August 2022

# The NEWSLETTER

## INTERNATIONAL HYDROFOIL SOCIETY

P.O. Box 8911, Reston, VA, 20195

## Contents



## Sustaining Members



## Officers & Board of Directors



## Mandle's Prize Perspective

Martinn Mandles and his wife Connie have funded up to $4,500 a year in IHS hydrofoil achievement awards for students commencing since 2014. Other sections of this Newsletter include the announcement of winners for 2022 and Rules for the 2023 Mandles Prize competition.

The awards consist of the $2,500 First Prize with a commemorative plaque, and as many as two optional Honorable Mention prizes of $1,000, also with commemorative plaques.

As we enter the 10th year, we want to express our sincere appreciation to Martinn and Connie Mandles for their continuing support as the benefactors and namesakes of the IHS Mandles Prize. We anticipate another group of excellent entries for the 2023 Mandles Prize and for many years to come.

For more information on the Mandles Prize, go to foils.org and watch this YouTube video

Mark Bebar

# IHS Business

## Support the International Hydrofoil Society and Enjoy Your Coffee

## Limited Offer to Purchase an Official IHS Mug

The IHS celebrated its 50th Anniversary in November 2021. In the spirit of membership, we are offering for sale a limited number of 16-oz coffee mugs with these features:

- Double wall stainless steel interior with black plastic interior.
- Push on/off, slide open/close lid.
- Fits most car cup holders.

The mug is pictured below and has both the IHS logo and the Society of Naval Architects and Marine Engineers (SNAME) logo in recognition of our relationship with SNAME Panel SD-5 on Advanced Marine Vehicles.


Pricing is as follows and includes shipping within the U.S. Shipping of mugs overseas will be priced based on destination.

- Single mug: $27.00
- Two mugs: $45.00

To order your mugs, place an order at:
https://foils.org/donate-and-merchandise/

## 2023 Mandles Prize for Hydrofoil Excellence

The International Hydrofoil Society is pleased to announce that thanks to the continued generosity of Mr. Martinn Mandles, a long-time member of IHS and his wife Connie, we will once again sponsor The IHS Mandles Prize for Hydrofoil Excellence competition. The competition, now entering its 10th year, includes up to $4,500 annually in IHS hydrofoil achievement prizes for students, with a $2,500 First Prize and up to two $1,000 Honorable Mention awards.

In order to open the competition to a wider spectrum of qualified entries, submissions by students based on work completed since 2018 will be eligible for the 2023 IHS Mandles Prize for Hydrofoil Excellence. The due date for application forms (included in the Rules) is May 1st , 2023.

This is an outstanding opportunity for the next generation of hydrofoil developers to be acknowledged for their efforts to advance the state of the art in hydrofoil and hydrofoil-assisted craft engineering, design and construction. Rules for the competition can be downloaded from the our website https://foils.org/mandles-prize-rules/

We anticipate a very exciting competition in 2023 and look forward to receiving many high-quality entries. Questions on the IHS Mandles Prize for Hydrofoil Excellence can be e-mailed to

Mark Bebar at: markbebar@juno.com or

Ray Vellinga at: IHSpresident2016@gmail.com

# 2022 Mandles Prize

## Announcement of Awards Congratulations to This Year's Winner!

**First Prize (one at $2,500):**

*Modification of a Lateral MIMO Model for Use as a Hydrofoil Boat Design Tool and Flight Control System with the Addition of Longitudinal Control*

By: Ethan Beachy and Jonathan Stanhope
Cedarville University, Cedarville, Ohio USA

Faculty Advisor: Professor Timothy Dewhurst

A synopsis of the First Prize paper is included on the next page of this Newsletter

**Honorable Mention (two at $1,000 each):**

*Velocity Prediction Program for a Hydrofoiling Lake Racer*

By: Michele Francesco Melis
Hamburg University of Technology, Hamburg Germany

Faculty Advisor: Professor Moustafa Abdel-Maksoud

*Optimization of a Hybrid Composite Hydrofoil Using a Genetic Algorithm to Improve Its Performances*

By: Jeanne Bouvier
University of Southampton, United Kingdom

Faculty Advisor:Professor Adam Sobey

Full Papers available for download at
https://foils.org/mandles-prize/2022-winner-announcement-and-papers/

## Background on This Year's Competition

The entries for the 2022 Mandles Prize reflected a range of hydrofoil-related research and technology. We are fortunate to have an outstanding panel of judges to review the entries, and they determined that this year's First Prize winner is from Cedarville University, Cedarville, Ohio. In addition, two Honorable Mention awards will be given this year, to students at the Hamburg University of Technology in Germany and the University of Southampton, United Kingdom. The three papers will be posted on our website, www.foils.org, in the near future.

Our appreciation and thanks go to the many prominent schools of the previous (2014-2021) and 2022 Mandles Prize cycles and the students and faculty advisers that competed. They include: Australian Maritime College, University of Tasmania; Cedarville University; Ecole Polytechnique Federale de Lausanne (EPFL), Switzerland; Florida Institute of Technology; Massachusetts Institute of Technology; Stevens Institute of Technology; University of Florida, Ghent University, Hamburg University of Technology, Hamburg Germany, Swiss Federal Institute of Technology; Technical University of Delft, Netherlands; Tolani Maritime Institute, India; University of Genoa, Italy; University of New Orleans; University of New South Wales, Australia; University of Southampton, United Kingdom; Newcastle University, United Kingdom; United States Naval Academy, Annapolis, Maryland; and Webb Institute, Glen Cove, New York.

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

By virtue of applying for the 2022 IHS Mandles Prize, all students and their faculty advisers are now members of the International Hydrofoil Society. We invite them and anyone who is interested to volunteer for our not-for-profit efforts encouraging hydrofoil research, development, and applications.

Now, with the 2022 IHS Mandles Prize in the record books, it's time to think ahead to the 2023 competition. The announcement for 2023 is posted at https://foils.org/mandles-prize-announcement/. The sooner preparations begin, the greater the chances of submitting winning entries. Good luck, and we look forward to welcoming all of you and those who follow in your footsteps next year.

Finally, as we enter the 10th year of the Mandles Prize for Hydrofoil Excellence, we want to express our sincere appreciation to Martinn and Connie Mandles for their continuing support as the benefactors and namesakes of the IHS Mandles Prize.

Sincerely,

Ray Vellinga, President
email: ihspresident2016@gmail.com

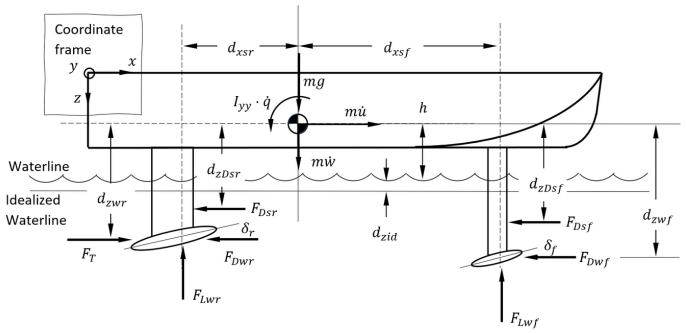
Mark Bebar, Vice-President
email: markbebar@juno.com

# First Prize paper

## MODIFICATION OF A LATERAL MIMO MODEL FOR USE AS A HYDROFOIL BOAT DESIGN TOOL AND FLIGHT CONTROL SYSTEM WITH THE ADDITION OF LONGITUDINAL CONTROL

ETHAN BEACHY
JONATHAN STANHOPE
ADVISOR: DR. TIMOTHY DEWHURST

A single-track hydrofoil boat is a watercraft with two struts protruding from the centerline of the hull with hydrofoil wings at their lower ends. Such a boat may be steered by turning one or both struts, with the possible assistance of wing-induced-roll. The height and pitch may be controlled using the foils to balance the weight of the boat with hydrodynamic lift. The Cedarville University Solar Boat Team desires to use such a boat to reduce drag and improve race performance. However, such a boat is unstable, motivating work to create an automatic flight control system using multi-input, multioutput state-space control theory and a feedback loop. Previous progress resulted in a model for steering control.
This work was modified and extended to allow the use of any valid combination of steering inputs. A height and pitch control model was also developed and the two combined to produce a single flight control system.




***An accurate and complete free body diagram is essential to correctly apply Newton's Second Law to the longitudinal model.***

# The IHS Video Corner and Foiling News

### Single Strut Hydorofoil Model

Benjamin Kelm shares his build using 3D printing to achieve a electronically stabilized electric hyrofoil RC boat
https://www.youtube.com/watch?v=nwcekw-SIEg

### Model Submerged foil Trimaran

"rctestflight" shares his build using three hydrofoils mounted to foam hull pontoons.
https://www.youtube.com/watch?v=HufHeNmxock

### Silent Personal Electric Foiler

Toby Hodges from Yachting World reviews the Overboat Personal Foiler. Which is a jet-ski catamaran stabilized with hydrofoils.
https://www.youtube.com/watch?v=yU5q7QTv_M8
PDF Brochure

### The World's First Flying Hydrogen Boat

Watch the TU Delft Hydro Motion Team build the first flying hydrogen boat. Last summer, they lifted a 1,100 kg trimaran above the waves.
https://www.youtube.com/c/TUDelftHydroMotionTeam
https://hydromotionteam.nl/

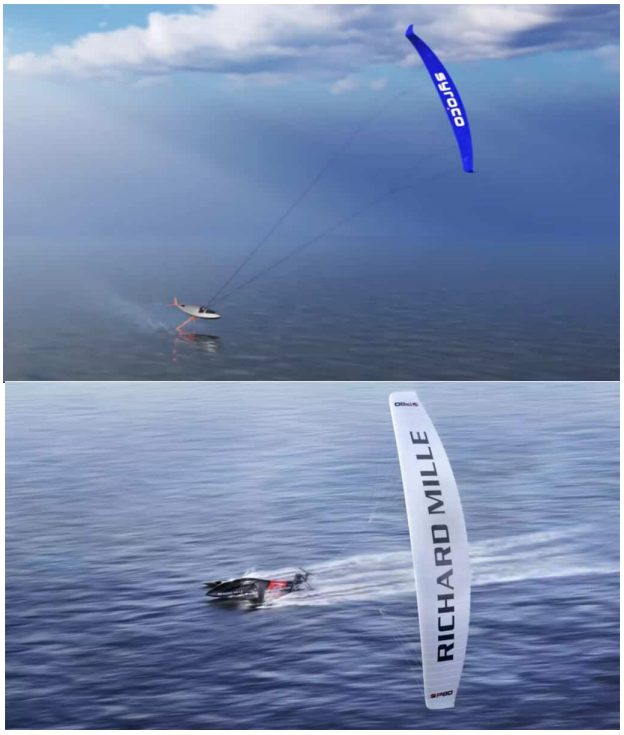
***TU Delft Hydro Motion Team Flying in Monaco in 2021, (Credit: hydromotionteam.nl/media/)***

### Solar Powered Model

"Think Flight" builds an RC solar powered hydrofoil boat and tests it. (https://www.youtube.com/watch?v=5__ywQa8qMQ) He uses IHS President Ray Vellinga's "Hydrofoils, Design, Build, Fly" publication. (https://www.youtube.com/watch?v=Va1bM3hE9yc)

### Speed-Record-Breaking Kite Powered Foils

A Swiss and French team are hoping to become the fastest sailboat in the world.
https://www.intelligentliving.co/kiteboats-aim-to-break-world-speed-sailing-record/




**Kiteboats are targeting 80 knots (Credit: Syroco, EPFL)**

### VESSEL Review

**Pioneer of Belfast - Northern Ireland Tech Firm Develops Electric Foiling Workboat**
Baird Maritime Article
https://www.youtube.com/watch?v=8t9rqOiJeXY

# Yoichi Takahashi's Russian Kometa and the German SK116 Models

By Ray Vellinga

Yoichi Takahashi, longtime member of the international hydrofoil society, has been making models of hydrofoil boats from his home in Japan for many years. Each new boat appears to be even better than the previous one. His latest successes are the Russian Kometa and the German SK116 both based on designs by IHS member Hanns von Schertel in the early 1940s. The Kometa was built to carry 120 passengers. The model is 750 millimeters long.

The purpose of the SK 116 was to launch a torpedo and retreat. Both models were built using 3D CAD imaging and 3D printing technology.

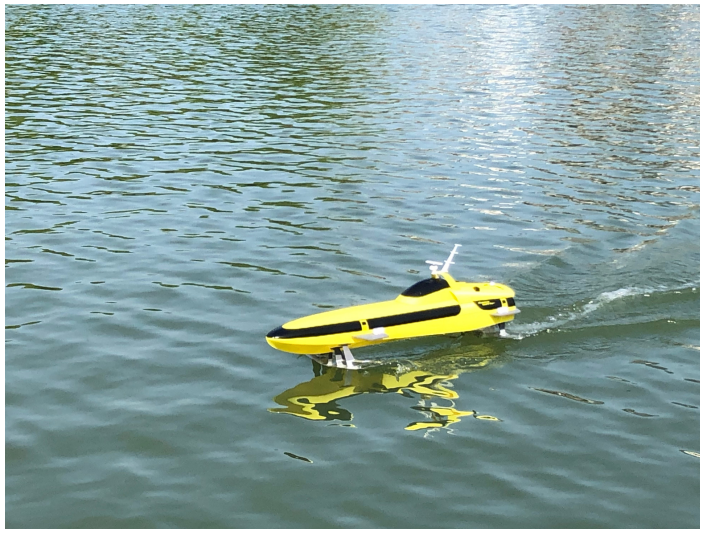
Even the propellers were printed. Ironically, in using this technique one of the most difficult challenges was to reproduce the multiple portholes. To meet this challenge Yoichi chose to use black plastic Sheet film.

These boats, like Yoichi's previous models are designed to fly and are radio-controlled. He uses multiple receivers, servo motors, and batteries, and that makes it possible to fly more than one model at the same time. You can see some of your Yoichi's models fly in his video posted on our "Hydrofoils" Youtube channel (along with 39 other IHS videos):

YouTube Video 1

YouTube Video 2

***Kometa Model on stand***



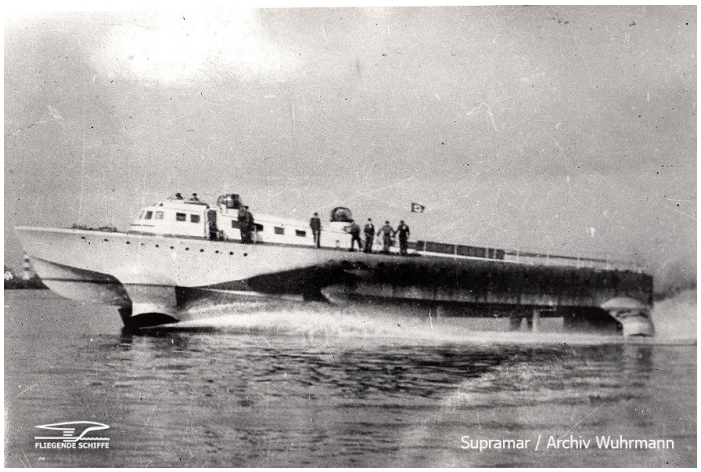
***Kometa Model on foils***

# The History of German and Swiss Hydrofoils

By Ray Vellinga

Recently while thumbing through my favorite book, Hydrofoils Design, Build, Fly I noticed in chapter one that there was an absence of history about hydrofoils from pre-World War II Germany. In fact, German and Swiss engineers of that period contributed significantly to the development of practical hydrofoils.

Just as the Germans in the 1930s and early 1940s advanced the science of rocketry and aviation they also established proof that hydrofoils were in many ways superior to conventional boats. For example, prior to 1940 the Germans created an 80 ton 60 knot hydrofoil, the VS 8, Schell I. More on this later.



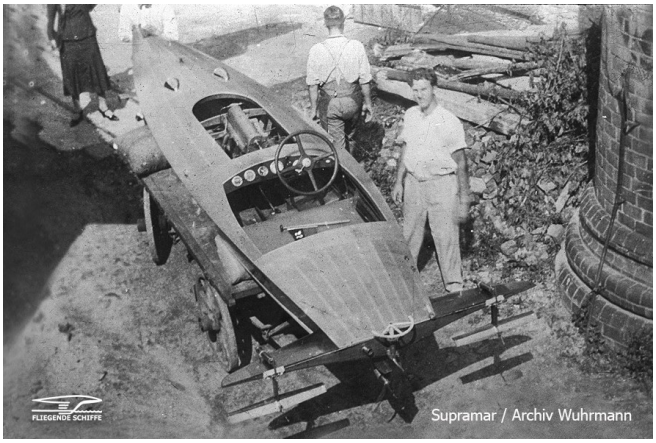

**VS 8, Schell 1**

For these advances, much credit can be given to International Hydrofoil Society's first President, Baron Hanns von Schertel -- born in Stanstad, Switzerland, in 1899 and died there on April 18, 1985.

According to an article written by Herr von Schertel and published by the Aviation and Marine Magazine of France much of the program's success came under his guidance. The wartime program was followed by his creation of the Schertel-Sachsenberg hydrofoil craft, a series of civilian hydrofoils built in Switzerland and elsewhere.

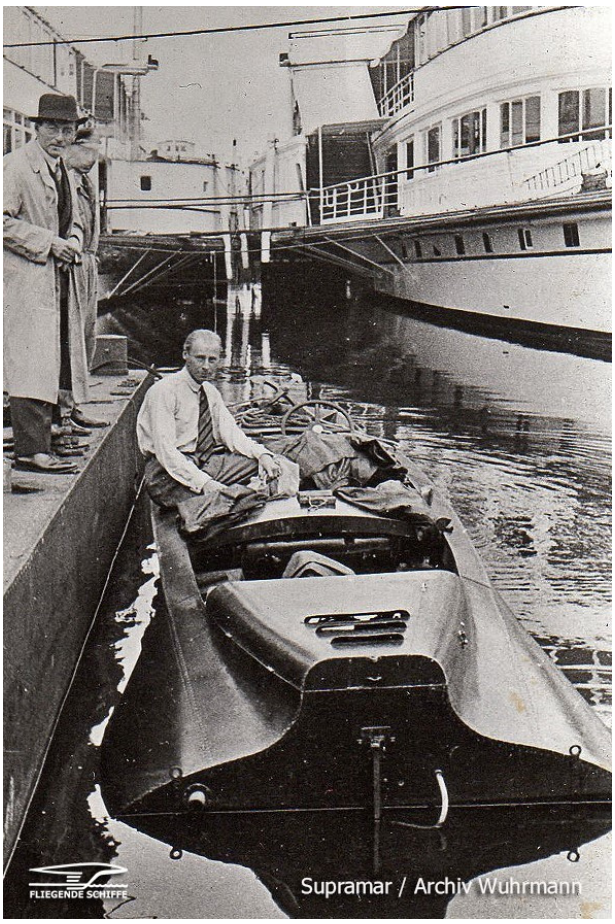
**IHS founding member Baron Hanns Von Schertel**

Herr von Schertel first experimented with hydrofoil craft in 1927. Initially he worked with fully submerged foils but evolved into surface piercing foils because of their inherent stability and lack of today's sophisticated computer driven control systems. Success didn't come easily, but in 1936 after many failures his first practical flying prototype, was completed. It was number 8 in this series. The craft was relatively stable transiting rough water, could transit long distances and was credited with being a workable design. For example, he flew the boat 230 miles between Mainz and Koln in bad weather and rough waves. No problem.




During the same period, von Schertel developed a practical system for testing prototype hydrofoils. He designed a special boat with rigging protruding from its bow. A prototype would be attached to the protrusion to allow its operation in undisturbed water. Lift, drag, and stability were measured using this test platform.


The test boat was fitted with a 110-horsepower gasoline engine which allowed the boat to plane up to 24 mph. Pushrods extended from the bow to the 10 or 11 feet long prototype. This allowed the prototype to freely heave, pitch, and roll. A platform was installed forward to allow close observation of the prototype.




In addition to boats, individual foils were tested. They were attached to a forward mounted float with a pushrod system that would allow changes in the angle of incidence and submersion while underway. In some tests, speed and submergence were kept constant while incrementally increasing the load. The resulting angles of attack verses lift and drag were then graphed to be later used in design calculations.

These tests were efficiently conducted in the nearly traffic free Wiesbaden-Schierstein Harbor. In the span of five minutes the length of the waterway would be run and four or six data points would be recorded. Duplicating these tests in a towing tank would have taken at least an hour for each run. During some summer nights 80 of these test runs were completed.

**Schertel Prototype (top)**
**Prototypes #3 (middle) and #4 (bottom)**


**Test Boat with Forward Rigging**

In the following years, right up to 1945, a variety of tests were conducted in these waters. One subject of particular interest was a hydrofoil hull that could dive beneath the surface as a buoyant submarine. Once at speed, the hydrofoil's angle of attack would be reduced producing strong negative lift that would submerge the vessel and keep it submerged without taking on ballast.

Starting in 1936, 16 different types and sizes of prototypes were developed at this test site. Some of the prototypes were subjected to extensive research and experimentation. In addition to their own test site, Herr von Schertel had access to the testing facilities at Schiffbau Versuchsanstalt in Hamburg as well as the circulating water channel of the Technische Hochschule in Berlin.

In 1937 Herr von Schertel and Gotthard Sachenberg founded the Schertel Sachsenberg Schnellboot Konsortium, and licensed the Gebrüder Sachsenberg shipyard at Dessau-Rosslau to construct their designs. Professor G. Weinblum led a team of highly qualified engineers who co-ordinate all design and construction work with large scale theoretical and experimental research studies.

Initially the military people did not show interest in hydrofoils, however in 1939 they started development of a craft for war. The first prototype was a 2.8-ton "Demonstration Boat", also called the "KOBO" or "Konsortial Boot".

The hull of the craft was of wood and the foils were bronze. The construction was done in the Wiesbaden-Schierstein yards with initial tests on the Rhine. From the onset, the boat performed well and only modest improvements were necessary.

The modifications were done in just a few days and the Demonstration Boat was taken to Lake Wannsee to further evaluate its performance.



***Schertel-Shasenburg Tragfluchenboot KOBO 1***

Of course, with the war going on there were priorities, so it was difficult to find an engine that was large enough to produce the needed 150 horsepower. The ingenious solution was to couple an orphaned 50 horsepower motor to the existing 100 horsepower already installed to obtain the necessary 150 horsepower. This combination allowed a speed of 38.5 knots. However the little engine didn't hold-up well. It soon threw a rod and had to be discarded. This reduced the speed to 32.5 knots

The high ranking naval officers and attendants were pleased with the performance of the prototype. In particular they were impressed with the small radius turns, but a bit of serendipity impressed them even more. Motor failure during the docking maneuver resulted in the boat ramming a piling. The military had been concerned that the foils would be too delicate for combat operations, but there was no damage to the foils or the hull.

It was concluded that further tests in salt water would be useful, so the craft was taken to the Sachsenberg shipyard at Dessau-Rosslau where it was heavily loaded with test equipment in preparation for transit to the Baltic Sea. Mixed news followed. While flying up the Elbe-Trave Canal it passed over a minefield. Fortunately, the pressure mines did not react to the very short-wave impulse created by the passing of the hydrofoils. This profoundly impressed the military brass and captured the attention of the crew who narrowly escaped disaster.

Most sailors hope for calm seas, but this crew was disappointed when offshore Travemünde there were no waves and the demonstrations were postponed several days. Of course, when the waves did show they were too big, but the craft once again proved its capabilities in smoothly traversing the 1 meter crests. However, the foils and struts did suffer from these extremes and the trials had to be cut short. This was really due to a purposefully engineered feature where the struts and foils were designed to break away in case of an unintentional grounding. During the last test at full speed an unusually high wave was hit causing a downward force on the front foil.This fractured the strut at the weakest point separating strut and foil from the hull. The propeller was also severely damaged.

The method used to retrieve the submerged foil was to string a line between two ships that moved forward as helmeted divers traversed along the line looking for the bronze foils. The water was shallow and there were only a few square kilometers to be searched, but no joy. The damaged foil was never recovered
Soon thereafter, new foils now of steel were installed at the Wiesbaden-Schierstein boatyard. The rear foils were fitted with flaps controlled by a joystick. An engine of 150 horsepower was installed but it was used, old, and weak. That caused problems.

Further testing was done in the Berlin lakes and followed by returning to Wiesbaden-Schierstein for performance studies that could not be model tested. Remarkable for this period, a custom designed gyro-control system was used for flap accentuation. It was the first of its kind.
The craft performed well and was soon

awarded orders from both the Army and the Navy, each having their particular missions. The German Navy planned to compare the proposed hydrofoil to a conventional hulled minelayer of the same displacement, dimensions, and engine power.


***TS 1-6 Patrol Boat***

The result was the VS 6 with a superior speed of 47knots compared to the minelayer's 30 knots.

The VS 6 was one of the first operable designs. It was 52.5 feet in length and capable of speeds up to 47 knots. Power was two Hispano-Suiza gasoline engines of 1,560 hp each linked to a separate propeller.

The original concept was to construct the hull of a light alloy; however, wartime shortages required construction in ordinary steel. This did not change the specified 17-ton displacement, but it did reduce the payload. Its forward foil was fitted with flaps, and two vertical-stem rudders trailed the propellers.

Following preliminary test runs, the VS 6 was moved to the Baltic Sea at the Travemünde test facilities.

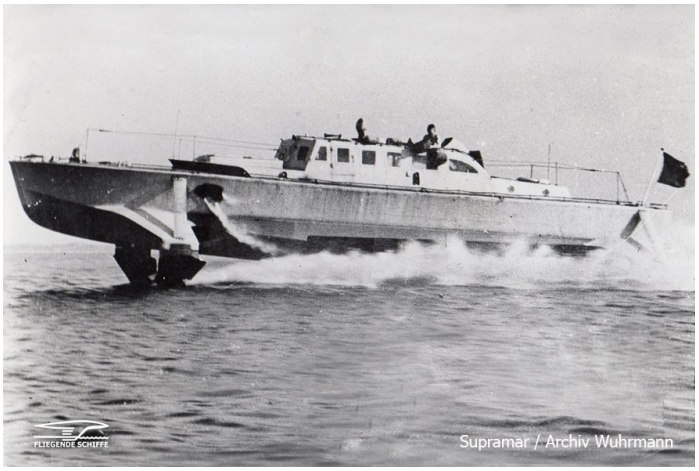
The tests were conducted in conditions up to sea state 4. During testing, cavitation on the deepest parts of the leading edge of the front foil was a problem. Various foil sections were tried without much success.

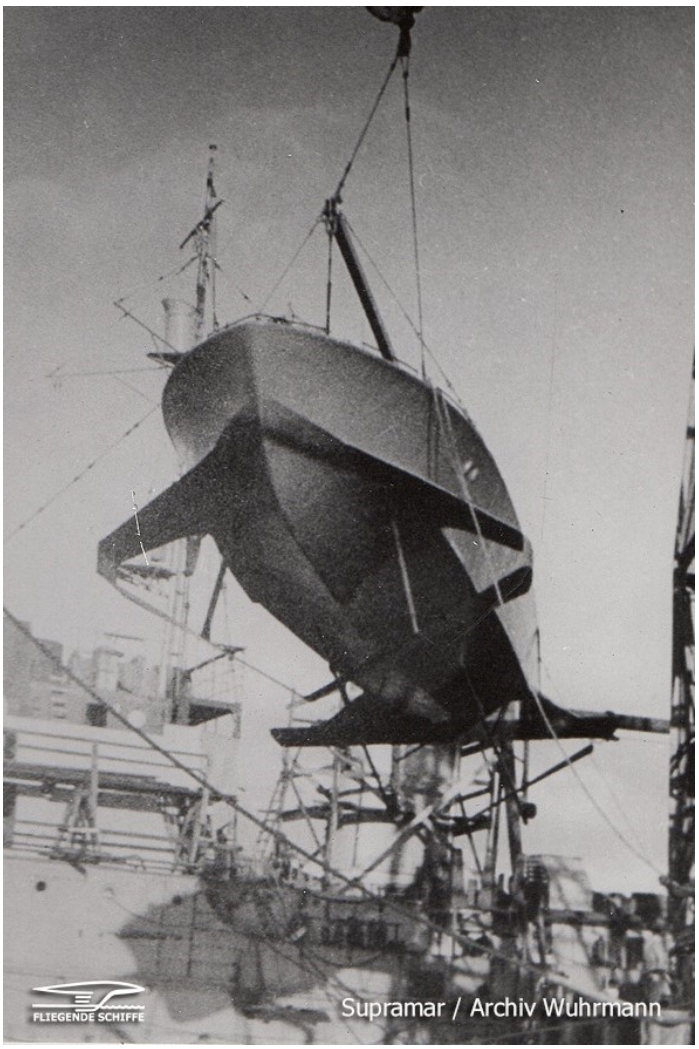
On one occasion, while flying in maximum sea conditions, a rogue wave was encountered shipping green water over the bow and submerging the cockpit. The crew was surprised when the craft immediately returned to being foil borne, but upon returning to port, bow damage was discovered. To compensate, the bow shape was sharpened.

Pilots soon learned to adapt to the effective controls. In a turn, flaps could be used to counter roll, and that inspired the idea to use automated systems to improve sea-keeping.

The maximum speed of 47 knots was a record for a military hydrofoil, and that would be held until the Grumman-built USS Dennison flew 50 knots in 1964. Of course this fell short of the September, 1919, Alexander Graham Bell's record of 70.86 mph set with the HD-4 civilian prototype hydrofoil.

Ultimately, trials were successfully finished, and they questioned what to do with the prototype? The plans were to use it as a Red Cross supply boat, however the war ended prior to its implementation, and the craft fell into the hands of the Royal Navy. They tested her extensively before she went into storage at the coastal forces base HMS Hornet, Gosport, England.




***VS 6***

During the fabrication of the VS 6, six other smaller boats were under construction to be used for coastal surveillance. Again, the war's end cut this program short. Despite not being commissioned, the boats received the consecutive numbers TS 1 to TS 6 and were armed with a 20 millimeter Mauser MG 151/20 machine guns located in transparent rotating turrets.

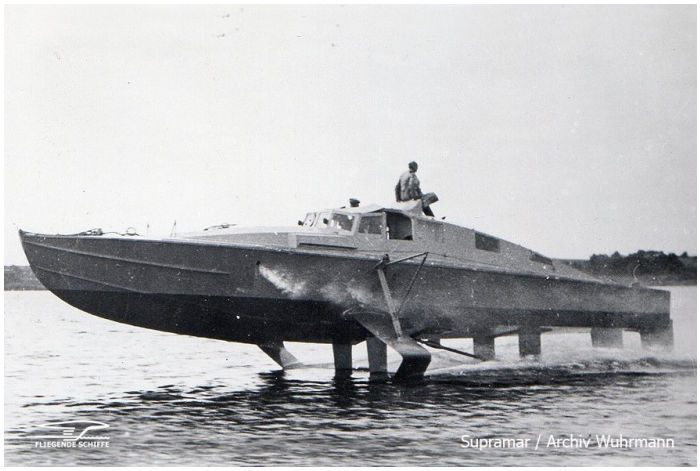
Incidentally, one of these six boats deviated from the design of the VS 6 by not using two long propeller shafts. The experimental configuration used an outboard motor type of strut, now commonly called a "Z" drive, with double bevel gears connected to counter rotating screws.

Unfortunately, for the Germans, the Russian army invaded the Dessau-Rosslau area shortly after the Z drive boat was completed. It was reported that the Russians launched the boat with an excessive number of passengers. Still, the boat flew well enough to persuade the Russians to send it to Russia for further testing.

In 1932, a surface-piercing hoop foil system was patented by professor Oscar Tietjens. His prototype was tested near Philadelphia in 1932. It displaced 500 pounds and was powered only by a five horsepower outboard motor. Remarkably, it flew at 23 knots.


***Oscar Tietjens Early Prototype***

Professor Tietjens then return to his native Germany to develop — in parallel with Herr von Schertel's work – the VS 7. The VS 7 was built in Schleswig, Germany at the Vertens Shipyard. It had the same weight and power as the VS 6 and flew at 55 knots — compared to 47 knots of the V6. However, the stability, manoeuvrability, and take-off performance of the V7 was inferior to that of the VS 6. Read more in IHS Past President John Meyer's book, Ships That Fly. (PDF download)




**VS 7 Designed by Professor Oscar Tiejens**

Another record-breaking military hydrofoil came out of this program. The VS 8, aka SCHELL l, set a record lasting 25 years as the largest hydrofoil. In 1943, the 80-ton VS 8 was launched. This 150 ft. long craft was designed to carry tanks and supplies from Sicily to support Rommel's North African campaign. Speed was important because of the short summer protection of darkness.

Fortunately, they were able to obtain lighter weight alloy metals for the structure which increased the relative payload. To power the VS 8 the plan was to install 2 supercharged 20-cylinder Mercedes-Benz diesel engines producing a total of 5,000 horsepower, however these powerful engines had been committed to be used in the S- boats. The the only available engines had 1,830 horsepower. These engines had no superchargers reducing the available power to 73%. The weight was also increased to 80 tons from 70 tons. The resulting horsepower to weight ratio was 48 hp/ton instead of the design 75 hp/ton. This dropped the expected maximum speed to 40 knots from its design of 45 knots.

Still the boat could cruise at 37 knots and fly through waves of six feet with swells of 150 feet. The underpowered craft was stable in head seas but came off the foils in some following waves

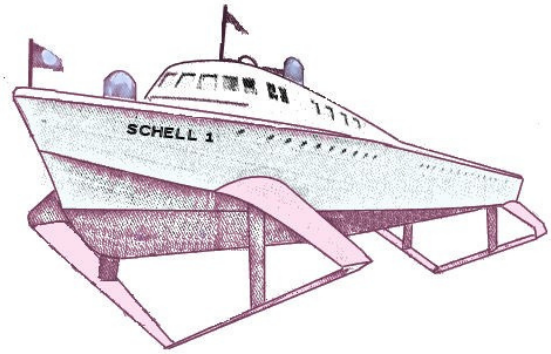
A unique feature of the VS 8 was its freight charging system. Flooding the hull allowed the loading of a raft containing a 20-ton army tank that could be floated off after reaching their destination. This load was greater than that of the VS 6.

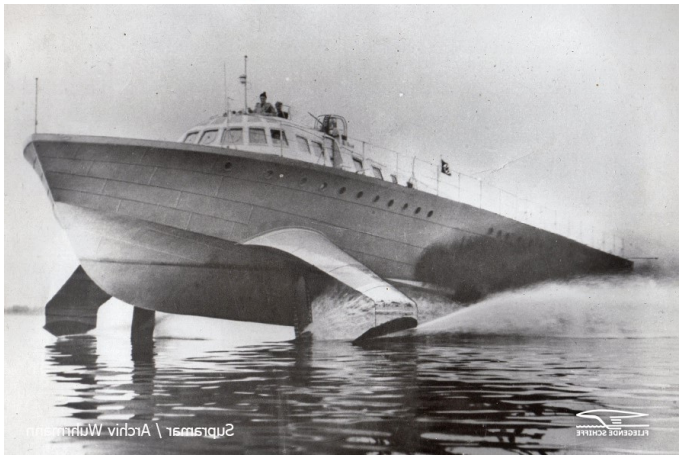
Meanwhile, despite hope for a glorious future, the VS 8 experienced an ignominious ending. In September 1944 a damaged propeller shaft was removed at Danzig and the vessel was ordered to be repaired in the Sachsenberg shipyard at Hamburg-Harburg. She departed with one engine functioning. Strong winds on the second day generated high waves that breached the hull and flooded the engine room. A radio malfunction prevented sending out a distress call. The anchor was weighed, but the gale force winds parted the chain. The craft grounded with the foils digging into a sandbank near the village

of Rowe.

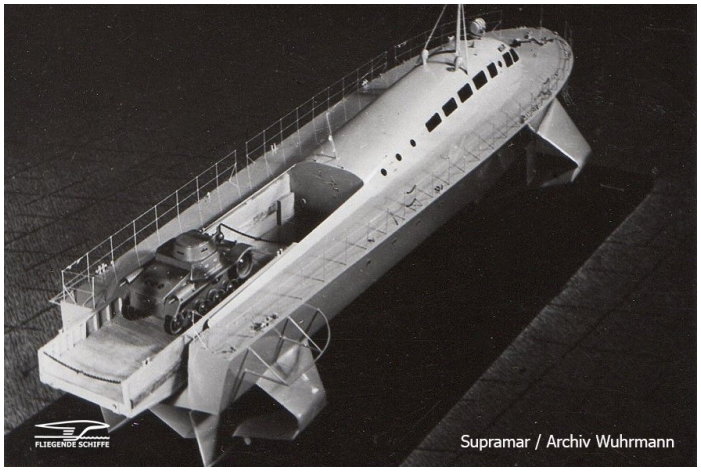
Four tug boats arrived to free her, but parting lines and other problems stymied the attempt. Bad luck returned the third night when more powerful waves release the vessel from the sandbank and on to the shallows 200 yards from the shore. After some delay, another attempt was made to free the vessel, but AGAIN the lines parted. Finally the Navy dispatched a floating crane and gave orders to remove the two engines and the guns.

The foils were to be salvaged but the acetylene torches being used to cut the struts exhausted their oxygen supply. Twice new oxygen tanks were delivered but incredibly both were empty. While waiting for full tanks, the winds returned with enough force to break the once glorious VS 8 into two parts. More bad luck followed in 1945, but that's another story.




**VS 8, SCHELL I**




**Model of VS 8 showing tank as payload**

**VS 8, SCHELL I**

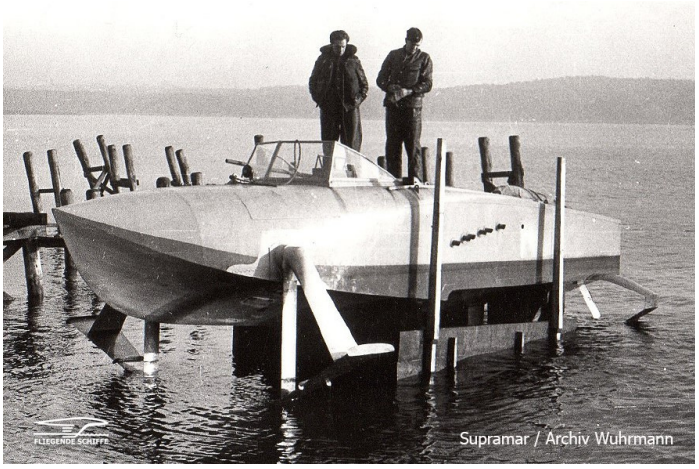
There were plans for a VS 9, AKA Schell lll, but work was never started.

All-the-same, construction was begun on the VS 10 designed to fly at 60 knots. Four 1,500 horsepower Isotta-Fraschini ASM 184 gasoline engines were installed. The two motors were staggered on each side and connected by gears to one of two inclined shafts each connected to a sub-cavitating propeller.

Under the cloak of wartime secrecy the VS 10 was to be tested as much as possible within the confines of the boatyard. The hope was to have a functioning craft leave the yard and thereby

reduce the post-launch testing. The boat was designed to go faster than any commercial or military vessel. Whether this speed was obtainable will never be known because of its destruction by allied Air Force raids the day before the scheduled launch. Such are the fortunes of war. At this point it was decided to concentrate on further improvements to the VS 6.

Sie hatten jedoch kein Glück (bad luch) with their 28 foot long, 3 ton, 240 HP, torpedo carrying attack boat, vs 11. In tests, it reached 52 knots, not far from the 60 knot design speed. Its solo pilot would charge an enemy ship, make a fast U-turn, release a torpedo off the stern, and dash to safety. Two were built, but never used. Could they have lacked pilot volunteers?




***VS 11, Torpedo carrying attack boat***

The most unusual hydrofoil boat constructed during this period was the four-ton Pioneer Corps Workboat. (Wikipedia: "A pioneer is a (German) soldier employed to perform engineering and construction tasks."). The requirements were for a rugged structure, a draft of 30 inches in all configurations, and the capacity to run safely ashore bow on. This would easily describe a flat bottom barge, but the Pioneer Corps wanted more speed and sea keeping by adding foils.

The Workboat had other interesting characteristics. The rear foil was submerged but could be raised along with the shaft and propeller. The shaft was streamlined and had double universal joints that allowed the propeller to be elevated to shallow submersion for hull-born operation. Likewise, the front foil could be elevated to allow the craft to be beached bow-first to allow the charging and discharging of cargo.

The Rhine River was chosen as the site for testing, so the craft was loaded on a railway car headed for the Berlin lakes. An unsolved mystery ensued. The craft disappeared and was never heard of since. kein Glück.

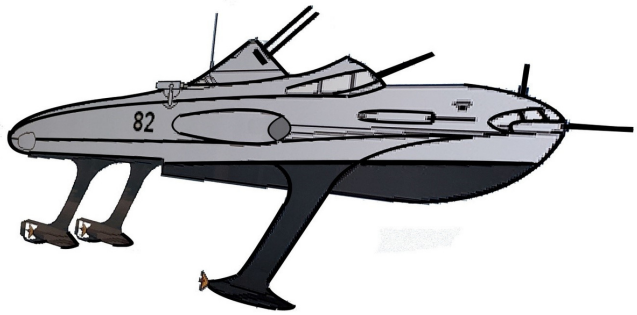

***Pioneer Corps Workboat***

Before leaving the subject of wartime hydrofoils, let's briefly take a look at a submerged hydrofoil design, the 1945 Tragflügelboot.

In 1944, the project was initiated as the K-Verband hydrofoil attack boat, and evolved into the TR-5B Tragflügelboot. It was intended to be

a high speed hydrofoil fast attack craft heavily armed — potentially with guns, torpedoes, and/or mines. To quickly engage and disengage enemy ships, the TR-5B was powered by conventional marine engines, perhaps similar to the VS 6 with two Hispano-Suzie gasoline engines of 1,560 hp each. To increase the speed two Jumo 004s or He S 011s turbojets were added – all fueled by testosterone (hydrofoil humor).

Unfortunately this design, scheduled to be built in 1945 but canceled do to the realities of the war, was calculated as being not much better than the existing planing S-boots.




***TR-5B Tragflügelboot***

Subsequent testing of a radio controlled model, Tomado, revealed problems with the jet propulsion. The design worked only in smooth waters. It could be speculated that the jet's center-of-thrust was so high above the center-of-drag of the submerged foils that significant pitch excursions were experienced when power settings were altered.

Five years later, a smaller prototype without jets called Wendell Schnellschiff (fast ship) was built and tested.

***Wendell Schnellschiff prototype***

It is unfortunate -- for the German military -- that none of these craft became operational. Whether or not they would have been an effective threat against the allies will never be known, and perhaps that's the best news of this twisted wartime history.

Good luck for the rest of us, the basic design characteristics that originated with Hanns von Schertel survived the war.

Seven years after the surrender of Nazi Germany, Herr von Schertel and others started a company known as Supramar. Supramar did not build boats. They used their knowledge of fast marine transport and especially the German hydrofoil system to design civilian and military craft and consult about their implementation.

Supramar-type designs based on the Hanns von Schertel concept of stable, rigid, surface-piercing V-foils were licensed to builders such is the Sachsenberg Shipyard who built the hydrofoils primarily to ferry passengers.

In May, 1953, the world's first hydrofoil service began. It ran on Lake Maggiore between

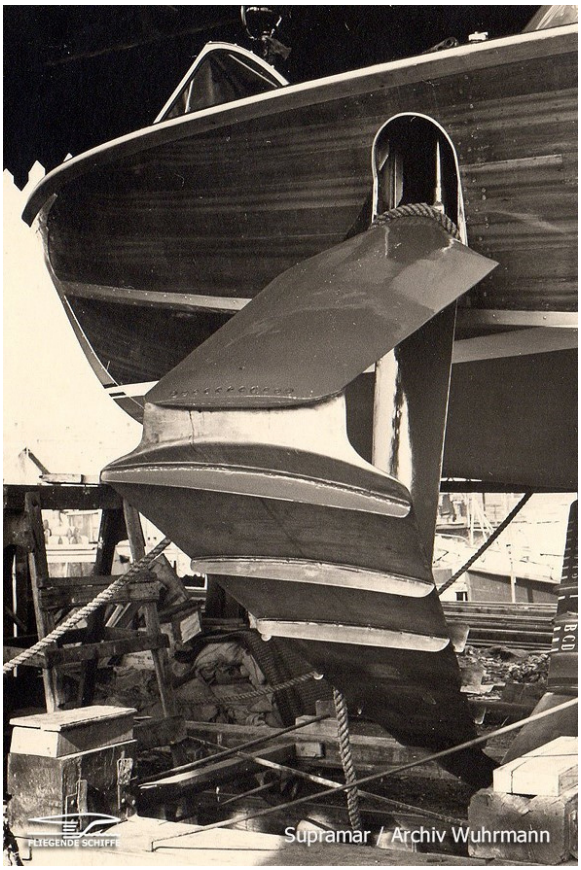
Ascona, Switzerland and Stresa, Italy. Initially it employed the Supramar designed PT 10, Freccia D'Oro, Arrow of Gold. Interestingly, the PT 10 was a seasoned design, first built in Stansstad, Lake Lucerne, before the war. Following a period of operation, the service was interrupted for a few years, and then re-established. It then employed several larger PT 20 Bremen Pioneers newly built by Rodriquez Shipyard. Freccia D'Oro was transferred to service on Lake Lucerne.

Supramar continued testing hydrofoils on lake Lucerne for 25 years The prototype turbine engine Schertel design ST3A was the result of the Supramar tests.. They also tested fully submerged air stabilized systems for the US Navy. But the Navy soon replaced Supramar with the Boeing Company because they did not trust "these Germans" to create military designs.

Following this successful license, many Supramar-type PT 20 and PT 50 hydrofoils were built by shipyards such as Rodriquez, Hitachi, and Westermoen.

In addition to hydrofoils, Supramar Ltd. was active in designing other high speed craft including monohulls and catamarans. Work continued in developing hydrofoil profiles that minimized and controlled cavitation and supercavitation at speeds said to be above 100 knots. They also worked on propeller blades with tip speeds reaching supercavitation conditions.

Another example of their successes was a project funded by the European Commission in Brussels under the name of Brite Euram. Also, funds were received from a grant from the


***PT 10 Freccia D'Oro, Lake Lucerne, 1955***

office Fédéral de l'Education et de la Science. A consortium of 13 specialized European countries were assembled by Supramar to develop the foils for a hydrofoil assisted wing-in-ground effect fast ferry, Seabus-Hydaer. The craft would displace 500 tons while carrying 800 passengers and 100 cars. Its proposed range was 850 kilometers while flying at 120 knots slightly above the surface in the ground-effect domain.

For testing, the foils were brought to the Ecole Polytechnique Fédérale de Lausanne, Switzerland. There they used the high speed cavitation tunnel of the Laboratoire des Machines Hydrauliques.

The history of German and Swiss hydrofoil development does not end here . A large number Supramar foils continue in service. According to Wikipedia, over 200 Supramar designs we're built mostly by Rodriguez in Sicily. Furthermore over 400 Soviet Meteor hydrofoils have been built.

Recent related sad news is that Vittorio Morace, the founder of Ustica Lines, later renamed Liberty Lines, had passed away in July, 2022 in


**ST3A on Lake Lucerne, 1967**


**PT 50 Built by Hitachi, Osaka, Japan under license from Supramar, 1963 - 1983**


**First Supramar PT20 Freccia Del Sol**


**Supramar PT50 Flecha De Oriente**

Cadiz, Spain. Ustica/Liberty would be the biggest operator of Supramar style hydrofoils in Italy and Europe.

He had previously run Aliscafi SNAV for a period as well, and his brother at one time had run Rodriquez. For a while, Liberty Lines also built its own hydrofoils at its shipyard in Trapani, Sicily. His son and brother remain active in the businesses.

Today, there continues to be many launch points in Europe and Asia where a hydrofoil enthusiast may hitch a ride up a river or off to a distant island.

Credits:

Much of the factual data about Germany's early work with Hanns von Schertal comes from an article, "Hitler's Hydrofoils" originally published by Aviation and Marine Magazine, France and subsequently reprinted by Sea Classics, magazine.

Thanks to Thomas Wuhrmann who generously provided much of the military and Supramar history as well as the most remarkable photos – indicated with his watermark.

https://www.youtube.com/watch?v=dQo78rDFrP0&t=74s

You can learn more from Thomas' exciting video – along with 39 other hydrofoil related videos -- on the International Hydrofoil Society Youtube channel, HYDROFOILS:

https://www.youtube.com/channel/UCHZDDNMvsa9JFi6YcFfrooQ/videos

Or, visit his web site: www.fliegende schiffe.ch

Thanks also to Rob Arndt's history about the TR-5B Tragflugelboot http://strangevehicles.greyfalcon.us/TR.htm

Continuing thanks go to Martinn Mandles, Martin Grimm, and Mark Bebar for fact checking and providing historical materials and information.

And for a treasure trove of hydrofoil knowledge, go to John Meyer's book, *Ships That Fly*. (PDF download)

For a good book with additional details, see:
Fast Fighting Boats, 1870 1945: Their Design, Construction, and Use. 1978, by Harald Fock, Naval Institute Press (website).

Thanks to proof-reader Patricia Vellinga, author of *Sailing There, Cruising Across Europe and the Mediterranean*. Available at Amazon.com

## Why not Leave a Tip?

We hope you enjoy being a member of the International Hydrofile Society. After 50 years of service to the community of hydrofoil lovers and professionals, we continue to carry on with a low budget and almost no income. You can help by tipping. If IHS has helped you please consider leaving a contribution **HERE**

# Departed Members

## Vittorio Morace

By Martin Grimm

Vittorio Morace, the founder of Ustica Lines, later renamed Liberty Lines, passed away in July. Ustica/Liberty would be the biggest operator of hydrofoils in Italy, and perhaps these days throughout the world. He had previously run Aliscafi SNAV for a period as well, and his brother, ..., at one time had run Rodriquez. For a while, Liberty Lines also built its own hydrofoils at its shipyard in Trapani. That seems to have now been discontinued.

Obituaries
Baird Maritime
Ferry Shipping News
Shippax

***Vittorio Morace, founder of Italian ferry company Liberty Lines (Photo: Liberty Lines)***

## In Memorium - Nadine White

By Mark Bebar

It is with great sadness that we report the passing of Nadine White, a long-time member of IHS, on 15 February 2022 at age 72. Her husband Bill is also a long-time member and ex-webmaster for IHS.

Dina received a Bachelor of Science degree in engineering, magna cum laude, from the University of Maryland in 1975, followed by a master's in mechanical engineering from the George Washington University in1981. (But her eclectic interests and love of learning had previously led to a bachelor's degree in ethnomusicology from the University of Michigan, where she had specialized in piano and the Javanese gamelan and also played the bonang gongs in a student touring group. In 1981-83 she even pursued doctoral studies in psychology at Georgetown University.)

Dina started her professional career at the David W. Taylor Naval Ship R&D Center (1973-1977) as a mechanical engineer doing hydrodynamics studies, including development of nonlinear numerical methods for predicting drag. She was one of the first scientists to extend analytical methods for calculating flows on arbitrary forms to 3D.

At the Science Applications International Corporation (SAIC) (1977-1983) Dina was responsible for human factors, safety, and reliability analyses in the design of a $250 million command, control and communications system

for the Royal Saudi Navy. That work included simulations to predict large-amplitude ship motions in a seaway.

At TRW Federal Systems Group (1983-1987) Dina was a systems engineering manager for a U.S. Air Force executive management information system and generated more than thirty studies to enhance the capability of the system. For the CIA/DIA she developed analyses of critical intelligence evaluation tasks for the Ocean Surveillance Intelligence System (OSIS).

In the Center for Integrated Intelligence Systems of The MITRE Corporation (1987-1996) Dina worked on imagery policy for the intelligence community of the US and its allies. Projects included land use studies for Riyadh, Saudi Arabia and Kobe, Japan and an environmental change analysis for selected vegetation in Botswana, Sudan and the Kola Peninsula.

She also supported the CIA in a number of counter-narcotics projects related to shipping container and cargo interdiction and data analysis.

Dina moved to the Lockheed Martin Corporation in 1996, where she worked to develop a voice-activated mobile mapper computing system to map and record evidence at disaster sites, bombings and other terrorist events. For that work she won a Creative Development Program Award in 1999, which included corporate support to develop a market for the system.


***Bill and Nadine White attended the launch of the USS Hawkbill at Mare Island, CA on 12 April 1969 . Bill is sitting in a small punt in the water just to the left off the stern of the sub and half hidden by the scaffolding. Nadine is behind the black drapes.***

It was marketed to the Navy for new shipboard applications to track cargo and supplies to meet the logistics needs of troops ashore. She supported many other Lockheed programs as a contractor after retiring from the company in 2007.

Dina was a long-time IHS member and attended almost all of the local Washington area IHS meetings. She attended the IHS 25-year Anniversary Conference and assisted planning for the IHS and PHM MSLG Joint Navy Hydrofoil Reunion in September 2013 in Key West, Florida, which she also attended.

Dina was a life-long prolific writer. One highlight was "The Dinosaur Papers 1676-1906," a major book on early dinosaur research with David Weishampel, published by the Smithsonian Institute Press in 2003.

She also wrote for and was a television host/producer for Fairfax Community TV in Fairfax, VA. Over a decade she appeared on more than 75 TV shows for the history program "Out of The Past Presents." One production won the Channel 10 FCAC Award for her program "Q Ships of WWII".

Nadine and Bill White married in 1970 and enjoyed 52 years together spending time with their extended family while also sharing a love of sailing and traveling the world. They explored dinosaur bones, fossils, folk music, ships and foreign cultures while traveling all over Europe, Kenya, Egypt, New Zealand, Australia, China, Mongolia and of course the Americas.

Nadine White was an outstanding member of IHS and will be greatly missed.

International Hydrofoil Society/PHM Reunion, Key West – 2013
Pictured (left to right): George Jenkins, Joel Billingsley, Bill White, Nadine White, Dave Patch, John Monk