles E. Iliff, Jr. – Charlie was born in Baltimore, moved to the Severn River above Annapolis at age 2. He grew up in his father's boats, ranging from dinghies and homemade rafts, to a Chesapeake Bay Log Canoe, converted for

Continued on Page 12

GREEN SHIP
(Continued From Page 1)

With an optimum capacity of 85,000 m^2 of cargo deck stowage area, E/S Orcelle will offer up to 50 per cent more space than contemporary car carriers which are capable of transporting 6,500 vehicles. Up to 10,000 cars will be accommodated on the eight cargo decks, three of which will be adjustable in height to allow high and heavy vehicles and equipment to be stowed.

A maximum deadweight capacity of 13,000 tons and a lightweight of 21,000 tons are similar to contemporary car carriers but the concept vessel will be capable of loading around 3,000 tons more thanks to the use of special construction materials and the elimination of ballast water.

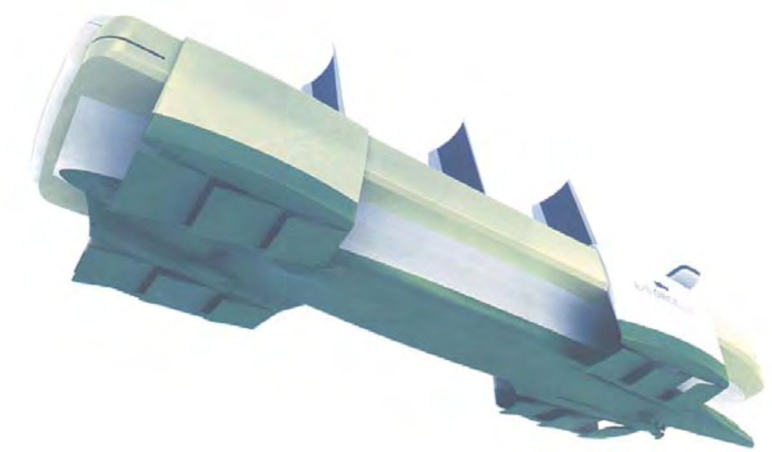
A pentamaran hull shape will help to optimize the cargo-carrying capacity, the five hulls comprising a long and slender main hull and four support hulls, or sponsons, securing stability at sea.

The stability secured by the hull and its fins, combined with propulsion systems that exclude the traditional stern propeller and rudder, will eliminate the need for the vessel to take on and release ballast water. (Ballast water is one of the major threats to the ocean environment). Additionally, the pentamaran hull will contribute to improved energy exploitation and a clean flow of water around the ship.

Aluminum and thermoplastic composite materials rather than common carbon steels will be specified to gain advantages in higher tensile strength and fatigue resistance, reduced maintenance and lower weight. The materials are also easier to shape and recyclable.

Renewable sources have the potential to provide an abundant supply of energy with minimal environmental impact and at relatively low cost. Primary energy Sources for the ship will be fuel cells, the sun, wind and waves, which will be transformed onboard to create energy carriers.

Solar energy will be tapped via photo-voltaic panels located in the vessel's sails. When not in use for wind propulsion, the sails may be tilted, laid down or in other ways directed for maximum solar energy collection. The solar energy will then be transformed into electricity for immediate use or storage.



The Pod Propulsion System and Fins Attached to the Support Hulls will Harness Wave Energy

Wind energy will mainly be exploited for propulsion directly through three sails constructed of lightweight composite material. Capable of folding upwards or outwards, the rigid sails are arranged to rotate about the masthead to fix the best position to extract wind energy through the creation of drag force or lift force, or a combination of the two.

Wave energy may be transformed into various types of energy by combining the relative movements of the waves, the fins and the ship. *EIS Orcelle* will have 12 fins in all, enabling the vessel to harness and transform wave energy into hydrogen, electricity or mechanical energy. The fins are also propulsion units that are driven by wave energy or by the electrical or mechanical energy available onboard.

Fuel cell technology is developing rapidly and approximately 50 per cent of the energy used for propelling the ship will be generated by fuel cells combining hydrogen and oxygen; the byproducts are pure water vapor and heat. Electricity generated is supplied to the electric motors of the two 4,000kW podded propulsors and to the fin propulsion systems.

Production and storage (at high pressure or low temperature) of hydrogen for a fuel cell system are currently obstacles that have to be overcome to develop viable fuel cell technology for commercial ships. But WWL envisages that future developments will be able to transform solar, wind and wave energy into hydrogen for immediate use and/or storage onboard.

Developing technologies for the production of hydrogen at sea will foster a significant reduction in handling

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GREEN SHIP
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and storing the energy source onboard. in addition, the company expects new technology to solve the hydrogen storage problems, enabling solid materials to replace the fluid.

Diverse energy sources, including the solar panels, fuel cell system and fins, will generate electricity for propulsion, lighting, ventilation and navigation. Battery storage facilities will provide operational flexibility.

Wave energy generated by the vertical movement of the fins may be transformed into mechanical energy for immediate use in fin propulsion. Additionally, energy from the movement of the fins may be harnessed to generate hydraulic energy that may either be used immediately or stored. Other promising systems for mechanical energy storage, such as flywheels, are under development.

Two variable speed electric propulsion systems will be installed, these podded propulsors will complement sail and fin propulsion systems. The compact pods - arranged at each end of the hull - will house a motor and gearbox and drive a propeller, providing full power and 360-degree maneuverability.

RODRIQUEZ ALISWATH DUE TO BE LAUNCHED IN 2007

(Excerpts by permission from Fast Ferry International, October 2006)

Rodriquez Cantieri Navali has released more details about its 64m AliSwath test craft, a hybrid design combining a central swath hull and fully submerged foils. The builder announced the existence of the project two years ago (see Spring 2005 IHS Newsletter) and has now confirmed that the first vessel "will undertake comprehensive sea trials in 2007".

The AliSwath is being jointly developed by Rodriquez and Registro Italiano Navale, who reports, "The prototype is designed to carry 450 passengers and 60 cars at speeds up to 28 knots, while reducing fuel consumption by 40% compared with existing designs and also reducing wash, emissions and risk of oil pollution.

The AliSwath Concept Combines A Torpedo-Like Hull and Fully Submerged Foils

"The key to the trimaran like design is an immersed torpedo shaped hull with secondary dynamic lift from a sophisticated wing-foil system. AliSwath is the result of a significant research and development project carried out cooperatively by the Rodriquez Group and RINA with the involvement of the University of Genoa and the Krylov Institute of St. Petersburg.

The main hull is being built at the Rodriquez yard in Pietra Ligure, near Genoa, and the torpedo hull and foils are being produced in Messina, Sicily. According to RINA, "The aluminium hull will have an installed power of 6,080 kW from two stern pods plus twin diesel main engines mounted in the underslung torpedo hull driving a high efficiency propeller. This compares with 9,300 kW required for the existing Rodriquez vessels of the same capacity and speed, the TMV 70 series.

"The stern pods, developed by Rodriquez Marine Systems, are equipped with innovative tractor propellers which provide extra power, high manoeuverability and allow an 11 knot speed in the case of main engine failure.

"The AliSwath design has presented us with some welcome challenges, including dealing with the hull strength, wave loadings and environmental aspects, such as location of the fuel tanks, while ensuring the vessel also complies with the IMO HSC Code. But it is a step change for high speed ferries and we are confident it will set a new benchmark for clean, green and quick sea transportation.

"The prototype will be used to validate the tank test results and calibrate the wash reduction manual which will assist the master to keep wash to a minimum at the required speeds. Following trials, Rodriquez expects to enter production during 2007."

Alcide Sculati, the technical director of the Rodriquez Group, adds, "In this time of high fuel costs and environmental awareness people still want to travel in comfort and travel quickly.

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AliSwath
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"The AliSwath concept brings together, for the first time, the best of two good ideas and combines them in a unique way to reduce power requirements and wash. We have taken the opportunity to design in a number of safety features and improve manoeuverability at the same time, and we are looking forward to proving the concept in service."

[Editor's Note: Although Rodriquez states that "the AliSwath concept brings together, **for the first time**, the best of two good ideas…" this hybrid hullform has been explored extensively over the past 35 years in the U.S., Japan and Germany. For more information contact: jr8meyer @comcast.net]

RAPID RESISTANCE EVALUATION OF HIGH-SPEED SHIPS

(From *Seaframes*, NSWCCD Publication, 2006, Volume 2, Issue 2)

By Gabor Karafiath (IHS Member) and Bryson Metcalf

Under the supervision of Gabor Karafiath, Naval Surface Warfare Center Carderock Division (NSWC CD) junior engineers Bryson J. Metcalf and John Grabeel developed the Total Ship Drag (TSDO) prediction tool. This work was supported through the Independent Applied Research (IAR) program, which was initiated to develop junior engineers in key areas of expertise within NSWCCD. At Carderock Division, the IAR is focused on critical research issues in the Ships and Ship Systems (S^3) Product Area (PA) with an emphasis on collaboration and mentoring of young investigators. Each IAR project is aimed at filling recognized technology gaps while enabling the Navy after Next. This IAR project was part of a focused effort on high-speed ships that has been completed. Current initiatives include projects on topside signatures and structures integration and reducing slamming loads on high-speed small craft.

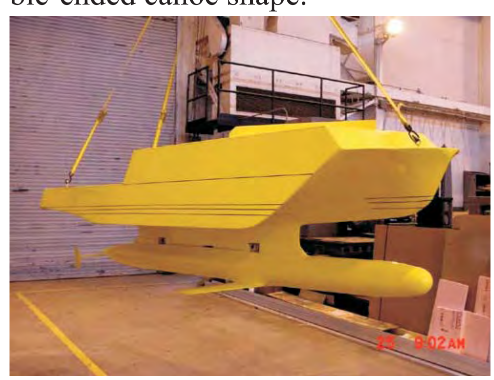
This effort focused on identifying a quick and robust computational tool capable of predicting the total resistance of many types of high-speed ships that are of interest to the U.S. Navy. The state of the art of viscous flow free surface CFD (computational fluid dynamics) flow codes is such that they tend to be too time consuming and expensive for use during the current source selection/design evaluation process. Therefore, based on the experience of the investigators, an analytical program utilizing the potential flow code FKSO, for predicting wave drag, was selected to be the most appropriate prediction tool for high-speed hull forms.

Carderock Division researchers Dr. Dane Hendrix and Gabor Karafiath, points out waterjet design to Bryson Metcalf. Collaborative efforts have resulted in a quick and robust computational tool capable of predicting the drag of many types of high-speed ship designs.

Dr. Francis Noblesse assisted in combining the FKSO code with analytical and semi-empirical relations for the remaining drag components, creating the TSDO code, which predicts total ship drag. TSDO meets the needs for a fast and robust high-speed resistance prediction tool for use in preliminary/conceptual design evaluation.

The capabilities of TSDO were proven through many comparisons of predictions to model resistance tests. Total resistance predictions were made for all 27 Series 64 high-speed monohulls and 60 Hyundai super high-speed monohulls. These two sets of data represent high-speed resistance over a wide variation in hull form. In addition, resistance predictions were made for catamaran, trimaran, and SWATH type ships, including wave-piercing bows. In total, TSDO resistance predictions were compared with model test data on over 100 different hull forms.

Using TSDO, six different drag coefficients were developed from prediction data, which were then summed together to represent the total drag coefficient. Of the six coefficients, the friction component was shown by far to be the largest drag component, with wave drag the second largest. Subsequent total drag coefficients were developed for a hull with a 40% transom, and also a full-depth transom, a multi-hulled vessel, a Hydrofoil Small Waterplane Area Ship (HYSWAS, shown here), and a double-ended canoe shape.



HYSWAS Test Model of 2200 Ton MCM(XH)

Additional work began on improving the TSDO code by accounting for the

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RAPID RESISTANCE EVALUATION
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effects of craft speed on vertical center of gravity rise, or sinkage, and trim angle on high-speed hull forms. Initial results of the sinkage and trim predictions are very promising and indicate that the TSDO code should routinely include the effects of sinkage and trim on the predicted resistance. In addition, the TSDO code was expanded to include the capability for evaluating air-cushion supported hull forms. Future efforts are necessary to more adequately handle air cushion support and partial hydrofoil support and evaluate the capability. Technical point of contact for this work is Gabor Karaflath (gabor.karafiath@navy.mil)

STABILIZING AT REST – A RETRACTABLE SOLUTION

(From Marine Propulsion, August/ September 2006)

Megayacht owners are increasingly demanding zero speed or stabilisation-at-rest systems, particularly for vessels 32m or more in length. Non-retractable fin systems have hitherto served such applications but Rolls-Royce motion control specialists based at Dunfermline in Scotland have created a more versatile solution by adapting the group's established Brown Brothers Aquarius retractable fin-stabiliser design to the role.

Modifying the compact and low weight Aquarius system - over 20 of which have been supplied since 1999 - involved extending the width of the Aquarius 50 model fin chord and creating a 'tadpole' profile with an area up to 5.7m^2 (compared with the original 3.5m^2). The tilt actuator was also adapted to increase the maximum fin sweep from 22.5 degrees to 40 degrees.

No strengthening of the finshaft, bearings, finbox or cruxbox (already proven in commercial and naval service) was required.

An advanced new control and electro-hydraulic system provides power to the fins when the vessel is stationary and senses the start of any roll. Electro-mechanical power is then fed to the fins, whose paddle effect generates stabilisation; a mass of water is accelerated quickly to provide the stabilisation-at-rest moment.

At rest, the system tilts the fins at a high angle to generate a reaction load counteracting the wave motion. When underway, the system takes the lift forces generated by the vessel's forward speed to dampen roll motion.

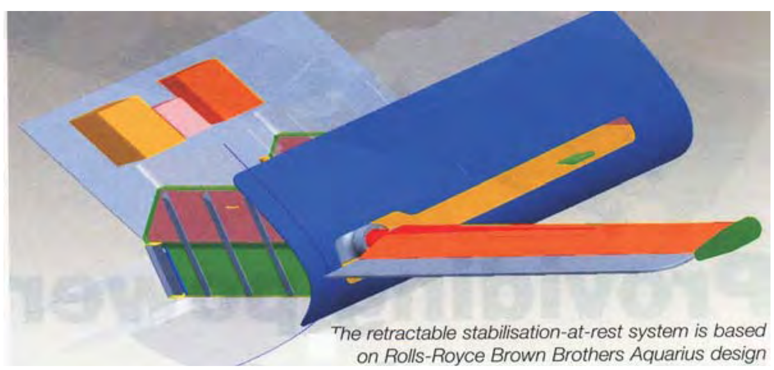
The fins can be completely retracted when the vessel is at rest (securing safety for swimmers), and also retracted during maneuvering in crowded harbors or narrow seaways.

Model tests at MARIN in The Netherlands, Rolls-Royce reports, confirmed that the system can reduce roll in sea heights of 0.5m by 80 per cent while the yacht is at rest, by 80-90 per cent when underway, and by up to 30 per cent when the fins are in passive mode. Performance in individual applications will depend on the vessel and equipment size.

A number of different fin geometries, actuation speeds and control algorithms were tested during the trials program, and the data analysed to determine the best overall configuration. Further testing on other projects has yielded similar roll reductions.

An innovative concept highlighted by Rolls-Royce is to let the trailing edge of the fin remain exposed outside the finbox when in "parked' mode. The hull can thus remain as sleek as possible, ensuring that the extension of the stabilisers while passive does not protrude beyond the bilge keel outreach, also avoiding the risk of grounding and damage.

Cost reduction opportunities are promised as one pair of Aquarius fins can replace two pairs of low aspect ratio non-retractable fins for yachts up



The Retractable Stabilisation-At-Rest System is Based on Rolls-Royce Brown Brothers Aquarius Design

to around 95m in length. A competitive system weight is also cited.

Initial orders for the new stabilisation-at-rest system have been placed by the Dutch yard oceAnco at Alblasserdam for serving three 67.4m long, 13.8m beam, 3.6m draft

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STABILIZING AT REST
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megayachts which are due for delivery in December 2006. The 1,850 tonne displacement vessels will have a maximum speed of 19 knots and an estimated roll period of just over nine seconds.

The first two yachts were originally specified with standard Aquarius systems but all three will now benefit from stabilisation-at-rest systems, oceAnco having worked with Rolls-Royce on a solution. A fourth order for an Aquarius 50 system will be executed for an Italian megayacht project, with delivery due next February.

Summarising, Rolls-Royce asserts that its retractable stabilising system delivers significant roll reduction when a vessel is stationary without compromising high performance when underway.

TRAFFIC GROWTH IN HONG KONG

It has been reported that Shun Tak Holdings TurboJet ferry subsidiary carried 5.2 million passengers on its Hong Kong-Macau route during the first half of 2006, "an increase of approximately 12% compared to the same period in 2005 and a record high since the formation of TurboJet in 1999". TurboJet's fleet of 31 fast ferries includes 14 Boeing Marine Systems Jetfoil hydrofoils, the remainder being catamarans.

"Total passenger volume on the Group's Transportation Division's sea routes grew by approximately 12% to over 5.9 million people as compared to the same period in 2005. The division retains its market leadership on the Hong Kong-Macau route, which it has maintained for the past four decades.

"The TurboJet Sea Express service linking Hong Kong International Airport with Shenzhen and Macau, and its MacauShenzhen route both achieved record high passenger volume with increases of approximately 29% and 39% respectively over the same period in 2005.

"The division's sailing frequency reached a record high level during the 2006 Chinese New Year holidays with 321 trips within a single day, including 282 trips on the Hong Kong-Macau route. These encouraging passenger trends were tempered by escalating fuel prices, which rose by approximately 30% from the same period in 2005.

The growth in Hong Kong-Macau traffic is confirmed by figures released by the Hong Kong Marine Department. These reveal that carryings between Hong Kong's Macau and China terminals and Macau totaled 6,779,000 passengers during the first six months of 2006, an increase of 13% compared with the corresponding period of 2005.

HYDROFOIL BUZZ IN ANNAPOLIS

(By Charlie Iliff, IHS Member)

Rohan Veal shipped his prototype KA Bladerider to Annapolis for the sailboat show - in a box about 18" by 24" by 12' long. In the box were boat, foils, mast, sail and dolly, the whole works weighing about 200 lb.

Foilborne MOTH Head-On

Since he had a couple of days to set up, on Tuesday, October 3, Rohan rigged the boat and sailed around Annapolis Harbor for a little over an hour. During that time he buzzed the Severn Sailing Optis and 420s, the University of Maryland 420s, and the Navy Laser, 420 and 44' keelboat fleets. In 5-10k of inconsistent breeze, up on the foils he weaved among boats queued up to enter the show space, dodged anchored boats, looped racing dinghy fleets and generally caused havoc as power and sail helmsmen lost track of their own duties as they stared and repeatedly called: "What the hell is that?"

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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

HYDROFOIL BUZZ IN ANNAPOLIS
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The Navy laser fleet got a little puff and picked up to about 7 knots boat speed. When Rohan went by the lead boat at about 16 knots, one of the observers on our powerboat called to the Navy sailor: “I’ll bet you thought you were going fast.” The response was “I was wrong about that.” The Navy coach ran up to us and called: “That is a naval architect’s dream.”

MOTH On Foils

And thus the buzz. At the show, Rohan has greeted a stream of sailors and sailing observers who saw him on Tuesday and came to the show specifically to speak to him in person.

This may have been the first sail of a modern foiling MOTH on the East Coast of America. Based on the interest at the show so far, it is the first of many. The boats are so easy to ship and transport that Rohan has speculated about a promotional “rolling regatta.” If someone rolled into a dinghy racing area with four or six Bladeriders on a trailer, think there’d be any volunteers to try them out?

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TRIMARANS OFFER TRANS-OCEAN OPPORTUNITIES

From Ferry Technology, October 2006

By Dag Pike

As operators look to start up open ocean routes, the trimaran is becoming a favoured hull design as it offers a combination of superior seakeeping performance and speed.

It appears that the day of the trimaran is going to be the next big thing as operators turn their attention to longer, more open sea routes. Apart from the notable example of the 127m Austal-built trimaran *Benchijigua* Express that operates in the Canary Islands, the fast ferry market has focussed on catamaran and monohull designs in various forms. This is largely because the routes that arc being operated by fast ferries arc short and in waters that are relatively inshore. With most of these routes now satisfied with fast services there is the prospect of these longer, more open sea routes being served by the trimaran.

Rendering of Craig Loomes Trimaran

Some of the designs offer a remarkable combination of performance with a long or an economic range. BGV based in Marseille in France has a range of large trimaran designs and while these have still to be proven on the water, they are in the frame for the development of a 180m version as a fast cargo carrier. This would be able to operate on trans-ocean routes at speeds up to 40 knots and have the sort of performance that could mark a major step forward in fast ferry operations.

BGV’s trimaran designs incorporate a foil system to generate lift to raise the vessel in the water and to reduce resistance. This same foil system also can be used for ride control. The wings that support the side hulls are also claimed to generate aerodynamic lift.

Craig Loomes Designs (CLD) in New Zealand has developed designs for a 148m trimaran that currently is aimed at the super-yacht market. This concept is claimed to have a trans-Atlantic range at 40 knots and a sprint speed of 50 knots. CLD is proposing the installation of four MTU’s 20V 8000 diesel engines that will produce a total of 32,800kW. These are coupled to waterjct units to give a flexible and economic propulsion package.

The yacht version incorporates many interesting features such as having the tender stowed in the side sponsons and a helicopter landing pad. As a super-yacht, the design is not likely to have to maintain a strict schedule in rough seas but that is the key to advanced ferry operations. For the tri-

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TRIMARANS

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maran to succeed in advancing the capabilities of fast ferries on open-ocean route there still remain many problems to be solved.

Unlike the wave piercing catamaran that have the main bulk of their structure well above water with only the side hulls doing the wave piercing, with a trimaran the whole hull is wave piercing. Even with the large sizes that are being proposed, this means that the superstructure has to be designed and built to withstand solid water coming down the deck in adverse conditions.

Trimaran designs mainly operate in the displacement mode and need the long thin hull to achieve the proposed speeds. One aspect that may cause concern will be the wash that these craft generate in inshore waters.

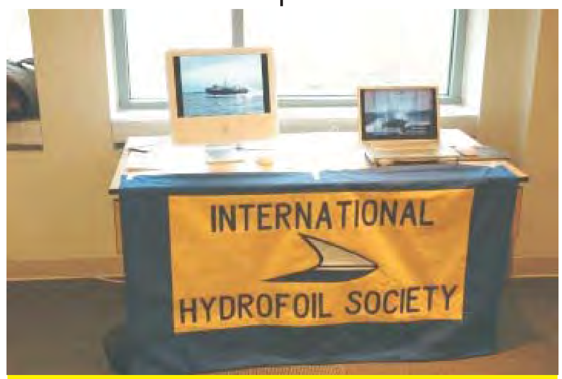
CLD already has smaller prototypes operating, so they are rapidly building experience in the trimaran concept. One 23m craft is operating in open ocean waters around Mauritius in the Southern Indian Ocean. This has been built as a private yacht by Diogenc Marine in Mauritius, but it is possible that this trimaran concept could be used to operate a ferry between the islands of Mauritius and Reunion, a distance of 180 miles. There is also a slightly larger version built to attempt a 'round the world' record. These prototypes could provide useful feedback for the development of' larger versions.

One wonders with these new trimaran concepts whether there could be a return to the days of the ocean liner fast crossings of the Atlantic. In the current aviation climate the time could be ripe.

IHS HAS BOOTH AT ASNE SYMPOSIUM

An ASNE "Ships and Ship Systems Technology Symposium" was held on 13 and 14 November 2006 at the Naval Surface Warfare Center Carderock Division (NSWCCD) in Bethesda, MD, USA.

Joel Billingsley, IHS Public Relations Chairman, had been in contact with Dennis Kruse, American Society of Naval Engineers (ASNE) Technical Director. Joel was successful in making arrangements with ASNE to have a small booth/table set up during the Symposium for the use of the IHS at no cost to the Society.



IHS Table at the ASNE Symposium

The IHS Board of Directors agreed that it would be a good opportunity for the Society to make itself known to the Naval Engineering community. At the same time it was a chance to show what the hydrofoil world is all about. This was done by setting up two computers; one an iMAC and the other a MAC laptop, on which we showed a continuously running Hydrofoil Slide Show and a DVD with 7 hydrofoil videos; see picture.

The Hydrofoil Slide Show contained about 125 pictures of hydrofoils dating from the early 1900s, including Forlanini and Alexander Graham Bell's hydrofoil craft, to some of the current hydrofoils from around the world.

The DVD contained: "FOILBORNE" – a video produced in 1973 by NSWCCD about PLAINVIEW; "A Ship Whose Time Has Come" – a video produced by the NSWCCD in1980 about the PHM-1 (Pegasus); the Granada Deployment of three PHMs in 1983; PHM Operations (1983); QUEST Rollout and Initial Trials (1995); Quest Rough Water Trials (1996); and a HYSWAS Motion Simulation in Sea State 6 (2002).

The IHS table was manned by IHS Members Steve Chorney, Ken Spaulding and John Meyer. Dennis Clark (IHS Member) Co-Chaired the Symposium, and stopped by several times to chat with interested attendees.

Many who passed by the table viewed the slide show and DVD with interest. Some of the "old timers" would reminisce about their experiences with Plainview, PHM and other US Navy developmental hydrofoils such as Flagstaff and Tucumcari.

It was an opportunity to engage the younger set who were not familiar with hydrofoils. One of the many IHS handouts included a "Hydrofoil Tutorial" that was apparently quite popular since many copies had disappeared from the table during the two day period.

Other handouts consisted of summary sheets identifying the hundreds of paper and reports available on the AMVCDs (#1, #2, and #3) and how they could be acquired via the IHS website.

FOILER MOTHS GO FROM STRENGTH TO STRENGTH

Foiler moths dominated the 2006 International Moth World Championships held at Horsens, Denmark, in July of this year. All but a couple of the fleet of 32 boats were using hydrofoils, demonstrating how foils have revolutionized this class of sailboats in only a few years.

The World Champion this year was Simon Payne from the UK, followed by Rohan Veal from Australia, the 2005 Moth World Champion. In third place was Adam May from the UK. Placing 8^{th} overall was Australian foiler moth designer and builder, John Ilett.

Sailing conditions were gusty with a shifting breeze on most days. The final day lacked any wind causing racing to be abandoned. The event demonstrated that it is now possible to become foilborne with the moths in as little as 5-6 knots of wind.

Rohan Veal, who has been instrumental in raising the international profile of foiler moth sailing, reports that to stay at the front of the fleet now requires sailors to have the ability to foil-gybe consistently without the hull touching the water. This requires the skill to keep the boat upright while maintaining a constant ride height, flipping the battens over and gybing through 90 degrees. The ability to remaining foilborne during a gybe translates to about a 50m lead over sailors who come off the foils while attempting a gybe.

John Ilett's Fastacraft Prowler boats have now won every race of the 2005 and 2006 worlds and his boats or foils claimed the top five places at the World Championships this year. In part this can be attributed to continuing refinements to the design with new mouldings for the foils and a redesigned outrigger to support the combined rudder and aft foil.

Unlike the Fastacraft produced Moths which have a surface sensing wand mounted off the starboard side of the bow to regulate the trim flap on the main foil, Linton Jenkins of Full Force Boats has completed a new 'M3' hull which features a wand mounted in the mid line of the boat just off the bow. He has also refined the hull shape with the inclusion of hard chines to allow the boat to lift clear of the water more easily. The highest placing of a Full Force boat in the World Championships this year was Sam Pascoe in 6^{th} place overall.

There are some good videos from the Moth Worlds on the "you tube" web site at: http://www.youtube.com/watch?v=rr7gyGwsQ21

Fastacraft Developments

Meanwhile John Ilett who runs the composite products company Fastacraft which specializes in the construction of carbon fibre foils, hulls, and other components for foiler moths reports he has set up in a new workshop in Yangebup to the south of Perth in Western Australia for over a year now. He has employed a first year composites apprentice and a casual worker in recent months following a steady demand for Fastacraft products. Currently they build four Prowler moths at a time which enables them to complete around 16 boats per year, plus four or more extra sets of moth foils for re-fits to other moth designs.

The foils fitted to the current production moths adopt the same NACA 63412 profiles as used on earlier moths built by Fastacraft although the foil planform is now tapered. John advises there have been numerous changes to the moth hull details, the biggest one being a new moulded main deck as all boats built before 2006 had custom made decks. Now the hulls are built with three mouldings plus the internals.

Including the four boats under construction as of September this year, Fastacraft have produced almost 30 foiling Prowlers plus extra foils sets

Foil Assemblies for Moths at the Fastacraft Workshop

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FOILER MOTHS
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for existing boats so John estimates a total of around 45 sets of moth foils now have been made by the firm.

For more details of the new boat features, go to the interview with John Ilett for the US Moth Class Summer 2006 newsletter which can be found at: http://www.mothboat.com/USMMCA/newsletters.htm

John Ilett with Carbon Fibre Main Foil for 18ft Skiff.

From Moths to 18ft Skiffs

John Ilett also reported on the development of an 18ft skiff hydrofoil in Switzerland. John has built the foils for this boat also and as of late September it has only been sailing three times but the setup has all worked very well and in very little wind. The all up weight of the boat including crew is approximately 400kg.

Further pictures and video of this craft can be found at: http://www.jeanpierreziegert.ch/06video.html

Swiss 18ft Skiff Fitted with Fastacraft Foils

Close-up of MOTH Foil Showing Flap

Close-up of Surface Sensor Wand on Fastacraft Prowler

Underside of Fastacraft Prowler with Foils Removed

WELCOME NEW MEMBERS

(Continued From Page 2)

cruising, a Star, a 35' Sparkman & Stevens Weekender, and a Tripp Vitesse 40. He earned a B.A. in English from Williams College, almost three years in the Army, then an LLB from The University of Virginia Law School. Charlie has 37 years of practice as a trial lawyer in Maryland. He has a private pilot's license and owns several small planes. Charlie's interest in hydrofoils was first sparked by observation of a Navy craft which is undoubtedly pictured in the IHS archives.. He has been racing on sailboats for 55+ years, currently on a modified J/105, with a keel using a foil shape from a competition sailplane, with trim tab. Charlie's interest in hydrofoils was rekindled by Rohan Veal's Foiler Moth and Dave Carlson's foiler cats.

Terence Orme - Terence is the current owner of the High Point, and has had the ship for just one year now. He looks forward to meeting people and exchanging correspondence regarding High Point's history and future. World War Two history is a specific interest of his. From childhood he always had an interest in military history and the collecting of artifacts, mostly WW1 and WW2 related. With no formal technical training, Terence has a good fundamental understanding of most mechanics and recognizes most basic principals. He would appreciate any and all discussion concerning the High Point project. Most people would be impressed from what Terence has accomplished just this last year.

J. Otto Scherer – Otto's career experience is in experimental and theoretical hydrodynamic research and hardware design. He received an M.S. degree in Aeronautical Engineering from the University of Michigan in 1963 and spent the next 20 years at Hydronautics Inc. where he was involved in a variety of hydrodynamic research projects. For the past four decades his work has been primarily in ship propulsion and includes fundamental research on conventional and supercavitating hydrofoils, propeller design theory and methods, the development of propeller design codes, and the design of both subcavitating and supercavitating propellers as well as waterjet pumps. He joined the Hydromechanics Department of the Naval Surface Warfare Center, Carderock Division in August of 2001. His current duties include surface ship and high performance combatant propulsor designs, and development of propulsor technologies. During the past several years he has been heavily involved in the development of advanced waterjet propulsion systems with underwater discharge.

Carlos Tomassoni - Carlos has over 40 years of experience in the field of ship design. He has worked for the firms of JJMA, the Advanced Marine Division of Litton industries - currently Ingalls Shipbuilding Division of Northrop Grumman, Hydronautics Incorporated, and has been with BMT Designers & planners, Inc. since 1980 where he has served in various ship engineering management positions. Carlos has worked in design of ships with conventional and advanced hull forms, and with a wide range of speeds from low to high speeds. He has been a member of SNAME since 1966, and ASNE since 1972. He has presented papers to local and national sections of both societies and is the recipient of the 2003 SNAME Elmer L. Hann Award.

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