# THE NEWSLETTER

INTERNATIONAL HYDROFOIL SOCIETY

P. O. Box 51 • Cabin John, Maryland 20818

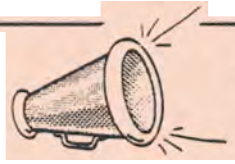
SPRING

Editor: Bob Johnston | SPRING 1991 | Production Editor: Patsy Jackson


## ANNUAL MEETING and DINNER

Thursday, 2 May 1991
Army-Navy Country Club
Arlington, Virginia

CAPT Robert J. Johnston, USNR (Ret.)
will speak on
*"THE FUTURE OF THE HYDROFOIL"*



## FIRST INTERNATIONAL CONFERENCE ON FAST SEA TRANSPORTATION

June 17-21, 1991
Trondheim, Norway

The Norwegian Institute of Technology is hosting the First International Conference on Fast Sea Transportation in Trondheim, Norway on 17-21 June 1991. Two of our members are preparing papers for this conference. Bill O'Neill's paper is entitled "The Maximum Attenuation of Seaway Induced Motions within a Given Set of Design Constraints Possible for Hydrofoil Supported Ships." John Meyer's paper is called "Hybrid Hydrofoil Technology -- An Overview," in which he provides an overview of the U.S. Navy and U.S. Coast Guard Hybrid Surface Ship feasibility studies, design effort, and technology developments with emphasis on the Hybrid Hydrofoil ship form. A brief synopsis of these papers can be found on page 7.

## INTER-SOCIETY HIGH PERFORMANCE MARINE VEHICLE CONFERENCE AND EXHIBITION

24 to 27 June 1992
Washington, D.C.

The Intersociety High Performance Marine Vehicle Conference and Exhibit (IHPMV '92) will occur in Washington, D.C. from Wednesday 24 June to Saturday 27 June 1992 at the Ritz-Carlton Hotel in Pentagon City, just south of the Pentagon. The IHS has participated from the beginning in meetings with representatives of more than 10 other societies; this is now leading to IHPMV '92. These representatives agreed to approach ASNE to be the main sponsor; they agreed, and the Flagship Section of ASNE will implement this role including financial responsibility. The Announcement and Call for Papers that appeared in the January 1991 Naval Engineer's Journal can be found on page 8. Our hope is that many abstracts will be forthcoming from members by 1 July 1991. If you need any clarification on abstracts, contact JimWilkins (301-266-7689) or John Meyer (301-227-1796). Let's maximize the IHS participation in attendance at this 1992 Conference.-----

Jim Wilkins
President, IHS

Newly elected
Officers and Board of Directors members
will be announced in the next issue.

## HYDROFOILS IN THE UNITED STATES DRUG WAR

The United States is threatened by an insidious enemy: illegal drugs. In fact, a national security decision in April 1986 declared illegal drugs a threat to national security. The goal of the President's National Drug Control Strategy, issued in January 1990, is to disrupt, dismantle and ultimately destroy the illegal market for drugs by attacking both the supply and demand sides of the problem. Effective policies must address both.

To combat the costs to society that drugs represent -- life, talents, security and money -- the military services have been tasked by Congress and the Secretary of Defense to help law enforcement agencies stop the flow of illegal drugs into the United States.

The Navy has steadily increased its support to law enforcement agencies in this effort since 1978.

Navy, Coast Guard, Air Force, Army, U.S. Customs Service, the Drug Enforcement Administration and the Federal Bureau of Investigation have been working together to more effectively accomplish the tough job of drug interdiction.

In February 1989, the Department of Defense established Joint Task Force 4, in Key West, Florida and Joint Task Force 5, headquartered in Alameda, California. Each task force has the responsibility for overseeing DoD anti-drug operations in their respective operational areas.

They focus on detection and monitoring of air and sea drug traffic and assist local law enforcement agencies with DoD assets.

With the development of the joint task forces, each agency gets better acquainted with each other's operational procedures, which helps accomplish the mission of drug interdiction and uses each other's assets to their advantage.

The consolidated efforts of all the agencies involved have forced the drug traffickers to change their habits in bringing illegal drugs into the United States.

Over the past 10 years the Navy and Coast Guard team has learned how challenging the drug interdiction mission is. Drug traffickers have access to a lot of money, they have sophisticated equipment and change their methods and routes rapidly after successful seizures by U.S. drug interdiction teams.

The Navy's PHM-1 Class hydrofoil is favored by Coast Guard law enforcement detachments for use in counter-narcotics operations. "The gray terror that flies" is the nickname given to the hydrofoils by one drug smuggler. He was apprehended while fleeing in a speedboat during a counter-narcotics operation. The hydrofoil boasts high speed and maneuverability in almost any sea condition, enabling Navy crews to catch the speedboats used by drug smugglers.

There is real evidence of effectiveness. The druggies run an intelligence network of their own. The captain of one of the hydrofoils at Key West, said that he had seen evidence of this. Some of the drug boats, some distance away, turn around and head back to their ports when he gets underway with a PHM. One way of interpreting that is that they are too smart for us to catch them. *But they went back home.* They didn't continue to come our way. I don't care how we keep the drugs out of this country, whether it's by actually seizing them, or by deterrent -- making it too hard to do -- just so we reduce the supply at the same time that we reduce the demand in society.

*Although the men and women of the Navy are but a small part of the nation's counter-narcotics operations, they're playing an important role in the national effort to make the United States drug free.*

[Material for this article was taken from the magazine of the U.S. Navy, *ALL HANDS.]*

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## CORRECTION

OOPS! We're Sorry

In the winter 1990 Newsletter, we reported that the Rodriquez foil assisted monohull, the 37m "Peroni" had Riva 1RC82DLX waterjets. The propulsion system on the Rodriquez built "Peroni" is a pair of Ulstein-Liaaen Speed-ZCPZ 60/42 125 units. The original specification for the vessel included waterjets but a decision to substitute the tractor controllable pitch propellers was taken during construction.

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# THE SPEEDIEST BOAT

Charles Pieroth supplied a copy of the September, 1911 *National Geographic Magazine* which contained the following article:

Through the courtesy of Dr. Alexander Graham Bell and Mr. F.W. Baldwin, the *National Geographic Magazine* publishes information of perhaps the most unusual craft afloat, the hydroplane boat of Mr. Forlanini. In this motorboat Dr. Bell recently traveled 45 miles an hour on Lake Maggiore, Italy.

The new Italian hydroplane is described by its inventor, Enrico Forlanini, of Milan, as follows:

"The apparatus has been patented under the name of appareccio idrovolante (apparatus for hydroplaning). It constitutes true hydraulic flight, the apparatus being sustained by the water in the same manner that birds and aeroplanes are sustained in the air; that is to say, by the dynamic reaction of the water on the superfices or planes attached to the hull of the hydroplanes, most of these planes remaining completely out of the water while the machine is in action.

"The idea of using the dynamic reaction of the water is not new, but up to the present has not been applied with success except what has been attempted with gliding boats. In these boats, however, the hull does not leave the water, but skims on the surface, which hinders the attainment of really high speeds.

"The most important characteristic of the hydroplane is that the resistance of the water is not dependent on the speed, but remains constant, and is equal to half the total weight of the apparatus; the total resistance is increased only by a portion of resistance due to the air, a portion naturally proportional to the square of the speed. In consequence, similar hydroplanes in the future should be able to attain speeds of 60 to 100 miles an hour and change themselves into flying machines by the addition of the necessary planes for aerial suspension."

After six years of experimenting, Forlanini can now consider that he has arrived at fully satisfactory and definite results, says the *Scientific American*.. The first hydroplane he tried, during the years 1905 and 1907, immediately demonstrated the excellence of the new system, but its performances were always handicapped by the irregular working of a bad 70-horsepower motor with which it was fitted. Another hydroplane, tried during the years 1908 and 1909, was fitted with a steam motor that worked more regularly. Although the effective power was only 25 horsepower and the weight of the boat over a ton, this machine attained a speed of over 50 kilometers an hour.

The hydroplane that is being tested at present weighs two tons when there are two persons aboard -- it is possible to carry four other persons -- and it is fitted with a 100-horsepower gasolene (sic) motor. It has attained a speed of 45 miles an hour, and this speed will be increased by the introduction of a few modifications that are being gradually indicated during the trials it is now undergoing. This hydroplane has a hull 32.8 feet long; at the bows and stern are two strong steel tubes transversely. At the four free ends of these tubes -- namely, on the starboard and port sides of the boat -- is fixed a sort of framework, which contains a series of planes, one above the other. These superfices of planes are made of high-resistance steel, the workmanship being very accurate, and their size decreases from the top to the bottom.

When the hydroplane is not working, but is floating on the water like any other ordinary boat, the planes are immersed in the water, and have a slight horizontal inclination. As soon as the hydroplane, owing to the working of the screw, begins to move forward, the water exercises a vertical force on the planes in precisely the same manner as the air on the planes of an aeroplane. The hull therefore tends to rise and so diminish its immersion and, naturally, the resistance against its motion in a manner that the speed is able to increase.

In this way there comes a moment when the hull is completely out of the water. At this point the speed rapidly increases, and little by little the various planes or superfices rise out of the water one after the other. When the maximum speed is reached only the bottom planes remain on the water, while the bottom of the hull is 65 centimeters higher.

The propeller by which this strange craft is driven is carried on a hollow fin, which may be seen amidships, the short propeller shaft being revolved by bevel gears attached to a vertical intermediate shaft, driven direct off the motor.

*Editor's Note: It is interesting to note that in 1911 The National Geographic Magazine cost 25¢ per copy or $2.50 per year.*

# UPDATES

## FLAGSTAFF

Sometime ago John Altoonian, current owner of FLAGSTAFF, reported that he had installed two outboards on his renamed "GOLDEN EAGLE." This enabled him to run her under the ship's own power from his dock in West Wildwood, New Jersey, to a yard in Tuckahoe, New Jersey where he expects to have repairs made to the hull.

## USS TAURUS (PHM-3)

A nice note was received from Commanding Officer, LCDR R. H. "Pacman" Greeves USN of the USS TAURUS expressing his and the crew's appreciation for "The Newsletter." He also sent a copy of the Surface Warfare magazine which featured the "Mighty" Taurus on the cover and from which this Newsletter's article on "Hydrofoils in the United States Drug War" was taken.

## USS GEMINI (PHM-6)

- The Naval Institute *Proceedings* for December 1990 published a picture of USS GEMIMI proudly displaying symbols of her four marijuana and two cocaine seizures.

- Bender Shipbuilding and Repair Co., Mobile, Alabama, has been awarded a contract for the overhaul and drydocking of the USS GEMINI. The Gemini arrived at Benders' facility in early 1991. Bender will perform the work in 100 days, employing approximately 80 workers. The base contract amount is $1.3 million.

## IHS LOGO

We are still accepting ideas for a new logo.

To refresh your memory. The Board decided it was time for a new logo, and to have a contest for the best Logo submitted. The new design must represent the *International* flavor of the organization. We have received several good ones so far.

It must be 1½ x 1½ size for a new letterhead. Get your entry in soon!! Mail to Patsy Jackson, IHS, P. O. Box 51, Cabin John, MD 20818.

## HIGHPOINT UPDATE

*As reported by John Meyer*

As many of you know, PCH-1 HIGH POINT was transferred to the Naval Inactive Ship Maintenance Facility, Bremerton, in May 1989 and put on "the block" The following March she was sold to Command Commodities of Chesapeake, VA. In a recent conversation with Hal Ward of Command Commodities, he related that the Rolls Royce engines and other equipment had been removed from HIGH POINT before he resold her. The RR engines were crated, but a deal to sell them fell through, so Command Commodities still has them in Chesapeake, VA. HIGH POINT's current owner is Ronald Fraser, Astoria, Oregon.

Mr. Fraser had HIGH POINT towed from Bremerton to the "Railroad Dock" in Tacoma, and has recently purchased generators and hydraulic power packs to replace those previously removed. The stern drive and diesel engine are still in place. Mr.Fraser, who was a Master in the Merchant Marine for over 40 years, plans to get HIGH POINT underway one of these days and is looking into the possibility of running the propulsion pod props with small diesels to get more speed out of "the ole girl" in the hullborne mode. Some of our retired Boeing/HYSTU members may want to give Ronald a hand! His address is:

Mr. Ronald Fraser
Columbia House Condo No. 104
Foot of 3rd Street
Astoria, Oregon 97103 Tel: 503-325-1390

## WINTER 1991 MEETING HIGHLIGHTS

Thomas Coker and John Monk gave a presentation for the PHM Lightweight LINK-11 program at the last IHS meeting held at the Bethesda Naval Commissioned Officer's Club.

They made notice to the fact that $4.15 million was not awarded to AEPSO Inc. but was actually the total amount of funding set aside for the program. Mr. Monk gave a short history of the PHM HYCATS Program as it related to the counter-narcotics funded LINK-11 program. Mr. Coker then described in detail the PHM LINK-11 program as developed by NAVSEA 06K. At that time the Navy was waiting for funding.

## LESSONS FROM *CANADA II*

*by John Avis*
*a crew member of 1987 America's Cup Races*

In *Marine Technology*, Vol. 28, No. 1, Jan 1991, a paper is published "Use of Antipitch Hydrofoil to Reduce Added Resistance of a Yacht in Waves" by John Avis of Wartsila Marine Inc., Vancouver, B.C., Canada. In Mr. Avis' words, the paper is described as follows:

> Frustration with the 12-Meter *Canada II's* performance in waves during the 1987 America's Cup elimination trials was the primary motivation behind this investigation. As a member of the sailing crew during the races, I witnessed firsthand the importance of seakeeping ability in the performance of a sailing yacht in a seaway. While *Canada II* was a solid performer in flat-water conditions, in the high wind and wave conditions of Fremantle, Western Australia her performance dropped drastically.
>
> However, performance in waves was not only a problem for Canada II. Many of the 12-Meter yachts had difficulty with the sea conditions encountered off Fremantle. Though millions of research dollars were spent by the 13 challengers and 5 defenders vying for the Cup, a very small percentage was devoted to the problem of added resistance due to waves. Of course, the problem is a very difficult and complex one. As a result, in the past, yacht designers have relied on calm-water prediction methods to optimize their designs and have assumed that a design that performs better in calm water will also perform better in waves.
>
> To find out more about the importance that 12-Meter designers placed on research and performance in waves, I sent a questionnaire to several designers, including representatives from the *Stars and Stripes*, *New Zealand*, *Heart of America*, *Eagle* and *USA* syndicates. The results showed that all designers felt added resistance in waves was an extremely important factor in Fremantle, estimating that it amounted for as much as 50 percent of the total resistance of a yacht traveling upwind at 8 knots into a typical Fremantle seaway. However, when asked if any research had been carried out addressing this problem, though some had done preliminary work, not one had obtained useful results from computer simulations or model testing that they used in their final designs. In fact most designers conducted no research at all on this topic, relying instead on past experience and intuition to help them with the seakeeping of their designs. Out of all the designers questioned, it is interesting to note that only one, from the eventual winner *Stars and Stripes*, stated that they had used a pitch reducing technique to improve motions between November and February (though they did not mention the method!).
>
> It is quite clear that a definite need exists to investigate the problem of added resistance in waves of a sailing yacht and methods of reducing it.
>
> With this in mind, this study was carried out with the purpose of showing that the added resistance of a sailing yacht could be reduced through the use of a bow antipitch foil.
>
> To achieve this objective, a mathematical model was developed from existing ship motion and added resistance theory to predict the effect of an antipitch foil on *Canada II*. A model foil was then designed and implemented on a 1/8-scale model of *Canada II* and regular head wave experiments were conducted at the British Columbia Research Ocean Engineering Centre towing basin. Motions, phases and resistance were measured on the model both without and with the antipitch foil. The results of the tests with and without the foil were then compared with each other as well as with the theoretical predictions.
>
> Theoretical results do not agree quantitatively with experiments. However, they do show good quantitative agreement with respect to the percentage reduction in motion and added resistance that can be expected through the addition of a foil.

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## EARTH DAY 1991

- Each ton of recycled office paper saves about 17 trees and 380 gallons of oil.
- U.S. and Canada have toughened regulations of industry to reduce sulfur dioxide emissions.
- India is using solar energy in new projects to run entire industrial complexes.
- It takes an entire forest -- over 500,000 trees -- to supply Americans with their Sunday newspapers every week.
- Garbage: We've buried it, burned it, turned it into electricity and dumped it at sea, but we're still overrun with the stuff.
- Many industrial countries produce half as much trash per person as the U.S. and recycle a major portion of it.

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## MANNING THE PHMs

In the November 1990 issue of *Proceedings* LT Kevin J. Maloy, USN published an interesting article entitled "Manning the PHMs Demands More Care." The following is part of that article.

It's a clear, sunny day in Key West. A foilborne guided-missile hydrofoil patrol boat (PHM) is returning from a routine sea trial off Key West, Florida. At speeds greater than 40 knots, even a routine run in familiar waters requires careful planning to keep ahead of the problem. Alertness is particularly important when those familiar waters are the reef-studded and debris-filled waters that surround Key West. As the flying ship maneuvers for the final approach on the outermost sea buoy in preparation for landing, a guest looks on in fascination. Suddenly the helmsman -- who is also the starboard lookout -- puts the helm over to port and announces, "avoiding left." He had spotted a floating log ahead on the starboard bow. The log passes down the starboard side of the ship, the helmsman reports "rolling out," and returns the ship to its ordered course. The guest, himself a qualified officer-of-the-deck on board a conventional surface ship, is flabbergasted. "The helmsman maneuvered the ship without orders from the conning officer. Things are different on board hydrofoils."

At first glance the difference is obvious, but a closer look reveals some key similarities with other ships. Like their slower, surface-bound sisters, hydrofoils still rely on men to make their electronic wizardry effective. Compared to more readily quantifiable subjects, the unique problems of PHM manning and crew training receive relatively little publicity. Articles written on hypothetical PHM missions tend to focus on technical capabilities and equipment. Important as these aspects are, there are also key issues involving carelessness in the detailing process with regard to PHM crew selection, lack of tailored pipeline training available to officers filling key leadership positions, and an unbalanced shipboard departmental organization, all of which undermine PHM effectiveness.

*Command Qualifications.* The dubious honor of achieving perhaps the shortest tenure as commanding officer of a commissioned vessel in U.S. Navy history belongs to a hydrofoil skipper. In August 1979, the new captain of the USS PEGASUS (PHM-1) was conducting a foilborne demonstration ride for visitors on his maiden voyage in Virginia's James River when the navigation picture became confused. A prudent seaman when in doubt stops the ship. Stopping a hydrofoil, however, increases the ship's draft from about 8 feet to more than 24 feet. Unfortunately the new captain's old reflexes got the better of him; forgetting the increased draft factor, he ordered the ship stopped and the PEGASUS settled in 15 feet of water. When she finally came to rest, her foils -- and her skipper's career -- were buried nine feet in the mud.

Maritime tradition imposes upon the captain of a ship total and inescapable culpability in the event of a mishap at sea. As the one ultimately responsible, the commanding officer must be the preminent shiphandler onboard. In a crisis, he must act -- not react. His reflexes must be correct. Skill comes from experience. This aspect of shiphandling can be a problem for PHM COs. Handling one of these screwless, rudderless, flying ships, whether foilborne at 40 knots or coming alongside a pier at idle, is significantly different than handling any other ship. New PHM COs must erase some lessons learned years before and correct their reflexes accordingly. You cannot bring old shiphandling habits aboard a PHM. To do so is to invite PEGASUS-type mishaps on a recurring basis.

## PEOPLE

- We were pleased and proud to learn that CAPT James (Jim) W. Orvis, USN became Commanding Officer of the USS ENGLAND (CG-22) on 15 September 1990 in the Persian Gulf. We were also delighted to know that the USS ENGLAND and Jim have safely returned from the Gulf. A "Well Done" from the membership.

- Bill O'Neill writes that his work on the two Norwegian "Foilcats" has been fun. Fjellstrand is building a 165-tonner and Westamarin a 101 tonner. Bill is a consultant to both of them and has the task of protecting both of their interests. Bill reports that if they work as well as the manned ¼-scale model, they really will be winners. He says they ride as well as Jetfoil at considerably less initial cost. Bill will be going back in the May and June time period for full-scale tests.

## KVAERNER FJELISTRAND FOILCAT

Kvaerner Fjellstrand has recently released preliminary details of its first Foilcat foil assisted catamaran. Construction of the vessel has now started at the company's Omastrand yard and it is scheduled to be launched in May 1991.

A twin deck design classed by Detnorske Veritas as +1A1 Light Craft Catamaran EO R25, it is to be fitted out for 284 passengers in the main deck salon and 130 in the upper deck salon. The only details of the fully submerged foils so far released is that they will be fitted with an active flap control system developed by Kvaerner Fjellstrand.

However, the company has confirmed that the vessel will have gas turbine engines, two General Electric LM500s rated at 4,400 KW, each powering a yet to be revealed waterjet.

| Kvaerner Fjellstrand Foilcat | |
|---|---|
| Length overall | 40.55m |
| Breadth | 12.00m |
| Depth | 4.20m |
| Loaded draught | |
| Minimum foilborne | 2.00m |
| Maximum hullborne | 4.00m |
| Tonnage | 470 grt |
| Capacities | |
| -Fuel | 2 x 7,000l |
| -Fresh water | 1..500l |
| -Bilge water | 1.000l |
| -Sewage | 1.500l |
| Passengers | 414 |
| Service speed | |
| -36.5 tonnes load | 50 knots |
| Range | |
| -50 knots | 300 n miles |
| Engines | 2 x GM LM500 |

*(1st Int'l Conf, from page 1)*

*Synopsis of Trondheim Conference Papers*

William C. O'Neill: This paper outlines a simple procedure by which one can define for a given set of design constraints, the control system feedback gains which result in the maximum attenuation of seaway induced motions. The procedure is based on a highly simplified model with an ideal sensor package. Those factors which would cause a real ship to have somewhat greater motions than those of the simple model are discussed.

John Meyer: The paper points out that compared to the conventional monohull, and even the so-called "advanced vehicle" forms exemplified by the hydrofoil, air cushion vehicle, surface effect ship, and small waterplane area twin hull (SWATH), Hybrid Ship concepts are relatively new. A "Hybrid Marine Interface Vehicle" is defined as one having more than one source of sustention (or lift) simultaneously over a a major portion of its operational speed envelope. There was a considerable gap in time between the early studies of hybrid ship forms at the David Taylor Research Center in the 1970s and the recent proliferation of hybrid commercial vehicle designs. The early U.S. Navy studies were, naturally, oriented toward military applications. These included a full range of missions utilizing various size ships from small patrol craft to 4,000 ton frigates. The technology has matured through analytical studies, feasibility designs, computer simulations, and model tests. More recent feasibility studies, including those for the USCG, clearly indicate that at least one hybrid ship, the Hybrid Hydrofoil, is technically feasible. It provides considerable potential improvement over current small monohulls in terms of maximum speed, motions in rough water, and range at high speed. Compared to the conventional hydrofoil, with a fully-submerged foil system, the hybrid has the potential for considerable range improvement as a tradeoff for very high speed capabilities.

## Welcome.... NEW MEMBERS

*Les J. Jackson* (Key West, FL USA)
Mr. Jackson is a PHM Squadron site engineer at Key West, Florida.

*William W. Thomas* (Springfield, VA USA)
Plank owner of FLAGSTAFF PGH-1. Assigned as Hydrofoil Technician to FLAGSTAFF from 1967-1971.

*Gregory John Koeser* (Poolesville, MD USA)
A student at Poolesville High school and has been selected for the Science and Engineering and Apprentice Program at David Taylor Research Center. His summer study will be associated with hydrofoils. He is interested in this field and wishes to learn all he can. His mentor is John Meyer.

*Frank S. Black*, III (Bethesda, MD USA)
A student at Gonzaga College High School. Worked at DTRC in hydrofoil center of 1990 and will be returning in the summer of 1991 to work on a hydrofoil design.

(IHPMV '92, from page 1)

## INTERSOCIETY HIGH PERFORMANCE MARINE VEHICLE CONFERENCE AND EXHIBIT 1992

Announcement and Call for Papers

24-27 June 1992
Washington, DC Area

An international conference is planned dedicated to the enhancement of ideas concerning Advanced Marine Vehicles and to fostering communications between users and technologists in the field. The program will provide a wide forum for the exchange of information. In addition to the formal technical sessions, video sessions, program progress reports, exhibits and displays, demonstrations and field trips are planned.

**Call for Papers**

Formal papers on modern craft and ships concepts, system and component characteristics, operations, test and evaluation, and engineering and economic analyses and comparisons. Vehicle types include planing hulls, hydrofoils, surface effect ships, amphibious air cushion vehicles, SWATH, catamarans, etc., including near surface high performance vehicles such as WIGs and seaplanes.

Prospective authors are asked to submit one-page abstracts prior to 1 July 1991. Please send abstracts to:

Capt. James Grabb, USCG (Ret.)
IHPMV '92
American Society of Naval Engineers
1452 Duke Street
Alexandria, VA 22314-3458

Sponsor: American Society of Naval Engineers (Flagship Section)
Cosponsor: More than 10 societies are anticipating cosponsorship

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Fall

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## FALL MEETING and DINNER ANNOUNCEMENT

Friday, 25 October 1991
Cash Bar: 7:00 pm - Dinner 7:30 pm

COMMISSIONED OFFICERS' MESS
NAVAL MEDICAL CENTER, BETHESDA, MARYLAND

Program: **"FAST-91 CONFERENCE OVERVIEW"** by W. Hockberger
**"NATO SWG/6 CURRENT ACTIVITIES"** by G. Jenkins

This promises to be a most interesting meeting. Please mark your calendars.
Reservations should be made no later than 18 October 1991.
Call: **Mark Bebar 703-602-8160; Patsy Jackson 703-329-0102; or John Meyer 301-227-1796**
Cost is $20 (payable at the door).

*MENU: Fresh Fruit Cup - Spinach Salad w/mushrooms*
*Roast Turkey w/sage Dressing - Green Beans Almandine - Stuffed Baked Potato - Creme de Menthe Parfait*



### ANNUAL MEMBERSHIP DUES

Dues year for 1992. Please send your $20.00 membership fee made out to IHS to:

CAPT John King, USN (RET.) 4313 Granada Street Alexandria, VA 22309 USA

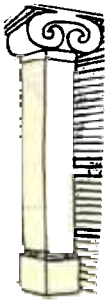
## HYDROFOIL COLLIDES WITH WHALE

During a recent patrol mission, one of the squadron of six hydrofoils based in Key West, Florida, rammed into a whale. The USS AQUILA (PHM-4), commanded by LT CDR W. E. Landay USN, was foilborne when the PHM collided with a whale apparently rising to the surface for air.

Some of the crew members were tossed about and two of the sailors were taken to Homestead Air Force Base for treatment and observation. The most serious injury was a dislocated shoulder. It is believed that the whale was not a survivor.

Encounters with whales are quite rare. Generally, the whales detect a PHM long before the crew detects a large sea fish or mammal. Whales are not usually considered a problem.

## THE PRESIDENT'S COLUMN



The IHS Newsletter has been a source of Hydrofoil related material and society activities for many years. Under Bob Johnston's editorship, the frequency of publication has increased -- one of the IHS Board goals for this year is to further increase the publication rate to four per year.

The Newsletter is an excellent way for us in the IHS to communicate with each other and spread the word on hydrofoil and hydrofoil related developments. Bob needs input from members to spice up the Newsletter and let all members know what others are doing in the field. How about a "Letters to the Editor" section? Also, why not have a running discussion of such controversial subjects as: surface-piercing vs fully-submerged; single hull vs multi-hull hydrofoils; and sharing dynamic lift with efficient buoyant lift?

Your Board of Directors is at work on a number of activities and new initiatives. As I recently stated in my letter to all members, we have had an expansion of our membership rolls and are now holding several meetings with planned programs during the year other than the traditional annual meeting. Activities to generate a new IHS logo and a "Certificate of Membership" are well underway. The possibility of finally publishing some parts of the long planned "Principle of Hydrofoil Technology" as monographs appears more real under the leadership of Bill Ellsworth.

In addition to these initiatives, the Board agreed to establish a series of Goals including a new IHS "Flyer" describing the IHS organization, its objectives, and membership benefits to aid in further increasing membership and reminding current members of who we are!

In subsequent "Columns" I will bring all members up to date on other Board activities and progress toward our Goals.

John R. Meyer, *President*

## FAST-91 -- A GREAT SUCCESS

The previous Newsletter issue referred to two of our members providing technical papers for FAST-91 held in Trondheim, Norway in June of this year. Hydrofoil and particularly Hybrid hydrofoil related papers made a significant contribution to the agenda. In addition to O'Neill and Meyer's papers, there were a total of 9 other papers on hydrofoils and an additional 5 on hybrids for a total of 16 out of 85 papers in the Conference.

Bill Hockberger, of NAVSEA, who attended FAST-91, will be one of our featured speakers at the Fall IHS meeting to tell us more about these subjects and give us a first-hand flavor of the Conference.

## NEW TECHNOLOGY AHEAD?

The *"Marine Log"* recently published an article discussing new technology for the U.S. Navy. These comments are taken from that article.

"The new constraints that mark a shrinking Navy have definitely affected our conceptual plans for the future," says Tom Warring, a spokesman for the Navy's David Taylor Research Center near Bethesda, MD. "The number-one factor governing any new design is now affordability."

Designers at the Taylor Center have a saying: mission drives equipment. For three years, CAPT Clark Graham, the center's director, has been proselytizing a design campaign for the Navy of the future. He calls it Technical Strategy Planning (TSP), which calls for an alternative battle-force in the years between 2010 and 2030.

Graham's proposed ship types are not classified. The largest of the three would be attack carriers, which would lead combat strike missions. Each would head a battle group that could replace any bases that the U.S. might be denied in Greece, Spain, Panama, Portugal, or the Philippines.

Today's fully deployed carrier battle group, says author Nathan Miller, "if superimposed upon a map of the U.S. and its center is Washington, D.C., would have forward ships ranging as far north as Trenton, NJ; the battle group's western ships as far as Harrisburg, PA, and the southernmost ships on the Virginia-North Carolina border. Combat air patrols could be vectored out to Detroit, and air strikes made north of Chicago." Graham's 21st-century counterpart would add weapons that could reach the floor of the sea, or into space.

The meat-and-potato part of this future battle-force would be a "carrier dock multi-mission" bloc of vessels, double-hulled smaller aircraft carriers of easily mixed modular designs, serving various purposes.

The third component of Grahams future Navy consists of small and fast striking ships called scout-fighters. These would be augmented by hydrofoil light-attack craft and air-cushioned amphibious vehicles.

"All of the technology exists today for what CAPT Graham has proposed." says Warring.. It certainly won't have gone away by 2010. His point is that we'd better start putting bucks in the bucket now for it, or someone else will."

## FAR EAST HYDROFOIL INCREASES JETFOIL FLEET

Three Boeing Marine Systems Jetfoil hydrofoils have been purchased by Far East Hydrofoil Company from operators who have recently replaced their original vessels with Jetfoil 929-117s built under license by Kawasaki Heavy Industries.

The first, originally Sado Kisen Kaisha's *Okesa*, entered service on FEH's Hong Kong-Macau route in mid-January. This was the only remaining example of the ten 929-100s built that had not been acquired by the company. Renamed *Guia*, the hydrofoil is the first entry on Hong Kong's new autonomous shipping registry.

The other pair of Jetfoils are the 929-115s originally delivered to Compania Trasmediterranea. *Princesa Guacimara* arrived in Hong Kong on January 8 and, renamed *Taipa*, entered service this month. *Princesa Guayarmina* is to be retained in the Canary Islands until a second KHI 929-117 becomes available in September. It is due to arrive in Hong Kong in November and enter service the following month, increasing FEH's Jetfoil fleet to ten 929-100s and six 929-115s.

## FOIL ASSISTED YACHT UNDER CONSTRUCTION

A 36m foil assisted planing catamaran designed in the United Kingdom by Nigel Gee and Associates is to be built by T-Craft in South Africa. The vessel, christened Catafoil, is to be completed as a luxury yacht for Sir David Brown.

The British industrialist has been closely involved with high performance on both sea and land, he has owned both Vosper Thornycroft and Aston Martin, and recently decided to proceed with a project to, as NGA puts it, "create his ideal high speed luxury yacht."

Because "a fundamental problem he had recognized in a dozen previous yachts was that of the rolling behaviour at anchor of high speed yacht forms," Sir David "Selected a high speed catamaran hull form and specified waterjet propulsion to give quiet and efficient operation coupled with superb maneuverability."

However, "Conventional theory showed that with the installed power available from high speed turbocharged diesels, the highest speed we were likely to obtain with the catamaran configuration proposed was around 35 knots. Sir David insisted we achieved over 40 knots and we finally were able to do that through a combination of the catamaran hull form with fully submerged hydrofoils."

Fibre reinforced plastic will be used for the hulls and a foam sandwich construction for the deck and superstructure. The vessel is to be produced in a new environmentally controlled extension at T-Craft's Cape Town facility designed for the moulding of large structures. Work on the tooling for the yacht is reported to be well advanced with both hull and deck moulds nearing completion.

T-Craft has already built several medium size foil assisted catamarans in addition to its range of 10-12m craft for the sporting, para-military and work-boat markets. Until now, the largest vessel proposed has been a 20m catamaran ferry.

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## WELCOME.... NEW MEMBERS

*ADM M. Dick Van Orden, RADM USN (Ret.) (McLean,VA USA)*
Did a study on PHM mobile basing and has a strong interest in hydrofoils in general.

*Philip Hercus (Australia)*
Very actively involved in the development and design of high performance marine vehicles. Currently working on development of the trifoil -- a foil assisted multi-hull vessel.

*Carl Flatman (Edmonton, Alberta, Canada)*
HYTOW

*Dan Kenway (Edmonton, Alberta, Canada)*
Experimental work with fairings, flow noise and towed VDS sonars. Operated from hydrofoils.

*Mervel H. Turner (Key West, FL USA)*
Currently an electronics technician with PHMRON 2 MLSG.

*Lori Morrone (Arlington, VA USA)*
Digitize high speed digital charts for the PHM.

*Scott Stephens (Reston, VA USA)*
Former combat systems officer PHM-1, currently Unisys program manager for AN/SSQ-87 Hydrofoil Collision Avoidancee and Tracking System (HYCATS)

*Prof. Alfredo Magazzu (Palermo, Italy)*
Inventor of TRIS

*Joseph F. Sladky, Jr. (Mercer Island, WA USA)*
Design, vehicle integration

*Svein Berntsen (Norway)*
Technical Manager, Westamarin Mandal A.S. Builder of Foilcat 2900-Foil assisted catamaran.

## NEW RODRIQUEZ DESIGNS

Scheduled for completion this summer at the Rodriquez Cantierei Navali yard in Messina are the first MEC 1 hydrofoil and 47m foil assisted monohull. The MEC 1 is scheduled to be completed for Aliscafi SNAV. The 47m vessels were ordered by Adriatica di Navigazione.

MEC 1

The MEC 1 is the first, and smallest, of a range of hydrofoils planned by Rodriquez that will feature hydrostatic propulsion. Other key features of these Maximum Efficiency Craft (MEC) designs, the company says, will be surface piercing canard foils, Series 65 hull form and seakeeping augmentation controller.

The surface piercing foils of the MEC 1 are a hollow construction design, of high tensile steel, fitted with hydraulically controlled trailing edge flaps. The V-shaped hull, divided into watertight compartments and built in seawater resistant aluminum alloy with longitudinal framing, will be both welded, using inert gas, and riveted.

Two aft mounted MWM TBD 604B V8 diesels will each power a tractor propeller directly driven by a hydraulic motor mounted on the rear foil. The power flow from the diesel to the hydraulic motor will be via a hydraulic pump and hoses. Steering will be hydraulically controlled by one of two main engine driven pumps.

Because the hydrostatic propulsion allows the diesels to be located at the stern, it will be possible to accommodate 110 of the 146 passengers in a single main deck saloon. Internal noise levels are expected to fall by up to 5 dBA compared with existing hydrofoils.

In addition, the new weight distribution has meant that the bow and stern foils can be moved further apart, which should result in an improved ride in bad weather. One design area to which particular attention has been paid is the integration of the hydraulic drives into the rear foil and here Rodriquez has had the cooperation of both the Italian Development Association for Shipbuilding (Cetena) in Genoa and NSMB in Wageningen, The Netherlands.

Compared with traditional hydrofoil configurations having the same installed power, it is anticipated that the MEC range will carry 25% more payload, in an internal volume increased by approximately 5%, at maximum speeds 8% higher, or carry the same payload at an 18% reduction in installed power.

47m Foil Assisted Monohull

The 47m foil assisted monohull shares many of the design features of the 37m version introduced this year by Aliscafi SNAV. The hull has V-shaped lines with a particularly slender bow hull form to reduce resistance, longitudinal structure with frames at 300mm intervals and watertight subdivisions. The construction material is inert gas welded seawater resistant aluminum alloy.

A surface piercing foil fitted port and starboard at the stern, produced in carbon/glass fibre for case of maintenance and minimum weight, will incorporate flaps operated electronically from the bridge to trim the vessel and by a seakeeping augmentation controller to minimize roll motions. The high pressure hydraulic system used to actuate the flaps will be powered by a pump driven off either of the two MTU 16V 396 TE741, main engines to give the system 100% redundancy. The propulsion system selected for the 47m foil assisted monohull is a pair of KaMeWa waterjets.

Rodriquez Cantieri Navali specifications:

| | MEC 1 Hydrofoil | 47M Foil Assisted Monohull |
|---|---|---|
| Length overall | 25.00m | 46.90m |
| Length waterline | 21.40m | -- |
| Moulded breadth | 6.50m | 7.60m |
| Draught - Hullborne | 2.80m | 1.15m |
| Displacement | -- | 136.9 tonnes |
| Foil spacing | 19.20m | -- |
| Foil width | 8.40m | -- |
| Passengers | 146 | 400 |
| Cruising speed | 38 knots | 34 knots |
| Range | 200 n mi | 200 n mi |
| Main engines | 2 x MWM TBD 604B V8 | 2 x MWM 16V 396 TE 741 |
| 100% mcr | 845 kW | 1,480 kW |

*(This article is from the November 1990, "Fast Ferry International" magazine.)*

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## HIGH POINT UPDATE

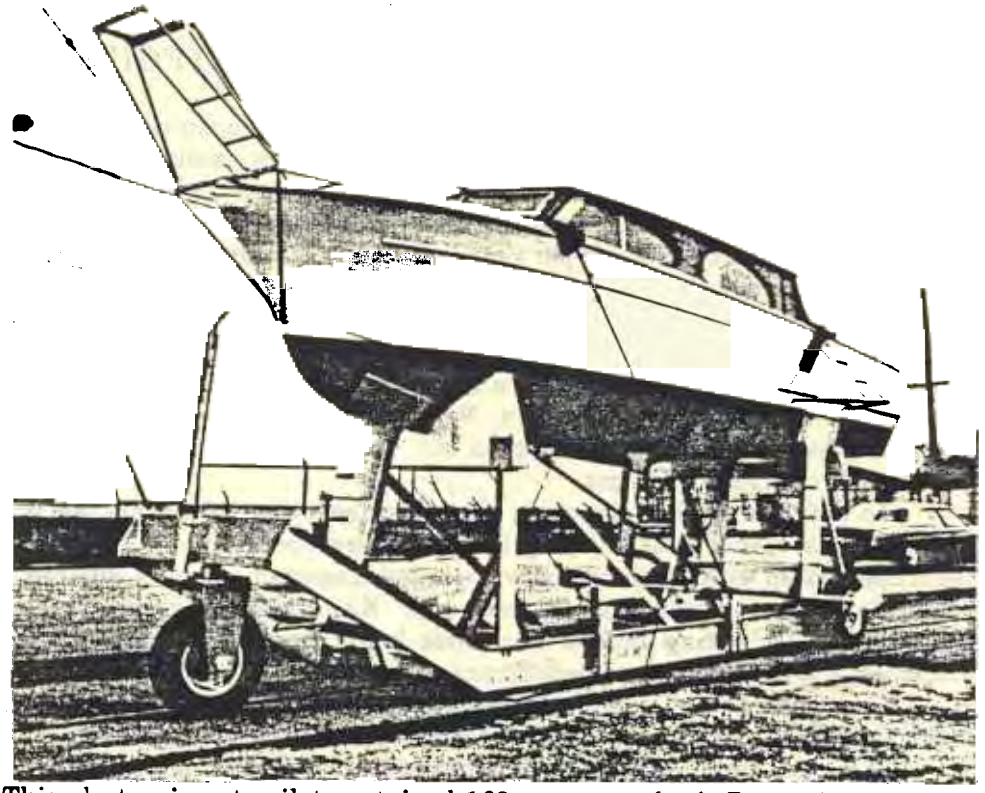
Ronald Fraser recently called reporting that his restoration of HIGH POINT is proceeding fairly well, but not as rapidly as he would like. He is concentrating on "clean up" at this point insuring that all areas of the ship are "clean enough to eat off." He is also preparing new foundations for two 165 hp Perkings generator units to be installed in the near future. Ronald keeps in touch with Dwain Sorenson, Al Rand, and Sumi Arima who provide him with first-rate technical backup on the "Ole Girl." A visit by them in early September provided Ronald with some pointers on various subsystems. The hullborne outdrive is apparently in good shape, but needs to be tied in with a new hydraulic power pack.

*contributed by J. MEYER*

# SEA LEGS

Recent contact with the Mariners' Museum in Newport News, Virginia revealed that SEA LEGS was still on display -- alive and well. Research Associate at the Museum, Lois Oglesby, was kind enough to loan us pictures and provide a short write-up from her files. The picture here was taken at the time SEA LEGS was being delivered to the Museum in the 70s.

Bill Ellsworth, in "Twenty Foilborne Years" briefly described the development of SEA LEGS. A short excerpt follows.



During the early 1950s, the well-known naval architectural firm of Gibbs and Cox of New York had assembled, with U.S. Navy support, a highly respected technical team. They first designed a versatile hydrofoil test craft which was built by Bath Iron Works and aptly named BIW. This was followed by the design of SEA LEGS, a modification of a Chris Craft hull, in 1954. A foil system was added and propulsion system changes were made. An electronic autopilot stablization system, developed by the Draper Laboratory at the Massachusetts Institute of Technology, was installed to control the fully submerged foil system. This electronic auto-pilot contained 160 vacuum tubes! Remember them? A signal input to control the flying height of SEA LEGS was obtained from a bow-mounted sonic height sensor. This device provided a continuous measurement of the distance between the bow and the water surface. The foils were made of aluminum and arranged in a canard configuration with about 30% of the lift on the forward foil and the remainder on the larger aft foil. Each foil had a trailing edge flap which was hydraulically actuated.

SEA LEGS made its first flight in 1957 and demonstrated its excellent seakeeping performance in rough water up to speeds of 27 knots. During the latter part of 1957 and early 1958 the craft continued its demonstration flights for Navy and civilian visitors in the New York area. It was in June of 1958 that the Chief of Naval Operations, Admiral Arleigh Burke approved a demonstration trip to the Washington, D.C. area. Arrangements were made to have SEA LEGS escorted by a Navy torpedo boat, the PT-812.

After a false start and a return to the Gibbs and Cox pier in New York for repair of a foil control attachment, the craft got underway for Cape May, NJ on 15 July 1958. After stopping overnight and refueling, SEA LEGS proceeded through the Delaware Canal to the Navy's small boat facility on the Severn River in Annapolis, MD where it and the PT boat arrived on the afternoon of 16 July. During the open-ocean portion of the trip, the boats experienced waves up to 4 or 5 feet, but SEA LEGS was able to maintain an average of 23 knots. It clearly demonstrated to the participants the superior seakeeping capabilities of this hydrofoil. The dry and comfortable ride they experienced would be impossible to duplicate on a comparably sized conventional craft. The conditions during this part of the trip were quite different on the PT boat which had been outrun by SEA LEGS.

After a week of successful demonstrations in the Annapolis area, SEA LEGS undertook the 170-mile run to Washington on 26 July. A Navy representative and crew arrived at the Naval Gun Factory in the afternoon after an uneventful trip down the Chesapeake Bay and up the Potomac River. The following day, Sunday, 27 July, the small hydrofoil took aboard the Chief of Naval Operations, ADM Arleigh Burke, along with a host of other high-level Navy dignitaries.

During the days that followed, SEA LEGS continued to display her unique capabilities to a wide variety of visitors. These included many Navy officers of flag rank, Congressional representatives, including Senator

Saltonstall of Massachusetts, and numerous members of the press, radio, and television. The craft returned to New York, arriving there on 20 August after covering 1,851 miles of which 1,751 were on foils. The visitor "box score" for this all-important demonstration included 3 Congressmen, 17 Admirals, 3 Marine Corps Generals, 3 Assistant Secretaries, and numerous other important civilian and military personnel for a total of 375. What followed was an impressive series of demonstrations that had a significant impact on the Navy's future course of action in the hydrofoil arena.

*contributed by J. MEYER*

## KAWASAKI JETFOILS

*Fast Ferry International* reports that Kawasaki of Japan now estimates the local market for Jetfoils is 30 craft. "When we first started building Jetfoils in Japan, under license to Boeing, we felt that a conservative estimate for the potential market in Japan was a total of 20 vessels," explains Masashi Oka, deputy general manager of Kawasaki's Ship Group Central Technical Office. "Consequently, we planned our construction programme to build two vessels per year over a ten year period. However, we have been surprised at the level of orders and now think that the domestic market could take 30 or more vessels."

When Boeing was marketing the vessels in Japan the cost of the Jetfoil including standby gas turbines was in the region of 4 billion yen. Today a similar package from Kawasaki is costing about 3 billion yen. He stresses, however, that it is difficult to compare the prices directly because of the large currency fluctuations between the yen and the U.S. dollar in recent years. Nevertheless the difference represents a large cut in capital outlay for the operator. Even at the new price, says Mr. Oka, operators feel that it is high compared to other options, particularly catamaran designs.

As to future sales of the craft, Kawasaki feels that its market lies with those operators who are already using Jetfoils, rather than in trying to convert new operators and routes. Certainly existing operators, among them Sado Kisen with another three vessels and Kagoshima Shosen with one additional craft, are marking noises about placing new orders with the company. Kawasaki sees the market as mainly a domestic one, with the opportunities for selling Jetfoils worldwide being limited to replacement vessels for Regie voor Maritiem Transport and Compania Trasmediterranea.

The production of Jetfoils has been limited to a small specialized section of the yard, which continues to build other ships including submarines for the Japanese Defence Agency.

There are approximately 300 engineers and naval architects in the Kobe yard's design division, 50 in the sales department and a further 50 in control and purchasing. However, they deal with all aspects of the yard's production. There is no dedicated design division for the Jetfoils. The reason for this is that Kawasaki is building a fairly standard product. Mr. Oka explains that it would be very difficult to change the basic design in terms of developing a second generation of Jetfoils because of expense and market limitations.

The company does have a small division, about 20 people, dedicated to the Jetfoils, but it is essentially a product support department. This is responsible for backup of all the Jetfoils worldwide, both those built by Kawasaki and Boeing Marine Systems. The product support role for the Boeing built craft was transferred to Kawasaki two years ago.

Bringing more of the construction work in house, Kawasaki has taken on licenses to manufacture specialist parts for the Jetfoils. When the company took the main license from Boeing it also signed a license agreement with Rockwell International for the manufacture of the waterjet system. From the fifth vessel Kawasaki has been manufacturing the ride control system for the foils under a further agreement with Boeing. However, the gas turbines are still purchased from Allison, although Kawasaki now carries out all the overhaul and maintenance on the units installed in the craft.

<u>Current Order Book</u>

To date Kawasaki has completed a total of six Jetfoils, and has orders for an additional five craft. Nine of the 11 vessels are for Japanese operators, while the other two are both for Trasmediterranea. They are all fairly standard craft with the exception of *Nagasaki* which is operated by Japan Ocean Cruise Line between Nagasaki in Japan and Cheju in South Korea. Because the vessel operates on an international route its seating capacity has been reduced to 180 passengers to allow for additional baggage carrying capacity.

Interestingly, yard No KJ08, which was due to be delivered to Kyushu Railway Company in January 1991 is also destined to operate on an international route between Hakata in Japan and Pusan in South Korea. The route is 115 miles long and will take the craft about 3 hours 10 minutes. However, the owner has specified 232 seats, a similar capacity to many of the craft working on substantially shorter routes.

**WE NEED YOUR HELP... WE'D LIKE YOUR INPUTS**

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YOU MAY RECALL THAT THE IHS WAS SEEKING IDEAS FOR LOGOS

WELL, WE GOT THEM... EIGHT IN FACT... WHICH DO YOU LIKE BEST?

A


B

THE INTERNATIONAL
HYDROFOIL SOCIETY

C


D


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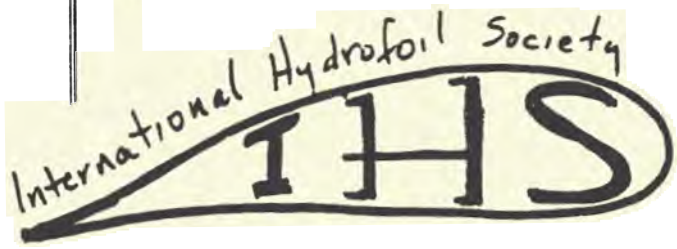


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MARK THE LETTER OF THE ONE YOU PREFER ON THE ENCLOSED POSTCARD...

SIGN YOUR NAME (LEGIBLY)... AND MAIL IT BACK...
YOUR VOTE COUNTS... WE NEED THEM BY NOVEMBER 4th

# THE FUTURE OF HYDROFOILS

*The following is a talk given by Robert J. Johnston at the 1991 Spring Dinner Meeting of the IHS.*

## INTRODUCTION

When John Meyer asked me if I would talk tonight, I strongly suggested that he seek an outside speaker. His response was that I could talk on any subject I chose. I naturally thought of discussing some of my more recent experiences. Those included such subjects as "the fun of obtaining a new set of hips"; "how to make a profit on the golf course"; and "how to say 'kaopectate' in seven different languages." However, after some discussion with John, the subject of "the future of hydrofoils" or "is there a future for hydrofoils" seemed more appropriate for this occasion.

## PEOPLE PROBLEM

In any profession or vocation the future rests with the people involved and their successors. Here is where we have a real problem. That problem is not confined to hydrofoils or even advanced ships but is a cause for serious concern to the entire marine industry. This is particularly true for the U.S. maritime field. Our technology base in naval engineering has seriously eroded and a further decline is predictable.

I was shocked to learn that my alma mater, the MIT School of Naval Architecture and Marine Engineering would have been eliminated if they had not changed the emphasis to Ocean Engineering. Last year, in the U.S., less than 50 students graduated with an undergraduate degree in Naval Architecture. When we visited China a few years ago, we spent some time at three different schools of Naval Architecture, schools in Beijing, Wuhan, and Shanghai. They were graduating over 1000 students with an expectation that 10% of the graduates would pursue an advance degree. Their national aims were very clearly expressed, "China would dominate the future shipbuilding industry of the world." By contrast our new Navy designs are in decline and there is an absence of commercial orders. Our national policy makers must be made aware of this serious situation if we are to have a future in any technology involving naval engineering. Some of you may be aware that this subject was discussed yesterday at the ASNE's Presidents Club Meeting.

## U.S. HYDROFOIL POTENTIAL

What is the potential for new hydrofoil projects in the U.S.? I must say that it is not very optimistic. Over the past ten years we have studied rather extensively the potential market for high speed waterborne vehicles. These studies include evaluations for the U.S. Department of Transportation for various states and municipalities, and for private investors. Only in two evaluations did we recommend that a hydrofoil be considered. These two situations were the Hawaiian Islands and the Puerto Rico/U.S. Virgin Islands area of the Caribbean. To use a hydrofoil profitably, the situation must involve sufficient distance to take advantage of their high speed and also require passenger comfort in rough water.

As you know in Hawaii the Boeing Jetfoil was introduced by Seaflight in 1973. In fact Hawaii was the proving ground for Jetfoil. Most of the modifications and improvements that were introduced in the later Jetfoils came from the Hawaiian Island experience. We had the privilege of studying the books of Seaflight, a company 75% owned by Kentron-Hawaii Ltd., a subsidiary of LTV and 25% owned by Boeing. The books revealed that during the proving phase the company lost money. However, after the improvements were installed on Jetfoil, Seafight began to show a profit. At about this time LTV decided to get out of their resort investments, including Seaflight. It is my opinion that if Seaflight had stayed in business, by now a profitable Hawaiian, inter-island hydrofoil system would exist. Not between Oahu and the big island of Hawaii, but among the other islands in the chain.

The other intriguing location for the use of hydrofoils is in the U.S. Virgin Islands/Puerto Rico area. The U.S. Virgin Islands are in need of good waterborne passenger and high priority freight service. We recently worked with a group of investors who explored this area with the use of two Rodriquez, RHS 160 hydrofoils. Principally the boats operated between San Juan and St. Thomas. What was determined was that a minimum of five boats were required. These for a system to cover the inter-Virgin Islands service, to cover the San Juan to Virgin Island route, and to take advantage of the cruise ship industry's desire to provide inter-island sightseeing for their passengers. Enough experience was obtained to demonstrate the profitability of such a system.

An encouraging development of the last several years has been the introduction of a number of high speed passenger ferries on U.S. routes. Most of these have been catamarans. The bad news is that most of these designs

have been foreign. I am convinced that the U.S. has the technology base to design any high speed vehicle. What we have not learned how to do is to design and build a profitable, high speed marine vehicle.

I have not said anything about the military future in the U.S. There are several in this audience who know more about that potential than I do. The PHMs have certainly been a great success in the anti-drug effort. Whether that success is sufficient to require more PHMs is doubtful, particularly with tighter budgets and reduced armed forces. We need more enthusiasm from Customs and Cost Guard for additional PHMs.

## FUTURE INTERNATIONAL COMMERCIAL PROSPECTS

When looking at the worldwide situation the picture is more optimistic. At last count there were 225 hydrofoils operational and 22 building or on order. This count does not include data from Russia and China. There are two builders that have provided us with an insight to their markets, Rodriquez and Kawasaki.

**RODRIQUEZ**: The Rodriquez story of their pioneering effort in hydrofoils is fascinating. After WW II the Rodriquez shipyard was in shambles. Carlo Rodriquez, the son of the founder, was the head of the family. By the early 1950s he had done some reconstruction of their yard. However, progress was slow and their trade consisted mainly in repair of local commercial and fishing vessels. Carlo learned of a ship that had run aground that was for sale where is-where as. After inspecting the ship and concluding that the damage was not as severe as most people thought, he bought the ship at a very favorable price. The Rodriquez yard was able to retrieve the ship, repair it and sell it for a sizable profit. During this same time period Carlo had become intrigued with the Supramar effort, particularly the operation of the PT-10 on Lake Maggiori in Northern Italy. Rodriquez Cantieri Navali (RCN), the full name of the company, using the profits from the retrieved ship undertook a license from Supramar. In 1956 they launched their first hydrofoil, a PT-20, named "Frecca d'Oro." That was the beginning of a series of buildings which now number about 200. Interestingly, the last time I was in Messina, I rode the original "Frecca d'Oro" on a scheduled passenger run from Messina to Reggio across the straights.

About ten years ago Carlo's son, Leopoldo, became the CEO of RCN. His ambition was to turn the Rodriquez holdings into a conglomerate. This he has succeeded in doing. The Messina yard is just one of five now owned and operated by the corporation. In addition to the original building yard, two other yards have the capability of building hydrofoils. RCN is now in ship operations; electronics; mechanical propulsion devices; ship, yacht and hydrofoil construction and repair; agriculture; and real estate. Who says that you can't make a profit in hydrofoils. Messina remains the principle building yard for hydrofoils and that yard has a current backlog of five years. With RCN's position in the hydrofoil market, particularly in Italy, and their technical innovations, they should remain active in the hydrofoil world for the foreseeable future.

**KAWASAKI**: As most of you know Kawasaki has purchased tools, jigs, fixtures, and the rights to build and sell Jetfoil from Boeing. They have supplied Jetfoil to several operators outside of Japan but have an in-country market for the capabilities of Jetfoil. Japan has fast ferry needs for many of its off-shore islands requiring rough water performance. Their initial estimate of the local market was 20 boats, but that estimate has now been increased to 30. They have also been successful in reducing the initial cost of the Jetfoil sales package to $21 million compared with Boeing's selling price of $28 million. The sales package is more than the basic Jetfoil, it also includes spares, support, and training for the operators. Kawasaki's current rate of building is 4 boats per year. At this rate their market and the replacement of Boeing built Jetfoils should provide them a consistent building program for a number of years.

## OTHER FUTURE OPPORTUNITIES

What else is ahead in the future? I am optimistic about the technical possibilities for innovative hydrofoilers. Currently there is a major effort in Norway in applying controlled hydrofoils to catamarans to improve ride qualities. Kvaerner Fjellstrand is producing a 165-net tons foil assisted catamaran called "Foilcat." Westamarin is also building a foil assisted catamaran of 101 tons which they call the "Skicat." Bill O'Neill has been a consultant on both projects and reports that the manned models show great promise for a better ride quality than a straight catamaran, at a lower price than a comparable hydrofoil.

John Meyer is presenting a paper at the First International Conference on Fast Sea Transportation in Norway on "Hybrid Hydrofoil Technology." This paper is an overview of Hybrid Surface Ships with an emphasis on the Hybrid Hydrofoil ship form. A hybrid marine vehicle is defined as one having more than one source of lift, simultaneously over a major portion of its operational speed envelope. The paper covers the hydrofoil catamaran, the Incal trifoil, and a hydrofoil SWATH.

To the sailing enthusiast and designer, the application of hydrofoils offers an interesting potential. Most sailing designs have been evaluated on calm water predictions. During the Americas Cup, 12-meter design, races off the Coast of Australia at Freemantle, the importance of resistance in rough seas was demonstrated. It has been estimated that a 12-meter yacht, traveling upwind at 8 knots in a Freemantle seaway, had an increase of 50% in resistance over the predicted calm water tests. One way of reducing that increase is through the use of anti-pitching hydrofoils. It is believed that "Stars and Stripes", the winner, used such a device in Australia. My prediction is that in the upcoming 1992 America's Cup races off San Diego, all boats will use anti-pitching hydrofoils.

## CONCLUSION

So is there a future in hydrofoils? I think we can be assured that hydrofoils will be around for a long time to come. To the innovative, marine engineer there exists the possibility of making a breakthrough in an interesting field. As I stand here I can't help but recall that when I left the Navy about 40 years ago to head Miami Shipbuilding's hydrofoil effort, I made the statement that I'd give it three years. If hydrofoils didn't take off in that time, I'd move into another field. I am not sure that hydrofoils ever really took off. But for these past 40 years it has been an interesting profession. But most of all it has been knowing and working with people like you that has provided a most satisfactory career.

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Remember, send articles and news of interest to us
to be included in the NEWSLETTER.

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**INTERNATIONAL HYDROFOIL SOCIETY**
**P. O. Box 51**
**Cabin John, Maryland 20818 USA**

# THE NEWSLETTER

INTERNATIONAL HYDROFOIL SOCIETY

P. O. Box 51 • Cabin John, Maryland 20818

Editor: Bob Johnston | WINTER 1991 | Production Editor: Patsy Jackson


## 1992 ANNUAL MEMBERSHIP FEES are DUE !!

Please send your $20.00 check made out to IHS to:

**CAPT John King, USN (RET.) 4313 Granada Street Alexandria, VA 22309 USA**

Past due notices will be sent to you within the next few weeks if you have not paid.

Please send in your check now!

## SPRING MEETING and DINNER

April 30th, Army Navy County Club, Arlington, Virginia

6:00 pm open bar - 7:00 pm dinner - $24.00 per person

MENU: chicken kiev - vegetable - salad - potato - rolls - butter - dessert - coffee or tea

Featured speaker will be: CAPT William Erickson, USN.

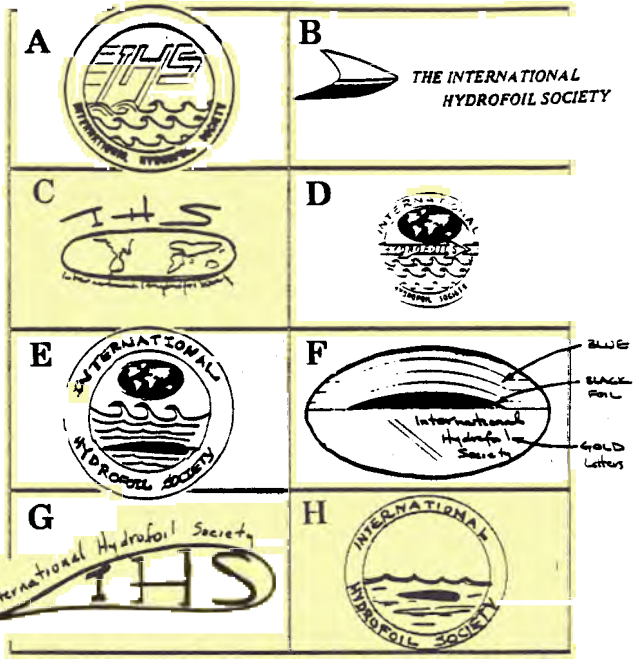
Make reservations to Mark Bebar at 703-697-9572 no later than April 17th if you plan to attend

## LOGO CHOSEN

Logo voting cards were received and the Board agreed to cut off further voting so a decision could be made. The following votes were received:

| | |
|---|---|
| Logo A: | 16 |
| Logo B: | 18 |
| Logo C: | 0 |
| Logo D: | 6 |
| Logo E: | 5 |
| Logo F: | 4 |
| Logo G: | 2 |
| Logo H: | 3 |

It was therefore decided to adopt Logo B, which is the original IHS logo. Logo B will be incorporated in the new stationary, the Certificate, and the IHS flyer.




## OFFICERS, 1991-1992

| | |
|---|---|
| President | John R. Meyer |
| Vice President | Mark R. Bebar |
| Secretary/Treasurer | CAPT John W. King |
| Recording Secretary | Patsy Jackson |

## BOARD OF DIRECTORS

| 1989-1992 | 1990 - 1993 | 1991 - 1994 |
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## THE PRESIDENT'S COLUMN

As I mentioned in my first column in the Fall issue of the IHS Newsletter, it has been a source of Hydrofoil related material and society activities for many years. Bob Johnston is on his way to reaching one of our goals -- a publication rate of four IHS Newsletters per year.

Another goal that was met in December is the selection of a LOGO. Many of the older members, particularly those whose activities in the IHS go back to the time when Headquarters was in London, will recognize the LOGO as the same one as then. The "North American Association" logo, which you have seen on letterheads and Newsletters, will no longer be used.

In the process of reviewing the Logo ballot postcards that many of our members were good enough to return, your Board of Directors uncovered some interesting and informative comments. Several of them are reproduced elsewhere in the Newsletter. These are the kind of inputs we need on a continuous basis. Please don't wait for us to send you a postcard to forward material to the Editor. Bob needs inputs from members to spice up the Newsletter and let all members know what others in the field are doing and thinking.

With the new Logo selected, Membership Certificates are in the process of being printed. This Spring all members will receive their "parchment" documenting the fact that they are indeed members of the IHS.

The Logo will also find its place on a new IHS Flyer. This will describe the IHS organization, its objectives, and membership benefits to aid in further increasing membership and reminding current members of who we are! Look for it in the mail soon and use it to recruit new members. Additional copies will be available from Patsy Jackson.

This issue of the Newsletter introduces a new area that we will be reporting on during the next year or so. Human-Powered Hydrofoils (HPH) have really taken off! The $25,000 prize for a 20-knot Human-Powered Waterborne Vehicle is up for grabs this summer. It promises to generate a lot of great designs with innovation abounding. See the write-up elsewhere in this issue.

John R. Meyer, *President*

## SAILING HYDROFOILS

Mr. W. R. Frank, of Barnsley, England, wrote to us some time ago regarding the international interest in sailing hydrofoils. Among his comments was the fact that Philip Hansford, who lives in London, England, sold his sailing hydrofoil to Ted Snead of Georgetown, Texas. Mr. Hansford held the world sailing speed record in the 10 square meter class for several years. Ted Snead, it is reported, plans to further develop the hydrofoil he purchased.

Any ideas on how to interest more sailing hydrofoil enthusiasts to become involved in IHS would be appreciated.

## FAST FERRY OPERATORS DIRECTORY 1991

This is the eighth year that "Fast Ferry International" has published a fast ferry directory. There are 150 companies listed with their craft and routes. The number of companies is virtually the same as last year. However, the number of vessels listed is 629 which is 65 more than last year. Recognizing that information was not available from some companies and that Russia's fleet is not included, it is estimated that over 800 fast ferries are operational worldwide.

There are 220 hydrofoils listed on active routes compared with 225 listed last year. Hydrofoils are operational in at least 20 countries. It is noted that several of the listed hydrofoils are for sale as replacement craft are on order. It is expected that the number of active hydrofoils will remain constant for the coming year.

A fast ferry is defined as a vessel capable of carrying a minimum of 50 passengers at a full load speed of at least 25 knots.

## FROM OUR MEMBERS

*"Bob Bateman hosted a Boeing Marine Reunion 14 Oct 1991 at the Red Barn of the Museum of Flight where the "Little Squirt" is in storage at the restorative facility Paine Field, Everett, WA. 250 were present."* . . . . . Vern Salisbury

*"I have some recent photos (9/91) of PLAINVIEW. Is there any interest in pushing the Columbia River Maritime Museum?"* . . . . . Michael Terry

*"I strongly prefer a logo with a stable 3-point submerged foil support and means of thrust demonstrated by a Jetfoil -- an actual, useful application. In place of the single foil in Logo H, a Jetfoil should approach the viewer at 45° from right to left, parallel to the hypotenuse and toward the 60° angle of an enclosing 60° /30° right triangle (instead of the circle). The Jetfoil will appear to move as the reader's eye shifts across INTERNATIONAL HYDROFOIL SOCIETY printed along the horizontal hypotenuse base. This logo would typify the active, energetic researchers and practitioners making this phenomenal waterborne transportation breakthrough a widely useful reality."* . . . . . Gene Weinert

## KAWASAKI

The October, 1991 issue of *Maritime Reporter* reports that Kawasaki Heavy Industries is ready to launch a marketing campaign for high speed hydrofoils in key cities throughout the world. Their plans also include a worldwide network of sales offices.

Kawasaki obtained a license for the construction of hydrofoils under a contract with Boeing in 1987. Under the contract, Kawasaki's marketing-sales territories were limited to Japan, the Far East, Southeast Asia and Australia-New Zealand. Now their marketing and sales efforts are expanding throughout the world.

In Japan, the company is encouraged by the Ministry of Transport's lifting of the ban on the operation of hydrofoils at night. High speed hydrofoil service is very popular among Japanese travelers.

## FOILCAT

Additional information has become available on the Kvaerner-Fjellstrand Foilcat. It's a 40 m, gas turbine powered and waterjet propelled vessel developed from the earlier 38.8 m Fjellstrand Advanced Slender Catamarans. With a service speed of 50 knots, it carries 449 passengers on two decks.

As its name implies, the vessel weds catamaran and hydrofoil technology, but the strut-borne foils are in much closer proximity to the hull than in a conventional hydrofoil, allowing a smooth transition from hullborne to foilborne modes. With the hull close to the water, there is the risk of slamming in a sea state. But as both catamaran elements are very slender and have a very high deadrise, they should cut through the waves without any drastic changes in the forces transmitted to them.

There's one full-width foil aft and two foils forward, one under each catamaran hull. The struts of the forward foils have a limited degree of rotation so that these foils act as rudders in the foilborne mode. All the foils have flaps. The foil flaps and rudders are controlled by a computer-based AFCS (Automated Flight Control System) taking information from a number of motion sensors.

The ride system is so advanced that Kvaerner-Fjellstrand's Jens-Herman Jorder claimed in a presentation at the recent Cruise & Ferry seminar in London, "the probability of motion sickness is . . . eliminated when foilborne."

FoilCat is a sophisticated exercise in technology and this is reflected in its navigational arrangements which are controlled from an integrated bridge. The principal navigational display is a console-mounted electronic chart.

## HYDROFOILS OUT PACE DRUG RUNNERS

by John Meyer
Reprinted from DTRC's *Centerline*

Many drug runners operating in the Gulf of Mexico and the Florida straits know what it means to look down the barrel of a 76-mm Oto Melara cannon mounted on a hydrofoil. Any one of the six Navy PHMs (Patrol Combatant Missile) operating with the PHM Squadron Two in Key West, FL can be called upon by the Joint Task Force 4 commander who coordinates DOD drug interdiction assets in the Caribbean. U.S. Navy and U.S. Coast Guard joint operations frequently result in a lengthy chase of "go-fast" boats.

DTRC has provided the focal point for U.S. Navy hydrofoil development over several decades, including the technical management of the PHM program during the 1970s. The Center continues to provide technical assistance to OPNAV and NAVSEA for PHM logistics support, PHM improvements, and future hydrofoil designs. For example, the Center's Hydrofoil Office (1233) manages the Automated Surface Ship Information System-Technical (ASSIST) and is also responsible to NAVSEA for developing a new aluminum hull inspection criteria, a new eddy current inspection procedure, designing and testing a foilborne propulsor early warning system (to warn of impending failure), and providing technical support associated with a variety of foil and strut issues.

The Navy's PHM hydrofoils represent only three percent of the Navy's surface combatants, but they have been responsible for 30 percent of the Navy's overall drug busts. Because of El Terror Gris que Vuela (The Grey Terror That Flies), surface drug operations have decreased in the Florida straits during the last several years. This has forced the PHMs to operate much further from home port on longer patrols in such areas as the Yucatan Peninsula and from naval bases at Guantanamo Bay and Roosevelt Roads.

## HIGH PERFORMANCE MARINE VEHICLE MEETING PLANNING WELL UNDERWAY

Jim Wilkins and John Meyer have been working with the Technical Planning Committee for the High Performance Marine Vehicle Conference scheduled to be held in June. In addition to the Hydrofoil Plenary paper to be presented by Jim Wilkins, John Meyer has obtained promises for papers from some of our fellow members and others. At the present time the hydrofoil and hybrid hydrofoil papers to be presented are listed on page 5.

## NEW RODRIQUEZ DESIGN

Rodriquez Cantieri Navali has announced details of a new foilmaster design as reported in *Fast Ferry International.*

The Foilmaster is essentially a merging of the hull and foil system of the RHS 160F with a new superstructure. It will replace the earlier design on the production line at the company's Messina yard at the earliest convenient time.

Major differences from the RHS 160F are the replacement of the MTU 16V 396 TB83 diesels by 16V 396 TE74s, an increase of a tonne in full load displacement, the resilient mounting of the engines and gearboxes, the fitting of exhaust silencers and the use of carbon fibre in the construction of the foils. The cruising speed of 38 knots is also two knots higher.

Normal capacity of the Foilmaster will be 219 passengers, nine more than the maximum for the RHS 160F. The upper deck will be fitted out with 129 seats, 63 in the bow saloon and 66 in the aft saloon, or 30 more than on the earlier vessel. However, the longer bow saloon will have only 30 seats, 28 less than on the RHS 160F, the forward area being used for a toilet, bar and two storerooms. The capacity of the lower aft saloon is similar on both vessels, 60 seats on the Foilmaster and 63 on the RHS 160F.

Rodriquez Cantieri Navali specifications:

| | Foilmaster |
|---|---|
| Length overall | 31.40m |
| Length waterline | 26.40m |
| Moulded breadth | 6.70m |
| Hull depth | 3.69m |
| Breadth over bow foil | 12.70m |
| Draught | |
| - Hullborne | 3.76m |
| -Foilborne | 1.60m |
| Displacement | |
| -Lightship | |
| -Full load | 107 tonnes |
| Passengers | 219 |
| Cruising speed | 38 knots |
| Range at cruising speed | 150 n mi |
| Main engines | 2 x MTU 16V 396 TE74 |
| -100% mcr | 1.680 kW at 2,000 rpm |
| Waterjets | |

## HOW TO IMPROVE YOUR LIFT OVER DRAG

Mark Drela, an Associate Professor of Aeronautics at the Massachusetts Institute of Technology, set the world's speed record for human-powered hydrofoils recently on the Charles River in Cambridge, Massachusetts. Drela reached a speed of 18.5 knots over the 100 meter course. The previous record for the course was 15.34 knots.

## HUMAN-POWERED HYDROFOILS TAKE OFF

The International Human Powered Vehicle Association (IHPVA) will award a grand prize of $25,000 for the invention of a watercraft that can reach a speed of 20 knots while powered by one person. The challenge is to design and demonstrate a watercraft that can maintain an average speed of 20 knots over a distance of 100 meters and be powered only by the rider's arms and/or legs. The prize, funded by E. I. du Pont de Nemours and Company, has been offered since January 1989 and the competition is due to end at midnight, December 31, 1992 (Eastern Time).

As early as September of 1988, Sid Shutt of Brea, California and rider Terry Vincent of Anaheim, California attained a speed of 13.8 knots with *HYDROPED II.* Since then remarkable progress has been made in approaching the 20 knot (10.378 m/sec) goal. The entries have been numerous and obviously hydrofoil supported craft have been in the forefront, overtaking alternative craft by a considerable margin. For instance, four seniors at Webb Institute of Naval Architecture have been working on *TWENTY SOMETHING.* Two inflatable pontoons, augmented by two sets of foils provide hullborne and foilborne lift respectively. The foils are arranged in a "ladder" style so that the larger foil is raised above the water surface by the smaller one at higher speeds. The rider provides power to a bicycle type drive system to a large, four-bladed air propeller.

The *FLYING FISH I,* in which Paul MacCready (of *Gossamer Albatross* human-powered airplane fame) is involved in consort with other Southern California enthusiasts, uses a similar approach, but with a 15.75 inch diameter water propeller. *FLYING FISH II* is a refinement of its predecessor and has achieved a speed of over 13 knots.

Technological fallout from another human-powered airplane project, DAEDALUS 87, at MIT is reflected in Professor Mark Drela's *DECAVITATOR.* He and his MIT team have designed a remarkable vehicle which has been clocked officially at 18.5 knots over a 100-meter course on the Charles River. A recent technical paper by Drela, Schafer, and Wall cites an unofficial speed of 19.59 knots. The MIT team used high-tech materials, two sets of foils (the larger one retracts out of the water at moderate flying speeds) and a 10-foot diameter air propeller with an estimated efficiency of 90%. This design will be hard to beat, but more about other human-powered hydrofoils in the next Newsletter.

*submitted by John R. Meyer*

## CONDOLENCES

We regret to inform you of the recent passing of Dick Becker. He was the Program Manager of the Canadian hydrofoil *Bras D'or* FHE-00 at De Haviland Aircraft in Canada.

## WESTFOIL 25 TRIALS PROGRAMME BEGINS

After a 4½-year development programme, the long awaited trials of the Westfoil 25 fully submerged hydrofoil began at Westport's yard in Washington at the beginning of July.

Westfoil International reports that the vessel became foilborne, at reduced power, in approximately 20 seconds. It was carrying a relatively light load at the time but results to date make the company believe that it will be possible to take off with "a good deal more weight than originally planned."

Part of the reason is "a patented drive system which uses both water and air propellers for better efficiency during take off and which automatically transfers full horsepower to the air propellers once the craft becomes foilborne."

Four Detroit Diesel 12V-92TA diesels each deliver about 1,000 hp during the take off run and 850 hp when the craft is foilborne. Maximum output is 1,080 bhp at 2,300 rpm. It is expected that fuel consumption at 40-42 knots will be around 680-760 litres per hour.

The engines drive a pair of shrouded air propellers having a Mach 0.7 design tip speed. Arneson drives and a bow thruster are used for hullborne maneuvering.

The vessel is constructed in GRP composite, GRP/Airex being used for the hull and a PVC core sandwich for the bulkheads, decks and superstructure. The canard foils and struts, which are retractable, have been manufactured in "Nitronic 50 stainless steel and composite structure."

An automatic ride control system, utilizing solid state electronics, designed by Westfoil is installed. Both the flaps and rudders of the foils are a modular design to "allow a whole flap and drive mechanism to be removed as a unit."

Maximum speed achieved on the first flight is estimated at "a little over 40 knots." Anticipated service speed is 40 knots in upper sea state 4 or lower Sea State 5 conditions.

Noise levels "were less than expected." At present no attempt has been made to reduce these but, "with the margins for thrust and weight better than expected." Westfoil anticipates doing "an effective job of insulating" while it should also be possible "to slow the air propellers down to a relatively slow tip speed for a further reduction of noise."

The vessel should be fitted out, certified and ready for service by spring 1992. To comply with United States Coast Guard requirements for composite hulls, it will have 149 seats at 810mm pitch but Westfoil estimates that capacity could be increased to up to 180 passengers for services elsewhere.

Electrical 12v DC and 25v DC power will be provided by an alternator on each main engine. A 30 kW generator, backed up by an 8 kW generator, will also provide a 110v AC supply.

**Westfoil International 25**

| | |
|---|---|
| Length overall | 24.4m |
| Beam moulded | 7.2m |
| Draught | |
| - Foils retracted | 1.1m |
| Capacities | |
| - Fuel | 5,675 litres |
| - Fresh water | 380 litres |
| Displacement | Under 70 tonnes |
| Grt | Under 100 tonnes |
| Main engines | 4 x DDA 12V-92TA |

## ALISCAFI SCANDINAVIA

Originally planned to start in March, in time for Easter, the first hydrofoil service in Denmark in over four years finally got underway on June 9 when Aliscafi Scandinavia, a subsidiary of the Rodriquez group, introduced Rodriquez 200 *San Cristobal II* between Arhus and Kalundborg.

The operation is being marketed as Citti Ships and a Rodriquez RHS 160F hydrofoil bearing the same name was originally earmarked for Aliscafi Scandinavia. Instead, the company received the RHS 200 last leased by Aliscafi SNAV, during 1989-90, to Compania Trasmediterranea in the Spanish Mediterranean. For the Danish service the vessel has been refurbished with only 209 seats, 32 of which in the upper bow saloon are being sold as business class accommodations.

*(cont from page 3)*

## HIGH PERFORMANCE MARINE VEHICLE MEETING PRESENTATION PAPERS

*"Recent PHM Operational Experience"*
*by Les Jackson*

*"Offshore Minibases for Small Naval Combatants"*
*by RADM M. Dick Van Orden (USN Ret.)*

*"JETFOIL Operational Experience in Japan"*
*by T. Yagi, Y. Saito, T. Ikebuchi, and M. Asao*

*"Numerical Simulation of Some Maneuverability Characteristics for a Surface-Piercing Hydrofoil Craft"*
by Igor Prislin

*"Performance and Trials Results of Full-Scale Foilcat"*
by William C. O'Neill and E. Instanes

*"An Estimation Method of the Motions in Waves for a Submerged Hull and Foil Hybrid High-Speed Ship"*
by Y. Yamagami, T. Ichebuchi, Y. Saito, and I. Toshihiko

*"Hydro-Numeric HYSWAS Design "*
by Volker Bertram

*"Hybrid Hydrofoil Technology Applications"*
by John R. Meyer

# HOW CDR MARK THORNTON RN, BECAME A WWII HERO

Many of the early members of IHS knew CDR Mark Thornton as the true founder of IHS and the glue that held the organization together during the first years of its existence. Those of us who knew Mark found him a man of integrity and quiet reserve while having a bulldog's perseverance. These traits are apparent in the following story. From time to time as I got to know Mark better, he told bits and pieces of his WWII experiences, but never any great detail. He told us about his commanding a British destroyer, the sinking of a German U-boat and his saving of most of the German crew including the Skipper while at the same time losing his Number One. But that was about all I ever learned about the event.

Recently, CAPT John King, who also knew Mark rather well, was reading a new book, "*Seizing the Enigma.*" This book is specifically about the code breaking efforts used to defeat the WWII U-Boats. It contains a detailed account of how Mark Thornton's destroyer brought U-559 to the surface and how the Enigma machine and the code keys were captured. The following is that account taken from "Seizing the Enigma."

A little before dawn on October 17, 1942, a Sunderland flying boat reported a radar contact, "possibly a submarine," in the eastern Mediterranean roughly halfway between Port Said, at the northern end of the Suez Canal, and Tel Aviv in Palestine. Four destroyers were ordered to search the area. Among them was H.M.S. *Petard.*

Built in Newcastle and launched into the brown waters of the River Tyne on a rainy day in March 1941, the *Petard* was one of eight P-class (for *Pekenham*) fleet destroyers. She had a handsome trawler bow, a single funnel, and a top speed of 32 knots, with great maneuverability at high speed and stability in bad seas. As her main battery she carried only four 4-inch guns, but she was otherwise well armed with eight torpedo tubes, one hundred depth charges, and two sets of depth-charge throwers. Her nine officers had individual cabins; the 211 ratings slept in hammocks.

By far the strongest personality aboard was the captain, a Royal Navy career officer, Lieutenant Commander Mark Thornton. He had come to the *Petard* after service aboard another destroyer, where he had won a Distinguished Service Cross for sinking a submarine. Of medium height, with a square, muscular frame, a square head, closely cropped thick gray hair, and a face as battered as a boxer's, he struck terror into many. At the commissioning he promised to send back a trophy to show the shipyard the results of its efforts; his ferocious talk about destroying the king's enemies left some of the workmen shaking their heads with pity for his crew. His energy seemed barely contained. At Scapa Flow, he would sometimes leap up from the officers' mess, beat the after bulkhead with his fits until it boomed, and show, "I must have action with the enemy now!" Earlier, during the evacuation of Dunkirk in 1940, many of his ship's inexperienced crew members had proved incapable of performing due to seasickness, strain, and lack of sleep, so on the *Petard* he was determined that events would not overwhelm the crew. He toughened his new men with relentless, almost merciless exercises. Once, just as the men were turning in from an exhausting day, he staged a false alarm; pretending the *Petard* had been torpedoed, he hosed them with icy sea water as they struggled to action stations. Gradually he whipped his crew into "a fully trained fighting machine."

Thornton's first lieutenant was Anthony Fasson, a Scot from the border country. An experienced career officer, he exerted a firm discipline on his subordinates but also mixed easily with them. The ratings rarely took umbrage at his punishments; the junior officers found him a genial companion; those who fell short of the captain's difficult standards found Fasson understanding. And Thornton considered him an exceptionally fine leader.

During the summer of 1942, the *Petard* was sent around the Cape of Good Hope through the Suez Canal to join the Twelfth Destroyer Flotilla. During that long cruise Thornton and Fasson spent many an hour in the captain's cabin discussing the Mediterranean, an area Thornton knew very well. They formed a mutual determination to capture the confidential books from a U-boat: "Other destroyers might sink U-boats."

Thornton said later, in ignorance of the U-110 exploit, "but we would capture one!" So they drilled a boarding team, and Fasson, who would lead it, wore gym shoes and his personal boarding gear day and night while at sea. He and Thornton, never doubting that an opportunity would come their way, discussed the boarding from every angle.

On September 22, as the German U-559, under the command of a German skipper named Heidtmann, rocked at her berth in Messina, the *Petard* was moored fore and aft to buoys at Port Said, almost abreast of the statue of the builder of the Suez Canal, Ferdinand de Lesseps. The next weeks were filled with antisubmarine practices and patrols and a sudden sortie to investigate a reported high-speed surface contact that ended in the *Petard*'s repelling three Junker 88s. It was difficult to keep the sailors from the off-limits bars and brothels of Port Said. Off Haifa, the stench of animal skins piled on the quays produced for the men aboard what one called "a night of unforgettable nausea." They spent seven days in Alexandria, where the crew, at sea on the night of October 23, saw the black sky to the southwest erupt with artillery flashes: the start of the battle of El Alamein! Thornton so itched for action that he repeated his bulkhead-beating performance. Then came the seaplane's report of a U-boat sighting as the *Petard* and other ships were sailing to Haifa. Being nearby, they were ordered to hunt the submarine.

The four destroyers reached the U-boat's suspected position a little after noon and began their sweep. The day was sunny, the wind light, the sea flat. The *Pekenham* obtained the first asdic contact but the *Petard* attacked first, dropping five depth charges set to 250, 350, and 500 feet at 12:57 pm. After the explosions, the *Petard*'s crew saw oil and heard a noise of escaping air -- but saw no submarine. A moment later, the Dulverton dropped ten depth charges. As the *Petard* was heading in for her second attack, she and the other ships heard a heavy explosion apparently under her. But they saw no disturbance of the water, and the cause remained a mystery. The *Petard* dropped ten depth charges, and soon the asdic operator reported a hissing noise. This contact was held for fifty-five minutes but eventually proved not to be the submarine. Perhaps underwater bands of different density and temperatures aggravated by the fresh water from the Nile were affecting the asdic.

The hunt continued for hours, with intermittent attack. In the U-559 the men were naturally fearful, but none lost control. Heidtmann, with the calm that had won his men's admiration, repeatedly announced "Alarm!" in a quiet voice, so unlike the hidious, dramatic "Alaaaaarm!" of other skippers. As time went on, the air in the submarine, bad at the best of times with the scent of unwashed bodies, old cigarette smoke, toilets, garbage, diesel oil, diesel fumes, and cooking, grew even fouler.

The attacking destroyer was directed by a cross-bearing of asdic contacts by two other ships. Thornton seemed to have a sixth sense: when contact was lost, he conned the *Petard* back on target, constantly changing course and speed. Tension on the ship remained high. At slow speed, all hands topside scanned the sea for a periscope and torpedo tracks. When revolutions increased, men braced themselves against the thuds of the underwater explosions.

Darkness fell. The wind rose, and clouds covered the sky. A torpedoman aft sent Thornton word that he thought the submarine was below 500 feet -- the maximum setting then on Royal Navy depth charges -- but if he stuffed soap in the holes of the depth charges, the water pressure would build more slowly and the charges would sink deeper before going off. He was granted permission to do so, and at 6:42 the *Petard* loosed ten soaped-up charges. The wait for the explosion was longer than usual, then the crew members saw the shiver on the surface and felt the thumps on the hull. The trick worked: the sub moved and contact was regained. Over the next three and a quarter hours, three more attacks were made.

A little after 10 pm, Thornton signaled to the *Dulverton* his intention to attack and, when the ship replied with ranges and bearings that matched the *Petard*'s, the ship's company felt that the hunt was nearly up; the sub must be close at hand. At 10:17 the *Petard* dropped depth charges. The heavy detonations and the fountains of water were followed by silence except for the noises of the ship and the sea. In Thornton's mind was only the lust to see the U-boat blown to the surface.

In the submarine, the crew counted 288 depth-bomb explosions; the last ones holed the bow and stove in plates on the starboard quarter. The air was intolerable; it seemed as if the oxygen had run out. Heidtmann ordered the ship up.

As the *Petard* nosed forward into the wind and the dark, a gun crew, the men on the bridge, and the gun director team suddenly and simultaneously smelled diesel fuel; a moment later, the asdic operators cried out that they could hear a submarine blowing its tanks. Guns were trained on the port bow bearing given by the asdic team; eyes strained to pierce the darkness. At 10:40, a patch of white water appeared on the black sea. The port signal lantern picked out a conning tower; a few moments later a 36-inch searchlight brilliantly illuminated a submarine with a white donkey painted on her conning tower and a few white figures bursting from it, then crawling and skidding along the slippery deck into the sea.

Thornton ordered his guns to open fire. The pom-poms and one of the Oerlikons did so at once. At that range one of his forward 4-inchers could not be depressed enough to fire at the target, so Thornton turned the ship away long enough to give the gun crew a shot. With their one round the crew members hit the base of the conning tower. Many of the 114 pom-pom and 79-Oerlikon rounds struck the U-boat, but it rapidly became clear that she was stopped and being abandoned and that further gunfire damage would make it harder to save her. Fasson rang the cease-fire bells. Thornton issued orders to put his boarding plan into effect.

By this time, the *Petard* had stopped and the submarine was lying to port in the destroyer's lee, down by the bows in the roughening chop. Fasson was on the starboard side aft, starting to have the starboard boat lowered. Thornton roared at the gunnery control officer, Sub-Lieutenant G. Gordon Connell, to dive over the side and swim to the U-boat. As Connell started to strip off his clothing, a young able-bodied seaman, Colin Grazier, joined him, shouting that he would swim across with him. Just then Fasson appeared. He told Connell to take charge of the whaler and bring it around the *Petard* to the U-boat. He himself was tearing off his uniform. Within moments he and Grazier had dived naked into the sea and were swimming to the U-boat. So was the fifteen-year old canteen assistant, Tommy Brown, who had lied about his age to join the service. He dived into the sea before the canteen manager could stop him. A few moments later, the whaler, encumbered by German sailors slinging to it, reached the U-boat and made fast.

That vessel was in desperate shape. Its deck was awash, and waves broke over it continuously. The rigging and wireless aerials had been almost completely shot away. The top of the conning tower was a shambles; at its base was the hole made by the 4-inch shell; in the middle were two or three dozen punctures an inch in diameter, through which water sloshed. Plates on either side were stove in. The searchlight pinned the U-boat in its dazzle. The Germans in the water cried for help. In the darkness beyond, the Petard's sister ships circled, listening for other U-boats.

Fasson and Grazier reached the submarine and climbed down into her control room. The U-boat's lights were on, and they could see two bodies there. Fasson shouted up that the submarine was holed forward. Then, using a machine gun, he smashed open cabinets in the captain's cabin and finding some keys behind a door, opened a drawer. From it he took out some documents, apparently secret ones.

Tommy Brown had gone below to help Fasson and Grazier, water from the 4-incher's hole pouring onto his back as he went down the ladder. Now he carried these precious papers up the conning tower and gave them to the men in the whaler. Another sailor, K. Lacroix, at the top of the conning tower, pulled up some books with a line. Brown went down again to bring up more documents, managing to keep them dry despite the leaks and splashes. On his third trip, the water, which had been rising gradually, stood 2 feet deep on the submarine's inside deck.

Back in the control room, Fasson was trying to free a box containing some instrument -- perhaps a radio or radar -- from a bulkhead to which it was attached by wires. The water was getting deeper; outside, it was starting to cover the aft gun platform. Brown told the lieutenant that they were shouting on deck for them to come up. Fasson directed Brown to take up the next batch of papers. The teenager climbed the ladder with the documents and passed them into the whaler. Meanwhile, Fasson and Grazier had managed to break away the instrument box and tie it to a line to be lifted up. As the sailors hauled it out, Fasson called out that they were pulling too fast, that the instrument appeared delicate and important and that they should be careful with it.

By now the sea was over the afterdeck platform, and Connell told Brown not to go down again but to tell Fasson and Grazier to get out at once. Brown saw them at the bottom of the conning tower and shouted, "you had better come up!" twice. They had just started up when, unexpectedly and swiftly, the submarine sank.

Brown jumped off; Lacroix, still on the conning tower, had to pull against the water pouring down as he climbed the last two runs of the ladder. He swam away against the suction, and he and Brown were picked up by the Whaler. But Fasson and Grazier had not been able to overcome the inrushing water. They went down with the submarine.

The whaler with its precious documents came alongside the *Petard* and was hoisted on the run as she and the Dulverton, their searchlights extinguished, moved at speed away from the possible danger of other U-boats. The euphoria of the crew members at having destroyed a hated enemy quickly turned to an expressible sorrow as they realized that they had lost a competent and well-liked officer and a regular serviceman who was an asset to the ship. The *Petard* continued to Haifa, where the valuable documents were given to naval intelligence officers. Thornton, true to his word that he would send a trophy to the ship's builders, sent a U-boat seaman's life jacket to Newcastle. After deciding that Fasson and Grazier could not be granted Britain's highest decoration for valor, the Victoria Cross, because they had not acted in the face of an enemy, the Admiralty posthumously awarded them Britain's second highest decoration for bravery, the George cross.

The documents that had cost the lives of Fasson and Grazier included two that were most useful. One was the current edition of the Short Signal Book, but it was less immediately useful than the second edition of the Short Weather Cipher. It could turn solutions of broadcast weather messages back into the form the weather messages had when the U-boats enciphed them.

The cryptanalysts learned that the four-letter indicators for regular U-boat messages were the same as the three-letter indicators for weather messages that same day except for an extra letter. Thus once a daily key was found for a weather message, the fourth rotor had to be tested only in twenty-six positions to find the full four-letter key. Once that was known intercepts came off the teleprinter revealing the position of U-boats. The solutions permitted evasive routing of the convoys, and sinkings were halved in January and February 1943 from the highs of the two previous months.

As you know Mark is not with us anymore. I think he would have been somewhat embarrassed by having the details of this event published, although the author of the book states the Thornton episode was described from Mark's personal notes. I well remember the last time that I saw Mark. He was helping us in England with our survey of high speed waterborne vehicles. I had asked him to gather some material for us. He had obtained everything that we had asked for and brought it to my hotel in London. I was shocked to see that Mark could hardly make it down the hall to the small reception room. When I remarked that he should have let me come pick up the material, he stated in no uncertain terms that he was going to finish the job he started out to do. He stated that his next stop was the hospital. I offered to go with him but he refused my company. I helped him into a cab and the look in his eyes as we said farewell told me why that U-boat never had a chance once Mark got on its tail.

*(Submitted by John King, Edited by Bob Johnston)*

## FIRST ORDER FOR MHI HYDROFOIL

The first order for its newly developed hydrofoil was announced by Mitsubishi Heavy Industries last month. The order for the Mitsubishi Super Shuttle 400, worth in the region of $2 billion yen, was jointly placed by the Shimane Prefecture and Oki Kisen and the craft will be used on a service to the Oki Islands, a route of about 50 miles.

The vessel will have a capacity of about 300 passengers and a service speed of 40 knots. It will be built at the company's Shimonoseki facility and is due for delivery by the end of March 1993 when it will replace the existing 350 passenger, 25-knot craft.

The Super Shuttle 4400 has a length of 34m and a beam of 11m and is constructed in aluminum. It will be powered by four Mitsubishi S16-MTK 850 high speed diesels driving waterjets.

Because of the local sea conditions, the service between the mainland and the islands has been unreliable. With the introduction of this new vessel, the travel time and overall service should improve substantially, thus making it more attractive to tourists.

## TWO COLLISIONS OCCUR IN SPANISH WATERS

One of Compania Trasmediterranea's two Jetfoil hydrofoils was seriously damaged on July 5 when it hit a whale while operating a service in the Canary Islands between Las Palmas and Tenerife. Four passengers were reportedly admitted to the hospital, the worst injury is thought to have been a broken leg.

The vessel, the Boeing built 929-115 *Princesa Guayarmia*, was towed to Tenerife and is to be repaired by Kawasaki Heavy Industries at its Kobe yard. The Japanese company completed a second Jetfoil 929-117 for Trasmediterranea in June and this had already been scheduled to replace the 929-115 in September. Anticipating its arrival, Trasmediterranea had sold *Princesa Guayarmia* to Far East Hydrofoil Company.

Later in the month, during the early evening of July 28, two of the catamarans operated by Flebasa Lines between Spain's Mediterranean coast and the Balearic Islands. Westamaran 95 *Rapido de Formentera* and Fjellstrand 38.8m *Rapido de Algeciras*, collided off Ibiza. Approximately 40 passengers were injured, some of whom needed hospital treatment.

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Remember, send articles and news of interest to us
to be included in the NEWSLETTER.

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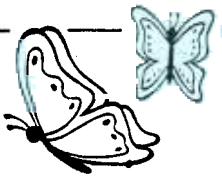
**INTERNATIONAL HYDROFOIL SOCIETY**
**P. O. Box 51**
**Cabin John, Maryland 20818 USA**

# THE NEWSLETTER

**INTERNATIONAL HYDROFOIL SOCIETY**

P. O. Box 51 • Cabin John, Maryland 20818 USA



Editor: Bob Johnston

**SPRING 1992**

Production Editor: Patsy Jackson


*Have you paid your*

**1992 ANNUAL MEMBERSHIP DUES ?**

Please send your $20.00 check made out to IHS to:
Capt. John King, USN (Ret.)
4313 Granada Street
Alexandria, VA 22309 USA
Please send in your check now! (Student membership is $2.50)

## SPRING MEETING and DINNER

April 30th, Army Navy County Club, Arlington, Virginia
6:00 pm cash bar - 7:00 pm dinner - $24.00 per person
Make reservations no later than April 27th if you plan to attend. Call one of the following:
Mark Bebar 703-697-9572 • John Meyer 301-227-1796 • Patsy Jackson 703-329-0102

PROGRAM: *"NORWEGIAN FOILCATS AND OTHER FOIL ASSISTED VEHICLES"*
William C. O'Neill & John R. Meyer

Two Norwegian firms, Kvaerner Fjellstrand and Westamarin, are in stiff competition to get their foil assisted catamarans, or Foilcats, into production. Come and hear all about them and other designers who are adopting foils to make their craft more acceptable by the paying passengers.

NOTE: *Captain Erickson, who was originally scheduled to be our speaker for the Annual IHS meeting, was unexpectedly assigned duties of higher priority.*

## NEWS FROM THE IHS BOARD OF DIRECTORS

- A Certificate of Membership is under preparation and should be distributed in the near future to all members who are in good standing, that means dues paid up to date.
- Jeff Benson who heads up the nominating committee for new members to the Board of Directors hopes you have sent in your ballot which was mailed to you several weeks ago.
- Work continues on monographs for the long awaited textbook. Some progress is being reported.
- A flyer useful for advising potential members about IHS is under preparation. The Flyer will be of interest to all of us.
- Considerable information has recently been released regarding current developments in the Russian hydrofoil industry. The next NEWSLETTER will summarize that information.

## THE PRESIDENT'S COLUMN

Hydrofoils and/or foil augmented craft appear to be getting more attention during the past several years -- not in the U.S. Navy, but in the commercial arena. Many passenger ferry operators and designers have come to conclusions that hydrofoilers have been sensitive to for many decades. Passengers won't tolerate a rough ride -- particularly characterized by "heaving" motions. As we know, the best way to control motions is with foils.

There are several papers in the forthcoming HPMV-2 conference in June of this year that describe craft whose designers are attempting, by various foil arrangements, to improve rough water operations. Most of these are catamarans or multihull variants. Some may achieve performance approaching that of a conventional hydrofoil with its hull well above the water surface, but only certain designs will be comparable, and many will be a compromise.

I encourage our members to request a pre-registration package for the HPMV-92. A related notice is given elsewhere in this Newsletter. We are pleased to announce that in addition to the hydrofoil papers listed in the Winter 1991 Newsletter for the HPMV-92, our own Jim Wilkins will present a plenary paper on "Hydrofoils" during the opening session.

The Human Powered Watercraft Saga continues in this issue. Your editor would like to know if any members have some information about other human Powered watercraft, particularly hydrofoils, that may be contenders for the "20-knot Grand Prize."

We are looking forward to expanding IHS membership. Each member should therefore encourage his colleagues to join the Society. Also, all current members are encouraged to pay their 1992 dues to retain their "member-in-good-standing" status.

John R. Meyer, *President*

## CHANGES AT RODRIQUEZ CANTIERI NAVALI

For the first time in many years, the management control of Rodriquez Cantieri Navali S.p.A. is not with the Rodriquez family. As a result several changes in top management have been made. Dott. Ing. Morace is the new Managing Director and Dott. Ing. Puccini is the Technical Director. The technical staff remains basically the same under the new management. Dott. Ing. Dino Di Blasi remains in charge of hydrodynamic studies and research. Dott. Ing. Falzea has now retired, he was the production manager. We wish the new management continued success in their new endeavors.

## MARITIME ADMINISTRATION CRITICISM

Gerry Rennerts, a long time hydrofoiler and fast waterborn transportation entrepreneur (he was the first to bring Russian-built hydrofoils into U.S. waters) recently sent the following letter to the editor of the "*New York Times*":

To the Editor:

Where have the writers of the Dec 14 letters headlines "U.S. Shipbuilding Withers as Japan's Thrives" been for the last 35 years?

Shipbuilders are a strange lot; they are caught up in tradition and have little vision. There has been a technological revolution in shipping. In the late 1950's, Maritime Administration researchers encouraged new ship configurations that could compete with aircraft on transocean and coastal routes. Grumman and Boeing developed impressive hydrofoil vessels. Bell Aerosystems, led by the visionary E. K. Liberatore, built the Skimmer One air cushion vehicle.

In 1968, while Mr. Liberatore was with the Aeromar Corporation, he designed a transocean air cushion vehicle ferry capable of operating in excess of 200 miles per hour. The ferry would carry 1,000 cars and provide 17-hour service between New York and London at a cost of $100 a car, including four passengers. The vessel could have provided the world with global mass transportation.

However, the Maritime Administration "subsidy club" doesn't want new technology rocking its boat to nowhere. Efforts were even made to develop an automated shipyard, so that conventional American ships could be constructed at a price competitive with labor-intensive foreign yards. United States shipbuilder unions objected, so the entire program, including its distinguished Ph.D. management staff was given to South Korea and Japan by Congress. *(continued, page 10)*

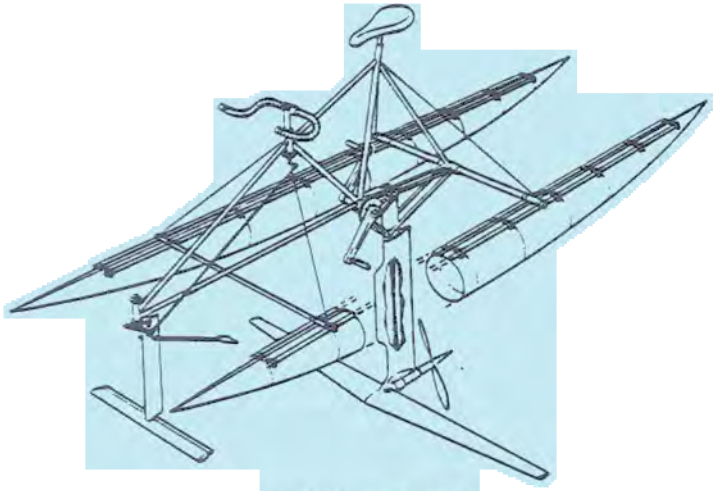
## HIGHPOINT

Sumi Arima writes that he has had conversations with Mr. Ron Fraser, owner of *Highpoint*. He has decided to take *Highpoint* down to Portland under its own power. He has talked to some hydraulic suppliers who claim they can replace the outdrive steering motor with a commercial, industrial type motor and a self-contained hydraulic package. He plans to steer with a lever control (bi-directional valve) located in the pilot house. Mr. Fraser is also getting rid of the "Skydrol" hydraulic fluid. He further has decided to not use the ship's fuel tanks but will add day tanks for the fuel supply to the diesels. Sumi says that he doesn't know where these tanks will be located while insuring adequate stability, but we're sure that Ron will figure that out.

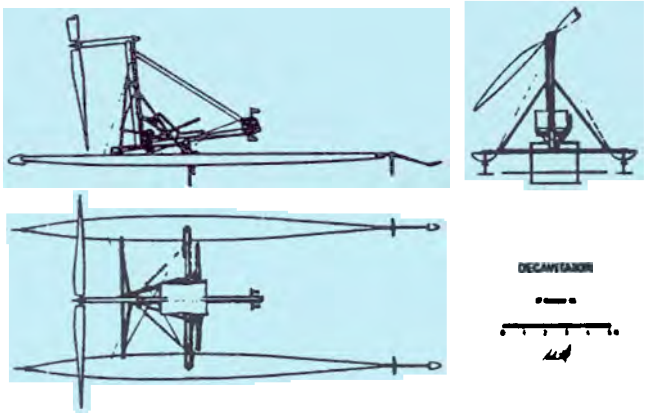
## THE HUMAN POWERED HYDROFOIL STORY CONTINUES

In the Winter 1991 Newsletter, an article mentioned the International Human Powered Vehicle Association and the $25,000 grand prize for a H-P watercraft reaching 20 knots.

Shown here are two of the contenders previously described -- namely, "Flying Fish II" and "Decavitator."

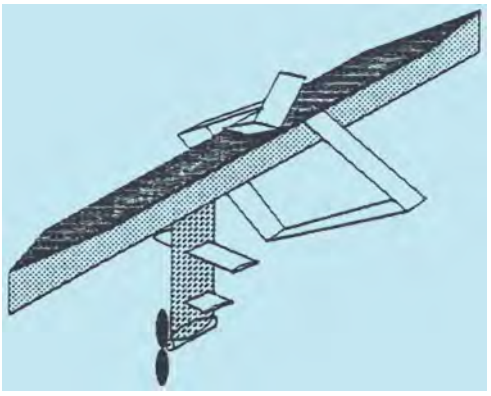


FLYING FISH II



DECAVITATOR

There are a number of additional craft that have been designed, built, tested or are in the process of that sequence in search of the "big prize." A University of Delaware team has designed Sea Cheetah, shown schematically here. They have put together a report which shows that considerable engineering analysis and design effort have gone into the craft -- all with great expectations.



SEA CHEETAH

Another contender is a group at Thacher School in Ojai, California, spearheaded by Kurt Meyer. An inspiration for an innovative approach to the Human Powered Hydrofoil solution gained momentum in the summer of 1991. Small scale "Tank tests" and some design modifications have spurred the Thacher Group onto accelerated effort this winter with full-scale tests expected in early Spring. Dubbed "Pegasus," the school emblem -- all other contenders should stand back while she cuts through the water -- rough or calm -- at hopefully 20 knots or more.

*Submitted by John R. Meyer*

### NOTICE

All members who wish to receive a pre-registration package for the High Performance Marine Vehicle Conference to be held in Washington, D.C. June 24-27, 1992, please write to:

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

or call her at 703-329-0102. The package contains a complete schedule of events -- about 90 papers -- and attendance information.

## NEW MEMBERS

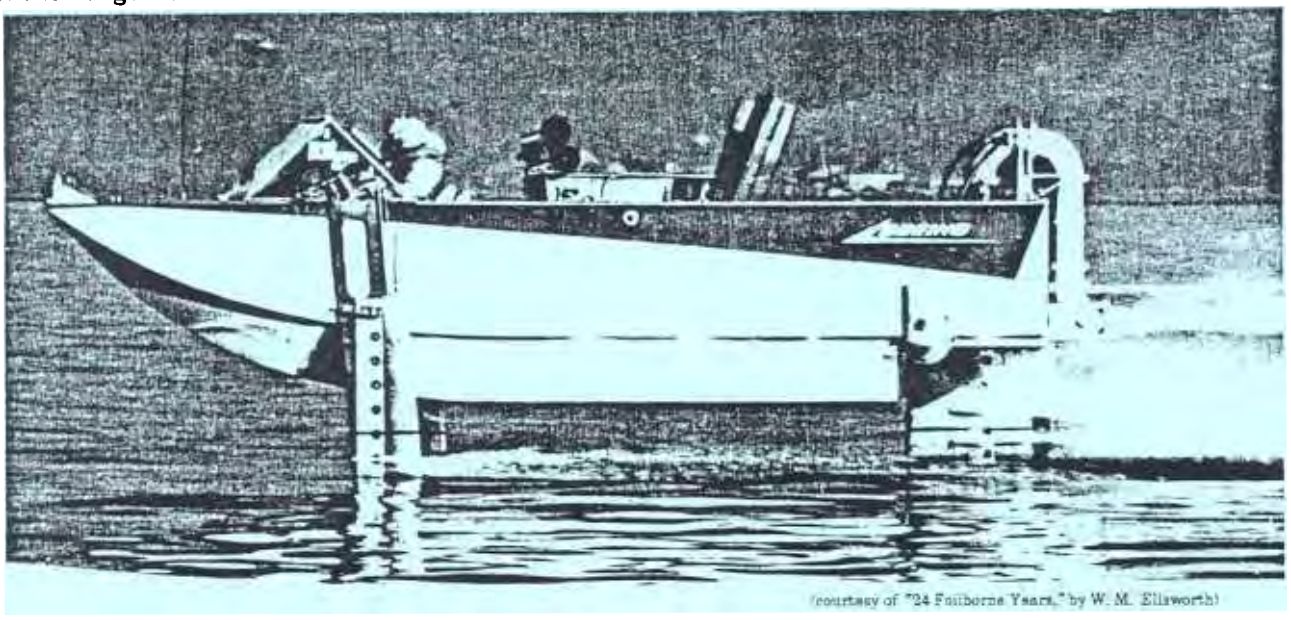
*Stephen J. Chorney (Maryland, USA)* -- Works at DTRC in the hydrofoil group of the Systems Program Division, Code 1230. Assists in examining various hydrofoil problems that concern the PHM squadron.

*Martin F. Galster (Washington, USA)* -- Ex-Boeing Jetfoil (929-115) Master; currently foilborne Control Systems Coordinator and Trials Captain for "Westfoil" hydrofoil prototype.

# *DO YOU REMEMBER* LITTLE SQUIRT?

It was in the 1960s that hydrofoil designers were intrigued with the idea that a waterjet could propel a hydrofoil boat. Advantages were simplicity through elimination of gears and lightweight. This led to the design and construction of a company-sponsored research craft by the Boeing Company. It was called LITTLE SQUIRT, and consisted of a small 5,500 lb, 20-foot runabout with a stepped W-form hull.

The boat used a centrifugal pump producing a flow rate of 3,600 gallons of water per minute out of the stern; hence its name. The pump in turn was powered through a reduction gear by a 425 hp Boeing gas turbine engine. It was at that time that this small gas turbine as one of Boeing's product lines, and they anticipated wide use of such engines on trucks and small craft.



(courtesy of "24 Foilborne Years," by W. M. Ellsworth)

## LITTLE SQUIRT

The following table describes the principle characteristics of LITTLE SQUIRT.

| | | |
|---|---|---|
| Length overall | | 20 ft |
| Beam | | 8 ft |
| Foil Span: | 2 forward | 3 ft, 1 in. |
| | 1 aft | 4 ft, 6 in. |
| Strut Length | | 2 ft, 9 in. |
| Displacement: | Full load | 2.6 L. tons |

Two foils were placed forward on the craft and one aft. It is interesting to note that the area of the single aft foil was equal to the sum of the areas of the two forward foils. Each foil had trailing-edge flaps, but in addition, lift was controlled by changing the incidence of each foil. The flaps were used for lift augmentation during takeoff and were retracted for the cruise, foilborne condition. The automatic control system used an acoustic height sensor. It measured the distance between a fixed point on the bow of the boat to the mean, or average water surface.

This test craft accumulated about 110 hours of foilborne operation on Lake Washington and Puget Sound, sometimes operating in 3-foot waves. LITTLE SQUIRT achieved speeds of up to 45 knots and established the technical basis for proceeding to the waterjet propulsion designs for the gunboat, TUCUMCARI, subsequently the U.S. Navy PHM hydrofoils, and also the Boeing's commercial hydrofoil passenger ferry, JETFOIL.

According to Verne Salisbury, LITTLE SQUIRT is presently located in a stored condition at the restoration facility of the Museum of Flight at Paine Field, Everett, Washington.

*Contributed by John R. Meyer*

# THE HENNING-LEE STORY

*by Bob Johnston*

It was during the New York Boat Show of 1952 that we first heard about the Henning-Lees. On the floor at the Old Madison Square Gardens, where the Boat Show was held, was a high speed hydrofoil boat. It was advertised that the Craft had been brought to the United States from England with the objective of seeking the world's speed record for marine craft. At this time the Bureau of Aeronautics was interested in hydrofoils to be used to improve the landing characteristics of seaplanes in rough water. Some experimental work was underway funded by the Bureau and managed out of the Office of Naval Research. It was decided that the Navy would make an investigation into this particular craft and as Hydrofoil Project Officer, I was given the task of looking into the vehicle.

Bill Carl, then with John H. Carl and Sons of Long Island, and Tom Buermann of Gibbs and Cox were two New Yorkers involved with the hydrofoil program. Upon contacting them regarding the Boat Show hydrofoil, they both reported that they had seen the craft and that the owners and operators were Mr. and Mrs. Henning-Lee, from England. Both Bill and Tom had talked with the Henning-Lees and had learned that they wanted nothing to do with the U.S. Navy. They were seeking commercial support and were convinced that they would be well paid for their efforts. They of course expressed interest in obtaining any contributions that Gibbs and Cox or John H. Carl would care to make.

With this information in hand, I visited the Boat Show to see the craft. It was named the "White Cloud" and had a beautifully made all-aluminum hull. The steel foil system consisted of a full span U-foil forward and a single tail foil aft. The aft strut-foil assembly was steerable. The hull looked like an airplane fuselage and was wrapped around a Rolls Royce Derwent jet engine. The Derwent gave the craft a thrust to weight ratio greater than one, so all you had to do was point it skyward and you had a rocket. The hull contained a single seat cockpit forward of the gas turbine. Now the problem became how we could get the Navy involved in the future of the "White Cloud."

Tom, Bill and I put our heads together and decided that the two New Yorkers would attempt to arrange a meeting with the Henning-Lees on the basis of our being interested in investing in their project. I was to be a civilian interested as a private investor. If the Henning-Lees could have seen the Johnston's bank account, what a joke that would have been. In any event we were granted an appointment to meet with them in the Grammercy Park Hotel. That evening meeting with them turned out to be a very interesting affair. Not so much from what we learned, but from the display put on by Mrs. Henning-Lee. The two of them had a pleasant two-room suite, a bedroom and a sitting room. Our appointment was just before the evening dinner hour and we were informed that our time would be limited as they had a dinner engagement with a very important representative from a major oil company. We met in the sitting room of their suite and began to learn a bit about them and their craft. The "White Cloud" had been designed, built and paid for by the United Kingdom's aircraft industry for the purpose of challenging the world's marine speed record. Both of the Henning-Lees were pilots and promotors of "White Cloud." Mr. Henning-Lee was a former submarine officer, during WWII in the Royal Navy, a very pleasant and likeable fellow. His wife was a statuesque, attractive woman with long blond hair and a very business like attitude. Both had strong British accents and used quite cultivated English.

After a rather short chat Mrs. Henning-Lee dismissed herself as she had to get ready for their dinner appointment. She left the bedroom door open and stayed tuned into and joined in the continuing conversation. In whatever stage of her dressing or undressing she might be in, she would pop back into the sitting room and enter into the conversation. Her abrupt appearances and disappearances did not help the flow of the talking and did take our minds off what was being said. It was made quite clear that they wanted no help from the U.S. Navy. On this note the meeting ended with no commitments on either side.

Some time went by before we heard anymore about the "White Cloud" or the Henning-Lees, perhaps about three months. Then one day I got a call from Bill Carl that the Henning-Lees had contacted him. Apparently their campaign to raise funds had not been very successful. The only commitment they had obtained was for fuel to power the craft for a speed attempt. They had asked Bill if they could anticipate any support based on our conversations at the Grammercy. Bill revealed to them that the meeting was an attempt by the U.S. Navy to learn more about them and their craft. He further told them that I was a Naval Officer in the assignment of Hydrofoil Project Officer with the Office of Naval Research. They expressed to Bill that they no longer had any reservations about Navy support. This is what had led to Bill's call.

We put our heads together in Washington and decided to try and get them to make a demonstration run for us. Our proposition was that if the Henning-Lees would furnish the craft and pilot, the Navy would pick up the expense for the other costs for a run over a measured mile. If they exceeded a speed of 100 miles per hour, the Navy would be interested in talking to them about a test program. The Henning-Lees agreed to this. The Navy put some extra funds into the John H. Carl and Sons contract and with Bill Carl as project manager, we started the process of getting the "White Cloud" over a measured course. Bill has always claimed that we under-funded the effort which is probably right, but Bill in his usual enthusiasm worked diligently on the task.

Our first troubles came about when the Henning-Lees informed us that they had never run the craft. In their eagerness to get to the States to raise funds, they had left England as soon as the craft was completed. They didn't know the last time the turbine had been run. So now we needed aircraft mechanics to put the engine in operating condition. Bill suggested that we seek help from Grumman Aircraft, with whom Bill had a working arrangement. An appointment was made with Mr. Jake Swirbul, a founder and then president of Grumman. He was most cordial in offering us the assistance of two mechanics. Since this was for the Navy he even stated that there would be no cost.

The thing that I remember most about this meeting with Mr. Swirbul and Grumman, who was later to become my employer, was an interruption we had from an unhappy employee. Mr. Swirbul had what was called an open door policy. This employee came to Mr. Swirbul's office and asked if he could speak to him. Mr. Swirbul excused himself and told the man to come right in. The man stated his problem which was that he wanted to borrow a company hand-power drill and that his foreman had refused him permission. Mr. Swirbul asked how long he had been an employee of Grumman. His answer was 14 years. With that Mr. Swirbul said, "and you have never taken a drill?" The individual vehemently said, "No, sir!" Mr. Swirbul called the man's foreman and directed him to give the fellow a drill. I think that attitude displayed in the President's office entered into my consideration to join Grumman in later years. But back to the Henning-Lees.

The location chosen for the measured mile was near Eaton's Neck on the northern shore of Long Island. Here there was sheltered water and the availability of the U.S. Coast Guard to assist in the event. As we learned more about the craft, the more we became concerned about the safety of the pilot. There were no instruments on board to give an indication of speed. Even the turbines instrumentation was quite limited. Further, when the pilot closed and secured the overhead hatch, it could only be opened from the inside. The Coast Guard agreed to furnish a helicopter with a rescue crew on board complete with an axe to break the pilot out in the event of an accident. The Coast Guard also furnished other boats along the measured mile to mark the course and to provide rescue assistance if required.

Finally, the course was laid out, the gas turbine was in operating condition along with the"White Cloud," the safety features and communications were organized and the day was selected for the trial. By now the news of the event had spread throughout the hydrofoil community and on the day of the trial about a hundred hydrofoilers had gathered on Long Island.

The night before the trial was most interesting. Several of us had dinner with the Henning-Lees. The question was brought up as to who would pilot the hydrofoil since both of the Henning-Lees had expressed capability. The discussion that followed revealed the concern both had for the safety of the venture. They discussed openly between the two of them who would be the pilot. They finally stated that it would be best for Commander Henning-Lee to make the run since in the event of an accident, Mrs. Henning-Lee would be able to take care of their young son. We also learned that Mrs. Henning-Lee had been born and grown up in Connecticut. She had met the Commander during the war, had married, and gone to live in England. In a few short years she had developed a thick English accent.

At last the great day had arrived. We selected an early morning run as the winds were light and the Sound was calmer. By about 0630 everyone and everything were in place. Enough private boats were available so that all observers could be a witness to the trial, and the Coast Guard had them well clear of the measured course. The Commander was in the "White Cloud" with the turbine running nicely about a quarter of a mile before the start boat of the mile. The signal to go was given and for the first time the "White Cloud" was underway on its own power. The craft quickly picked up speed and was foilborne well before reaching the start of the mile. The vessel hit the start line well up on its foils, running quite stable, and from the sound of the turbine seemed to be near full power. For the next quarter of a mile things seemed to be going beautifully when suddenly the craft disappeared into a cloud of white water spray. The "White Cloud" emerged from the spray

intact and afloat. The hatch was opened and the Commander came out in apparently an OK condition. When the excitement died down and we could get to the Commander we asked what had happened? His reply was that sitting in that enclosed space he had no idea of the speed he was making. All he knew was that things on the water were coming at him very fast. He had lost his nerve and had chopped the throttle.

An examination of the craft revealed that everything was intact except the turbine had ingested a quantity of water and would have to be cleaned before anymore running. Events were called off for the day and the attempt was rescheduled for the following morning. Our Grumman mechanics worked diligently through the day and night to clean the turbine and by dawn the next day the craft was ready to go. However, the winds had come up over night and the water over the course was rough. So another delay had to be taken. The Navy representatives decided that we could no longer keep all our assistants waiting around and called off the trial at Eaton's Neck. We had seen enough in the short run to want to pursue the matter further. The Navy asked the Henning-Lees to come forth with a proposal to permit the Navy to conduct trials at Patuxent Naval Air Test Center.

About three weeks later the Henning-Lees arrived in Washington with a proposal and a very pushy lawyer. The proposal far exceeded our available funding. It was based on an achieved mile per hour basis demonstration. Each time the speed exceeded certain threshholds the cost per mile per hour went up by a sizeable margin. The cost of reaching 125 miles per hour along with the living costs and salaries for both of the Henning-Lees was just more than we could afford. Instead of offering some revision the lawyer demanded an immediate contract. That really spoiled the entire negotiations and the discussion was terminated. In the meantime, the interest in hydrofoil supported sea planes was diminishing. Even though the Henning-Lees eventually called and said they would accept any proposition the Navy would make, the end of this venture had arrived.

Sometime later the Henning-Lees came to see me at the Office of Naval Research. They were in rather drastic financial shape. I must say that I liked the two of them. They were true entrepreneurs and really quite likeable and pleasant to visit with when they weren't trying to get rich off the Navy. They had gone broke in trying to promote their craft and didn't have enough funds to return them or their craft to England. They had both taken jobs in retailing to keep their son in school and to save enough to go home. Unfortunately there was nothing I could do to help them. The "White Cloud" was stored at a gas station in Silver Spring and they were having trouble paying the storage costs. That is the last I ever heard of the Henning-Lees or the "White Cloud." If any of you know "the rest of the story" let me know and we'll print it in the Newsletter.

## SUMMARY OF HYDROFOILS WORLDWIDE

(SOURCES: *Fast Ferry International, Dec. 1991; Jane's High Speed Marine Craft 1990)*

| Military | Built | In Service |
|---|---|---|
| U.S. Navy | 6 | 6 |
| Commonwealth of Independent States (Soviets) | | |
| Pchela | 2 | 2 |
| Turya | 30 | 30 |
| Matka | 16 | 16 |
| Sarancha (NATO code name) | 1 | 1 |
| Babochka | 1 | 1 |
| Muravey | 1+ | 1+ |
| Italian (Sparrero Class) | 7 | 7 |
| Israeli | 2 | 2 |
| TOTAL MILITARY | 66 | 66 |
| **Commercial** | | |
| Boeing | | |
| Jetfoil 929-100 (built 1974-77) | 10 | 10 |
| Jetfoil 929-115 (built 1977-86) | 18 | 12 |
| Hitachi | | |
| PT 20 (built 1962-81) | 17 | 4 |
| PT 50 (built 1964-83) | 25 | 17 |
| Kawasaki | | |
| Jetfoil 929-117 (built 1989- ) | 11 | 11 |
| Rodriquez | | |
| PT 20 (built 1965-71) | 48 | 22 |
| PT 50 (built 1959-70) | 29 | 16 |
| RHS 70 (built 1972-82) | 10 | 10 |
| RHS 110 (built 1970-75) | 5 | 1 |
| RHS 140 (built 1971-77) | 13 | 6 |
| RHS 150F (built 1983- ) | 3 | 3 |
| RHS 150 FL (built 1988- ) | 3 | 3 |
| RHS 150 SL (built 1979-84) | 6 | 6 |
| RHS 160 (built 1975-82) | 9 | 8 |
| RHS 160 F (built 1984-90) | 18 | 15 |
| RHS 200 (built 1981- ) | 2 | 2 |
| MEC 2-200 | 1 | 1 |
| Rodriquez/Hyundai | | |
| RHS 70 (built 1985) | 1 | 1 |
| Seaflight H.57 (built 1968-69) | 6 | 2 |
| Westermoen PT 50 (built 1962-68) | 3 | 1 |
| Kolkhida (built 1983- ) | 30 | 19* |
| Kometa (built 1964-83) | 130 | 100* |
| Meteor | 7 | 7* |
| Raketa (built 1957- ) | 500* | ? |
| Voskhod (built 1969- ) | 9* | 9* |
| Cyclone (built 1985- ) | ? | ? |
| TOTAL COMMERCIAL | 914* | 287* |
| GRAND TOTAL | 980 | 353 |

**Numbers for Soviet hydrofoils uncertain, but greater than values shown.*

# FAST '91 PAPERS

FAST '91 was held in the city of Trondheim, Norway last June. Eighty papers were presented over a period of three and one-half days covering the field of advance marine vehicles. We were pleased to see that several members of IHS had papers on the agenda. FAST '91 Proceedings have been published in two volumes totalling 1,352 pages. Further information on these proceedings can be obtained from: The Norwegian Institute of Technology, N-7034 Trondheim, Norway.

Hydrofoil papers of interest were listed as follows:

*"The Catafoil -- A Foil Assisted Catamaran for Fast Ferry and Yacht Applications"*
N. Gee, Nigel Gee and Associates.

*"Aspects of Hydrofoil Design with Emphasis on Hydrofoil Interaction in Calm Water"*
H. J. B. Morch and K. J. Minsaas, Marintek.

*"A Submerged Hull and Foil Hybrid Super High Speed Liner"*
N. Yamanaka, Kawasaki Heavy Industries; O. Yamamoto, NKK Corporation; R. Satoh, Ishikawajima-Harima Heavy Industries; T. Nagatsuka, Sumitomo Heavy Industries; T. Arii, Hitachi Zosen; T. Fuwa, Institute for Technical Research of Ships.

*"Seakeeping of Foil Catamarans"*
S. Falch, Kvaerner Batservice

*"Hybrid Hydrofoil Technology -- An Overview"*
J. R. Meyer, David Taylor Research Center

*"Structural Analysis and Design of Hydrofoils and Struts"*
T. Moan, Norwegian Institute of Technology; B. Skallerud and O. Skjastad, Sintef

*"Vertical Motions and Wave Loads of Large High Speed Ships with Hydrofoils"*
H. Ohtsubo and A. Kubota, University of Tokyo

*"Feasibility Study of a High Speed Hydrofoil Catamaran of Lesser Pitching"*
M. Nakato and H. Nobukawa, Hiroshima University; O. Matsumoto and Y. Osawa, Blue's Naval Design; M. Nisioka, University of Osaka; M. Tamashima, West Fluid Engineering Laboratory.

*"The Development of an Automatic Control System for a Submerged Hull and Foil Hybrid Super High Speed Liner"*
T. Itoko, S. Higashino, Y. Yamagami and T. Ikebuchi, Kawasaki Heavy Industries.

*"Rough Water Capabilities of Fully Submerged Hydrofoil Craft Jetfoil"*
Y. Saito, M. Oka, T. Ikebuchi and M. Asao, Kawasaki Heavy Industries.

*"The Development of a 50-Knot 40m FoilCat"*
J-H. Jorde, Kvaerner Fjellstrand.

*"Full Scale Experiments by the First Hydrofoil Catamaran Wingstar 12 Exceller"*
H. Kawaguchi, Setouchi Craft; H. Miyata and H. Yamato, University of Tokyo; T. Takai, Hitachi Zosen.

*"The Maximum Attenuation of Seaway Induced Motions, Within a Given Set of Design Constraints, Possible for Hydrofoil Support Ships"*
W. C. O'Neill.

*"The Prediction of the Hydrodynamic Performance of Hydrofoil Craft in Waves"*
F. van Walree, Marin; C. Buccini, Rodriquez Cantieri Navali; P. A. Genova, Societa di Elettronica per l'Automazione.

Among issues of hydrofoil interest discussed at the conference were the following as reprinted in the November 1991 issue of *"Fast Ferry International"*:

TECHNO-SUPERLINER

A progress report on Japan's Techno-Superliner research project was given by Kazuo Sugai and Masahiro Yamaguchi of the Technological Research Association of Techno-Superliner. The ultimate aim of

the programme is to develop, by the end of this decade, a vessel capable of carrying a payload of approximately 1,000 tonnes, operating at up to 50 knots in sea state 6, having a range of over 500 nautical miles and achieving a service reliability of 98% on routes around Japan and southeast Asia.

Currently being considered are the two hull forms that appear to be the most promising concepts: "One is a combination of fully submerged hydrofoils and a submerged hull which is supporting about half of the ship weight. This concept features superior seaworthiness. However, comparatively large engine power is necessary and poor stability needs to be improved.

"The other hull form concept is similar to the surface effect ship, although it has comparatively long and narrow dimensions and small control fins. This features superior powering performance. However, anxiety still remains about its comparatively poor seaworthiness. In particular, high level accelerations and flagellation of the seals."

TSL-F

The foil-assisted Techno-Superliner design, the TSL-F, was discussed in a paper contributed by representatives of six of the eight Japanese companies that have formed the Technological research association of Techno-Superliner.

To achieve the target performance, it is of major importance that "the vessel must avoid the influence of the sea surface. For this reason, the fully submerged buoyancy and dynamic lift obtained by the fully submerged foils were selected." The TSL-F concept comprises four hull components; a main hull, a fully submerged lower hull, fully submerged foils and struts.

Three configurations have been considered during the program: A displacement type which consists of a fully submerged hull and struts with control fins; a dynamic lift type which consists of fully submerged foils and struts; and one which is a hybrid type consisting of a fully submerged hull and foils and struts with a buoyancy/lift ratio of 50/50 as an example.

HYDROFOIL CATAMARAN

Details of a foil assisted catamaran project in Japan were given in a paper prepared by four representatives of Setouchi Craft, Hitachi Zosen and the University of Tokyo. These revealed that a hydrofoil catamaran research programme has been underway at the University of Tokyo for more than five years. To date, more than six models have been tested in towing tanks and last year four series of experiments were conducted using "Exceller," a 12m water-jet powered trials craft.

Now being developed by Hitachi are three Wingstar 22-35m hydrofoil catamaran ferries and currently being designed for these is "the most suitable ride control system."

Hitachi Zosen Wingstar hydrofoil catamaran ferry designs:

| | Wingstar 22a | Wingstar 30a | Wingstar 35a |
|---|---|---|---|
| Length overall | 22.0m | 30.5m | 35.5m |
| Beam overall | 6.6m | 8.6m | 10.6m |
| Depth | 3.0m | 4.4m | 5.1m |
| Draught | 2.0m | 2.8m | 3.2m |
| Passengers | 90 | 200 | 350 |
| Service Speed | 32 knots | 34 knots | 40 knots |
| Main diesels | 2 x 1,000 PS | 2 x 1,700 PS | 2 x 3,500 PS |

After reviewing these proceedings related to hydrofoils, your editor who has an interest in the future of hydrofoil research in the USA can't help but note the progress being reported from Japan. The manner in which Japan supports their R&D with the cooperation of industry and government can't help but be admired and envied. Again as the USA is dropping out of continued development of high speed surface craft, Japan is vigorously pursuing the future. Is this another example of where we are going to be left out of a technology area where we once had a substantial lead?

(continued, from page 2)

Surely, the Maritime Administration must be reorganized, but not by the subsidy club, as before.

In the meantime, Japan has secured a license to build the Boeing jet foil; Japan has constructed the high-speed SWATH vessel (United States patent), and will use a novel populsion system (United States patent). One of the hottest ship designs in America is the hydro-lance. Bob Price, the designer, has had to fight his way through the maritime bureaucracy for several years (with no help from the Maritime Administration) to develop a ship that is stable in 30-foot seas and can exceed 120 mph. Would you believe he has had to turn to Japan for financing?

It seems to me that United States shipbuilding and the Merchant Marine Academy want taxpayers to subsidize World War II ships, while the smart money is investing in the future.

GERALD O. RENNERTS
President, American Hydroliners
Flushing, Queens, Dec 20, 1991

## In MEMORIAM
## GUSTAV U. LILJEGREN

Word has been received that Gus Liljegren died 24 January 1992. Many of the old timers will remember Gus as a General Electric engineer who was involved with the gear design of the "Denison" and the "Plainview" (AGEH). After the AGEH was delivered to the Navy, Gus spent time at the U.S. Navy's Hydrofoil Ships Trial Center in Bremerton, Washington inspecting the main propulsion gear boxes.

He was born 30 January 1909 in Gothenberg, Sweden, moved with his family to Boliva in 1921, and came to the United States in 1924. He graduated from MIT and worked for General Electric as a gear engineer until his retirement in 1974. Since then, Mr. Liljegren remained active as a consultant to the U.S. Coast Guard, completing his last job less than a month before his death. He had lived in Bellevue, Washington, since 1964.

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Send articles and news of interest to us to be included in the NEWSLETTER.

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**INTERNATIONAL HYDROFOIL SOCIETY**
**P. O. Box 51**
**Cabin John, Maryland 20818 USA**

# THE NEWSLETTER

**INTERNATIONAL HYDROFOIL SOCIETY**
P. O. Box 51 • Cabin John, Maryland 20818 USA

Editor: Bob Johnston

**SUMMER 1992**

Production Editor: Patsy Jackson


## ANNOUNCEMENT

**23 October 1992**

**FALL DINNER AND MEETING**
Army Navy Country Club, Arlington, Virginia
*Williamsburg Room*
*6:00 PM Cash Bar - 7:00 PM Dinner - 8:25 PM Program*
$25.00 per person
Make reservations no later than October 19 if you plan to attend. Call one of the following:
Mark Bebar 703-697-9572; John Meyer 301-227-1796; Patsy Jackson 703-329-0102
PROGRAM: **"HISTORY Of PHM PROGRAM, PARTS I AND II"**
CAPT John W. King, USN (RET.) and Dr. James R. Wilkins, Jr.

## ***** WELCOME NEW MEMBERS *****

Don Burg, *Miami, Florida USA* - Works on advanced SES designs, including hydrofoil stabilizers on most advanced designs.

Giles Clark, *Benenden, Trent United Kingdom* - Editor of "Fast Ferry International" magazine.

Ken Spaulding, *Washington, D.C. USA* - Head of Advanced Vehicle Design Section, NAVSEA, for several years (up to September 1990).

Eiichi Kobayashi, *New York, NY USA* - Assistant in the research and development of a hydrofoil marine vehicle.

George R. Duclos, *Somerset, Massachusetts USA* - Shipyard owner.

Ken Kiehl, *Harrison, Ohio USA* - Kawasaki jetfoil, Phil Hurcus INCAT, Kawasaski patrol and new AMD-300.

Rob Rye, *Cincinnati, Ohio USA* - Gear box supplier for (Boeing) Kawasaki jetfoil.

Richard W. Loheed, II, *Lexington, Park, Maryland USA* - Employee of Maritime Dynamics, Inc.

J. William McFann, *Lexington Park, Maryland USA* - Employee of Maritime Dynamics, Inc.

Chris Pappas, *Lexington Park, Maryland USA* - Employee of Maritime Dynamics, Inc.

Dan Gore, *Lexington Park, Maryland USA* - Employee of Maritime Dynamics, Inc.

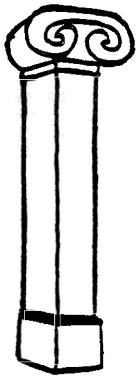
John D. Adams, *Lexington Park, Maryland USA* - Employee of Maritime Dynamics, Inc.

John Moss, *Cincinnati, Ohio USA* - Provides engines to shipyards for propulsion systems in high performance vessels such as foilborne and air cushion boats for GE Marine and Industrial Engines Dept.

Wayne A. Eveland, *Kent, Washington USA* - Manager for PHM Program ISEA and Technical Publications. Previously electronics technician, field service engineer, and field service representative for Boeing jetfoil and PHM programs.

Oliver L. Trumbauer, *Thousand Oaks, California USA* - Operating a consulting business for operations analysis and planning, marine propulsion. Previously product support manager, waterjet propulsion, Boeing jetfoil.

## THE PRESIDENT'S COLUMN



ONE of the major highlights in the Advanced Marine Vehicle community since the last Newsletter was the High Performance Marine Vehicle Conference in Washington, D.C. in June. IHS was well represented with 22 members attending. A "booth" was arranged in the Exhibit area to tell over 550 Conference attendees who we are. Many thanks to Bill Buckley for making these arrangements. We were fortunate to have a PHM model provided by the Carderock Division, Naval Surface Warfare Center to enhance our display.

Your Board, with the help of Wade Webster, is proud to announce that it has procured a Banner for the Society. The new Society logo is displayed on a yellow/gold background. This new Banner will be a significant addition to our future meetings and at future conferences.

Your IHS Board, in the name of the Society, spearheaded a Special Session at HPMV-92. Bob Johnston lead the discussion on the topic of "Hydrofoils - Where Do We Go From Here?" with the participation of about 30 attendees. Issues such as "Why Hydrofoils?", "What are Obstacles to Greater Hydrofoil Use?", "What are Potential Design Improvements?" and "How Can we Expand the Market for Hydrofoils?" were discussed. IHS plans to assemble and disseminate a summary of the discussions, comments and recommendations made during the Session. We feel that the IHS should take the lead on this topic and do everything within its charter to enhance hydrofoils and their utilization throughout the world.

We are most gratified in the success the Society has had recently in obtaining new members. We must continue this trend and each current member is asked to help in this regard.

At the latest Board meeting the possibility -- pros and cons -- of having an IHS 25th Anniversary Meeting and Technical Symposium in 1995 was discussed. With the many new hydrofoil projects or hydrofoil related designs "in the mill" throughout the world like Foil Cats, CATAFOIL, Hydrofoil Catamarans, Kawasaki's "Super Techno-Liner", and Rodriquez' fully-submerged hydrofoil MEC-1 and 3, 1995 should be ripe with exciting results.

John R. Meyer, *President*

### HAVE YOU PAID YOUR 1992 ANNUAL MEMBERSHIP DUES?

As of the end of July, all IHS memberS in good standing should have received their Membership Certificates. If you have not, perhaps you have not yet paid your 1992 dues. So please send your 1992 dues in before the 1993 dues are due, and we will get your Certificate off to you right away. Please send your $20 check made out to IHS to: CAPT John W. King, USN (Ret.), 4313 Granada Street, Alexandria, VA 22309 USA.

### THREE AGENCIES FOIL WOULD-BE SMUGGLERS

(From *The Miami Herald*, March 20, 1992, Sec. B, pg 1)

Cooperation among a U.S. Customs airplane, a Navy hydrofoil and a Coast Guard cutter led to the discovery of 800 pounds of cocaine and the arrest of three men aboard the Marathon lobster boat Bad Habits, authorities said Thursday.

Arrested March 6, the three men were indicted Wednesday by a federal grand jury in Key West. They are being held on $250,000 bail in the county jail in Key West.

CAPT Eugene Culmer, 24, of Marathon, and crewmates James Urban, 31, of Marathon, and Rubin Orlando Valdes, 31, of Miami, are charged with smuggling and attempting to sell 314 kilogram-sized packages of cocaine.

They were arrested just after midnight. A Customs radar tracking plane had followed another plane's route up to the Gulf of Mexico, apparently from Colombia, said Customs spokesman Michael Sheehan. The plane was seen dropping 12 large bales containing the drugs. Then the bales were picked up by the lobster boat about 180 miles northwest of Key West.

The Navy PHM hydrofoil USS ARIES intercepted the boat. The cocaine bales, which Sheehan said had been thrown overboard, were picked up by the Navy frigate Flatley and turned over to the Coast Guard cutter Sea Hawk.

The 43-foot lobster boat was also seized, said Steve Mocsary, a Customs group supervisor in Key West.

### BILL BUCKLEY RETIRES

William H. Buckley retired from the David Taylor Research Center in June after 21 years of government service. A party was held recently to celebrate this event at which time John Meyer presented him with an 18x24 picture of PHM-3. We all wish Bill the best of luck and good health in his retirement.

## CZECHOSLOVAKIAN OPERATIONS

*(As reported at the 8th International High Speed Surface Craft Conference -- )*

A rare insight into a fast ferry service in Eastern Europe was given by Miroslav Gerhàt of Ceskoslovenskà Plavba Dunajskà (CSPD). The company's first Soviet hydrofoils, three Raketas, were introduced in 1964 and its present fleet of 11 vessels operating on the River Danube includes a single Voskhod hydrofoil and five Meteor hydrofoils. The Voskhod and Meteor specifications are described under Russian Hydrofoils elsewhere in this issue of the Newsletter.

The hull, divided into seven watertight compartments, and superstructure of the Meteor are welded and/or riveted aluminum alloy, the foils and propeller shafts are high quality abrasion resistant steel, and the propellers are non-ferrous metal. As Miroslav Gerhàt pointed out, one advantage of the steel foils is that it is easy to repair damage resulting from debris impacts.

The Meteor is equipped with three saloons, seating a total of 116 passengers, plus a bar and toilets. The M400 12V diesels, having a rated output of 740 kW at 1,700 rpm or maximum output of 810 kW at 1,800 rpm, each drive a fixed-pitch five-bladed 710mm propeller, one of them right-handed and the other left-handed.

Average fuel consumption in litres per hour for each hydrofoil during 1991 was 169 for *Meteor I Kosice*, 233 for *Meteor II Trnava*, 202 for *Meteor III Myjava*, 222 for *Meteor IV Modra*, 252 for *Meteor V Bratislava* and 111 for *Voschod II Piest'any*.

CSPD's hydrofoils are operated from Bratislava to Budapest and Vienna, and from Komarno to Budapest via Sturovo. The vessels are also available for charter. Journey times are 1 hour 15 minutes for the 60 kilometres from Bratislava to Vienna or one hour for the return trip, and 3 hours 30 minutes for the 222 kilometres from Bratislava to Budapest or 4 hours 15 minutes for the return trip. The most popular route is Bratislava-Vienna, during the 1991 season. This attracted 48,698 passengers.

## JETFOIL OPERATION

Also at the 8th International High Speed Surface Craft Conference, another foilborne operation was considered by Mr. T. Yagi of Kawasaki Heavy Industries in his paper "The marine transportation system between Kobe City and Kansai international airport utilising the high speed passenger ship Jetfoil."

The new international airport at Kansai, 5km off the coast of the Senshu region in Osaka Bay, is due to be completed in 1994 and will be Japan's first airport to be open for 24 hours per day. Consequently, the airport developers have been seeking to open up access routes by sea from Kobe, Awajishima and Shikoku, to run alongside road and rail access. Particularly as these routes potentially offer great benefits in terms of punctuality and speed. Initial investigations into the operation between Kobe and the airport have looked at operating a Jetfoil on the route.

## CATAMARAN ADOPTS FOILS

Condor 9, the Incat 49m wavepiercing catamaran built by Aluminum Shipbuilders that operates on the western end of the English Channel between St. Malo, Jersey, Guernsey, and Weymouth, was withdrawn in August of 1990 after only three days in service. Condor's managing director, David Norman, says that the decision to withdraw the vessel was taken because of problems experienced with ride quality, parts of the structure, and water ingress.

To improve the ride quality, Maritime Dynamics, Inc. (MDI) developed a fin-based ride control system. The system consists of a microprocessor-based controller that measures the vessel's motions and commands six hydraulically acutated fins to reduce wave-induced pitch, roll, and heave motions. There are four bow fins that are mounted inboard and outboard on each hull and two stern fins that are mounted inboard on each hull. In 1991, after the ride control system was installed, motion sickness was significantly reduced and the vessel successfully completed its first season of service in November. It carried significantly more passengers than the original market projections.

After further tests in February of 1992 with a wave height measurement of 2.4 meters, the motion control system reduced the vessel's pitch and roll motions by approximately 50 percent.

Maritime Dynamics has now entered a joint marketing agreement with the Hydraulic Power Division of Vosper Thornycroft (VT) which covers motion control systems for catamarans and SWATH vessels. MDI provides computer simulations of ship motions and ride quality to establish fin configurations and arrangements and to define control system performance. For each system, MDI supplies the controller hardware and software, and VT supplies all other components including the fins, fin actuation mechanisms, and hydraulic power packages.

*Submitted by John Adams, MDI*

## HYUNDAI BUILDING FOIL ASSISTED CATAMARAN

Hyundai Heavy Industrties has confirmed that it is planning to launch a 45.5m foil assisted catamaran in May 1992. The vessel is scheduled to enter service three months later. Neither the Korean operator or route have yet been revealed.

The design is the result of an inquiry received by Hyundai last year from an operator looking for a fast ferry capable of carrying over 300 passengers on a 350-nautical mile route.

Having concluded that no suitable vessel existed anywhere in the world, the company initiated a research and development programme in August 1991. Due to the time constraints of the contract, most of the design work had to be completed by the end of 1991 and all of the model tests, several hundred of them, during the first four months of this year.

Not surprisingly, Hyundai feels that the key is how to improve seakeeping capability, for the comfort of both passengers and crew, on the unusually long route while maintaining high speed. Consequently, "a great effort has been made to significantly improve seakeeping quality in high seas even if resistance properties are somewhat sacrificed."

One response has been to adopt the foil ride control system. Drawings of the design reveal that fully submerged foils will be fitted fore and aft, the latter incorporating a rear flap.

The vessel will be a displacement hull form catamaran having a length overall of 45.5m, beam of 11.4m, depth of 5.1m and design draught of 1.6m. With a pair of PaxmanValenta 18RP 200CM diesels, rated at 4,105 bhp at 1,540 rpm, and waterjets installed, the range at a service speed of 35 knots is expected to be 700 nautical miles. Classification will be Det norske Veritas + 1A1 R170 EO HSLC Passenger Catamaran.

Two saloons will be equipped for a total of 300 passengers. On the main deck there will be two twin berth cabins and one nine berth cabin forward plus a toilet, storeroom and luggage stowage areas: 208 seats in a basic 3-4-4-4 configuration; and four toilets aft, grouped around the stairs to the upper deck, plus two more luggage areas and a cafeteria.

The upper deck will have crew quarters behind the wheelhouse; a passenger saloon with 92 seats in a 3-4-3 configuration plus two toilets and luggage areas aft, and air conditioning rooms port and starboard. A row of liferaftswill be located on the upper deck along both sides of the superstructure.

## TORONTO / ST. CATHARINES STUDY POSSIBLE HIGH-SPEED FERRY

*(from "Maritime Reporter," April 1992)*

A joint study involving the Toronto Harbour Commission (THC) recently revealed that a high-speed ferry service between St. Catharines and Toronto is economically feasible.

During the summer of 1980, a regularly scheduled hydrofoil service operated between Niagara-on-the-Lake and downtown Toronto on Lake Ontario. The service was popular with shoppers and tourists, but was discontinued when the out-of-country owners/operators were refused a Canadian business license.

In November 1990, Wavetrain Inc., a Canadian corporation, entered into an agreement with the Ontario Ministry of Transportation to investigate the viability of a high-speed ferry service for commuters from one or more ports on Lake Ontario to downtown Toronto. Based on the analysis conducted by the various consultants, the conclusions of the study include: there are several harbors that could accommodate ferry service; the Lakeshore West corridor (Hamilton-downtown Toronto) offers the best opportunity for a high-speed ferry providing commuter service; a cross-lake high-speed ferry service could be viable if sufficient numbers of Toronto commuters move to St. Catharines or if the non-commuter market such as tourists, shoppers and occasional users is captured; and the idea of a high-speed ferry to downtown Toronto was favorably received by current commuters, particularly those residing in the St. Catharines area.

### CONFERENCE PAPERS AVAILABLE

The 8th International High Speed Surface Craft Conference papers, totalling 500 pages, are available from Fast Ferry International, 69 Kings Road, Kingston upon Thames, Surrey KT2 5JB, United Kingdom. The cost, including postage and packing, is £105 for addresses elsewhere. Please make cheques payable to High Speed Surface Craft. Alternatively, payment may be made by Access, Visa, Mastercard or Eurocard credit cards. Please allow 4-8 weeks for delivery. Further details from Fast Ferry International, Tel: +44 81 549 1077, Fax +44 81 547 2893.

# EDITORIAL

*CAPT Robert J. Johnston, USNR (Ret.)*

Recently your editor was asked by the American Society of Naval Engineers to provide a statement of advice and counsel on the maintenance of a naval engineering capability in the United States. Major cutbacks in shipbuilding programs and dramatic reductions in the defense budget loom before us. Numerous proposals and strategies are being floated from the Department of Defense, Congress, Academia study groups, and industry. While it is not clear where this will lead, the profession of naval engineering is surely in jeopardy without some alteration. My response to that request follows:

**Future Naval Engineers and Naval Architects:** In any profession the future rests with the people involved and their successors. Here is where we have a major problem. Our people technology base has seriously eroded and a further decline is predictable. It is my understanding that last year the U.S. graduated less than 50 naval architects. Most other maritime nations are out-educating us in the marine field. For example, when I visited China a few years ago, I spent time at three different schools of Naval Architecture, schools in Beijing, Wuhan, and Shanghai. They were graduating over 1000 students with an expectation that 10% of those graduating would pursue advance degrees. Their national goals were very clearly expressed, "China would dominate the future shipbuilding industry of the world." They were enticing these students by supporting and offering future technical opportunities. We must do the same in this country as a matter of national policy.

**Research and Development:** The attitudes and policies of how to support R&D in the U.S. must be changed. Often in the U.S. there is an adversary role between government and industry. Other maritime nations work with an entirely different attitude. Theirs is one of complete cooperation during this phase of technology development. This I have observed in Germany and Japan. A team is formed consisting of government and industry personnel and a particular concept is jointly pursued and funded.

I recently reviewed a series of papers presented at the *FAST 91* conference in Trondheim, Norway sponsored by the Norwegian Institute of Technology. This conference was on the subject of high speed ships, a subject dear to my heart. The nation with the most papers was Japan. To demonstrate this national cooperative effort, I'll site a few of the subjects and the authors sponsoring organizations.

"*A Submerged Hull and Foil Hybrid Super High Speed Liner.*" Authors were from Kawasaki Heavy Industries, NKK Corporation, Ishikawajima-Heavy Industries, Sumitomo Heavy Industries, Hitachi zosen, and Institute for Technical Research of Ships.

"*A Concept Design Study of Techno-Superliner.*" Authors were from Mitsui Engineering and Shipbuilding, Nagasaki Shipyard, and Mitsuibishi Heavy Industries.

"*Research of Hydrodynamic Aspects of Techno-Superliner A.*" Authors were from Akishima Laboratory, Mitsui Engineering and Shipbuilding, and Mitsubishi Heavy Industries.

"*Hydrodynamic Design of Fast Ferries by the Concept of Super Slender Twin Hulls.*" Authors were from Ishikawajima-Harima Heavy Industries and University of Tokyo.

Japan is into all types of advanced research and development for fast ships. Ships up to 1,000 tons of payload, with speed of 50 knots in sea state 6, ranges over 500NM, and a reliability factor of 98% are under consideration. What is the U.S. doing with the technical lead we had in this field just a few years ago. A national policy to support advanced ship concepts would do much to keep our country's technology base alive.

**Warship Design and Construction:** The shipbuilding in the United States could be headed for the hiatus of the 1920s where our technical skills in this field reached a very low ebb. The importance of maintaining skills in this area must be sold to our nation. There will be another Saddam Hussein who if

he thinks he can dominate a part of the world without getting hurt will result in another Gulf War. We need at all times to have on board and under construction an advanced submarine, aircraft carrier and surface ship with newly developed, integrated combat systems. The U.S. cannot afford to do otherwise.

**Merchant Marine:** The U.S. has neglected this field for so long it is pathetic. To visit ports in Florida and see the myriads of cruise ships leaving and entering without one U.S. flag among them is the result of national policy. That the U.S. became a very second-rate maritime nation in my lifetime is deplorable. The U.S., as a nation, cannot afford to be without the design and construction of at least one sophisticated merchant ship on each coast. Such ships should be readily convertible to military application in times of national emergency.

I wish you well in bringing the prestige of the American Society of Naval Engineers before the policy makers and shakers to stress the concern of losing naval engineering capability in the U.S. This is another opportunity for the U.S. not to miss the boat!

## SPRING MEETING AND DINNER

On April 30th the International Hydrofoil Society held its annual meeting and dinner at the Army-Navy Country Club in Arlington, Virginia. A good turnout of hydrofoilers were present for the occasion. The evening was marked by the accomplishment of one of the goals of the founders in providing the opportunity to meet old friends and enjoy an occasion of comradery.

**PRESIDENT'S REPORT:** President John Meyer presented a report on the year's activities of our Society. This has been a most active year with the Board of Directors meeting once a month. Highlights of the year were the Fall meeting and dinner held in October and the participation in the Inter-Society High Performance Marine Vehicle Conference and Exhibition. Membership was increased by the addition of 12 new members. This set a new increase record and all were encouraged to do even better next year by encouraging prospective members to sign up. The IHS brochure which defines what our organization is all about is ready for distribution. A new certificate of membership along with a forwarding letter will be mailed in the near future to all members in good standing (dues paid). John King reported that the Society was on a sound financial standing but that dues for 1992-93 were slow in coming in. *(Are your dues paid?)* At the conclusion of John Meyer's report, the members gave him a rousing ovation in appreciation of his outstanding year of effort.

**TECHNICAL PROGRAM:** William C. O'Neill (Bill) gave a very interesting presentation of the development of the Norwegian Foilcats by Kvaerner Fjellstrand and Westamarin. The information had to be carefully restricted by virtue of the proprietary nature of the two companies' efforts and Bill being a consultant to both. In spite of this restriction, the talk was most informative and gave a good insight into the status of their efforts and the expected characteristics of these two craft.

KVAERNER FJELLSTRAND FOILCAT DEVELOPMENT MILESTONES

| | |
|---|---|
| 1985 - 1986 | One-fifth scale model without control system |
| 1987 | One-twelfth sscale model with changes from earlier model |
| | Hull Shape |
| | Foils Fitted on Struts |
| | Forward Foil Split in Two |
| | Decided that full-scale craft would need a control system |
| 1989 | One-quarter scale model built |
| | Control surfaces on all foils |
| | Successful testing in waves and convinced of smooth ride |
| | In late 1989 started design work on full-scale foilcat |
| 1991 | Testing Started |

KVAERNER FJELLSTRAND FOILCAT CHARACTERISTICS

| | | | |
|---|---|---|---|
| Length overall | 40.55 | Passengers | 414 |
| Breadth | 12.00m | Service speed | |
| Depth | 4.20m | - 36.5 tonnes load | 50 knots |
| Loaded draught | | Range | |
| - Minimum foilborne | 2.0m | - 50 knots | 300 n miles |
| - Maximun hullborne | 4.00m | Engines | 2 x GM LM500 |
| Tonnage | 470 grt | | |
| Capacities | | | |
| - Fuel | 2 x 7,000 liters | | |
| - Fresh water | 1,500 liters | | |
| - Bilge water | 1,000 liters | | |
| - Sewage | 1,500 liters | | |

WESTAMARIN FOILCAT 2900 CHARACTERISTICS

| | |
|---|---|
| Displacement | 115 tons |
| Length | 29.25 m |
| Beam | 8.36 m |
| Draft | 1.0 m (FB), 3.7 m (HB) |
| Speed in calm water | 50 knot goal |
| Propulsion | 2 - 2000 KW MTU Diesels<br>2 Propellers |
| Passengers | 140 |

Following Bill O'Neill's talk and resulting discussions, and with the evening getting late, John Meyer wrapped up the technical program by reviewing Japan's Techno-Superliner project. The goals of this project are a sea capable ship with a speed of 50 knots, a payload of 1000 metric tons a range of over 500 miles, sea-worthiness in sea state 6, and a reliability factor of 98%. John discussed the Techno-Superliner TSL-F, a hybrid ship with a submerged hull and a fully submerged foil system. He also presented information on the other design under consideration, the Techno-Superliner TSL-A. This superliner has the characteristics of a Surface Effect Ship assisted with foils. The principal dimensions of this ship are a displacement of 3,000 tons, a length of 127 meters, a beam of 27 meters and an overall height of 11 meters. It is contemplated that an air ride control system will be augmented by a foil control system.

## RUSSIAN HYDROFOILS

For some time information has been available on the characteristics of Russian built and exported hydrofoils. However, the scope of their effort was generally not available. Most tabulations of the world's numbers of hydrofoils left blank the extent of the Russian effort. Recently "Fast Ferry International" and "Janes" have obtained information on the production types and numbers of past and present Soviet hydrofoils. The following information is derived from those sources.

### HISTORY

Fast ferry development in the USSR is concentrated at the Research and Production Corporation Central Hydrofoil Design Bureau. This was founded in 1955 by Rostislav E. Alexeyev, the hydrofoil pioneer who died in 1980. During the late 1940s, he had started work on the concept of shallow submerged hydrofoils and the first result was the 66 seat Raketa river ferry. Approximately 500 Raketas were built before production ceased and Sudoexport reports that some of the earliest vessels remain in service more than 30 years after they were delivered.

The Raketa was followed by the Meteor river hydrofoil, which is still in series production: the 260 seat Sputnik, which remains one of the largest hydrofoils ever built; and the Kometa coastal hydrofoil. During the 1960s, the Bureau also developed two waterjet powered vessels, the 30-seat Chaika and 150 seat Burevestnik. The larger craft was fitted with gas turbines, giving it a maximum speed of 54 knots, the highest to date for a passenger hydrofoil design. Smaller rivers were also opened up for high speed navigation by the appearance of shallow draught Raketa-M and Belarus vessels.

In recent years, seven new designs have been developed. Three, the 53 seat Polesye, 70 seat Voskhod and 70 seat Lastochka, are rivercraft. The other four, the 140 seat Kolkhida and Albatros and 250 seat Cyclone and Olympia, are coastal or seagoing hydrofoils.

Over the years, a series of hydrofoil boats has also been produced. The first, Volga, appeared in 1957.

Total production since 1955, is approximately 1,100 hydrofoil ferries plus more than 6,000 hydrofoil boats. Some 200 of the ferries and 700 of the boats have now been exported to 31 countries.

Over 100 of the ferries are operating in European countries. More than half of these are Kometas and a fifth are Kolkhidas. The remainder comprise Meteors, Voschods and a single Raketa.

## RIVER HYDROFOILS

The latest shallow water hydrofoil design to enter series production is the Polesye. This is able to navigate in the upper reaches of major rivers, in river tributaries and on freshwater reservoir having water depths of at least 1.15m.

The vessel can operate foilborne in waves up to 0.5m high or hullborne in waves up to 1.2m high. Maximum time to foilborne operation is 90 seconds. At service speed, its turning circle is 100-150m and an emergency stop can be completed in 5-6 craft lengths.

The newest river hydrofoil produced is the Lastochka, the first exmple of which has now been built and tested. Full details have yet to be released but the vessel offers a significantly higher service speed than previous designs plus control flaps on the bow foil for a smoother ride.

River Hydrofoil Specifications

| | Polesye | Lastochka |
|---|---|---|
| Length overall | 21.32m | 29.0 |
| Beam overall | 5.00m | 7.2m |
| Hull width | 3.60m | 4.4m |
| Maximum draught foilborne | 0.40m | 1.2m |
| Maximum draught hullborne | 1.03m | 2.4m |
| Displacement lightship | 14.2 tonnes | 28.0 tonnes |
| Displacement full load | 20.4 tonnes | 37.3 tonnes |
| Passengers | 53 | 70 |
| Crew | 2 | 3 |
| Speed foilborne | 35 knots | 48 knots |
| Speed hullborne | 4 knots | 13 knots |
| Range foilborne | 215 n miles | 270 n miles |
| Mximum foilborne waveheight | 0.50m | 1.3m - 1.5m |
| Main engines | 1 x M401 12V | -- |
| - Maximum rating | 1 x 810 kW at 1,600 rpm | 2 x 994 kW |
| - Service rating | 1 x 736 kW at 1,550 rpm | 2 x 846 kW |

## COASTAL HYDROFOILS

The Meteor and Kolkhida, which have been well documented in the past, are being joined in increasing numbers by Voskhod-2. The first vessels to be exported entered service in Hungary and Czechoslovakia over 10 years ago and three more were delivered to Hungary during 1986-87. This year, two have been completed for Canadian Lake Express, a Soviet-Canadian joint venture.

The hull of Voskhod-2, which is divided into eight watertight compartments, is of welded construction and the superstructure is riveted with contact spot welding and adhesive bonding. The material for both the hull and superstructure is aluminum-magnesiuum alloy.

The foil system comprises a main foil fore and aft, midship foil, stabilizer behind the bow foil, struts and brackets securing the foils to the hull. The main foils are stainless steel, the remainder is aluminum-magnesium alloy.

Voskhod-2 is designed to continue operating on foil in waves up to 1.5m high and hullborne in waves up to 2.0m high. A single M401 12V four stroke turbocharged diesel drives a propeller via a reduction gearbox. Sudoexport claims that the service life of the engine to first overhaul is 3,000 hours.

Presently being designed is another hydrofoil, Onyx, for river and coastal routes Again, few details have yet been revealed but the vessel will be powered by a single MTU 12V 396 TB83 diesel.

## SEAGOING HYDROFOILS

A far more ambitious hydrofoil project was the twin deck Cyclone, a gas turbine powered vessel that entered experimental service between Yalta and Odessa with the Black Sea Shipping Company in 1987. This was designed for routes up to 110 miles from a port of refuge and to continue operating on foil in waves up to 3.5m high.

However, another design able to carry the same number of passngers and having an identical range, albeit at a slightly lower service speed, has entered batch production. Known as Olympia, the first two vessels were scheduled to be completed by the end of 1991 or the beginning of 1992.

From 1993 onwards, the Olympia 2000 should be available for delivery. This will be produced in three versions: a 250-seat single deck ferry powered by either diesels or gas turbines and a 300 seat twin deck ferry powered by gas turbines.

Reports are that several other preliminary hydrofoil ferry projects are presently underway which feature "deep depth foils based on vessels in service."

## COASTAL AND SEAGOING HYDROFOIL SPECIFICATIONS

| | Voskhod-2 | Onyx | Kolkhida | Meteor | Olympia | Cyclone |
|---|---|---|---|---|---|---|
| Length overall | 27.6m | 30.0m | 34.5m | 34.60m | 42.55m | 44.2m |
| Beam overall | 6.4m | 6.3m | 10.3m | 9.50m | 14.00m | 12.6m |
| Hull width | 4.4m | -- | 5.8m | -- | 8.30m | 7.3m |
| Maximum draught | | | | | | |
| -Foilborne | 1.5m | 1.1m | 1.9m | 1.20m | 2.00m | 2.4m |
| -Hullborne | 2.0m | 2.1m | 3.5m | 2.35m | 4.60m | 4.3m |
| Displacement | | | | | | |
| - Lightship (tonnes) | 20.0t | -- | 56 t | 36.4 t | -- | 106 t |
| - Full load | 28.4 t | -- | 72 t | 53.4 t | 135 t | 143 t |
| Passengers | 71 | 71 | 150 | 116 | 250-300 | 250 |
| Crew | 3 | -- | 5 | 5 | 6 | 7 |
| Speed | | | | | | |
| - Foilborne | 32 knots | 32 knots | 34 knots | 35 knots | 37 knots | 43 knots |
| - Hullborne | -- | -- | 10-12 knots | -- | 10-12 knots | 7 knots |
| Range | | | | | | |
| - Foilborne | 270 nm | 250 nm | 150 nm | 320 nm | 300 nm | 300 nm |
| Max waveheight | | | | | | |
| - Foilborne | 1.3 m | -- | 2.0m-2.2m | -- | -- | 3.5m |
| Main engines | 1xM401 12V | 1xMTU 12V 396 TB83 | 2xMTU 12V 396 TC82 | 2xM401A 12V | -- | -- |
| - Max rating | 1x810 kW | -- | 2x1,050kW | 2x810kW | | 1x5,150kW |

## HYDROFOIL BOATS

Smaller hydrofoils also continue to be built and production has recently started of the Murena, Dolphin 5,. Dolphin 6 and Pastoral designs. One unusual feature of Murena, for a Soviet design, is that it is built in grp. Three versions are available equipped for five, six or ten people.

A choice of engines is also offered,either a single 210 hp or twin 150 hp Johnson Sea Drives. The cockpit, mast and access points are all concentrated aft.

The major difference between the Dolphin 5 and Dolphin 6 is capacity. The Dolphin 5 is an eight seater, the Dolphin 6 is a five seater. Both are designed for pleasure, water skiing, business or water taxi uses.

The Pastoral is relatively large by hydrofoil boat standards, being almost twice as long as the other new designs and incorporating a superstructure. There are currently three under construction.

The vessel, also makes use of plastic technology originally developed for the Buran space shuttle. Versions being offered include a yacht with cabins for 5-6 people, special purpose workboats and a 20-seat taxi. With twin diesels and surface peircing propellers installed, a maximum speed of 37 knots is expected. Another variant being considered would be equipped with gas turbine power, increasing speed to an anticipated 48 knots.

Hydrofoil Boat Specifications

| | Murena | Dolphin 5/6 | Pastoral |
|---|---|---|---|
| Length overall | 9.30m | 9.75m | 18.0m |
| Beam overall | 3.40m | 2.50m | 5.0m |
| Draught foilborne | -- | 0.50m | 0.5m |
| Draught hullborne | -- | 1.00m | 1.5m |
| Displacement full load | -- | 2.9 tonnes | 18.2 tonnes |
| Passengers | 5-10 | 5-8 | 20 |
| Speed -- | | 32 knots | 37-48 knots |
| Range -- | | 200 nm | -- |
| Engine | 1x210 hp or 2x150 hp | 1x150hp | 2xdiesel or gas turbine |

# HPMV-92 A BIG SUCCESS

The Intersociety High Performance Marine Vehicle Conference and Exhibit (HPMV-92) attracted a large gathering of participants and attendees. There were 560 registrants and 60 papers from 16 countries. 290 registrants and guests boarded the *"Potomac Spirit"* on Saturday morning to watch demonstrations of the U.S. Navy's SES 200, two U.S. Navy's LCACs, the U.S. Army's LACV30kk and a recreational ACV. The Conference and Exhibition were held at the Ritz-Carlton Hotel from June 24th through June 27th, 1992. This wide display of interest in the conference subject, indicates the worldwide importance of HPMVs.

The sponsor of HPMV-92 was the Flagship Section of the American Society of Naval Engineers. 13 Societies and U.S. Government organizations co-sponsored the conference. IHS was proud to be among the co-sponsors. Papers and discussions were presented on hydrofoils, air cushion vehicles, surface effect ships, multi-hull craft, wingships, planing craft and related research and analysis. A great deal of credit goes to the individuals who were organizers, particularly IHS's Bill Ellsworth who was a co-chairman of the technical program. Bill was also the session organizer for the plenary session and our IHS President, John Meyer was the organizer for the hydrofoil sessions.

From the opening Plenary session to the last of 16 technical sessions, the papers and discussions were meaningful and lively. The plenary sesison included talks by John J. Kelly, President of Textron Marine Systems on *"An Industry Perspective,"* RADM M. Kinnon III, USN (RET) ON *"HPMV: A Military Perspective"* and LTGEN Walter E. Boomer, USMC gave the keynote address. The first technical session presented an overview of the status of development of the various HPMVs. Bill Ellsworth was the moderator for this session and Jim Wilkins (IHS) presented the hydrofoil overview which was co-authored by John Meyer, Mike Terry (IHS) co-authored *"Hydroaviation,"* a paper on Wingships. Jim Wilkins, John Meyer, Mike Terry and George Jenkins, all members of IHS, were moderators or assistant moderators of various sessions.

On the evening of June 24th, a well-attended Panel Discussion was held on the topic, "What are the obstacles that impede wider utilization of high performance marine vehicles and what steps can be taken to reduce or eliminate such obstacles?". The moderator of the panel was Mr. John J. Kelly. The panel consisted of Hon. Gerald A. Cann, Asst. Secretary of the Navy; Mr. Richard W. Thorpe, Vice President, Shipbuilders of America; Mr. Giles Clark, co-editor of Fast Ferry International; and CAPT Robert J. Johnston, USNR (Ret), IHS and Marine Consultant. Not many problems of the world were solved, but many interesting viewpoints of the subject were presented and discussed by the panelists and members of the audience who kept the panel on the hotseat well into the evening.

To wrap up the hydrofoil aspect of the conference, a special session was sponsored by IHS on the subject "Hydrofoils -- Where do we go from here?". The discussion leader was Bob Johnston and brought a good group of interested hydrofoilers together. Subjects from recreation hydrofoils to large ocean transporter hybrids were discussed. Kawasaki's T. Yagi gave us a review of their current hydrofoil effort and Dott. Ing. C. Buccini of Rodriquez Cantieri Navali showed pictures of their future and current hydrofoils.

As you can see from the foregoing, IHS was well represented by active participants at the conference. In addition IHS had a display booth at the Exhibit part of HPMV-92, thanks to the good efforts of Bill Buckley. So a big thank you comes from all the membership of our Society to those who helped make HPMV-92 such a noteworthy event.

Hydrofoil papers presented at the conference were as follows:

- *"Hydrofoil Development and Applications,"* by John R. Meyer and Dr. James R. Wilkins, Jr.
- *"Recent PHM Operational Experience,"* by L. J. Jackson
- *"JETFOIL Operational Experience in Japan,"* by T. Yagi, Y. Saito, T. Ikebuchi, and M. Asao.
- *"Hybrid Hydrofoil Technology Applications,"* by John R. Meyer.
- *"Numerical Simulation of Some Maneuverability Characteristics for a Surface Piercing Hydrofoil Craft,"* by Igor Prislin (Yugoslavia).
- *"An Estimation Method of the Motions in Waves for a Submerged Hull and Foil Hybrid High-Speed Ship,"* by Y. Yamagami, T. Ikebuchi, Y. Saito, and T. Itoko (Japan).
- *"Hydro-Numeric HYSWAS Design,"* by Volker Bertram and Ernst Mohr (Germany).
- *"Offshore Mini-Bases for Small Naval Combatants,"* by RADM M. D. Van Orden, USN (Ret) and Dr. Roy D. Gaul.

Anyone intersted in the Proceedings of the Conference should contact ASNE, 1452 Duke Street, Alexandria, VA 22314 USA.

# THE NEWSLETTER

## INTERNATIONAL HYDROFOIL SOCIETY

Post Office Box 51, Cabin John, Maryland 20818, USA

Editor: Robert J. Johnston | **FALL 1992** | Co-Editor: John R. Meyer


**IN THIS ISSUE.....**



### *A TRIBUTE TO CARLO RODRIQUEZ*

*The International Hydrofoil Society has learned of the death of Carlo Rodriquez this past Spring. Carlo was one of the true pioneers in bringing commercial hydrofoils into existence. His efforts in this field began in the early 1950s in Messina, Italy and have impacted upon the rest of the world. Today over 200 hydrofoils bearing his name are in operation.*

*Carlo's son, Leopoldo, took over as the business head of the family's interests. With great pride Carlo supported his son's success as he turned the shipyard interest into a conglomerate. As of now, the Rodriquez family has only a minor interest in Rodriquez Cantieri Navali, but the hydrofoil world will always remember what Carlo Rodriquez accomplished.*

*As a life member of the IHS, we salute the great life of Caballero de Lavore Carlo Rodriquez, a title awarded him by the Italian government making him a Knight for his contributions to Italy. The world has lost a true entrepreneur, the IHS has lost one of its founding members, and I have lost a great friend. All of us at IHS send our sincere condolences to the Rodriquez family.*

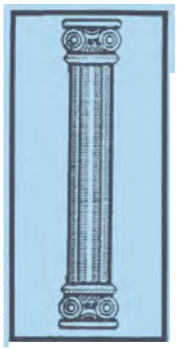
*Robert J. Johnston*

******* DUES REMINDER *******

ALL IHS MEMBERS IN GOOD STANDING SHOULD HAVE RECEIVED THEIR MEMBERSHIP CERTIFICATE. IF YOU HAVE NOT, PERHAPS YOU HAVE NOT YET PAID YOUR 1992 DUES.

Please send your $20.00 check made out to IHS to:

CAPT. John W. King, USN (Ret.)
4313 Granada Street
Alexandria, VA 22309 USA



## THE PRESIDENT'S COLUMN

In a letter to me several months ago, Bob Johnston recommended that someone in the D.C. area take over the editorship of the Newsletter. I brought this up at several Board meetings, but received no "takers". So, Bob, I guess you will continue to be the Editor. However, I volunteered to be Co-Editor, and asked all the Board members to participate in helping to put the Newsletter together. If any of the members at large would like to take over the Editorship, please let Bob know.

One of the more exciting and potentially promising developments for High Performance Marine Vehicles in general, and hydrofoils in particular, in the U.S. is the relatively recent Intermodal Surface Transportation Efficiency Act of 1991, described elsewhere in this issue of the Newsletter.

I have talked to Capt. James Carman of MARAD who is an aid for Ports and Intermodal Transportation. He informed me that the former UMTA is now the Federal Transit Administration (Mr. Bryan Climer is the "administrator"). I recalled the AMSA study of 1984, but he did not seem to be familiar with it. CAPT Carman said that any study of this kind now would require working with the local planning group where an advanced vehicle fast ferry operation may be a component of the Intermodal System. Each major metropolitan area has to generate an Intermodal Planning document which then gets integrated into a State Plan by 1996. He was very encouraging regarding the incorporation of high speed passenger ferries in intermodal transportation planning. He recommended that we start with FTA to find out what is happening. Your Board is taking some initial, non-committal steps by examining the legislation, making contacts and gathering additional information. We would appreciate any information IHS membership may have on this program.

In the Summer Newsletter I mentioned that the Board is considering the possibility - pros and cons - of having an IHS 25th Anniversary Meeting and Technical Symposium in 1995. At the October Board meeting it was agreed that the IHS should not compete with other, larger technical meetings. We anticipate that there will be an HPMV Conference in 1995, similar to HPMV-92, in which we will participate. In that case, we plan to have a special social gathering of IHS members sometime during such a conference.

The Human Powered Watercraft Saga continues in this issue. Your editor would still like to know if any members have some information about other Human Powered watercraft, particularly hydrofoils, that may be contenders for the "20-knot Grand Prize".

Although we are pleased with the success of our "new-member" drive this year, dues from about half of our current members have not been forthcoming. We are looking forward to both re-instating our "lost Sheep" and expanding IHS membership. Each member should therefore encourage his colleagues to join the Society. All current members who have not paid their dues are encouraged to do so to retain their "member-in-good-standing" status.

*John R. Meyer, President*

## FALL DINNER MEETING

The Fall Dinner Meeting held at the Army-Navy Country Club on 23 October was well attended with 26 members and guests. The evening was highlighted by a "double-header" pitched by John King and Jim Wilkins on the topic of PHM History, Parts I and II.

Today's PHM had it origin in the late 1960's in a NATO group known as the Fast Patrol Boat Conference. This was a branch of the NATO Naval Armaments Group and consisted mainly of Fast Patrol Boat operators and shipbuilders in the Navies employing these craft. The sinking of the Israeli destroyer ELATH by an Egyptian FPB armed with STYX missiles was of great concern in NATO and the FPB Conference was one of many NATO groups looking into the matter.

I should explain that the NATO Naval Armaments Group's Information Exchange Group 6 - Ship Design- had as its primary objective the exchange of information on shipbuilding and armaments that could lead to a cooperative shipbuilding program among NATO nations. Although there have been several attempts, this goal has never been achieved to this date. However, the NATO PHM became the closest, in that a cooperative standard design package was accomplished.

This was how matters stood when Adm Zumwalt became the CNO in July of 1970. Early in his administration, Adm Zumwalt issued a number of policy questions to his OPNAV staff in the form of very structured and concise papers called "Green Stripes". One of these fell my lot to answer as OP-723B. Adm Zumwalt essentially asked whether the hydrofoil or the Surface Effect Ship was better to counter the OSA/KOMAR threat in the Med. The answer was easy. Hydrofoil technology had a solid base, the two 100 ton SES test craft had yet to be finished and their evaluation was years behind the hydrofoil. I also mentioned that the new NATO Exploratory Group was studying the same subject, but was foundering because of a lack of U.S. Navy committment.

Adm Zumwalt's response was immediate: "GO FOR". This meant that that we could confirm a U.S. committment into the NATO forum. The result was nothing short of electric. Canada, Denmark, France, Germany, Italy, the Netherlands, Norway and the United Kingdom joined us in pursuing a common hydrofoil design.

Adm Zumwalt approved Larry Kelley's proposal to demonstrate our hydrofoil technology by deploying TUCUMCARI incompany with the LST WOOD COUNTY to Northern Europe and the Mediterranean. This venture was a great success as most every CNO counterpart in NATO got to fly in TUCUMCARI and most came away favorably impressed.

Jeff Benson, then a Lieutenant in NAVSEC, presented a prelimary design of a nominal 170 ton Hydrofoil based on a HIGH POINT hull form. We had some SCN funding for this effort and within NAVSEA, Capt Earl Fowler had become the first project manager. From this design as a point of reference, discussions of national requirements among the NATO participants began to grow.

The Exploratory Group developed a primary mission - to attack surface ships using anti-ship missiles and light guns. The mission was further defined to a five day at sea period.
(Continued on page 9)

## IHS SPECIAL SESSION HPMV-92

### HYDROFOILS - WHERE DO WE GO FROM HERE?

At the conclusion of the second Hydrofoil Session of the HPMV-92 Conference on June 26, 1992, the IHS sponsored a Special Session on the topic: "Hydrofoils - Where Do We Go From Here?" John Meyer opened the session with introductory remarks related to the only recent hydrofoil development in the U.S. (Westfoil), but emphasized the progress on hydrofoils in Japan (Kawasaki), Norway (Westamarin and Kvaerner Fjellstrand), and of course Italy (Rodriquez). The remainder of the session was chaired by Robert J. Johnston. There were approximately 25 attendees.

Bob Johnston challenged the attendees to develop an "entrepreneurs" attitude for the future of hydrofoil technology. He cited the fact that the present market for hydrofoils of the sizes now operating was pretty well saturated. The future could lie in the direction of a major breakthrough perhaps in the direction of much larger craft than those operating today. This could well mean using a hybrid concept such as Kawasaki's Techno-Superliner. To make this happen a display of "entrepreneurship" such as was demonstrated by hydrofoil pioneers of the past, is needed. Bob then related a brief history of two hydrofoilers who succeeded as successful entrepreneurs.

The earliest marketeer of hydrofoils was Carlo Rodriquez who passed away earlier this year. Baron Hanns von Schertel by the early 1950s had developed a successful hydrofoil. His problem was how to find and build a market for his concept. In Messina, Italy the Rodriquez Shipyard was making a recovery from the effects of World War II. Carlo, the owner and manager-director, learned of the Schertel hydrofoil. Risking all the Shipyard's working capital, he obtained a license to build a PT 20. In 1956 he launched this craft and undertook to operate the vehicle, commercially, himself. He told the story of how on the first trip across the Straights of Messina he couldn't bear to go to the departing depot to see if anyone would ride this new boat. He hid in his home, which is on the waterfront, peeking from behind the curtains to see if anyone boarded. To his great delight the craft left with a full load of passengers. The rest is history, that first PT-20 continued to operate until a couple of years ago when it was removed from service. From that beginning the Rodriquez's ultimately developed their own designs. Today over 200 Rodriquez-built hydrofoils operate over a worldwide market.

The future could lie in the direction of a major breakthrough perhaps in the direction of much larger craft than those operating today.

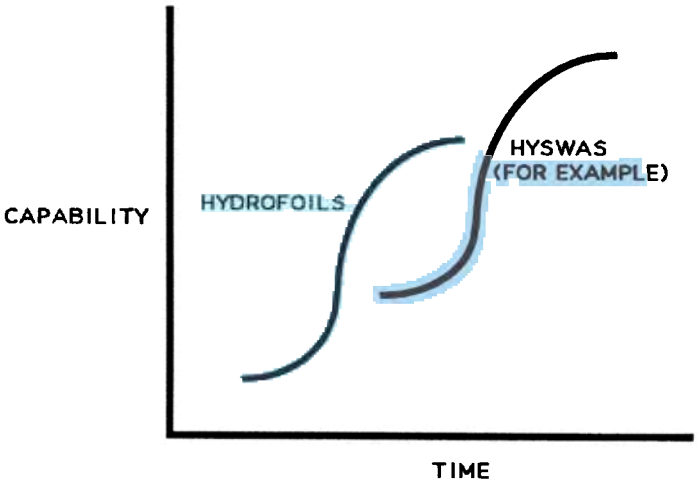
The other entrepreneur that Bob discussed and who made a success of his effort was William P. (Bill) Carl. Bill was a part owner and manager of a small hydrofoil, research and development company on Long Island, New York named Dynamic Developments, Inc. Bill had produced hydrofoils from runabouts to seaplane landing gear. At this time Charles Denison, the U. S. Maritime Administrator, became interested in making a dramatic leap in the speed of ocean going ships. It was 1960 and Charles Denison's aim was to achieve a speed of 60 knots. His interest centered on a high speed hydrofoil. Dynamic Developments Inc. was quite interested because, using Bill Carl's design, they had produced the XCH-4 which had achieved speeds of over 60 knots during the 1950s. Charles Denison was successful in obtaining an appropriation of 7.5 million dollars which was his estimate of how much it would cost to design and build an ocean-capable ship in 1960 dollars. Unfortunately Charles Denison died before the project could be started. The available funds immediately dropped to 1.5 million dollars.

Bill Carl was convinced that by obtaining industry cooperation, Denison's dream could be realized. One of the part owners of Dynamic Developments was the Grumman Aircraft Engineering Corporation, now known as the Grumman Aerospace Corporation. Bill convinced Grumman that he could pull together a group of companies that, by jointly supporting the project, could build the 60 knot ocean hydrofoil for the 1.5 million dollars available. Grumman backed Bill in this venture, but to obtain Grumman's support, Bill had to agree that if he failed to bring the project in for the money available he would hand over to Grumman everything he owned including his stock as well as his home. Bill was successful in bringing together a large number of organizations to supply technical know how and components to the project. Grumman built and outfitted the ship as well as constructing the struts and foils for the lowest bid price of any shipyard. General Electric supplied the gas turbines and the transmission. Hamilton Standard, along with many others were willing to invest in the hope it would lead to a new market for their products. Even with the support it became nip and tuck whether the project could be finished for the money available. Finally came the launching and the ship was named most appropriately the DENISON. Now all that remained was to demonstrate the one requirement of the contract, achieve a speed of 60 knots. On the first attempt over a measured mile the required speed was met and Bill had achieved the completion of the project for the funds available. Bill's stock and home were removed from jeopardy and Grumman purchased Bill's share of Dynamic Developments. Bill joined Grumman and spent many years in their marine and space programs. He now enjoys a very pleasant retirement having made the trans-Atlantic crossings in his own sailboat to spend a year in cruising European waters along with his first mate, his supportive wife, Ann.

Unfortunately Charles Denison's dream of faster ocean hydrofoils did not materialize. The necessary marketing had not been accomplished and the demonstration was not enough. This in itself is a good lesson. Visionary dreams must be supported by thorough market analysis. Now who wants to be the next Carlo Rodriquez or Bill Carl?

Dr. Volker Bertram suggested that the industry consider product improvement and showed the usual "S" curves associated with current vs new products. It is duplicated here showing HYSWAS (Hydrofoil Small Waterplane Area Ship, the subject of Dr. Bertram's and other's papers at the Conference), as an example, replacing (or at least supplementing)

current hydrofoils. He felt that we should think about high speed shipping for low-density, high-value cargo on routes such as Seattle to San Francisco; New Orleans to Miami, New York to Miami. etc.




Bill Ellsworth emphasized that talking about hardware, whether they be hydrofoils or other forms, is addressing the wrong problem! The primary question is: "Is there an application or need for hydrofoils?" Where can we compete for routes with other forms of transportation? Are these high speed forms really competitive with current transportation systems?

Messrs Yagi, Yamagami and Ikebuchi from Kawasaki contributed several remarks in connection with their JETFOIL and TECHNO-SUPER-LINER projects in Japan. In connection with the JETFOIL:

(a) There is no government persuasion.
(b) Kawasaki explains to potential operators the excellent capabilities of JETFOIL.
(c) Emphasis is placed on satisfying the customer. This includes doing research on any aspect of the design so the product satisfies the customer. Passenger comfort is stressed.
(d) Although not much information was provided, a smaller, single-engined "JETFOIL" is being considered. This will bring down the cost and make it more competitive with other hydrofoils and high speed marine vehicles.

Claudio Buccini mentioned that the quickest way to kill a high speed passenger ferry route is to run vehicles that produce a dissatisfied customer!

Regarding the Techno-Superliner project, Kawasaki representatives reported that this is a cooperative effort on the part of several Japanese companies and the Japanese government. It has generous funding support. The objective is to develop the technology base for a 50 knot, 1,000 ton payload, 500 n mile cargo carrier to operate on a year-round basis with 98% reliability in the Pacific Rim. It is a long-term, 5-year project which has already been extended one year. There are high expectations that there will be a market for such a high speed cargo carrier.

Claudio Buccini, from Rodriquez, showed several slides of their standard line of hydrofoils (RHS-160 and RHS-200), and new developments such as the MEC-1 and MEC-3. It should be noted that the MEC-1 will have a fully-submerged foil system, unlike all of the Rodriquez surface-piercing hydrofoil predecessors. The MEC is a "Maximum Efficiency Craft" using a hydrostatic transmission system. He also described several of their non-hydrofoil projects including MONOSTAB and a deep-V hull monohull passenger and car ferry. The key to Rodriquez success over the years has been low cost and giving the operators and the passengers what they want. There is a very close business relationship between Rodriquez and many of the operators. Customer support therefore is very strong. Robin Ing, of Boeing, also emphasized the importance of customer support; it should be "customized to the particular operator".

Inter-island operations are ideal for a hydrofoil applications. Claudio Buccini mentioned that the quickest way to kill a high speed passenger ferry route is to run vehicles that produce a dissatisfied customer! An important point that Claudio mentioned is that Rodriquez's hydrofoil costs are coming down. This is because they have introduced CADCAM and adopted efficient fabrication methods. He anticipates that the cost difference between a monohull and their hydrofoils (now about 10%) will continue to shrink with time.

There was a short discussion of Foil Cat developments in Norway (Kvaerner Fjellstrand and Westamarin) and Japan (Mitsubishi), although there were no attendees who represented this new catamaran approach to hydrofoil design. It was noted that a catamaran usually represents a 20% increase in hull weight relative to a monohull and that this configuration is susceptible to wave impacts on the cross-structure. It will be interesting to follow these developments and compare motions, seaway speed degradation, and cost with more conventional fully-submerged hydrofoils, like the JETFOIL and MEC-1.

It was suggested that the hydrofoil community consider the possibility of an alliance with comparable manufacturers in the former Soviet Union. Mike Terry further suggested that perhaps Russia's hydrofoil technology and designs could be upgraded by those in the "West". Claudio felt that since they have no money it may be better to wait. Mike Terry also suggested that hydrofoil unique components be marketed to monohull manufacturers.

Potential routes in the U.S. for hydrofoil applications were briefly discussed. Several were recommended in the 1984 DOT Urban Mass Transportation Authority study on "High Speed Waterborne Transportation Worldwide". These include the Caribbean and the Hawaiian Islands. Others suggested by attendees at the meeting were: the Northeast (around New York and Long Island), Seattle area, the New Orleans - Pensacola - Panama City - Tampa area (with a tie-in with Disney World via land transportation). A high speed cargo/passenger carrier from New York City to Miami may be a possibility. To make any of these routes really work it would be necessary to bring the operator into the design of the vehicle and also assure that the hydrofoil operation was tied

into ground or air transportation as a total system. Also a competitive edge is required by the hydrofoil operator. The route needs to be an alternative to the current system which is becoming saturated.

It should be noted that military applications of hydrofoils were not discussed during this session since audience interest centered on broader, commercial hydrofoil applications.

From the discussions at this special session on "Hydrofoils - Where Do We Go From Here?", it can be generally concluded that for a commercial hydrofoil passenger/cargo operation to be successful, the following ingredients are required:

1. An entrepreneur, or equivalent group, to spearhead the overall effort and develop a plan.
2. A consortium of business organizations teamed with the government to study, design, and build a total "intermodal transportation" system. Appropriate areas need to be selected where a high speed marine vehicle component of the system is financially attractive and necessary to make the Intermodal Transportation Center function.
3. Establish the requirements for the marine vehicle.
4. Examine the various alternative designs base on the requirements.
5. Establish some commonality of vehicles to serve as large a number of Intermodal Transportation Centers as possible.

In view of the above, the question arises: What role should the International Hydrofoil Society play? It must be remembered that we are an international organization. To concentrate our efforts solely upon the U.S. problem may not be entirely appropriate. IHS, as an organization, should perhaps take a more Global view.

*Note: This article is a compilation of notes taken by Wade Webster, Van Bibber, Bob Johnston and John Meyer at the Special Session.*

## JAPAN'S TECHNO-SUPERLINER PROJECT ON TRACK

*(From the Motor Ship, June 1992)*

The development of technology and design to meet the demands likely to be placed on marine transportation needs in the future is the subject of a great deal of research. In Europe the tendency has been to study designs which are likely to provide the basis of the next generations of ships, while much Japanese ship research has been aimed at the longer term and includes alternative forms of main propulsion to those in common use today.

One concept, the Techno-Superliner (TSL), may be in operation as early as 1996/97, according to the Japan Ship Centre. The five year research project has been extended by one year. This is not because the work has been delayed but because the realization of the TSL has progressed further than expected and the experimental ship forms were achieved sooner than anticipated, (the Motor Ship, September 1991).

Models are to be built of the two hull forms being studied, which are hydrofoil and air-cushion variants, with construction planned to start in 1993. The hydrofoil system (TSL-F) has been likened to the Kawasaki Jetfoil but it has a fully-submerged hull and foils unlike the Jetfoil. See the accompanying artist's rendering.

The TSL-F model will be 15m long and main propulsion will be by a 2,795kW (3,800hp) gas turbine engine giving a speed of 40 knots. It is expected to cost between Yen 15 and 25 billion (US $113 and 188 million) and will be completed in the first quarter of 1996. [Ed Note: Costs seem high.]

Construction of a 15m-long Model of the TSL-F Hybrid Hydrofoil is Scheduled to Start in 1993

The air-cushion system (TSL-A) model will be 70m long. Main propulsion will be by a 15,370kW (20,900hp) gas turbine engine to give a speed in excess of 50 knots. A much larger model was required for this variant as experience from existing large hovercraft showed that results from smaller models did not produce adequate results, and a half-size model was considered necessary to conduct accurate working tests.

The model is expected to be completed during 1994 and costs are estimated at between Yen 7 and 10 billion (US$53 and 75 million). To provide the required high service speed, water jets are seen as offering the best form of drive. Each of the two vessels being considered are likely to have 18,400kW (25,000hp) waterjets with aero-derivative gas turbines providing the prime power source. Mitsubishi Heavy Industries is developing the waterjet for the TSL-A. One potential problem with the TSL-A is a high fuel consumption, and for journeys over 1,000km mid-voyage refuelling is likely to be needed. It is expected that each of the seven shipyards involved in the project will specialize in its particular area of research. However, the main assembly of the two hulls will take place at two main shipyards.

Daily routes for the TSL were originally planned between Japan and Taiwan, Singapore, Korea and Hong Kong, with voyage time to each destination taking about one day. There has also been interest from regions within Japan, such as Hokkaido and Kanto, which have been suffering from the migration of young people and industries to the major cities, as it is envisaged that improved transport links will help sustain local industry. It is also hoped that the development of the TSL will encourage graduates into the shipbuilding industry, which is suffering from an "outdated" image.

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**Don't be afraid to go out on a limb; that's where the fruit is.**

## INTERMODAL SURFACE TRANSPORTATION EFFICIENCY ACT OF 1991

*(The following has been extracted from Public Law 102-240; December 18, 1991)*

It is the policy of the United states to develop a National Intermodal Transportation System that is economically efficient and environmentally sound, provides the foundation for the Nation to compete in the global economy, and will move people and goods in an energy efficient manner.

The National Intermodal Transportation System shall consist of all forms of transportation in a unified, interconnected manner, including the transportation systems of the future, to reduce energy consumption and air pollution while promoting economic development and supporting the Nation's preeminent position in international commerce.

The National Intermodal Transportation System(NITS) shall include a National Highway System which consists of the National System of Interstate and Defense Highways and those principal arterial roads which are essential for interstate and regional commerce and travel, national defense, intermodal transfer facilities, and international commerce and border crossings.

The NITS shall include significant improvements in public transportation necessary to achieve national goals for improved air quality, energy conservation, international competitiveness, and mobility for elderly persons, persons with disabilities, and economically disadvantaged persons in urban and rural areas of the country.

The National Intermodal Transportation System shall provide improved access to ports and airports, the Nation's link to world commerce.

The National Intermodal Transportation System shall give special emphasis to the contributions of the transportation sectors to increased productivity growth. Social benefits must be considered with particular attention to the external benefits of reduced air pollution, reduced traffic congestion and other aspects of the quality of life in the United States.

The NITS must be operated and maintained with insistent attention to the concepts of innovation, competition, energy efficiency, productivity, growth, and accountability. Practices that resulted in the lengthy and overly costly construction of the Interstate and Defense Highway System must be confronted and ceased.

The National Intermodal Transportation System shall be adapted to "intelligent vehicles", "magnetic levitation systems", and other new technologies wherever feasible and economical, with benefit cost estimates given special emphasis concerning safety considerations and techniques for cost allocation.

The National Intermodal Transportation System, where appropriate, will be financed, as regards Federal apportionments and reimbursements, by the Highway Trust Fund. Financial assistance will be provided to State and local governments and their instrumentalities to help implement national goals relating to mobility for elderly persons and disabilities, and economically disadvantaged persons.

The National Intermodal Transportation System must be the centerpiece of a national investment commitment to create the new wealth of the Nation for the 21st century.

## FLYING CAT 40m NEWS

*(From Fast Ferry International, July-August 1992)*

A Fjellstrand Flying Cat 40m catamaran has been ordered by Clipper Navigation for delivery in Norway next February. It is to be introduced alongside the company's Fjellstrand 38.8m catamaran and Incat by Gladding-Hearn 31m catamaran on its United States-Canada route between Seattle and Victoria, Vancouver Island. The value of the contract is NOK 45 million.

Two departures from the standard vessel design specified by Clipper Navigation are the fitting of KaMeWa 71S II waterjets and a motion damping system (MDS). Developed by Kvaerner Fjellstrand and Marintek, the MDS consists of a strut and adjustable flaps forward on both hulls, hydraulic transmission system, sensors, computer, control panel and monitor. The first MDS was fitted on Clipper's 38.8m catamaran earlier this year and has been operational since March.

The main deck of the company's Flying Cat 40m will be fitted out with 234 seats. On the upper deck there will by 90 seats around 16 tables, a bar, crew mess, storeroom and two toilets. The aft upper deck area will be used to carry up to ten luggage containers.

The craft is powered by a pair of MTU 16V 396 TE74L diesels, rated at 2,000 kW at 2,000 rpm, giving the vessels a service speed of 34 knots when carrying 27 tonnes. Fuel capacity is 2 X 6,000 litres, fresh water capacity is 1,800 litres and bilge water capacity is 1,000 litres. Equipment on the bridge includes Furuno 8050D and 7040D radars, Anschutz gyrocompass, Ben Athena log, Robertson AP9 autopilot, Furuno FMV 603 echosounder and Sailor RT2047 radiotelephone.

Kvaerner Fjellstrand Shipping also introduced their Flying Cat 40m catamaran on a route in July in Denmark. The Danish service is being operated by Kat-Express, and new subsidiary of KFS, between Arhus and Kalundborg. Scheduled journey time is 90 minutes and three return crossings a day have been timetabled.

In addition, three Fjellstrand Fly Cat 40m catamarans have been ordered for a new airport feeder service by a subsidiary of Universal Boss, a company based in Hong Kong. The vessels, valued at approximately NOK 120 million, are to be built at the recently completed Kvaerner Fjellstrand yard in Singapore. Two are scheduled to be delivered by the end of this year and the third in November 1993. They are to be operated between Hong Kong and a new airport nearing completion near the Chinese city of Shenzhen. A maximum speed of 38 knots is anticipated.

## IHS MEMBERSHIP LIST

From time to time inquieries may be made regarding the names and addresses of IHS members. For your Board of Directors to properly respond, it would be helpful to know if any members do not want their names and addresses released to someone or some organization who might request this information. In any event, the Board will require an appropriate reason for the request of such information. Please send your preference for non-release of your name to John W. King, the IHS Secretary-Treasurer, who will maintain such a file.

## WELCOME NEW MEMBERS

Toshikazu Yamamoto, Kawasaki Heavy Industries (USA). Represents the manufacturer of JETFOIL in the U.S.

Georges F. Selvais, CEO, Intelligent Resources International. Works with and represents Feodosia Shipyard in Crimea, Ukraine which produces Voskhod, Cyclone and Olympia hydrofoils.

## MEMBERSHIP NEWS

On August 21, 1992 at a Change of Command Ceremony, Captain James W. Orvis, USN was relieved by Captain Peter J. Gaskin III, USN as Commanding Officer of the USS ENGLAND (CG 22). This ceremony was held at the Naval Station, San Diego and marked the end of a very successful tour of duty for Captain Orvis. The tour included involvement in Dessert Storm. Captain Orvis is a former U.S. Navy hydrofoil skipper.

Apologies to PhilipHercus, of INCAT, for an error in the 'Welcome New Members' section of the Summer Newsletter. We regret the misspelling of his name and the garbled association. The Fall 1991 Issue had already welcomed him to our Society and decribed his association with hydrofoils.

## WESTAMARIN FOILCAT 2900 UPDATE

*(From Fast Ferry International, June 1992)*

The trials programme of Westamarin West's first Foilcat 2900 foil assisted catamaran, Foilcat, began in February, 1992 and it made its long anticipated public debut with a series of demonstrations during the third week of May.

Foil technology is not new to Westamarin's Mandal facility. The yard was originally established to produce Supramar designs under license and built a total of ten hydrofoils, ranging in size from the PT.20 to the PT.150, between 1962 and 1970.

The Foilcat 2900 differs in having fully-submerged foils. It is also, of course, a symmetrically hulled catamaran design - although whether it is best described as a foil assisted catamaran or a hydrofoil catamaran is open to question. At medium speeds or rough sea conditions the hulls remain in the water but at service speed in normal conditions the hulls are clear of the water, and the vessel is operating as a hydrofoil.

Westamarin reports that development of the hull and foils was based on model basin test and theoretical calculations by Marintek, including both sea state and maneuvering conditions, the results of which formed the basis for the development of the electronic Flight Control System (FCS) stabilization of foil flaps, hydraulic actuators and electrically controlled valves.

The structure is aluminum alloy; AA 6082 is used for the profiles and AA 5083 for the plating. The foils are stainless steel castings, there is an inverted-T foil forward on each hull and one full width foil, incorporating two Ulstein-Liaaen Speed Z propulsion systems across the stern. There is a single flap on the trailing edge of each of the forward foils and three flaps on the stern foil.

The main engines are a pair of MTU 16V 396 TE74L diesels rated at 2,000 kW at 2,000 rpm. Each of these drives a Speed Z CPZ 60/42 - 125 L HC controllable pitch pulling propeller. Auxiliary power is provided by a pair of Mitsubishi S6F-T diesels, rated at 56 kW at 1,500 rpm, and Stamford UCM 224G 65 kVA 3 X 230v 50 Hz generators.

The Foilcat 2900 has a service speed of approximately 45 knots and maximum speed of approximately 50 knots. The maximum lifting height possible at the forward struts is 1.9m, resulting in the hulls being 0.3m clear of the sea in flat calm conditions.

The vessel operates at a bow up trim of 1° and the height of the hulls is reduced when waves exceed 2.0 to 2.5m to reduce the risk of the propellers ventilating. However, Westamarin reports that during trials the Foilcat 2900 has continued to operate, with the hulls running through the water, in 2.5 to 4.0m waves at speeds of 35-40 knots. Vertical accelerations, the company says, have proved to be similar to those recorded during tank testing for the Westamaran 12000 vehicle ferry design. Wash during foilborne operation also proved to be low and the vessel has been cleared to pass through the harbor in Kristiansand at 45 knots.

Marintek also supplied the data which formed the basis of the FCS software supplied by Camo. Westamarin has so far supplied few details of the FCS components on the Foilcat 2900 but the company has revealed that, working to its specifications, Robertson Tritech supplied the electronics, hardware control systems and control panels, and Movator supplied the hydraulic actuators.

Foilcat was originally ordered by Hardanger Sunnhordlandske Dampskipsselskap but the contract was cancelled by the operator in 1991. Westamarin West has completed the vessel as a private venture and it is now available on a lease or purchase basis. An outright purchase would cost approximately 50% more than a Westamaran 4200 catamaran but a lease possibly to an existing fast ferry operator on Norway's west coast, may initially be more likely.

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## SOLAR LAUNCHES MARINE GAS TURBINE FOR FAST FERRIES

*(From Fast Ferry International, July-August 1992)*

Solar Turbines, a subsidiary of Caterpillar, has released details of a marinized version of its 5 MW Centaur Taurus gas turbine. The company describes the unit as "a rugged, reliable and highly efficient industrial engine that uses a two stage, variable speed power turbine designed to drive waterjets, propellers or electrical generators on fast ferries of at least 40 metres in length. It has special corrosion resistant coatings to protect its air compressor assembly from salt air environments and can operate on Grades 1 and 2 diesels and fuel oils, or optionally, on kerosene".

Since it produced its first design for the United States Navy in 1950, Solar Turbines that have logged approximately 385 million operating hours in some 75 countries. Nearly 1,500 of these which by the beginning of this year had accumulated 85 million operating hours, were installed in marine and offshore environments.

The original Centaur gas turbine was developed in 1966 and its derivatives now total 2,300 units that have been operated for 100 million hours. The T6502M Centaur Taurus developed for fast ferry applications is 3.38m long, 1.65m wide, 1.78m high and weighs 3,045 kg.

(Continued on page 11)

## DO YOU REMEMBER.....DENISON?

*(This supplements Bob Johnston's remarks about DENISON in the IHS Special Session recorded elsewhere in this Newsletter.)*

Sparked by the commercial application of hydrofoils in Europe and the research being sponsored by the U.S. Navy in the 1950s, the Maritime Administration (MARAD) started a project leading to the HS DENISON.

The Marad Coordinator of Research, Charles R. Denison, was enthusiastic about the future commercial potential of the hydrofoil and in 1958 sponsored an extensive parametric study carried out by Grumman Aerospace Corporation and its affiliate Dynamics Developments, Inc. The purpose of the study was to determine the type of hydrofoil craft best suited to future express-cargo and passenger applications and establish design criteria for such craft. Speeds of 50 to 200 knots, displacements from 100 to 3,000 tons, and ranges from 400 to 3,600 nautical miles were considered. Based on the favorable results of this study, MARAD contracted with Grumman in 1959 for design studies for two test craft. One was to have a conventional powerplant and the other a provision for a lightweight aircraft *nuclear power* source when such a system became available.

In January of 1960 MARAD placed a contract with Dynamic Developments, Inc. to build an experimental hydrofoil capable of speeds up to 60 knots with gas turbine engines. Provision was made for a second phase where the subcavitating foils would be replaced with supercavitating foils. The intent was to achieve speeds up to 100 knots with the same power plant. Unfortunately, Charles Denison, whose vision and enthusiasm was in great part responsible for the program, suffered an untimely death before the ship got beyond the early design stage. It was in his memory that the ship was later christened HS DENISON.

Although MARAD had contracted with Dynamic Developments, Inc. to build DENISON, Grumman Aircraft Engineering Corporation, because of expanding interest in hydrofoils, was part owner of and eventually acquired all of Dynamic Developments, Inc.

DENISON was launched by Grumman on 5 June 1962 at Oyster Bay, Long Island, and began sea trials only four days later. On the first trial, DENISON met the contract design speed of 60 knots. The 95-ton DENISON had a unique foil system. The forward surface-piercing foils carried 85% of its weight, and a single fully-submerged tail foil aft carried the remaining 15%. The ship's length overall was 104.6 feet, maximum hull beam was 23 feet, and maximum draft hullborne with its foils extended was 15.4 feet.

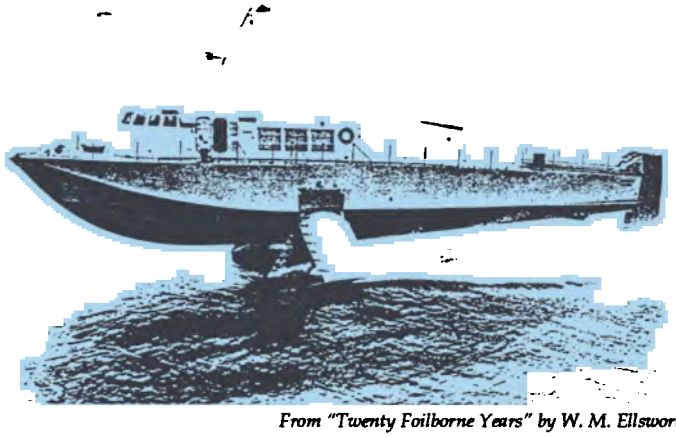
It is significant that the main propulsion for foilborne operations was provided by a General Electric gas turbine engine rated at 14,000 horsepower. It was a marine version of GE's J-79 aircraft jet engine. MARAD had obtained two J-79 engines from the Navy and then bailed them to GE who then provided the marine version by the addition of a so-called free power turbine to take energy out of the jet. This arrangement was interesting in that it was accomplished for the total sum of *one dollar*. This proved to be a wise long-term investment on the part of the General Electric Company because it was the basis for their later so-called LM series of marinized gas turbine engines which are extensively used in Navy ships today.

The above financial arrangement was not entirely unique on the DENISON program because although MARAD contracted $1,500,000 for design and construction, Grumman, General Electric and 72 other companies invested from $5M to $7M of their own funds!

The design of a propulsion system capable of putting 14,000 hp into the water through a single high speed propeller was a considerable challenge at the time. Power was transmitted from the gas turbine engine through a right-angle bevel-gear drive to a supercavitating propeller mounted at the bottom of the aft strut. The spiral bevel gears, 20 and 21 inches in diameter and turning at 4,000 rpm, were designed and built by General Electric Company and represented the most stringent requirement of any gear train which previously had been manufactured.

A series of trials were carried out at speeds of 50 to 60 knots as the ship demonstrated its ability to be stable and highly maneuverable. DENISON was also a good performer in rough water under high winds and low temperatures. The temperatures on some tests were below freezing, but no icing problems were encountered during either hullborne or foilborne operations. In comparison, it was reported that a 30-foot escort boat was unable to proceed out of sheltered waters during that time due to heavy icing on its deck and superstructure.

Following these trials, the DENISON was fitted out with a passenger compartment. She the visited all the major seaports on the East Coast. Hydrofoil trips into the open ocean were experienced by several thousand individuals. U.S. Navy and MARAD had planned to proceed with the next high-speed phase of the DENISON program incorporating a supercavitating foil system. All seemed to be on track when the Navy decided to change course and proceed with the design of their own high speed foil research craft, designated FRESH-1. Since the Navy withdrew their financial support, MARAD decided to terminate the program and not pursue development of commercial hydrofoils any further.



*From "Twenty Foilborne Years" by W. M. Ellsworth*

It has been said that the MARAD program, and more particularly the HS DENISON, contributed in large measure to the growing technology base for the design of hydrofoils. Many of the DENISON's subsystems were at the leading edge of the state-of-the-art (see Van Bibber's Letter to the Editor). Knowledge gained was invaluable in further developments by the U.S. Navy.

*Submitted by J. R. Meyer*

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It is significant that the main propulsion for foilborne operations was provided by a General Electric gas turbine engine rated at 14,000 horsepower. It was a marine version of GE's J-79 aircraft jet engine. MARAD had obtained two J-79 engines from the Navy and then bailed them to GE who then provided the marine version by the addition of a so-called free power turbine to take energy out of the jet. This arrangement was interesting in that it was accomplished for the total sum of *one dollar*. This proved to be a wise long-term investment on the part of the General Electric Company because it was the basis for their later so-called LM series of marinized gas turbine engines which are extensively used in Navy ships today.

The above financial arrangement was not entirely unique on the DENISON program because although MARAD contracted $1,500,000 for design and construction, Grumman, General Electric and 72 other companies invested from $5M to $7M of their own funds!

The design of a propulsion system capable of putting 14,000 hp into the water through a single high speed propeller was a considerable challenge at the time. Power was transmitted from the gas turbine engine through a right-angle bevel-gear drive to a supercavitating propeller mounted at the bottom of the aft strut. The spiral bevel gears, 20 and 21 inches in diameter and turning at 4,000 rpm, were designed and built by General Electric Company and represented the most stringent requirement of any gear train which previously had been manufactured.

A series of trials were carried out at speeds of 50 to 60 knots as the ship demonstrated its ability to be stable and highly maneuverable. DENISON was also a good performer in rough water under high winds and low temperatures. The temperatures on some tests were below freezing, but no icing problems were encountered during either hullborne or foilborne operations. In comparison, it was reported that a 30-foot escort boat was unable to proceed out of sheltered waters during that time due to heavy icing on its deck and superstructure.

Following these trials, the DENISON was fitted out with a passenger compartment. She the visited all the major seaports on the East Coast. Hydrofoil trips into the open ocean were experienced by several thousand individuals. U.S. Navy and MARAD had planned to proceed with the next high-speed phase of the DENISON program incorporating a supercavitating foil system. All seemed to be on track when the Navy decided to change course and proceed with the design of their own high speed foil research craft, designated FRESH-1. Since the Navy withdrew their financial support, MARAD decided to terminate the program and not pursue development of commercial hydrofoils any further.

*From "Twenty Foilborne Years" by W. M. Ellsworth*

It has been said that the MARAD program, and more particularly the HS DENISON, contributed in large measure to the growing technology base for the design of hydrofoils. Many of the DENISON's subsystems were at the leading edge of the state-of-the-art (see Van Bibber's Letter to the Editor). Knowledge gained was invaluable in further developments by the U.S. Navy.

*Submitted by J. R. Meyer*

**Fall Dinner Meeting** - Continued from page 2

The desired performance was defined to include speeds in excess of 40 knots. Combat range was flexible as only the U.S. had a need to maximize the range, European nations being willing to accept less.

Also at this time, Adm Zumwalt had developed his "High-Low" mix shipbuilding program. The "High" end were the new CVNs and Aegis ships. His "Low" end consisted of the PHM, an new small escort, the Patrol Frigate PF which became the FFG-7 class, and a new small aircraft carrier called the Sea Control Ship.

Within OPNAV, a new division was formed to concentrate on the "LowMix" ships called the Advanced Ship Division, OP-03Z, under VADM Gerry King, who was OP-03. Larry Kelley had received orders to the JUSMAAG Korea and it was determined that I would leave OP-723 amd relieve Larry as the PHM desk officer as OP-03Z3.

Just before Larry left, Earl Fowler said that the U.S. Navy was wasting time and money with the NAVSEC preliminary design and he was awarding Boeing a contract to get started immediately. This announcement created a lively discussion. However, Earl's position had been approved with NAVSEA, Radm Nat Sonenshine, and he prevailed. Shortly afterward, Earl Fowler turned over the NATO PHM project to a new SHAPM who had just checked into NAVSEA, Jim Wilkins.

CDR Ron Adler was then in NavOrd and charged with doing analyses to optimize the PHM weapons suit. In a preliminary presentation, Ron postulated a scenario in which a hullborne PHM was trailing a Soviet when a STYX missile is suddenly fired. Ron was developing a case that PHM's weapons should be defensive. Bob Ripley and I jumped up to protest. Stressing that the NATO mission is surface attack, we proposed that Ron turn his scenario into a "dark and stormy night" situation in which the Soviets exploit heavy weather to exit the Black Sea into Aegean against groups of PHMs hiding among the islands. In the end, A CNO Executive Board meeting was held to determine the weapons issue. When the dust settled an offensive weapons suit was approved.

The Design Stage Memorandum was signed in November of 1972 and NATO Project Group Six was established. Radm George Halvorson, OP-03Z, became the Chairman and I reverted to U.S. member. By now, the NATO Standard PHM design was growing to over 200 tons. The CNO and the Congress were showing increasing interest in program costs. Adm Halvorson, at a CNO Executive Board meeting discussing the U.S. production program costs, showed that the average cost of a 30 PHM program could meet the budgetary target cost of $18 million each, if we used the foreign gun and gun fire control systems. It was argued that the decision to "Americanize" these systems was a separate programmatic issue. In addition, the PHM was an international cost sharing program and many cooperative decisions were yet to be made. The PF program, it was argued, was a U.S. Navy program and it was an unnecessary burden on the NATO PHM program to bear the costs of Americanization. In retrospect, it is surprising that the CNO accepted these costs. The issue of Americanizing these systems was to become one of the largest cost factors in both the PHM and PF programs and a source of much Congressional irritation.

The PHM acquisition process, or Part II, was described by Jim Wilkins. He reiterated the process of establishing the PHM program requirements that would satisfy those nations that were willing to participate - meaning spending money for a design and build some ships.

The mission was described as short range - i.e. Baltic, Mediterranean, Caribbean; not trans-oceanic. A five day sortie was established thereby committing to the need for a support ship or operating base. Another milestone was the agreement to "go metric". All items not off-the-shelf were to be designed "hard metric". Cost sharing amongst the "common" elements of the ship were to be shared equally. A construction program goal to spend equal amounts in each participating country was also agreed upon.

The next major milestone was to establish "involvement". Letters of commitment were requested, followed by a "Memorandum of Understanding". Willingness to participate in the cost of the program was essential along with a commitment to contribute personnel to a Project Office at NAVSEC.

Boeing was selected for the Preliminary Design and a NAVSEC review team was established. A wide variety of issues and trade-offs had to be considered in such areas as: propulsion systems (prime movers, waterjet pumps and reduction gears), electrical systems (400 Hertz and solid state frequency converters), foil material (17-4PH which was used on TUCUMCARI vs HY-130 that was still in development).

Arrangement of the ship was a balance between that proposed by Boeing and NAVSEC which provided an acceptable solution to the small space available. In the combat system arena, many tradeoffs were studied regarding the missile system, gun and countermeasure equipment.

Design reviews with the nations, NAVSEC and Boeing were required involving many long and tedious hours. Contract negotiations were also long and arduous. The early construction program did not go without some problems, including: aluminum welding, reduction gear design factors, and foil welding sequence and heat treating. High costs required a major rescheduling effort and entailed a time delay in identifying a new cost target. As a result, PHM-2 was cancelled (a painful act); only PHM-1 was to be completed at this stage of the program. Other problems were confronted, such as: electrical cabling and piping installation, metric fastener costs, and combat system integration. These were all resolved however between the Navy, the other nations, Boeing and its subcontractors.

With the launch of USS PEGASUS (PHM-1) on November 9, 1974, the U.S. Navy and Boeing could be proud that this ship was the first in many ways: first NATO ship, first production U.S. Navy hydrofoil, first ship with 400 Hertz primary power (all 60 Hertz is converted from 400 Hertz), first modern U.S. Navy ship built in "metric", and first ship to be procured under the DOD "Fly-Before-Buy" policy.

Operational Evaluation of USS PEGASUS and subsequent PHM program developments will be described by George Jenkins at the next Dinner Meeting.

[Editor's Note: John King's write-up from his talk has been only summarized here. The unabridged version will appear in the Winter Newsletter.]

## USS ARIES PROVES VERSATILITY

*(From "The Southernmost Flyer", by LT R. N. Hein Oct. 2, 1992)*

USS ARIES (PHM-5) departed Key West on September 10th to participate in a fleet exercise off the coast of North Carolina. As she did so, USS ARIES was celebrating almost 11 years of "flying high" since she was launched on November 5, 1981. The exercise (formally known as FLTEX 1-93) was designed to prepare and train the warfare commanders and staffs of a Battle Group Strike Force, a carrier battlegroup, and an amphibious response group for an extended deployment to the Mediterranean Sea.

Along with two other warships, two submarines, and a target fast boat, USS ARIES emulated the forces of potential real-world enemies. A scenario was constructed in which this "Orange" force would protect its nation's coastal territorial waters from intrusion and attack by a deployed "Blue" U.S. naval force. The Blue force was comprised of major U.S. combatants and amphibious units and United Kingdom combatants.

From September 14th to the 17th, ARIES, assuming the role of a group of enemy coastal fast patrol craft, conducted multiple attacks on the U.S. units, employing a diversity of tactics. Everything from midnight high-speed runs on the Blue force to multi-unit coordinated missile strike simulations were utilized in training the response capabilities of the U.S. forces.

The operation honed USS ARIES fighting capabilities as well. EW1(SW) Greg Sammarco, USS ARIES Electronic Warfare Technician, commented on his experience in regard to the training he received. "It felt great to perform actual attacks on other platforms, to show how formidable a hydrofoil can be in a war scenario. This exercise allowed USS ARIES to further develop its own tactics in fighting an opposing force. I think all units involved in this past exercise received a better understanding of how effective a hydrofoil can be in both training and actual engagements."

FLTEX 1-93 was the third multi-unit training operation in which ARIES participated this year. Following her return to Key West, she will commence a schedule of Counter-Narcotic Operations in conjunction with the Coast Guard in the Caribbean Sea and the Gulf of Mexico.

## USS PEGASUS

During 10 - 13 October USS PEGASUS (PHM-1) participated in "Broward Navy Days" honoring the U.S. Navy's 217th birthday. She, along with USS THEODORE ROOSEVELT (CVN 71) and USS JACKSONVILLE (SSN 699), joined in the celebrations which included general public visits to the ships, crew sports competitions, military ceremonies, and other U.S. Navy and community goodwill ventures.

*Submitted by Les Jackson*

## PHM SQUADRON NEWS

On Friday, 17 July, Captain Ronald C. Berning, USN was relieved as Commander, PHMRON TWO by Captain Roger L. Buschmann, USN at Trumbo Point Annex, Naval Air Station, Key West, Florida. Captain Buschmann had been part of PHMRON TWO in the 1981 to 1983 time frame as Executive Officer aboard PHM-3. The International Hydrofoil Society welcomes CAPT Buschmann and wishes him well. Captain Berning served as the Squadron Commodore for the past 3 years. We all congratulate him on a job well done and wish him continued success as CO of USS Yellowstone (AD41).

## NAVIES FIGHT SMUGGLERS AND PIRATES

*(From: Naval Institute Proceedings, June 1992. This was in response to an article by N. Friedman. pp. 122-123, Nov. 1991)*

Les J. Jackson and John R. Meyer - Contrary to Dr. Friedman's article, high speed is one of the most vital elements in countering drug smuggling. Proof of this assertion is the record of the U.S. Navy's squadron of patrol hydrofoils (PHMs) based in Key West, Florida. The PHMs have speeds of more than 40 knots in rough water and can sustain a high-speed chase for many hours. Therefore, they have become an integral part of the U.S. drug-enforcement network and have accounted for nearly one-third of all the Navy's drug interdictions. Several points can be made in support of the need for high-speed ships - like the PHMs - in the drug war.

First, the value added to drugs (particularly cocaine) successfully landed in the United States is astronomical. Exact figures are, of course, difficult to establish but it is generally considered to be on the order of 100 to 1. With such profits, drug traffickers are quite willing to jettison cargo to avoid capture. The amount of drugs found floating in the Florida Straits actually exceeds the amount captured. In fact, the crews of the hydrofoils have experience several cases in which the pursued vessels have been scuttled to avoid capture. Second, anti-smuggling operations, as Dr. Friedman pointed out, are "little different from a major military operation." It is true that defense begins in depth. Intelligence from source countries, radar-picket ships, air and sea surveillance, and networks of communication combine to form a tactical picture. However, all this time-consuming and expensive effort is wasted if, because a pursuing ship is too slow, drugs are jettisoned during the last minutes of pursuit or the quarry outpaces its pursuers.

The final pounce phase of any seizure is critical. Seasoned captains in the drug war widely hold that approximately one hour is all the time needed to sanitize a drug-carrying ship completely or sink it. In such cases, speed makes all the difference, particularly when some drug traffickers use vessels that can easily match or exceed the speed of the hydrofoils.

The capture of drug traffickers at sea is a precision team effort. The PHM operators are an effective part of that effort, and, given a choice, they would like even faster ships.

## PHM BOXSCORE

The following PHM "drug busting" seizures (in pounds) have been recorded through September 1992:

| SHIP | MARAJUANA | COCAINE |
|---|---|---|
| PHM-1 | 3,800 | 0 |
| PHM-2 | 92,865 | 6,174 |
| PHM-3 | 59,440 | 165 |
| PHM-4 | 5,405 | 0 |
| PHM-5 | 35,525 | 880 |
| PHM-6 | 22,691 | 1,844 |
| TOTALS | 219,726 | 9,063 |

NOTE: PHM-3 DATA NOT COMPLETE

**SOLAR** - Continued from page 7

A simple cycle two shaft design with a free power turbine, its primary features are: a 12 stage compressor with 20.4 kg/s of inlet air flow at a compression ratio of 11.2, the first four compressor stages having variable geometry stators and inlet guide vanes; a single annular combustor having 12 vortex stabilized fuel injectors; a two stage gas producer turbine assembly with air cooled first stage nozzles and blades; and a two stage power turbine capable of operating over a large range with an optimum speed of 12,900 rpm, output power being provided through direct drive, conventional reduction gearbox with or without reverse gear, or an epicyclic gearbox.

A microprocessor based control system monitors and controls the static dynamic parameters of the gas turbine system, driven equipment and auxiliary devices. Engine starting is by means of an electro-hydraulic system with clutch assembly using an AC induction motor driving through a hydrostatic transmission.

## DUPONT HUMAN POWERED WATERCRAFT SPEED PRIZE GRAND FINALE

A major watercraft event was held on the weekend of October 23, 24 & 25 in San Dimas, California. The International Human Powered Watercraft Speed Championships at Puddingstone Reservoir, in the Frank G. Bonnelli Regional Park gave competitors the maximum opportunity to set world records. This was the final open competition to determine who will win the DuPont Human Powered Watercraft Prize of $25,000 for Speed. Due to run until the end of this year, the DuPont Prize can be won by anyone who goes at least 20 knots over a 100m distance. At the last event speeds of over 15 knots were recorded, and in October of 1991 the MIT team posted a speed of 18.5 knots. Each day the 100m event was held from dawn till 10 AM. Also each day, from 11 AM till noon, there were other popular events which included a 2000m "one turn" course, a 100m figure eight, and a mass start event. Afternoons were reserved for competitors to make adjustments to their vehicles. Results will be announced in the next Newsletter.

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# LETTERS TO THE EDITOR

## HIGH POINT UPDATE

On August 22, 1992 the HIGH POINT arrived in Portland under tow. She is now in a fresh water berth. A retired Merchant Marine Bosun and Ronald Fraser rode her down from Tacoma. On the way, an air-cooled 30 KVA generator set, which Ronald had installed, was run to operate the ship's lighting including small reefer, hot plate, and under-tow side lights and stern light. The voyage through the Straits, in the Ocean, and across the Bar and River all went smoothly; the complete voyage taking about two days. There were lots of sport fishermen just inside the Columbia River bar. One called the tow boat to ask what was going on with HIGH POINT. He said he had worked on the project. The Tug Captain said he knew nothing!

Ronald's plans for HIGH POINT are indefinite except that he has to take care of his other projects first. HIGH POINT is in fresh water with watch persons so he doesn't have to worry about her or take frequent trips to Tacoma.

*(Based on a letter from Ronald Fraser)*

## EXPERIENCES FROM YESTER-YEAR

The "Denison", like all of our "first-of-a-kind" craft had very notable problems right after launching. The paper: "Experience With the Hydrofoil Craft Denison", by Robert Krack and James Gross of the Maritime Administration, May 13-14, 1965 SNAME meeting provided a complete description of the first several years of the ship's life.

The three hydrofoils, Denison, High Point, and Plainview were called the "Hop, Skip, and Jump" by those of us that were in the very beginning of hydrofoil development. Each of these craft were pushing the edge of our engineering technology. We were all aware of the lacking technology but it was pushed aside "so the show could go on." The specifications were indicative of our lacking detail knowledge. "Use the best and the lightest for this specific purpose." Examples were:

- 3000 PSI hydraulic pumps of any volume were not light; so aircraft pumps were used. Hydraulic cylinders with a position feedback loop did not exist so we "cobbled" things on the outside.
- The High Point had the first static converter ever built to provide the 28 volts for the autopilot. Wouldn't you know, when flying down the Sound with Admirals and other dignitaries aboard, it failed. The High Point flipped on it's side as everyone bounded around - one arm broken; so the reason was "hydrofoil craft". Funding was delayed one year. The bench tests on the static converter were done only at maximum loading. When surge loads were imposed, it failed every time.
- Galvanic interfaces
- Hydraulic design system
- Ventilation systems, etc.
- The AGE(H) Plainview.

I was the Project Engineer. Whenever I would reject something I would end up with the President of Lockheed Shipbuilding (Archie Folden) and Dale Daniels (head of the Engineering Department). Also whatever engineering division had a "Design Rejection Slip" would also be present. Archie Folden would always ask one question: "Will this pass the specifications as written?". In almost all cases it could. Whenever I came back with: "it will cause a failure in these areas", I would be told by Mr. Folden - "it's closed, Van Bibber, build it as the other gent says".

I resigned three times from Lockheed but I always went back because - "Van we are going to correct things as you want them". Obviously it never happened. I kept all of those "change orders" and associated "specs" I wanted to throw at Lockheed Shipbuilding but Admiral King and a lawyer said: " don't do it Van. With their "bank" of lawyers the only loser is Van Bibber".

V. H. Van Bibber, Panama City, FL

# ANNOUNCEMENT - FAST '93

SECOND INTERNATIONAL CONFERENCE ON FAST SEA TRANSPORTATION
PACIFICO YOKOHAMA CONFERENCE CENTER, YOKOHAMA, JAPAN
13-16 DECEMBER 1993
SPONSORED BY THE SOCIETY OF NAVAL ARCHITECTS OF JAPAN

FAST'93 shall contribute to the design and operation of high speed marine vehicles. Seaworthiness, structural strength, machinery and propulsion, as well as safety, navigation and transport economy will be emphasized. FAST'93 is intended to bring together the high speed maritime community and aeronautical field for an exchange of information for mutual benefit and international cooperation. TENTATIVE TOPICS INCLUDE: Transportation economy; Design criteria;procedures and examples; Conceptual design; Fluid-dynamic design and analyses; Structural design and analyses; Propulsion and machinery transmission systems; Safety and operation.

**CALL FOR PAPERS:**

Papers are invited on the subjects indicated. Abstracts should be approximately 200 words in length and should be submitted no later than 31 March 1993 to: FAST'93, ISS International, Shinkawa Bldg. 5F; 2-2-21 Shiba-kohen, Minato-ku, Tokyo 105, Japan. The abstracts will be reviewed and further information will be sent from the Secretariat by 31 May 1993.



REMEMBER - Please send articles and news of interest to the Editor to be included in the NEWSLETTER

**THE NEWSLETTER**
**INTERNATIONAL HYDROFOIL SOCIETY**
**P.O. BOX 51, CABIN JOHN, MD 20818, USA**

**IF YOU ARE NOT ALREADY A MEMBER OF IHS, WE ENCOURAGE YOU TO JOIN. PLEASE SEND YOUR REQUEST FOR A BROCHURE, DESCRIBING THE IHS, AND APPLICATION BLANK TO:**
CAPT. John W. King, USN (Ret.)
4313 Granada Street
Alexandria, VA 22309 USA

**Address correction requested**

# THE NEWSLETTER

## INTERNATIONAL HYDROFOIL SOCIETY

Post Office Box 51, Cabin John, Maryland 20818, USA

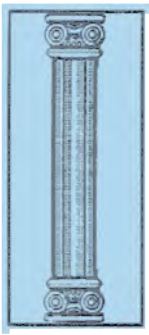
Editor: Robert J. Johnston **WINTER 1992** Co-Editor: John R. Meyer


**IN THIS ISSUE.....**



ANNOUNCEMENT
WINTER DINNER AND MEETING
FEBRUARY 19, 1993
FORT MYER OFFICERS' CLUB, ARLINGTON, VIRGINIA
ABRAMS ROOM
6:00 PM Cash Bar - 7:00 PM Dinner - 8:15 PM Program; $25.00 Per Person
Menu: Soup, Salad, Breast of Chicken Picatta, Wine, Dessert, Coffee
Make reservations no later than February 12 if you plan to attend. Call one of the following:
Mark Bebar 703-697-9572; John R. Meyer 301-227-1796; Patsy Jackson 703-329-0102
PROGRAM
"HISTORY OF PHM PROGRAM, PART III"
CDR GEORGE JENKINS, USN (Ret.)

**1993 DUES NOTICE**
**ALL MEMBERS ARE REQUESTED TO PAY THEIR DUES FOR 1993**
Please send your $20.00 check made out to IHS to:
CAPT. John W. King, USN (Ret.)
4313 Granada Street
Alexandria, VA 22309 USA



## THE PRESIDENT'S COLUMN

Your Board has been busy continuing to meet once a month. These meetings usually last about two hours and cover reports by the various committee chairmen and other topics of interest.

One of the new initiative is the design of an Award Plaque. Jim Wilkins, Bill Buckley and John King have contributed to the design and made contacts with vendors to obtain quotes bearing in mind limited financial resources. The Board recently approved the final layout and vendors, and is proceeding with the purchase of several plaques. We expect to make two awards at the Spring Annual Meeting.

I noticed in the October issue of the "Marine Log" that New York Governor Mario M. Cuomo announced that a request for proposals (RFP) had been issued to begin new high-speed ferry service in and around New York City. Proposals were due November 24, 1992. The bidding process, which is being jointly conducted by the New York State Urban Development Corporation of the New York City Department of Transportation, is expected to be completed within eight months. New service could begin by the end of 1993. Possible ferry routes include Staten Island to midtown Manhattan, and routes between downtown or midtown Manhattan and the Brooklyn Army Terminal, Hunters Point in Queens, Ferry Point Park in the Bronx, Nyack, Yonkers and Rye Playland in Westchester County, and Tappan Beach in Nassau County. The project is intended to compliment the existing regional transportation network, reduce automobile congestion and provide an economic foundation for establishing a shipbuilding facility within the state. A presubmission conference held at the World Trade Center was attended by more than 70 interested firms.

Since that conference, the state and city worked together to assemble essential information for ferry operators. The RFP provided ferry operators with extensive demographic and market data detailing possible routes and potential ridership. The state and city are prepared to help operators secure environmental permits and approvals, make available certain suitable parcels at potential docking and terminal sites, coordinate mass transit connections, and help operators gain additional assistance from government sources. One of the key evaluation criteria during the selection process will be maximum investment by the private sector. Federal funds have been obtained to advance the Staten Island to mid-town Manhattan route.

We will be following up on this development and report any news of interest to our members. Other IHS activities related to the ISTEA 1991 described in the Fall Newsletter are on hold for now due to a change in both the administration and people we will be contacting when the new administration settles down. We are hopeful that High Performance Marine Vehicles may play a role in the various intermodal systems of the future.

*John R. Meyer, President*

## BOB JOHNSTON REMEMBERS CARLO RODRIQUEZ

*[The Fall Newsletter announced the death of and paid tribute to one of its outstanding members, Carlo Rodriquez. Bob Johnston's close association with him is described here.]*

Carlo was one of the true pioneers in bringing commercial hydrofoils into existence. His efforts in this field began in the early 1950's in Messina, Italy and his results extended throughout the world. Today over 200 hydrofoils, bearing his name are in operation.

I first heard about Carlo's interest in the hydrofoil field while still on active duty with the U. S. Navy and while visiting Supramar's first commercial operation at Ascona, Switzerland. This was 1952 and the Rodriquez Shipyard had just expressed interest to Baron von Schertel, the founder of Supramar. In 1956 we learned that the Rodriquez Shipyard had launched a PT 20 and placed it in operation across the Straits of Messina. Carlo later told me about what a big risk the venture was to his business. He had used all the Shipyard's working capital to fund this venture.

I met Carlo for the first time in the late 1950's while I was working with Miami Shipbuilding Corporation. We had a business relationship under discussion with a Supramar. Carlo Rodriquez, as the principal licensee of Supramar, had a vested interest in the well being of Supramar. As such, he was sent to Miami to represent Supramar in these discussions. I think the major outcome of these discussions was that it put Rodriquez in the hotel business. He was fascinated with the appearance of the Miami Beach Hotels. As a result he returned to Messina and built a beautiful Miami Beach type hotel overlooking the Straits of Messina.

In 1960 after joining Grumman, I was assigned the program management job of working out a joint venture with Rodriquez Cantieri Navali (RCN) for the design and construction of a larger version of the "Denison", a hydrofoil Grumman had built for the Maritime Administration. This vessel was to be a militarized version for the Italian Navy. For the next year and a half I spent a great deal of time in Italy working closely with Carlo and his staff on this project. After developing an acceptable design and equipping to the requirements of the Italian Navy, we entered into the complex world of contract negotiations. The Italian Navy's shipbuilding contract contained many requirements with penalties not related to hydrofoils. These had to remain and be accepted. When asking an Italian Admiral where such requirements came from he replied that they come from Julius Caesar. Finally the design was fixed, the price set, and the contract was prepared for final signature by the Navy and by Carlo. We had all gathered for this moment when Carlo entered the room and announced he couldn't sign it. For his relatively small shipyard it was just too big a financial risk. While I was terribly disappointed, I could not help but admire his business judgement.

From this experience came a very close relationship and friendship. After forming Advanced Marine Systems Associates, we had the privilege of representing Rodriquez Cantieri Navali (RCN) on several business arrangements. We watched Carlo's son, Leopoldo, mature and take over as the business head of the families interests. With great pride

he supported his son's success as he turned the shipyard interest into a conglomerate. As of now the Rodriquez family has only a minor interest in RCN, but the hydrofoil world will always remember what Carlo Rodriquez accomplished.

We salute the great life of Carlo Rodriquez. In 1960, the President of Italy, in recognition of his achievement in the industrial field and particularly hydrofoils, awarded Carlo the CAVALIERE DEL LOVORO (Knight of Labor). He was the youngest man ever nominated in Italy for this highest Italian honor for an industrial manager. The world has lost a true entrepreneur, IHS has lost one of its founding members and I have lost a great friend. All of us at IHS send our sincere condolences to the Rodriquez family.

*Robert J. Johnston*

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## HYDROFOIL NEWS AROUND THE WORLD

*(From Fast Ferry International - July-Aug 1992)*

GREECE

Ceres, with a fleet of 28 vessels and a route network spreading from Thessaloniki in the north to Kythira in the south, remains the country's dominant fast ferry operator. During the past three years, it has continued to re-engine its Kometas with MTU 8V 396 diesels, allowing an increase in service speed of two knots to 34 knots and in capacity from 116 to 136 passengers; it has acquired seven more Kometas, *Flying Dolphin XXII-XXVIII.*

There are now at least 49 fast ferries on the Greek register: 38 Kometa hydrofoils, five Kolkhida hydrofoils, two Ulstein Eikefjord CIRR 120P surface effect ships, a Westmaran 86, a Westmaran 100, a Precision Marine 36m catamaran and a Kvaerner Fjellstrand Flying Cat 40m catamaran. All but two or three are currently in service.

ITALY

In northwestern Italy a new service was introduced this summer between the mainland and the islands of Elba and Corsica by Moby Fast, a joint venture between Aliscafi Snav and local ferry company Navarma Lines, using RHS-160F *Moby Fast.* Originally the State Transit Authority's *Sydney,* the hydrofoil is one of four that returned to Italy from Australia earlier this year.

DENMARK

Aliscafi Scandinavia, a company with the Rodriquez group which markets its service as Citti Ships, has been on the Arhus-Kalundborg route since June 1991 operating *San Cristobal II,* an RHS-200 fitted out for 209 passengers. *May W. Craig,* a 150 seat RHS 160, joined it a few weeks later.

Danish State Railways (DSB) and Citti Ship have joined forces. Since May 31, 1992, DSB has been promoting its former rival and both companies have been selling combined train-hydrofoil tickets for the journey between the two city centres - Citti Ship's special coach service does not operate into central Copenhagen but to suburban Hoje Taastrup.

Originally, a Norwegian consortium was to have introduced the first FoilCat 40m foil assisted catamaran earlier this year on the much longer Copenhagen Helsingborg-Arhus route but this project has been postponed due to the delays in the trials programme of the novel design.

CANADA

Toronto has, during the past two years, been the centre of substantial speculation over the introduction of fast ferry services across Lake Ontario to St. Catherines and Niagara-on-the-Lake, a 27 nautical mile route. During the period several companies, including Lightning Hydrofoils, TNR Corporation and Canadian Lake Express, have indicated an interest in running a service or services in the area, although by July this year Canadian Lake Express was the only one with any craft in Toronto, in the form of two Voskhod hydrofoils.

Meanwhile, the third player in the market, Lightning Hydrofoils, first looked at the possibilities of a hovercraft operation between St. Catherines and Toronto. Discarding this option it turned to the possibility of a Rodriquez RHS 160F hydrofoil service on the same route. At the time this put Lightning Hydrofoils and TNR in direct competition for landing facilities in St. Catherines and, after the local council came down in favour of TNR. Lightning Hydrofoils withdrew from the race. It is by no means the first time that the western end of Lake Ontario has proved to be an attraction to potential fast ferry operators. During the summer of 1980, a scheduled Westermoen PT-150 hydrofoil service was operated by Royal Hydrofoils between Toronto and Niagara-on-the-Lake. According to the Toronto Harbour Commission the service was popular with shoppers and tourists alike, but was discontinued for reasons unrelated to market demand.

## CORRECTION

The Spring 1992 issue of the NEWSLETTER contained an article entitled: "THE HENNING-LEE STORY". It described a high speed hydrofoil boat brought to the U.S. from England with the objective of seeking the world's speed record for marine craft. The article referred to this craft as the "White Cloud". A photograph of this boat was recently discovered in an old NAVSEA file folder, recovered from oblivion by J. Meyer, and it was evident that the many years between Bob Johnston's contact with the craft and his writing of the article had taken its toll. Low and behold, the name displayed on the craft is: "White Hawk", as can be seen in the accompanying picture.

## PHM HISTORY PART I

*[An abbreviated version of John King's talk at the IHS Dinner meeting on October 23, 1992 was published in the Fall issue of the Newsletter. The following is the unabridged version.]*

Today's PHM had it origin in the late 1960s in a NATO group known as the Fast Patrol Boat Conference. This was a branch of the NATO Naval Armaments Group and consisted mainly of Fast Patrol Boat operators and shipbuilders in the Navies employing these craft. The sinking of the Israeli destroyer ELATH by an Egyptian FPB armed with STYX missiles was of great concern in NATO.and the FPB Conference was one of many NATO groups looking into the matter.

In this talk, I intend to name as many of those who were involved with what became the NATO PHM Project. I am sure there are many more, but for the interest of our newer members who may not be aware of the intricacies of shipbuilding in NATO, I will try to tell it like it was. Also, in order not to overlap with Jim Wilkins talk, I will confine these remarks to the NATO and OPNAV side of the program.

The U.S. Navy position in the NATO FPB Conference was almost indifferent. Officially, we expressed only limited interest, chiefly in riverine warfare and in the clandestine operations of our SEAL teams. As a consequence, the US principal representative to the FPB Conference was Capt Larry Kelley, our head SEAL in OP03, occasionally supported by OP-723, the RTD&E office charged with advanced ship developments. Of particular interest to the Conference in the 1969-70 timeframe was the ongoing evaluation of the TUCUMCARI and FLAGSTAFF operations in Viet-Nam. It became clear that the US side had made a good case that the hydrofoil was an ideal FPB platform by demonstrating high speed in the higher sea states that hindered conventional planing hull FPB performance. The U.S. proposed to offer our hydrofoil technology to any interested NATO navy, but, as we are a "big-ship" navy, we would not participate in a cooperative FPB building program. Despite this dichotomy, the result of the U.S. proposal was the formation of an Exploratory Group under IEG 6 to further study the hydrofoil as an FPB that could counter the Soviet OSA/KOMAR threat.

**ADM Zumwalt's response was immediate:"GO FOR".**

I should explain that the NATO Naval Armament~ Group's Information Exchange Group 6 - Ship Design- has primary objective of exchanging information on shipbuilding and armaments that could lead to a cooperative shipbuilding program among NATO nations. Although there have been several attempts, this goal has never been achieved to this date. However, the NATO PHM became the closest, in that a cooperative standard design package was accomplished.

This was how matters stood when Adm Zumwalt became the CNO in July of 1970. Early in his administration, Adm Zumwalt issued a number of policy questions to his OPNAV staff in the form of very structured and concise papers called "Green Stripes". One of these fell my lot to answer as OP-723B. Adm Zumwalt essentially asked whether the hydrofoil or the Surface Effect Ship was better to counter the OSA/KOMAR threat in the Med. The answer was easy. Hydrofoil technology had a solid base, the two 100 ton SES test craft had yet to be finished and their evaluation was years behind the hydrofoil. I also mentioned that the new NATO Exploratory Group was studying the same subject, but was foundering because of a lack of U.S. Navy commitment.

Adm Zumwalt's response was immediate:"GO FOR". This meant that that we could confirm a U.S. commitment into the NATO forum. The result was nothing short of electric. Canada, Denmark, France, Germany, Italy, the Netherlands, Norway and the United Kingdom joined us in pursuing a common hydrofoil design. I had chaired the first few EXG meetings, but as this issue was becoming a major CNO interest project, my immediate superior, Capt Bill Montgomery OP 72B, became Chairman and I became the U.S. member. It also had became clear that we needed to involve the OPNAV ship acquisition community in order to obtain SCN funding and Capt Bob Ripley, newly reported to the Ships Characteristic Board, OP-36, was drafted.

In retrospect, I did one smart thing in those early days when I found myself in a leadership position and that was to call for a meeting of the advanced ship community. Bill Ellsworth arranged a conference room at David Taylor and we were all there including Capt Randy King who was the CO. I had a message. It looked like the hydrofoil may receive much attention in the near future and we should not let internecine arguments in the community get in the way. Hydrofoils are different from SES's. Each had unique capabilities and limitations. Let us build on the strengths and support one another. I believe this message was well received. Over the ensuing years, Bob Ripley and I were able, literally at the drop of a hat, to scoop up a handful of viewgraphs and give a briefing on why both were important. I am convinced many of our important offices and many naval attaches got a better understanding of these capabilities.

Under Bill Montgomery's leadership we addressed some particularly peculiar NATO problems. One had to do with conflict of interest. In the U.S., Boeing was independently pursuing a hydrofoil design as a replacement for the next generation of German FPBs. Boeing was also building a TUCUMCARI derivative for the Italian navy. Grumman was also widely marketing a FLAGSTAFF variant abroad. More exasperating was a common European practice of introducing naval officers in their delegations, who in reality, were reservists marketing their own national armaments interests. Bill solved this problem by closing the meetings to all contractors. Further, the U.S. announced that it would proceed to develop a preliminary design within the U.S. Navy's Ship Engineering Center that would represent the best of our technology and would be free of contractor bias. From this preliminary design, detailed national requirements would be determined which would then lead to competitive proposals from interested contractors, most notably, Boeing and Grumman in the United

States, and Alinavi in Italy and possibly others in Norway and the United Kingdom.

Meanwhile, Adm Zumwalt approved Larry Kelley's proposal to demonstrate our hydrofoil technology by deploying TUCUMCARI in company with the LST WOOD COUNTY to Northern Europe and the Mediterranean. This venture was a great success as most every CNO counterpart in NATO got to fly in TUCUMCARI and most came away favorably impressed. It so happened that when TUCUMCARI was in Brest, France, a young U.S. NROTC midshipman was an exchange officer on a French destroyer. Midshipman Conway Zeigler, who was later to become my son-in-law, spoke excellent French and was impressed into liaison with the French Navy at Brest and later in Toulon. During the French visit, it had been proposed to study the effects on the hydrofoil's height sensing system when a missile is fired. The French wanted to instrument the ship and dump overboard some heavy weights to simulate a firing. Our technical community opposed these tests, quite possibly because we had not done this before and we not sure of the outcome. But the French did it anyway, and as Conway reported, the recorders showed absolutely no sign of perturbation.

Back in the NATO arena, Jeff Benson, then a Lieutenant in NAVSEC, presented a preliminary design of a nominal 170 ton Hydrofoil based on a HIGH POINT hull form. We had some SCN funding for this effort and within NAVSEA, Capt Earl Fowler had become the first project manager. From this design as a point of reference, discussions of national requirements among the NATO participants began to grow.

The second major NATO peculiar problem now became apparent. Essentially, we had to determine amongst the several voices speaking who "the real players" were. Bill Montgomery solved this diplomatically by gradually requiring expression of varying levels of interest from our NATO partners. I should add that our NATO group had many informal meetings, not only at lunch and but often in the evenings. In the end, we entertained each other in our own homes and began to know each other very well. We were well aware who the "players" were, but did not want to unnecessarily force out the others. As a consequence, Denmark, France, the Netherlands, Norway and the U.K. became "observers", free to attend and participate all discussions but asked to refrain from stating requirements.

From this background. the Exploratory Group developed a primary mission - to attack surface ships using anti-ship missiles and light guns. The mission was further defined to a five day at sea period. The desired performance was defined to include speeds in excess of 40 knots in 10 to 12 foot seas. Combat range was flexible as only the U.S. had a need to maximize the range, the European nations being willing to accept less.

About this time, Bill Montgomery retired from the Navy and I again assumed the chair. In his last meeting, Bill received the plaudits of our mentor within the NATO Naval Armaments Group, Italian RADM Egidio Cioppa. I must say a few words about Adm Cioppa. He held a unique position in NATO. I later checked and found that the NATO Army and Air Force Armament Groups had no such counterpart. He titled himself Director of the NNAG and, as such, he ruled. He used to say that his mission in life was in NATO because he had been fighting Communists since he was a midshipman in the Spanish Civil War. In World War II he was an aide to Mussolini and was captured in Sicily and made the senior officer in charge of Italian prisoners on the island. Years later and for reasons unknown he fell into disfavor with his navy and was sent to an innocuous posting in NATO. Not be be undone, then retired Capt Cioppa went to the Italian courts and sued to be made an Admiral. This is a uniquely Italian procedure, but he won by producing files of his fitness reports that said he should be promoted. Later, before I stepped down, he did this again and got promoted to Vice Admiral. Adm Cioppa was an eccentric, but thoroughly delightful and dedicated NATO official.

Also at this time, Adm Zumwalt had developed his "High-Low" mix shipbuilding program. The "High" end were the new CVNs and Aegis ships. His "Low" end consisted of the PHM, an new small escort, the Patrol Frigate PF which became the FFG-7 class, and a new small aircraft carrier called the Sea Control Ship (which was later defeated by Congress). A distant future Low-mix candidate was the Surface Effect Ship.

Within OPNAV, a new division was formed to concentrate on the "Low Mix" ships called the Advanced Ship Division, OP-03Z, under VADM Gerry King, who was OP-03. Larry Kelley had received orders to the JUSMAAG Korea and it was determined that I would leave OP-723 and relieve Larry as the PHM desk officer as OP-03Z3.

Just before Larry left, he gave me a call and said there was going to be a meeting in Gerry King's office and I had better be there. At that meeting, Earl Fowler threw a bombshell. He said that the U.S. Navy was wasting time and money with the NAVSEC preliminary design to competitive design approach and he was awarding Boeing a contract to get started immediately. This announcement created a lively discussion and, later, an acrimonious response from Grumman. However, Earl's position had been approved with NAVSEA, Radm Nat Sonenshine, and he prevailed. Shortly afterward, Earl Fowler turned over the NATO PHM project to a new SHAPM who had just checked in to NAVSEA, Jim Wilkins.

**The desired performance was defined to include speeds in excess of 40 knots in 10 to 12 foot seas.**

Activity in NATO was also moving at a fast pace. In NATO Headquarters in Brussells, meeting halls were booked six months in advance. We needed to meet more frequently and began to meet in each others capitals every four to six weeks. Another programmatic issue arose in the Pentagon. At this point, the U.S. was committed to build "a number" of PHMs in a cooperative program. The number needed to be defined. I proposed to the CNO that we commit to a force of 30 PHMs, composed of 5 six ship squadrons, two in the Atlantic, two in the Pacific with one squadron in reserve.

This was approved and was later to be an important number in sharing development and acquisition costs with the PF program.

Another programmatic issue was brewing in the Pentagon - selection of the weapons suit for our PHMs. I was later to read in Adm Zumwalt's memoires of his CNO experience, "ON WATCH", that he considered the PHM to be very promising in the surface attack mode in "narrow or coastal waters like the Gulf of Tonkin, or the Mediterranean or the Red Sea". He went on to add "or to serve as a low value trailer of high value Soviet ships in such waters". In his book, Adm Zumwalt said that he had ridden in a SES and found it very exciting. It is sad to note that we never got him to ride a hydrofoil. How much more interesting it might have been if he had stood on the bridge of PLAINVIEW thundering along foilborne. An opportunity lost.

CDR Ron Adler was then in NAVORD and charged with doing analyses to optimize the PHM weapons suit. In a preliminary presentation, Ron postulated a scenario in which a hullborne PHM was trailing a Soviet when a STYX missile is suddenly fired. Ron was developing a case that PHM's weapons should be defensive. Bob Ripley and I jumped up to protest. We stressed that the NATO mission is surface attack and adding defensive weapons only increased ship size and cost and reduced range. We proposed that Ron redo his scenario into a "dark and stormy night" situation in which the Soviets exploit heavy weather to exit the Black Sea into Aegean against against groups of PHMs hiding among the islands.

In the end, A CNO Executive Board meeting was held to determine the weapons issue. When the dust settled an offensive weapons suit was approved. More importantly, the CNO approved the development of a lightweight cannister launcher for the Harpoon. This gave the PHM a battery of eight missiles, more than enough, according to weapons effective studies, to render the largest Soviet ship mission incapable. The adoption of the Oto-Melara rapid fire 3" gun and the Dutch WM-25 gun fire control system was also approved and these systems were later incorporated in the PF design.

When these decisions reached the NATO group, there was no question that the U.S. Navy driving hard. As an example, at one point I announced that only those countries bringing a letter stating an intent to proceed further could participate at the next meeting. That meeting was in Copenhagen and the Germans reported that their letter of intent was being "held up" in their bureaucracy. To assist them, I expelled them from the meeting sending them home to get the authority. This caused sufficient embarrassment that they returned the next day with letter in hand.

Another example of the U.S. intensity was the introduction of Radm Frank Price into the NATO group. Bob Ripley convinced Adm Price that the "group dynamics" would be upset if he exerted a heavy hand and suggested that he remain in the background as the "gray eminence". Adm Price, as head of the Ships Characteristic Board, was well known in NATO and when a decision came up, I had only to turn to him. When he nodded, the whole group knew the decision had the full weight of the U.S. Navy. But Adm Price had an annoying practice. In the Pentagon, particularly in regards to PHM/PF common matters, he would call for the SHAPMs to appear in his office, usually late in the afternoon. Being an old professor of naval ordnance, he conducted these meetings in front of his blackboard which he used liberally to do make his points and to do his arithmetic. These "chalktalks" frequently went on for hours and Jim Wilkins would have to forsake his carpool to Annapolis. Several evenings found me driving Jim to the Grayhound bus station in order to get him home.

I remember an occasion when we were in Brussells, and as a joke, I asked the consierge at the Metropole Hotel to put a blackboard in Frank Price's room. An important issue had come up during that days meeting and another "chalktalk" ensued. The issue was would the U.S. perform the PHM design using the metric system? After much discussion, Adm Price called Adm Gerry King in the middle of the night. Adm King referred the matter to the CNO and the "Go For" decision was relayed in time for our NATO groups meeting the next morning.

In parallel with these proceedings, Bob Ripley and NAVSEA's advocate, Penny Moed, were working the Memorandum of Understanding issue with German and Italian lawyers. This was painstaking work and the MOU that was concluded was a truly significant document. The MOU was conceived to have two separate phases, one covering the NATO common design and for the construction of two U.S. Navy prototypes for evaluation. A later document, to cover the cooperative shipbuilding phase, was never signed. The Design Stage MOU provided for the cooperative design of a "NATO Standard Design", which was cost shared and for National Variant Designs whose costs were borne by each nation. The Standard Design included those common features as the basic hull form, the LM-2500 gas turbine and waterjet propulsion system, the struts, foils and flight control systems, the diesel hullborne propulsion system and the Oto-Melara 3" gun. National Variants included such items as the primary missile systems. The U.S. and the FRG chose to use the Harpoon, the Italians opted for their Teseo Missile. There were a number of variations in the design of accommodations and in the electronic subsystems. The MOU also provided for establishment and manning of an international Project Office in NAVSEA under Jim Wilkins.

The Design Stage Memorandum was signed in November of 1972 and NATO Project Group Six was established. Radm George Halvorson, OP-03Z, became the Chairman and I reverted to U.S. member.

By now, the NATO Standard PHM design was growing to over 200 tons. The CNO and the Congress were showing increasing interest in program costs. I assisted Adm Halvorson at a CNO Executive Board meeting that discussed the U.S. production program costs. In that presentation, it was shown that the average cost of a 30 PHM program could meet the budgetary target cost of $18 million each, if we used the foreign gun and gun fire control systems. It was argued that the decision to "Americanize" these systems

was a separate programmatic issue. In addition, the PHM was an international cost sharing program and many cooperative decisions were yet to be made. The PF program, it was argued, was a U.S. Navy program and it was an unnecessary burden on the NATO PHM program to bear the costs of Americanization. In retrospect, it is surprising that the CNO accepted these costs. The issue of Americanizing these systems was to become one of the largest cost factors in both the PHM and PF programs and a source of much Congressional irritation. At the time I made my final report the the NATO Naval Armaments Group that announced the signature of the Design Stage MOU by the U.S., Germany and Italy, VADM Cioppa called me aside. Our NATO Exploratory Group had been very successful, but its work was not over. The mission of anti-submarine warfare, for example, had not been considered in any detail. He asked that I sit down and write the Terms of Reference, the NATO definition of a Group's charter, for the "Extended Roles for Hydrofoils in Naval Warfare". He then introduced what I had written into the NNAG meeting and received concurrence to create Special Working Group Six to operate as specified in the Terms of Reference. I am pleased that, although under different terms, SWG-6 still continues to operate albeit on shaky legs. That is a story that George Jenkins will tell in our next Dinner Meeting.

In conclusion, the years 73-75 were fast and furious for me with Monthly design reviews in Seattle and NATO Project Group Meetings in the US, Bonn and Rome. I have one serious regret for a missed opportunity - I failed to convince Jim Schuler to fund a study of available reserve fleet shipping assets that could be converted into a PHM mother ship. Clearly, the lack of waterborne mobility has been a serious limitation on the Fleet's acceptance of the PHM as a fighting asset. Finally, in Nov 1974, I attended the launch of PEGASUS PHM-1 in Seattle. Adm Halvorson, then retired, also attended. We had been old friends since the early SO's and when I announced my plans to retire, he said "Its about time". Its also about time that I sit down. Here's Jim Wilkins.....

*CAPT. John W. King, USN (Ret.)*

## CODE OF SAFETY

*(From Fast Ferry International)*

The development of a Code of Safety for High Speed Craft, to replace the existing Code of Safety for Dynamically Supported Craft, better known through the industry as A.373(X), is currently underway through the International Maritime Organization.

**High Speed Definition**

At the fast meeting of the sub-committee on ship design and equipment agreement in principle was reach over a revised version of Chapter 1 of the Code. The chapter gives a general outline of the Code's aims and covers subjects such as definitions, surveys, certifications, equivalents and execptions and applicability.

Nevertheless, there were still some misgivings about an appropriate definition of the term 'High Speed Craft' and 'lightweight construction'. It had been agreed that the definition of 'high speed' would be covered by a minimum speed criterion of 25 knots and, for the purposes of the draft revision of Chapter 1, that 'lightweight construction' would be a matter for agreement between the Administration and the Port States.

Now, however, both Australia and the United Kingdom have put forward proposals covering suitable definitions of the terms. The proposals were up for discussion of the 35th session of the sub-committee of ship design and equipment.

The United Kingdom in its proposal said: "The United Kingdom is of the opinion that a more scientific definition of the term, 'High Speed Craft' should be attempted. Such a definition would in its opinion greatly assist the shipping industry and at the same time reduce the possibility of protracted difficulties in interpretation from arising."

The formula the United Kingdom has proposed is:

$$C_{cc} = \frac{\Delta}{(L \times B)^{1.5}}$$

where $C_{cc}$ = Coefficient of construction

$\Delta$ = full load of displacement (t)

L = Length of the rigid hull measured on the design waterline inthe full load displacement mode when the craft is stationary (m)

B = breadth overall (m)

It is not clear from the information available what limitations of Ccc are proposed as applied to high speed craft.

Australia too had looked at the alternatives available for the two definitions. "As one of these alternatives, consideration has been given to the volumetric Froude Number concept proposed by the United States in document DE 34/18.

According to the Australian submission: "This concept has been found to have the advantage that it simultaneously defines both a required minimum speed and a value of maximum permissible displacement (used in place of 'lightweight construction').

Consequently Australia has proposed that the definition of a high speed craft should be amended to:

'High Speed Craft' is a dynamically supported craft or a craft capable of a fully laden service speed of:

$$V = 5.0\ \nabla^{0.1667}$$

where: $\nabla$ = maximum permissible displacement ($m^3$)

V = service speed at displacement (m/sec)

The new definition has four main benefits. It would, says the Australian contingent:

-permit the revised Code to be readily applied to all types of ships covered by Resolution A.373(X);

-provide a significant reduction from the speed requirements of the present Code;

-be readily applied to vessels such as SWATHs for which the length is not easily measured; and

-at the same time provide a clear demarcation between conventional ship types and those for which lightweight construction is essential for satisfactory operation.

## HYBRID HYDROFOIL DEMONSTRATOR

The Hydrofoil Office of the Systems Programs Division at Carderock Division, Naval Surface Warfare Center has received funds in connection with a Phase I SBIR Topic for an unmanned hybrid surface ship demonstrator.

This Exploratory Development will seek to utilize hybrid hydrofoil technology to satisfy a need for unmanned surface craft with high speed (40 knots) in rough water, long range at high speed, high payload capability along with superior motion in waves all at a reasonable cost. Hybrid hydrofoil technology has progressed to the point where it appears particularly suited to successfully meet the demanding and often conflicting requirements for such an unmanned surface ship decoy. A hybrid hydrofoil consists of a marriage of conventional surface ship monohull and foils mounted on a submerged lower hull connected by a single, slender strut. An automatic foil control system is used to provide dynamic lift and to maintain a stable platform in waves. The expected payoffs using a Hybrid Hydrofoil concept include:

a. Significant reductions in roll, pitch and heave forces and motions in rough water.

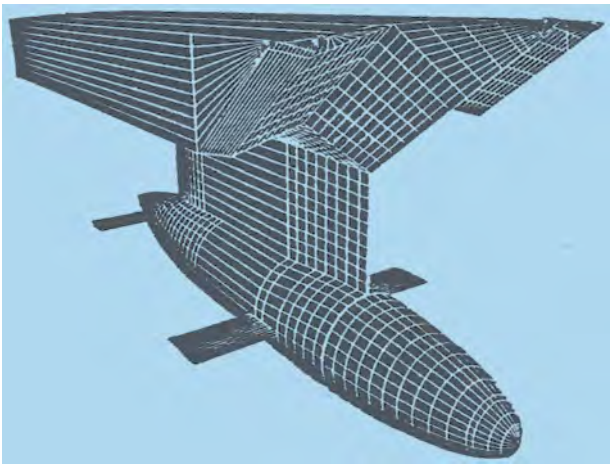
b. Improved hydrodynamic efficiency at speeds greater than 20 knots, with relatively little speed degradation in waves.

c. Improved propulsive efficiency compared to conventional craft and ship propeller arrangements because of the favorable flow conditions around the slender lower hull.

d. Very small wake, thereby significantly reducing surveillance by wake signature.

e. Greater range and endurance at high speeds because of the combination of high fuel fraction and improved hydrodynamic and propulsive efficiencies.

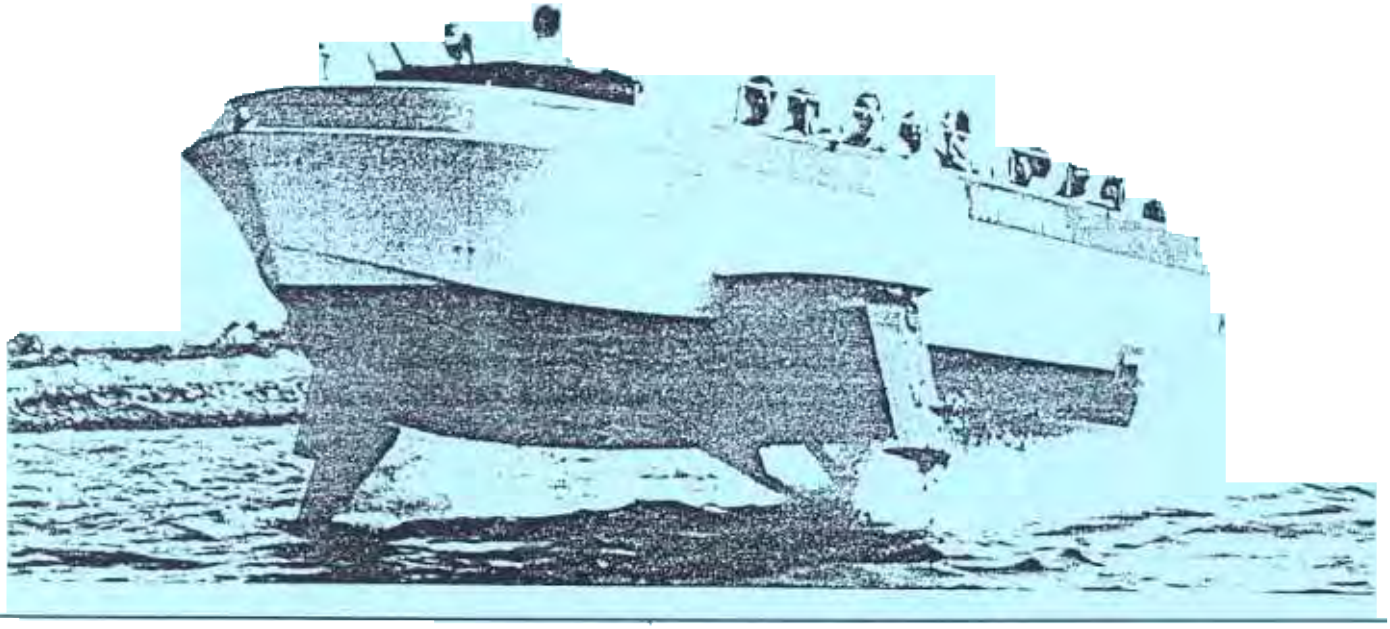
The specific objective the SBIR project will be to develop and document a Hybrid Hydrofoil design concept and to generate the engineering drawings suitable for fabrication and assembly of a demonstrator of about 12 tons. Phase II will focus on fabrication and at-sea trials of the Hybrid Hydrofoil demonstrator and to provide design validation and other technical data.



## MARINE WORLD'S HYDROFOIL REFURBISHED

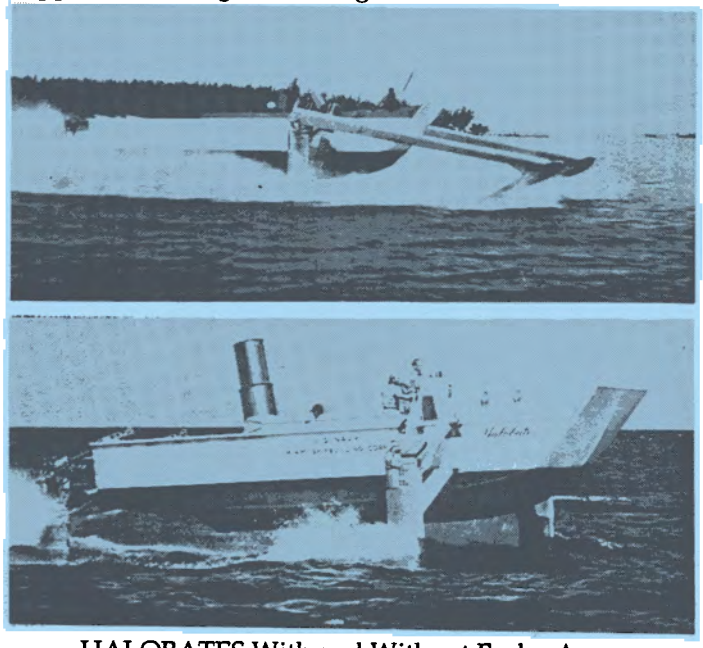
*(From Boats and Harbors, Second June Issue 1992)*

For a number of years a hydrofoil has operated in San Diego Harbor carrying passengers to Marine Land. This craft has been retired and now refurbished and is on the market for sale. $100,000 was spent to recondition the hull and foils and to install a new 570 KP Silver Detroit 8V-92 engine. This 34.6 feet long by 12 feet beam hydrofoil carries 28 passengers. The vessel has been recertified by the U. S. Coast Guard for 35 knots and is restricted to operation on lakes, bays, and sounds.



## DO YOU REMEMBER.....HALOBATES?????

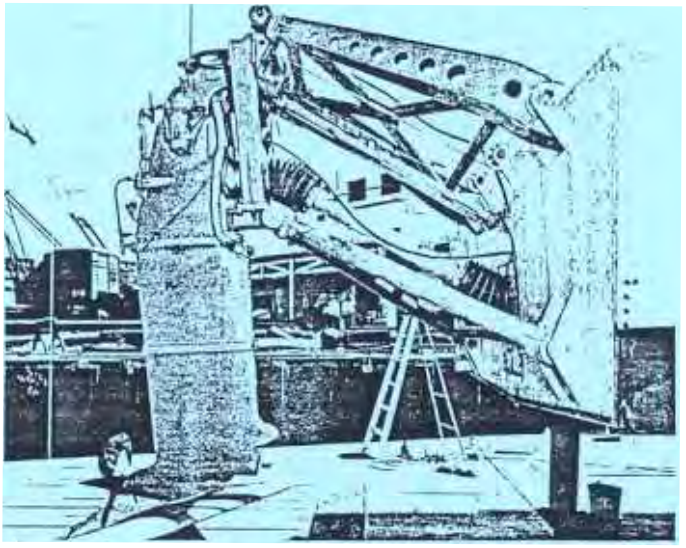
One of the many craft contributing to the development of the modern hydrofoil was "HALOBATES", designed and completed in 1957 by the Miami Shipbuilding Corporation. This development grew out of a desire of the Marine Corps to increase the speed of approach to landing on the beach. They noted that these speeds during the Korean War landings had not changed perceptibly since William the Conqueror headed for a beach in 1066. As a result, a program was initiated in 1954 to evaluate a hydrofoil-supported landing craft, designated LCVP.



HALOBATES With and Without Feeler Arms

One version of the craft is shown here with "feeler" arms adapted from the Hook system. The name, HALOBATES, was suggested by the Marine Laboratory of the University of Miami since *halobates* is a sea going insect which has forward extending feelers. The hydrofoil HALOBATES, a modified small landing craft, was 35.5 feet long with a beam of 11.7 feet and a full load displacement of 31,000 pounds. A 630 hp gasoline engine provided power for the craft which demonstrated speeds up to 34 knots in 5-foot waves. The design was complicated by the use of many ball and screw actuators necessary to provide retraction of the foil and propulsion system for the landing craft requirement. However, in spite of its relative success, this configuration led to a comment which in essence said: "If this is the way hydrofoils are to be built, we have no use for them in the Navy!". The feeler concept was certainly objectionable, and so, feelers went their way and HALOBATES was reconfigured with an electronic automatic foil control system. The feelers were removed and a step-resistance incorporated along the leading edge of the two forward struts. This feature provided a height signal, based on wetted length, to the autopilot, which in turn controlled foil lift. Also, it was decided to replace the reciprocating gasoline engine with an Avco T-53 gas turbine engine providing about 1,000 hp.

The photos show both configurations of the craft. The gas turbine installation in HALOBATES marked a notable technological "first" for hydrofoils in particular, and in the marine field in general.



HALOBATES Retractable, Steerable Propulsion System

An interesting aspect of the HALOBATES design was associated with the landing craft requirement. Not only did the foil and propulsion systems have to retract, but they were to continue to operate during the retraction process, that is, the craft was to be capable of flying continuously from relatively deep water up to the point it became hullborne as the water became very shallow. The aft propulsion "out-drive", shown in the accompanying picture, had not only to provide thrust during retraction, but remain steerable at all times.

*Submitted by John R. Meyer*

## USS TAURUS MAKES BIG BUST

*(From THE SOUTHERNMOST FLYER, December 11, 1992)*

During early September, while assigned to Law Enforcement Operations in the Gulf of Mexico, USS TAURUS (PHM-3) intercepted a 34-foot fishing boat and seized sixteen bales of cocaine.

The confiscated contraband totaled 1,700 pounds and had a street value of over 16 million dollars. This highly successful mission was a joint effort between the U.S. Navy, U.S.C.G., the Drug Enforcement Agency and the U.S. Customs Service.

## New Ukrainian Hydrofoil Nears Completion

*(From Fast Ferry International, Oct 1992)*

The Feodosia Shipbuilding Association, now trading as Morye, has confirmed that the first Olympia hydrofoil is due to be completed before the end of this year. During the last 40 years, the Crimean yard reports, it has built over 600 hydrofoils including the first examples of the Raketa, Kometa, Cyclone and Lastochka.

Production has also included naval hydrofoils, patrol boats and the Pormornick hovercraft. One of the more intriguing projects at the yard at present is an evaluation into the feasibility of turning the 57m hovercraft into a cargo carrier.

The 43.3m Olympia is described as a seagoing hydrofoil designed to operate on routes in tropical and moderate climates up to 50 miles from a port of refuge in open seas, or up to 100 miles on inland seas and large lakes, with the permissible distance between two ports of refuge being not more than 200 miles.

Also currently in production is the 27.6m Voskhod-2M, a seagoing version of the Voskhod-2. This shares the same overall dimensions as the earlier design but has a slightly higher installed power and lower range to produce "a hydrofoil designed to operate, in sea gulfs during daylight hours in regions with moderate climates, up to 25 miles from a port of refuge."

Far larger is the Cyclone-M, series production of which is expected to start in 1993 or 1994. A 44.2m double deck design, the major difference between this and the prototype is that it will have a pair of 2,960 kW gas turbines in place a single 5,150 kW unit. This is intended for operation "on sea routes up to 100 miles from a port of refuge in countries with moderately cold climates." This summer the prototype Cyclone was operating a passenger service across the Baltic Sea between Tallinn, Estonia, and Helsinki, Finland.

Morye also points out that it is willing to enter into co-operative ventures with overseas partners covering joint manufacture of high speed vessels, operation of passenger services, and leasing of vessels.

*[Editor's Note: Physical and performance characteristics of Olympia,*

## MITSUBISHI "FOILCAT"

*(From Marine Log, November 1992)*

Mitsubishi Heavy Industries, LTD. (MHI) recently launched the Mitsubishi Super Shuttle 400, *Rainbow*, the world's "first" super high-speed catamaran hydrofoil powered by high speed diesel engines. The craft will be delivered in March 1993 and will begin operation in April 1993.

Information from a brochure provided by the New York office of Mitsubishi is as follows:

MITSUBISHI SUPER SHUTTLE 400 CHARACTERISTICS

| | |
|---|---|
| Overall Length | 33.3 m |
| Length at water line | 28.5 m |
| Beam | 11.0 m |
| Maximum foil span | 12.8 m |
| Total displacement | 310 tons |
| Maximum speed | 40 knots |
| Propulsion: 4 Mitsubishi Diesels and 2 Waterjets | |
| Passengers | 341 persons |
| Crew | 5 persons |
| Navigable area | Limited coastal |

"The Mitsubishi Super Shuttle 400 is built with a twin hull and because of the large span hydrofoils, its high lift allows for diesel engines to be used. As a result, costs in construction, inspection and maintenance are reduced, making it possible for delivery of a high-speed craft at a low cost. Another advantage of the design to note is that because the ship is built with a twin-hull, with a deep "V" shaped bottom on both sides, the craft is stable even in bad weather, thus, giving a comfortable ride. The Super Shuttle 400 is the flying high-speed ship of the 21st century."

## SNAME FIFTH BIENNIAL POWER BOAT SYMPOSIUM

The SNAME Fifth Biennial Power Boat Symposium will be held on February 9 and 10, 1993 at the University of Miami Rosenstiel School of Marine and Atmospheric Science (RSMAS) on Virginia Key, Miami, Florida. This year the theme for the Symposium will be "A Century Of Progress In Power Boats" in recognition of the Society's Centennial. The program will provide twelve papers in two days plus a tour of the Historical Museum Of Southern Florida-Harrison Collection of antique race boats and outboard engines.

Fellow IHS member, Jean Buhler, is Symposium Chairman and has organized this Symposium to include the following papers:

"A Century of Small Craft Propulsion" - David F. Butler
"Small Passenger Vessels: A Tradition of Innovation" - Timothy A. Graul
"Nathaneal G. Herreshoff's Power Boats" - Halsey C. Herreshoff
"A Hundred Years of Overcoming Archimedes Principle" - Robert J. Johnston, John R. Meyer
"The Coast Guard's Response to Rum Running During Prohibition 1919 to 1933" - Irving H. King
"Reflections of Planing Hull Technology" - Donald L. Blount
"Performance Potentials for Stepped Planing Monohull and Catamaran Motor Cruisers" - Eugene P. Clement, Joseph Koelbel Jr.
"The Evolution and Contribution of Model Tests to Understanding Planing Hull Hydrodynamics" - Daniel Savitsky
"Speed Boat Developments From The Past Into The Future" - Morley S. Smith
"Maneuverability of High-Speed Power Boats" - Edward M. Lewandowski
"Effect of on Planing Craft Predictions" - John M. Almeter
"Enhancement of Catamaran Speed With Bottom Air Film" - Robert C. Latorre

*More information on page 12*

## CLIPPER NAVIGATION CONTINUES TO GROW

*(From Fast Ferry International)*

Clipper Navigation's service between Seattle and Victoria, Vancouver Island began with the introduction of its catamaran, Fjellstrand 38.8 m Victoria Clipper in July, 1986.

Clipper Navigation announced that it would be running a year round service with the 300 seat vessel, encouraging traffic by running special promotions. It was the first ferry company to attempt this. The established operator, the British Columbia Steamship Company, ran for just five months of each year. From October until May the only direct services between Seattle and Victoria had previously been provided by floatplane and commuter aircraft companies.

Six years later, the company's fleet has increased to the three catamarans, its workforce has more than doubled and it has recently placed an order for a Fjellstrand Flying Cat 40m that is to be introduced next summer.

Victoria Clipper II entered service with Clipper Navigation at the beginning of 1990. An International Catamarans 30m design was launched two years earlier by Nichols Brothers Boat Builders. Clipper Navigation is operating it as a 285 seat vessel.

Victoria Clipper III, an Incat 31m built by Gladding-Hearn Shipbuilding, followed last year. Clipper Navigation has placed a $7.3 million order with Kvaerner Fjellstrand of Norway for a 40-meter Flying Cat design catamaran. The cat is scheduled for a March 1993 delivery. Power will be provided by two MTU 16V396TE74L diesels with two KaMeWa model S 71 II waterjets and two ZF marine gears. Auxiliary power will be supplies by two MTU 6R 099 TA 31 diesels. Another feature on the catamaran will include a Motion Damping System for Ride Control.

Modifications have also been made to the vessels, particularly to Victoria Clipper. At the beginning of 1991, the MTU 16V 396 TB83 2,010 hp diesels were replaced by a pair of 16V 396 TE74s. At the beginning of 1992, Kvaerner Fjellstrand motion damping system (MDS) was fitted.

Developed in association with Marintek, this basically comprises a strut mounted foil forward beneath each hull, hydraulic transmission system, sensors, computer, control panel and monitor.

Clipper Navigation fitted the first system produced because its route passes through an exposed stretch of water across the Strain of Juan de Fuca which, on bad days, has generated its fair share of sea sickness. Until now the only alternative has been cancel the service, or to reduced speed and re-route through the San Juan islands, which can increase the trip time by as much as 2 hours or more.

It has subsequently reported that the MDS has reduced vertical accelerations at the LCG by 40% and that it is now able to operate in up to 3.5m maximum waveheights, conditions that would have previously resulted in cancellation. On the debit side, it is estimated that service speed in calm conditions has been reduced by approximately 1.5 knots.

Since Victoria Clipper returned to service, Clipper Navigation states there has been virtually no incidence of sea sickness in up to 2m seas while that experienced in 2-3m seas is estimated to be significantly less than half that previously experienced. So impressed is the company that it says it would now not consider introducing a catamaran that was not fitted with a motion damping system.

Running struts and submerged fins through waters noted for their population of deadheads, or sodden logs, may have its moments but in early July, despite some impacts, it had survived.

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**Please fill in, cut along dashed line, and send along with your 1993 Dues**

**Full Name** _____
**(No initials, please) Last First Middle**
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Street, Apt. #
_____ Phone # (____)_____
City State Zip Code
Brief summary on area of expertise and what you are doing now: _____

SNAME FIFTH BIENNIAL POWER BOAT SYMPOSIUM (Continued from Page 10)

Price: (1)Registration for the Technical Program and visit to the Museum (Includes a bound copy of all papers, bus transportation to and from the Historical Museum, a pass to the Museum, a pass to the Miami International Boat Show on Miami Beach, and refreshments at all coffee breaks).

SNAME Members - $67.00

Non-Members - $89.00

(Note - Does not include the cost of the luncheons at RSMAS or tolls on the Rickenbacker Causeway. For registrations received after February 1, Boat Show passes are still included but can only be picked up at the Boat Show).

(2)Banquet at the Rusty Pelican (Cash Bar - Cocktail Hour).

Per person - $30.00

Symposium Registration: Please make checks payable to: "SNAME Southeast Section" and mail payment to:

Mr. William L. Lane, Secretary/Treasurer
SNAME Southeast Section
7251 S. W. 53rd Place
Miami, Florida 33143



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