HSVA NewsWave

THE HAMBURG SHIP MODEL BASIN NEWSLETTER 2001

# DR.-ING. DIETRICH K. WITTEKIND NEW MANAGING DIRECTOR

**HSVA's** supervisory board elected Dietrich Wittekind as Managing Director of HSVA from 1st of October. Dietrich Wittekind studied Naval Architecture in Hannover, Michigan and in Hamburg. He worked for Thyssen Nordseewerke in Emden from 1981 to 1998 in different positions. During that time he also received his doctoral degree from the German Military Forces University in Hamburg with a thesis on noise reduction by double elastic foundations. In 1998 he moved to Howaldtswerke Deutsche Werft AG where his last position was Division Manager Design Mechanical Engineering.

# FAREWELL TO DR.-ING. GERHARD JENSEN

Starting from October 1, 2001 Dr. Gerhard Jensen will take on the new assignment as Technical Director of Schottel GmbH & Co, KG, the manufacturer of propulsion systems and PODs, etc. in Spay.

Dr. Jensen has been with HSVA since April of 1990, when he was appointed head of the resistance and propulsion and computational fluid dynamics departments. With the beginning of 1994 he became Managing Director.

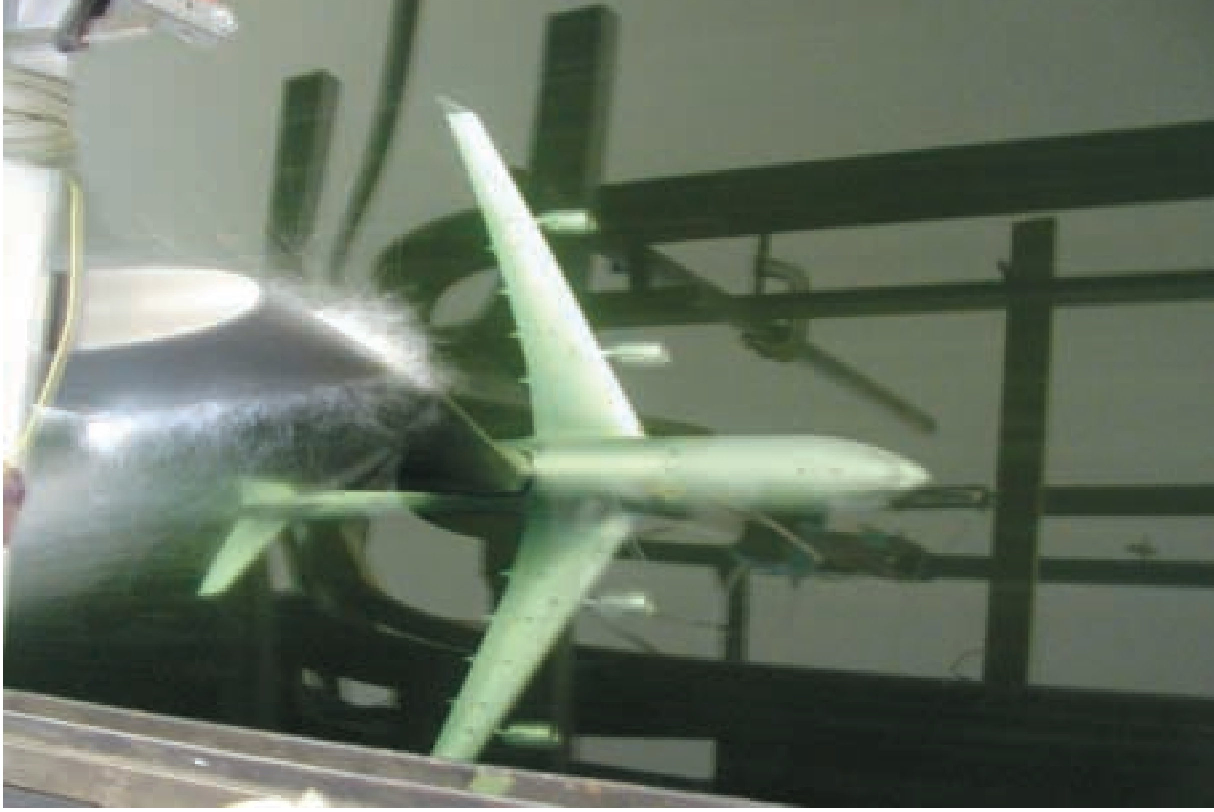
He proved himself not only as a good manager with the ability to motivate the crew and a keen eye on value for money. With his ideal combination of technical talent and detailed scientific knowledge he contributed to the developments and the success of the Hamburg towing tank. His support and advice has helped in the development of many hull form design projects.

Gerhard Jensen was the driving force behind significant improvements in the predictions from model experiments by combining experimental and computational techniques. Today HSVA has an excellent name world-wide for accurate and dependable performance predictions for ships of all kinds. This is reflected in the permanent increase in the volume of industrial contracts from near and far at HSVA during the time of his reign.

The model fabrication methods were also modernised during this time, Today HSVA has a most modern large 5-axis-high-speed-milling machine for the fabrication of models for the towing tank of up to 16m meters. When the work load was particularly high for the model makers it was not unusual to see Dr. Jensen running the computerised milling machine himself.

I would like to thank Dr. Jensen for his devotion to his task at HSVA during his time with HSVA: He has left his mark! I wish him all the best for his future.

Dr. Hans Payer,
Chairman of the Supervisory Board of HSVA



# *TRAILING VORTEX OF AN AIRBUS*

by Jochen Laudan

Since spring 2001 a Particle Image Velocimetry (PIV) system is used in the HSVA. The basis of the PIV technique is simple: Speed equals distance divided by time.

Seed particles are suspended in the water to trace the motion of the water and provide a signal. When a light sheet illuminates a thin slice of the flow field, the illuminated seeding scatters the light.
A camera detects this. The light sheet is pulsed twice at a known interval, t. The first pulse of the laser freezes images of the initial positions of seeding particles onto the first frame of the camera. The camera frame is advanced and the second frame of the camera is exposed to the light scattered by the particles from the second pulse of the laser light. The two camera frames are then processed to find the velocity vector map of the flow field. This involves dividing the camera frames into small areas called interrogation regions. In each interrogation region, the displacement, d, of groups of particles between frame 1 and frame 2 is measured using correlation techniques. The velocity vector, v, is then calculated using the equation v = d/t. (Fig. 1)

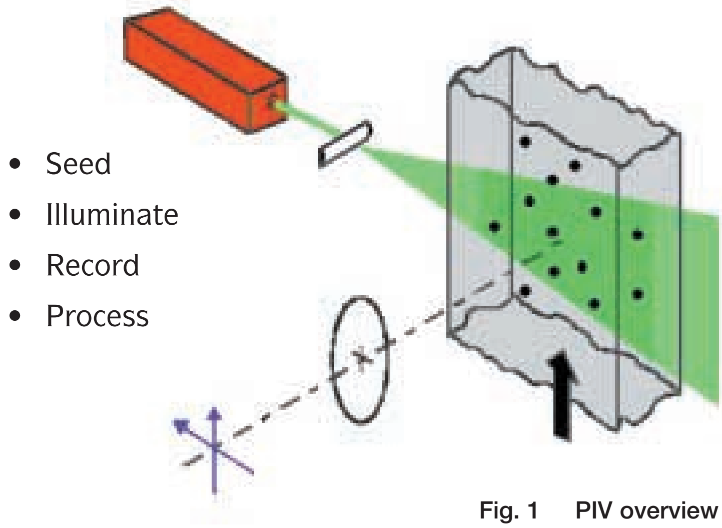



**Fig. 1 PIV overview**

In contrast to the pointwise methods of measuring like LDA, the whole 2-dimensional velocity field by PIV can be obtained.

An interesting application of the PIV technique was the measurement of the vortex wake of an Airbus - yet airplane.

The pressure difference between the topside and the underside of a wing equalizes at the wing tips and produces a vortex. These vortices include circulation, which approximately increases with the square root of the product of flight weight and the lifting coefficient. During the take off and landing of aeroplanes the vortices are very strong because the lifting coefficient is quite high. The vortices dissipate slowly as, especially behind large aircraft, high tangential velocities are recognized at a distance of several kilometers.

These vortices can be hazardous to following aircraft. This is important especially during the process of landing because all aircraft come down along the same path. Secure distances between the landing aircraft are imposed, so not to risk the life of passengers. These distances determine the frequency of landing, as well as the capacity of the airport. By various devices the strength of the vortex can be attained.

During the development process of the new Airbus A380, the trailing vortices behind an Airbus model were measured in the towing tank at HSVA. The model of an A340 (scale 1:48) was chosen because full-scale measurements were available for comparison. The model was submerged 1 meter and the velocity was 3 m/s. The measuring area of PIV system was 0.44 x 0.61 m. The camera and light sheet moved slowly downward, following the motion of the trailing vortex.

Fig. 2 shows the velocity field 10.2 wingspans behind the model. The co-ordinate origin is situated along center line of the plane at the wing. The circulation can be calculated from the velocity vectors (Fig. 3). The coordinate of the maximum circulation shows how the vortex core moved down slowly and to the middle (Fig. 4).

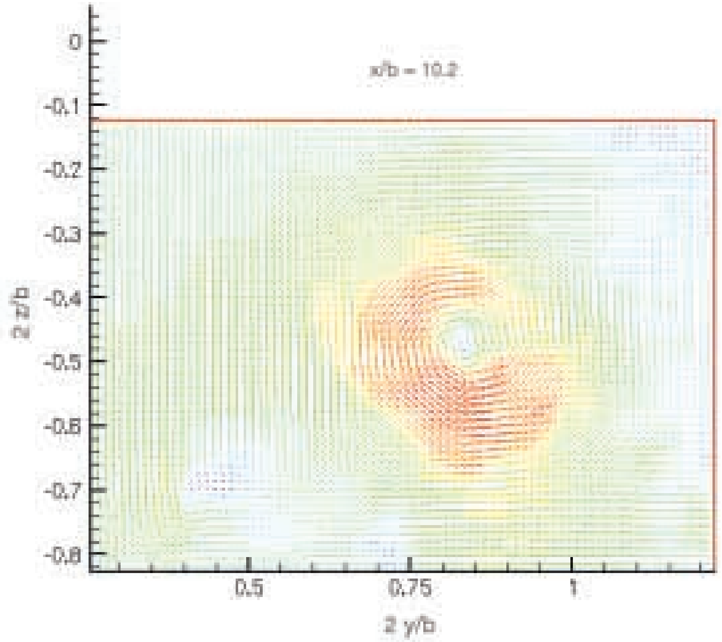



Fig. 2 Velocity field behind an Airbus

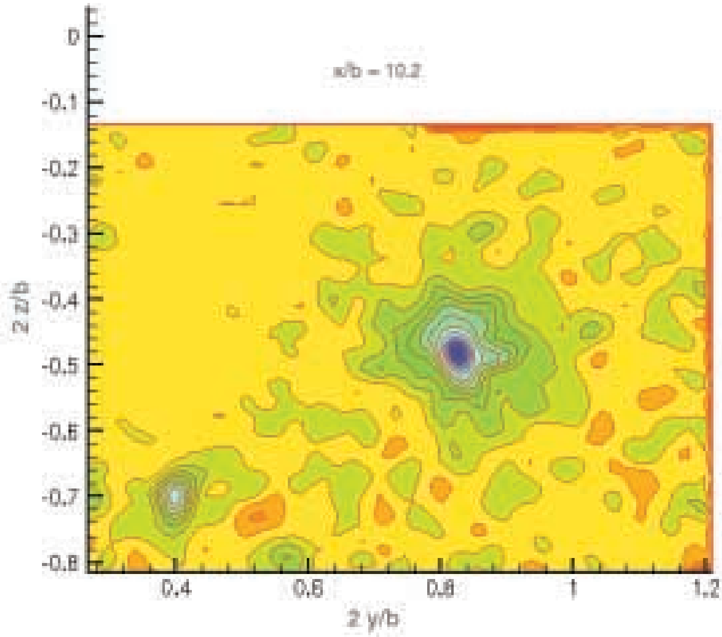



Fig. 3 Circulation behind an Airbus

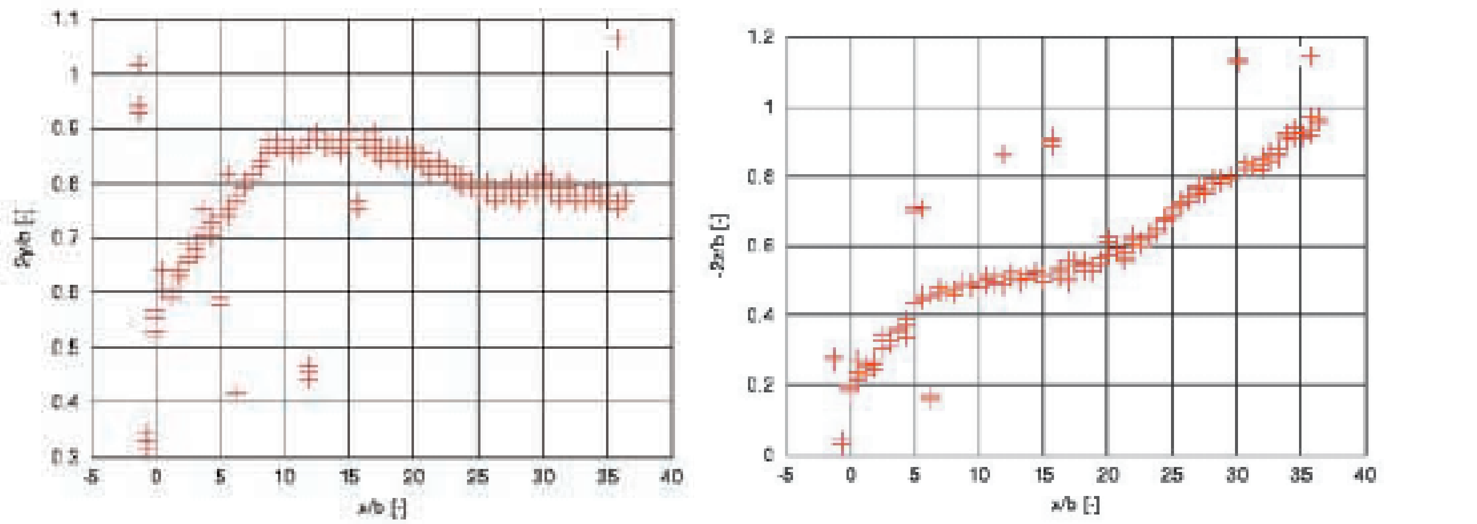



Fig. 4 Co-ordinates of Vortix Core

# MODEL TESTS FOR THE VALIDATION OF EXTREME ROLL MOTION PREDICTIONS

by Kai-Enno Brink

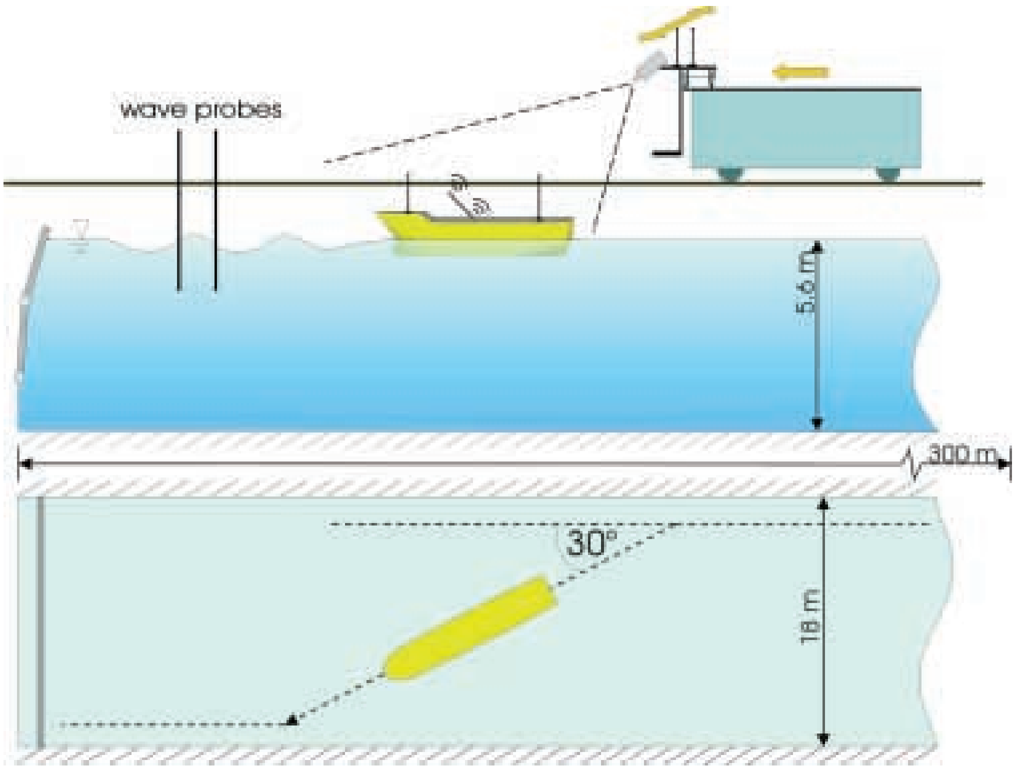
The rapid development in ship design calls for the determination of ship and cargo safety with regard to extreme roll motions or capsizing during the early design stage. To some extend this problem will be solved by means of numerical simulations of ship motions in the future.

Within a German BMBF-funded Joint Research Project the Hamburg Ship Model Basin performed dynamic stability tests with a model of a Container Ship in order to provide data for the validation of existing theoretical methods, which will be further improved. The main objective of the test series was the investigation of parametric ship roll motions caused by the variation of righting levers in waves.

During the model tests the data of the seaways encountered as well as the motion response of a free running model have been determined. Therefore reproducible model scale seaways were described and measured in a first series of tests as a function of time and place in the model basin. During subsequent tests the position of the model in the tank and its actual orientation in six degrees of freedom was determined as a function of time as well. Finally the time histories of the seaways and time histories of the related ship motions were matched over time and location in the tank.

The performance of model tests, which are intended to serve for the validation of numerical simulation methods, put high demands on the test and data acquisition techniques in use. In order to perform accurate, reproducible model tests each single test run was conducted completely computer controlled. Therewith the temporal co-ordination between the wave maker and the model ride, the piloting of the model and the control of the carriage happened fully automatically. During the tests a non-contact measurement system was determining the position and orientation of the radio controlled, self-propelled, completely free running model in the tank. A newly established Krypton 6D Motion tracking system fulfilled this task at a very high degree of accuracy and therefore will be a powerful tool for various real-time measurements to come.

Beside the utilisation of regular waves and irregular seaways the deterministic model testing process allowed the application of transient wave groups, which are generated in such



a manner that they concentrate at a selected model position in a deterministic freak wave. This innovative test technique has been introduced at HSVA in cooperation with the Institute of Naval Architecture and Ocean Engineering (ISM), Berlin University of Technology, and will play an essential role for HSVA´s seakeeping investigations in the future. In this connection we would like to express our thanks for the teamwork in this project to ISM who also kindly made available the attached principal drawing of the test set up.

As an example some model test results of a single test run in regular stern quartering waves are given as a function of model position in the tank. The uppermost diagram contains the wave amplitude at the midship section of the model (z A MS) whereas the diagram underneath is showing the transversal track (y) and the yaw angle (Y) of the model during the test, which has been performed on a zig-zag course. In the last diagram the corresponding roll angle of the ship (F) can be found.

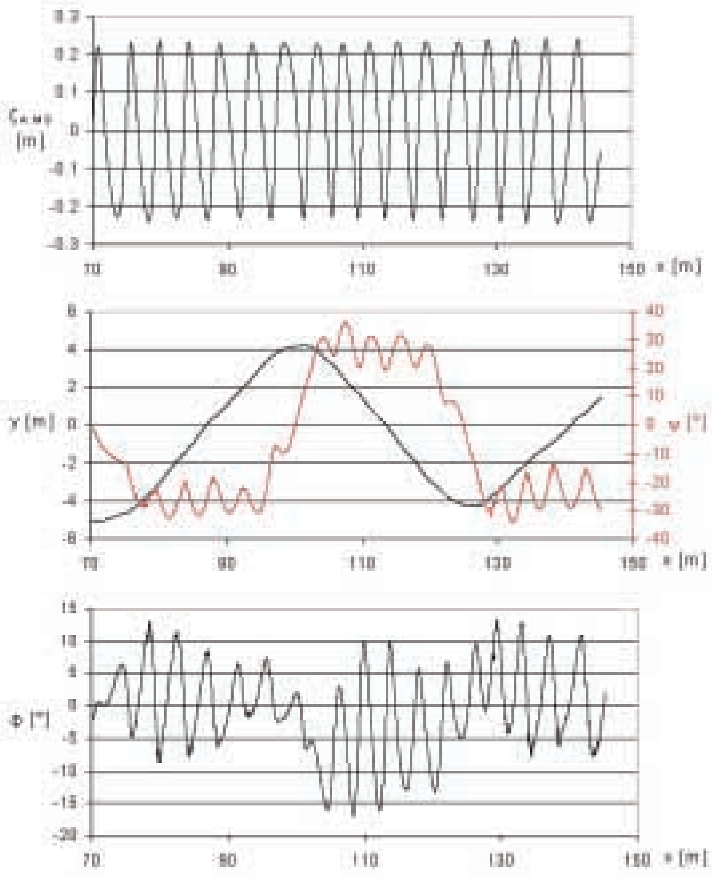
By the investigations conducted, the motion behaviour of a ship in response to the actual wave pattern encountered has been determined as a function of place and time to a high degree of accuracy. With the findings of the model tests a further improvement of numerical simulation tools and therewith a better assessment of ship safety will be possible in future.

Main parameter of the full scale ship:

| | |
|---|---|
| Lpp | 145.75 |
| B | 23.60 m |
| T | 9.00 m |
| $C_B$ | 0.7395 |
| GM | 0.82 m |
| $T\Phi$ | 17.7 s |

Parameter of regular waves:

| | |
|---|---|
| $\lambda/L$ | 1.1 |
| $\zeta A$ | 6.4 m |



**OPTIPOD project participants visiting MILLENNIUM in dock at Chantiers de l'Atlantique**

### *Further Developments for Pod Driven Ships:*

# OPTIPOD PROJECT AT MID-TERM

by John Richards

OPTIPOD deals with the design and implementation of azimuthing pods for the safe and efficient propulsion of ships. In June of this year the OPTIPOD project reached the half way mark with the work progressing very well. The project is partially funded by the European Commission within the fifth Framework Programme. The OPTIPOD consortium is made up of 14 partner companies from 7 European countries, and the work is being coordinated by Chantiers de l'Atlantique.

Within the project, pod drive applications for four ship types are being investigated: 3 twin screw vessels (ropax, cruise and supply) as well as a single screw product tanker. HSVA is the leader of the hydrodynamic interaction work package, and is also responsible for the practical powering and maneuvering investigations for the cruise vessel.

The MILLENNIUM class cruise vessels are being built by Chantiers de l'Atlantique and the first three, the MILLENNIUM, the INFINITY and the SUMMIT are already in service. The ships are fitted with Kamewa pods. The experience being gained at both model scale and full scale with these ships is of great value for understanding and improving performance prediction methods for pod driven ships.

Rig 257 at the Kashagan East exploration well

# *DRILLING EXPLORATION IN THE NORTH CASPIAN SEA*

by Karl-Ulrich Evers and Walter L. Kuehnlein

Since 1999 a consortium of Agip, British Gas, BP Amoco, ExxonMobil, Inpex, Philips Petroleum, Shell, Statoil and TotalFinaElf - has been drilling exploration wells in the North Caspian Sea. The consortium has recently be renamed Agip Kazakhstan North Caspian Operating Company N.V. (AgipKCO) from its previous name of Offshore Kazakhstan International Operating Company (OKIOC). Despite the fact that the water temperature may rise up to +30°C in summer time the drilling rig is also exposed to interaction with ice from about early December to late March.

To satisfy the special demands and constraints of the North Caspian Sea a unique barge drilling rig has been designed and built. **Sunkar** owned by Parker Drilling is the largest barge drilling rig in the world. It has a length of 84.6 m, a width of 52.8 m, and a height of 5.5 m with additional ice deflectors of 4 m height above the barge deck. The hull, which is exposed to the ice, is built of low temperature steel with a wall thickness of 32 mm. The minimum weight of the rig during tow (rig move) is about 9000 t with a corresponding draft of 2.7 m. It is water ballasted on location on a pre-built subsea berm in approx. 3.4 m of water. The entire rig has been designed for a zero-discharge operation to protect the sensitive North Caspian Environment.

In order to verify that the grounded barge has sufficient resistance to withstand the global ice loads, an ice model-testing program was performed at the Hamburg Ship Model Basin. Since November 1997 several ice model tests with different model scales (1:15 to 35) have been carried out in the Large Ice Model Basin at HSVA. These model tests have been used to help determine the ice loads acting on **Sunkar** at different locations. The barge rig had to be designed to withstand ice interaction up to 1.3 m thick. Rafted ice thickness up to 1.3 m thick, with a velocity of up to 2 knots have been modeled. As a further result of the model tests, the design was changed from a barge with vertical sidewalls to a barge with inclined walls.

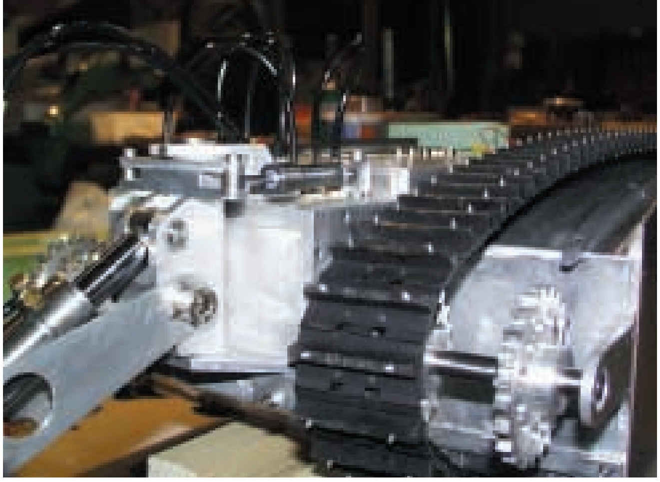
**Model of Sunkar**


**Selected ice model test results with different ice rubble scenarions**

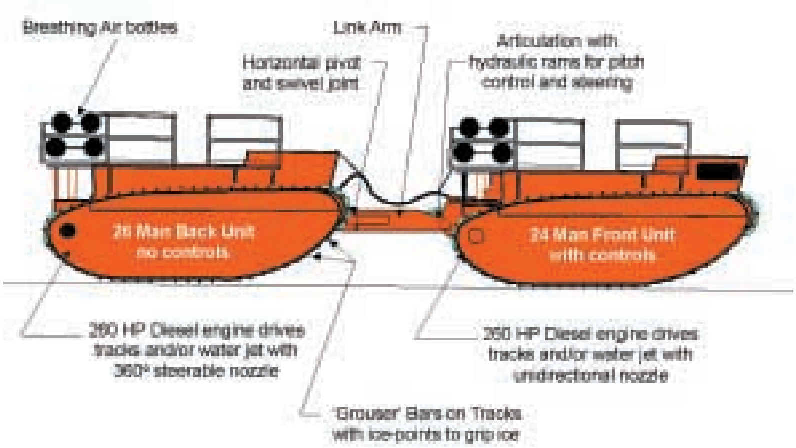
The tests also clearly indicated that it was necessary to install ice deflectors at the barge deck in order to avoid ice override. After two winters it can be stated that these design improvements have been of benefit to the safe operation of **Sunkar**.

In order to predict the full-scale ice loads from the measured model ice loads, the generation of model ice plays a very important role. HSVA's model ice is frozen from a low sodium chloride solution in the natural way, i.e., the ice surface is exposed to cooled air. The preparation of the ice sheet is started by a seeding procedure. For this purpose water is sprayed into the cold air of the ice tank. The droplets freeze in the air forming small ice crystals, which settle on the water surface. This initiates growth of a fine-grained ice of primarily columnar crystal structure. Tank water, which has been pressure-saturated with air, is uniformly discharged along the tank bottom during the entire freezing process. Immediately after discharging, the surplus air segregates from the water and forms tiny air bubbles. These air bubbles rise to the ice sheet, where they are embedded into the growing ice crystals. During the growth of the ice cover its lower surface is periodically scraped. This interrupts the growth of the columnar crystals and layers of randomly oriented crystals are created. Due to the embedded air in the ice and the scraping procedure one gets a more rigid model ice, i.e. the ice fails more brittle in smaller ice pieces.

But not only the major ice loads and the stability of **Sunkar** when sitting on location have been checked in model tests, also the main evacuation crafts, the so-called Arktos amphibious vehicles have been investigated at HSVA. The Arktos model was designed



Model of front unit with link arm and hydraulic ram




Schematic of Arktos front and rear unit

and built by HSVA on the basis of full scale design drawings from Arktos Developments Ltd., Canada. The entire model consists of a front and rear unit connected by a link arm. Arktos unit has a hydraulic ram for pitch control and steering. From the rig, only the relevant part of the Arktos garage and ramp was modeled, to achieve a large model scale of 1:10. During the model tests the Arktos unit was totally remote controlled. Ice model tests with the "Arktos unit" were carried out to investigate the behavior of the unit when leaving the ramp of the drilling rig. Ice thickness as well as the ice drift velocity was varied in the level ice and broken ice tests. The main objective of the tests was to investigate the manoeuvring capabilities of the "Arktos unit" when leaving the ramp of Rig 257 especially in the presence of moving ice.

All tests were recorded with digital video cameras as well as a digital High Speed Video Camera using a recording rate of 158 frames per second. Thus smooth video displays in full scale speed could be produced, that are also used to teach operators the safest manoeuvres.

HSVA would like to take this opportunity to thank AgipKCO (OKIOC) for their loyalty for so many years.


Arktos model has left the ramp backwards into level ice

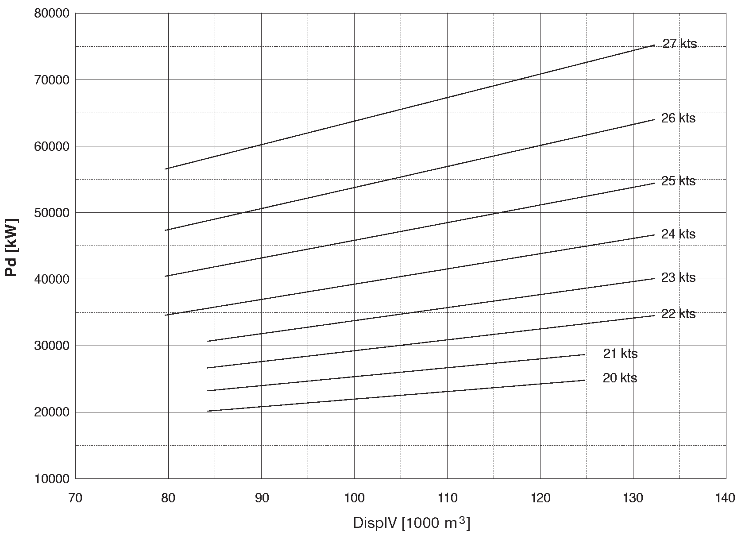
# DEVELOPMENT OF VERY LARGE CONTAINER SHIPS IS CONTINUING

by Friedrich Mewis

The development of container ships is leading to larger and larger vessels for economical reasons. HSVA has been involved in the design and optimization of single screw container ship hull forms with capacities of up to about 9000 TEU.

One of the special advantages of HSVA is the many years of experience with container ships, beginning with the introduction of this ship type. HSVA involvement has been primarily in the areas of hull form and propeller design, development and optimization, also covering manoeuvring and seakeeping aspects. As a result of HSVA participation in container ship projects more that 1500 hull form variants have been investigated. This provides a very firm basis for further development of very large container ships.

Another advantage that HSVA has is the large towing tank (300m x 18m x 6m), and the large cavitation and hydroacoustics tunnel HYKAT, where the same model used in the towing tank is investigated regarding cavitation behaviour. These very large facilities allow the use of large hull and propeller models, which means higher accuracy of measurements and greater reliability of predictions.




Required power at the propeller for very large container ships (6000 TEU to 9000 TEU)

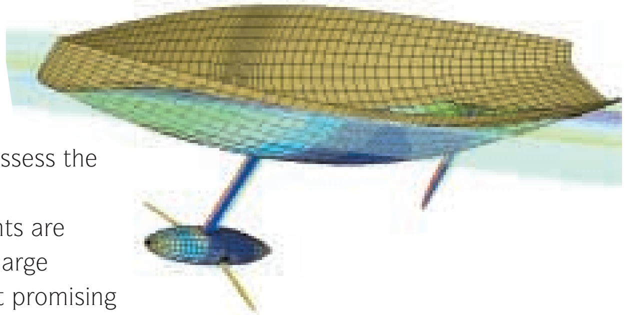
# *HSVA BACKS FIRST GERMAN "AMERICA'S CUP" CHALLENGE*

by Jochen Marzi + Arndt Schumacher

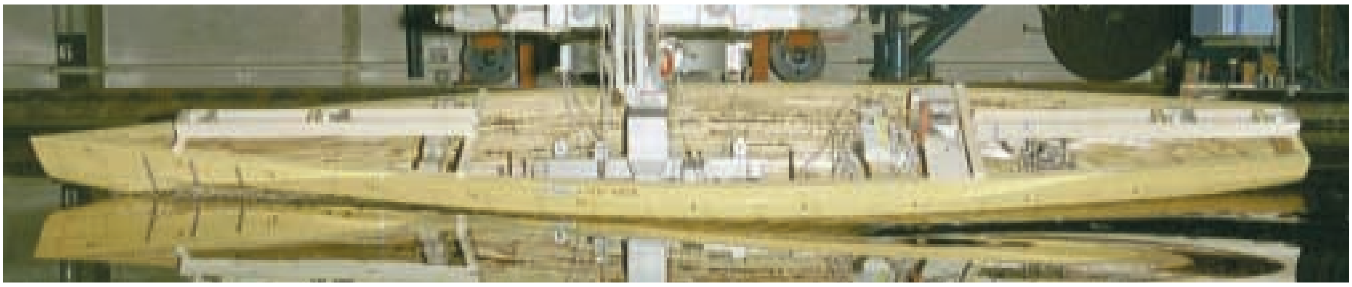
The America's Cup, dating from 1851, is the oldest trophy in international sport and is considered yacht racing's Holy Grail. For the first time ever, a German challenger will compete in the races in 2003.

Illbruck – Pinta GmbH – together with the Düsseldorfer Yacht Club – will participate in the next challengers' regatta in New Zealand. An international team of experts for hullform design, sailing aerodynamics and further technical details has been brought together to support an outstanding crew of internationally renowned sailors to challenge the present cup holder – Team New Zealand.

HSVA has been asked to join the expert team and perform the hydrodynamic assessment of the new ship hull which will be built in 2002. The main activities for the model basin lie in CFD computations and – naturally – experimental tests in the large towing tank. The CFD analysis for the new yacht was an extremely challenging task. The most important issue was the inclusion of lifting effects in HSVA's free surface potential flow code n-SHALLO. Together with the use of the parallel PC-cluster, this allows to perform a large variety of computations for all the different sailing conditions that need to be considered in order to assess the quality of a new design.



Validation experiments are being performed in the large towing tank for the most promising candidate. Here the sophisticated planar motion carriage – CPMC is used to control the different operational conditions including all trim, heel and yaw variations that need to be considered.



# *SEMINAR FOR SHIP OWNERS AND OPERATORS*

by Friedrich Mewis

**HSVA** has held an international seminar for ship owners and operators in Hamburg on May 10, 2001. The purpose of the seminar was to provide this audience with helpful information and documentation from HSVA's considerable experience with commercial vessels.

The seminar was very successful with more than 50 participants who attended the presentations by HSVA staff and participated in the lively discussions.

The topics presented included:

- ❑ The Optimal Ship
- ❑ Pod Drives – pros and cons
- ❑ Propeller Optimization
- ❑ Seakeeping Qualities of Ships
- ❑ Manoeuvring and Safety
- ❑ Operating in Ice

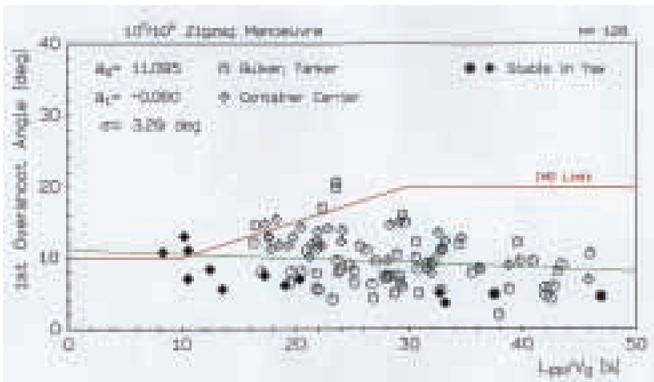



**Diagram from the paper "Manoeuvring and Safety" (Seminar for Ship Owners and Operators)**

Due to the great interest of the participants, HSVA is planning to hold a further seminar for ship owners and operators in the spring of 2003.

# A SERIES OF PROPELLER DESIGNS FOR A CONTAINER VESSEL

by Thomas Lücke

During the last years the numerical tools (CFD) are frequently used to predict the hydrodynamic characteristics of propellers in terms of propulsion, cavitation and pressure pulses. Besides the purpose of own propeller designs within HSVA, the numerical tools in HSVA are used more and more to review extern designed propellers. These reviews have the aim to help the designer to verify the characteristics of his propeller design in advance of the model tests. Shipyards use the design reviews to distinguish and choose between different propeller designs in an early design stage of their projects.

The following example of the daily practice describes such a cooperation between a propeller designer and the model basin. During model tests in HYKAT a propeller for a container vessel showed high amplitudes of pressure pulses and face side cavitation. The designer wanted to redesign the propeller to improve the cavitation behaviour, which otherwise could lead to inconvenient ship vibrations and to erosion on the propeller blades itself.

An analysis of this propeller within HSVA showed the face side cavitation which was observed during the model tests, and also the measured pressure pulses were confirmed. After this proof, a series of new propeller designs were analysed in HSVA to support the designer in questions concerning their expected characteristics.

A series of 5 propellers were designed and analysed. After determining the open water and the propulsion characteristics, the cavitation behaviour and the pressure pulses were predicted. Fig. 1 shows the attained ship speed Vs for a certain amount of delivered power PD for the different propellers. Fig. 2 shows the first blade harmonic amplitude of the pressure pulses.

Design A has a relatively high efficiency, leading to the highest ship speed, but also to the highest first harmonic amplitude of the pressure pulses and to face side cavitation. All following designs (B-E) show different but low safety margins against the onset of face side cavitation. The design B has the lowest efficiency and relative high pressure pulses. The design C has the highest efficiency and the pressure pulses lay between the comparators. The design D which has the lowest margin against the onset of face side cavitation, has a relative low efficiency leading to a low ship speed, but on the other hand to the lowest pressure pulses. The design E shows almost the same propulsion behaviour as the design A but the pressure pulses are lower than those of design A, B and C.

Two propellers of the design series (A and D) were model tested (Fig.1,2).

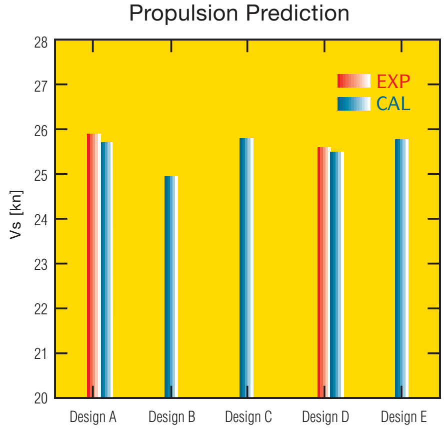



**Fig. 1: Attained ship speed of the 5 propeller designs**

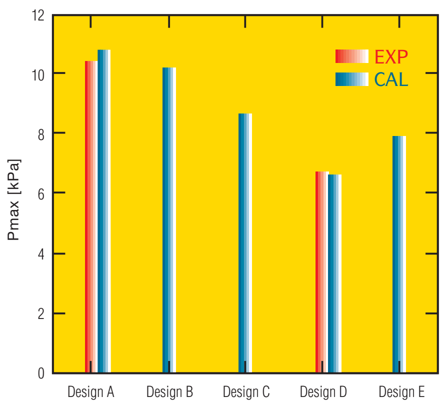



**Fig. 2: Pressure pulses of the 5 propeller designs**

Both plots show a good correlation between the measured (EXP) and predicted (CAL) ship speed and pressure pulses. The theoretical predicted ship speed for design A and D is in both cases smaller than the speed found by the model tests (Fig.1). But the relative decrease in the attained ship speed of design D compared to design A is predicted reasonably well by the analysis tools. If model experiments are available, as in this case, the theoretical determined propulsion behaviour and the pressure pulses can be correlated with the measured values. With such a correlation the absolute quality of the numerical results is further increased, in order to make better predictions for a following design series.

This example shows the worth of both, the numerical tools for the optimisation process and the cooperation between the designer and the model basin. The advantage of the numerical tools is the fast and cheap statement about the characteristics of a new design compared to the model tests.

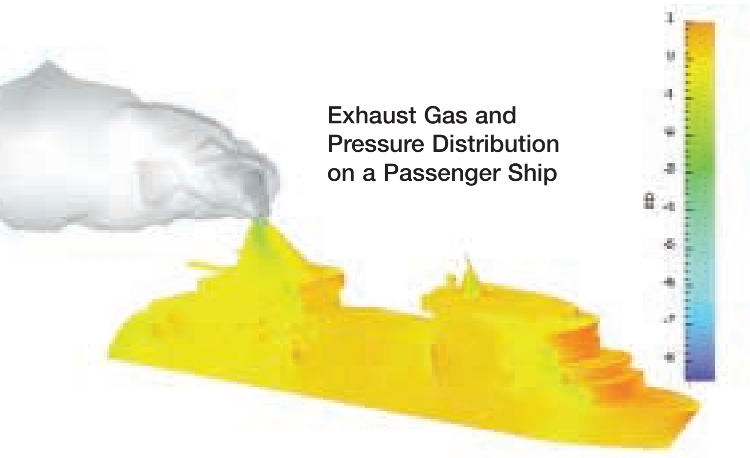
But the absolute quality of the results are less reliable than those of the model tests. For this reason, it is still necessary to prove the predicted characteristics of a new design, which should be used on the ship, by model tests.

# NUMERICAL WIND TUNNEL

## AERODYNAMIC CFD FOR SHIP SUPERSTRUCTURE

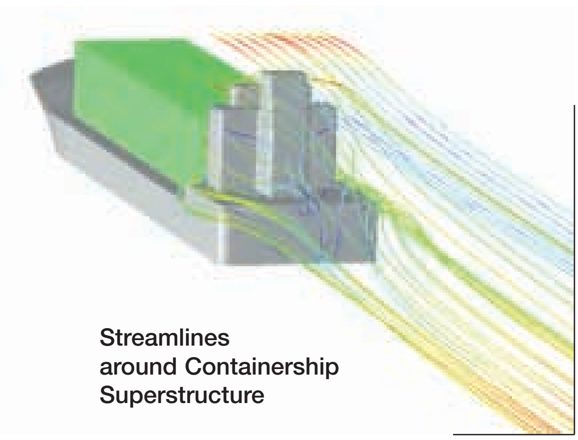
by Ould El Moctar, Scott Gatchell, Volker Bertram

Aerodynamic flows about ship superstructures are of increasing interest for the marine industries. A typical example is exhaust gas propagation in cruise vessels and ferries during the design stage to ensure passenger comfort on the top deck.
Other applications concern safety of helicopter landing, wind resistance and drift forces (particularly for ferries and car-carriers), ventilation of internal rooms etc..



Exhaust Gas and Pressure Distribution on a Passenger Ship

State-of-the-art are experimental investigations for exhaust gas propagation in wind tunnels. These experiments are usually reasonably cheap and fast. As an alternative, CFD has some unique advantages over experiments in that it is easy to inspect all areas, including all those usually difficult to access physically. In addition, one can always come back to CFD and extract additional data, as all the results remain on file or are quickly reproduced.



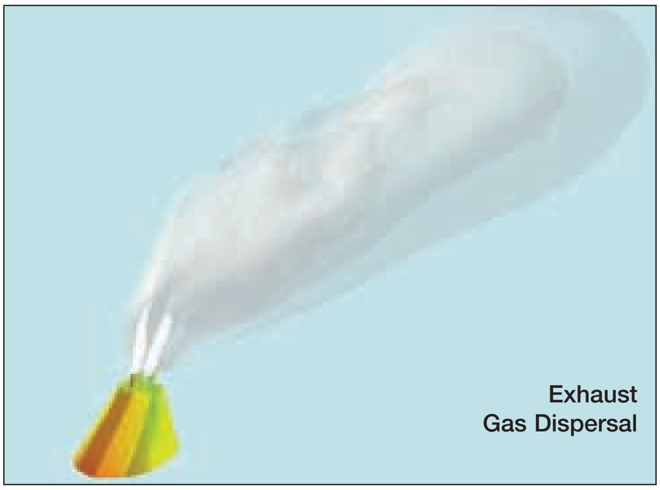
Streamlines around Containership Superstructure

Still, CFD has so far not been accepted as an alternative for wind tunnel experiments due to the complex grid generation which prevented it from being competitive in terms of time and cost until most recently.

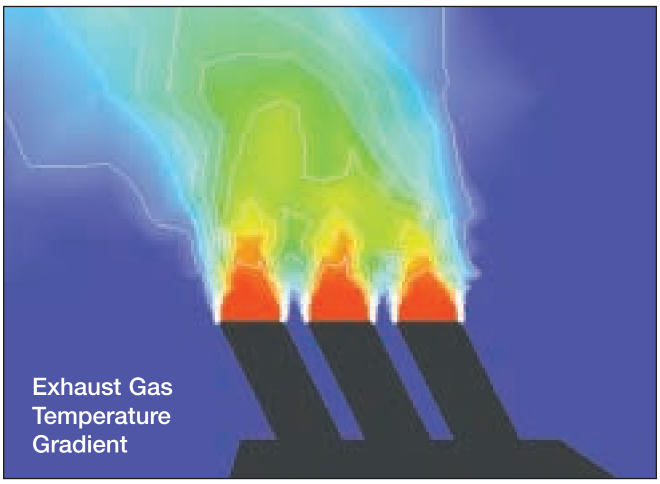
Research partially sponsored by the German ministry for education and research (BMBF) has allowed HSVA rapid progress over the last year in this arena.

A fast and sufficiently accurate modeling of the ship geometry in a suitable grid is decisive for the success of CFD. Ship superstructures are geometrically much more complex than the underwater body of ships. Ship superstructures feature many appendages like masts, winches, radar, etc. Railings stimulate turbulence and are usually considered to be essential in physical wind tunnel testing. Detailed geometric modeling of all these appendages in a CFD grid is practically impossible, but fortunately also not necessary. It suffices to model the global effect of the filigree appendages and model only the larger appendages geometrically.

The aerodynamic flow around ships is turbulent and features massive separation. The appropriate numerical tool is thus a RANSE solver for turbulent flow. The flow is inherently fully turbulent and can be performed at the Reynolds numbers of the full-scale ship. Unlike in wind tunnel tests, there is no need for additional turbulence stimulators. The blockage effect of small appendages is captured by using



Exhaust Gas Dispersal



Exhaust Gas Temperature Gradient

so-called baffle elements, i.e. elements or cell faces with specified partial permeability. These baffle elements were incorporated by ICCM GmbH in their RANSE solver Comet. Preliminary studies for a railing structure showed that the partial blocking of the flow is much higher than intuitively assumed. This is partially due to the effect of the boundary layer, partially due to the local flow direction which is often far from being orthogonal to the railing's plane. Based on these numerical studies, higher blockage values are chosen for the baffle elements.

The aerodynamic boundary layer is much thicker than the hydrodynamic boundary layer. This allows a coarser discretization of the fluid domain near the hull. Grids based on tetrahedral and prism elements become then feasible. These grids are much faster to generate than our usually employed grids based on hexahedral elements, as largely automatic grid generation procedures exist for tetrahedral elements.

Combined, baffle elements and tetrahedral grids now allow to generate grids about ship superstructures within acceptable times based on a suitable CAD description.

A reference application was recently produced for a typical generic cruise vessel created at HSVA from published deckplans of actual modern cruise vessels. The created CFD model is far more detailed than any other such aerodynamic CFD model for ships found in the literature. Several grids of increasing fineness were created with the largest having approximately 5 million cells. Ongoing research focuses on determining proper grid resolution, and we expect that 1-2 million cells may suffice for most practical applications.

The CFD simulations allow particle tracing, but also computation of integral forces. The research results obtained so far show that CFD has become already a realistic alternative to wind tunnel tests.

# EROSION ON SHIP PROPELLERS AND RUDDERS
# THE INFLUENCE OF CAVITATION ON MATERIAL

EROCAV

## A THREE YEAR EU PROJECT

by Jürgen Friesch

**HSVA** has signed a contract with the European Commission as part of a three-year project aimed at improving the prediction methods for cavitation induced erosion on ship propellers and rudders. Together with 10 other partners, HSVA launched the project at a special Kick-off meeting held in January 2001 in Hamburg. HSVA has assumed the position of overall coordinator of the consortium, which includes:

Bassin D'Essais Des Carenes (BEC), France

Chalmers University of Technology, Sweden

Germanischer Lloyd (GL), Germany

Ship Design and Research Center (CTO), Poland

LIPS BV, The Netherlands

Lloyd's Register of Shipping (LR), England

Maritime Research Institute (MARIN), The Netherlands

Mecklenburger Metallguss GmbH (MMG), Germany

SSPA Maritime Consulting AB, Sweden

Wallenius Lines AB, Sweden

are addressed, bubble collapse impact correlation by use of acoustical measures will be investigated and the role of cloud cavitation for the occurrence of erosion damages is checked.

In WP2 observations and the analysis of cavitation erosion processes in full scale are examined. In this part of the proposal at least three ships will be selected of which the propeller and/or the rudder erode. On these ships observations will be carried out to determine the type of cavitation which causes erosion. Each of the ships to be investigated will be measured by a different participant, so that the different partners will use their capabilities to do these observations.

WP3, the third part of the project, will study the development of model test procedures for the prediction of cavitation induced erosion. The main aim of this WP is to develop different cavitation erosion prediction methods, that allow for a quantified full scale erosion prediction. Four separate tasks

**Erosion damages**

Divided into four technical and one management work packages, the first of these, WP1, focuses on the basics of cavitation induced erosion. Systematic analysis of possible erosion mechanisms and the related cavitation patterns will be performed, scaling effects

are formulated which will be solved by different task leaders:

- ❑ Paint Test Method
- ❑ Impact Method
- ❑ Video Method
- ❑ Soft Metal Method

In an effort to assist qualifying and quantifying design cri-teria with regards to propeller and rudder design, the intention is to develop methodologies and associated test procedures. At the end of the project guidelines should be available for

- ❑ the practical application of test methods,
- ❑ for the judgement of test methods and test results
- ❑ for the design of propellers and rudders.

Therefore in WP4 the test procedures developed in WP3 will be used in different facilities for the same test cases which are the ships investigated in full scale within WP2. This means that the developed measuring techniques will not only be validated against the full scale data obtained in WP2, but also for different test facilities. This is important, because each facility has its own range of flow parameter variation (speed, Reynolds number, air content, propeller blade roughness) and specific test procedures. Additionally the sensitivity of the results to model test parameters will be investigated during these tests.

WP5 deals with the management of the whole project.

For more information contact the EROCAV – website – www.EROCAV.de or the project manager

J. Friesch
Hamburgische Schiffbau-Versuchsanstalt GmbH
Bramfelder Str. 164 • D-22305 Hamburg, Germany
Tel.: +49-40-69203-252 • FAX: +49-40-69203-345
e-mail: Friesch@hsva.de

## RECENT RETIREMENT

### Dr.-Ing. Joachim Schwarz

*After 25 years in HSVA Joachim Schwarz was retired. The major part of his time at HSVA he had been the head of the ice department, which he built up.*
*His effort and leadership has made HSVA a leader in ice model testing and hull form design for ice breaking ships.*
*Joachim Schwarz´s international recognition was reflected in an "Ice Research and Engineering Colloquium" that was held in May on the occasion of his retirement with attendants and speakers from all over the world. This colloquium well reflected his major fields of activity: ice forces on structures, efficient hull forms for ice breaking ships and Arctic transportation systems.*
*Joachim Schwarz will continue to support HSVA in the ongoing EU-funded STRICE research project, also remain the president of "Gesellschaft für Maritime Technik (GMT)" so that the time he can spend on the golf course will be limited.*

### Dr.-Ing. Peter Blume

*Peter Blume, one of the most distinguished scientists and engineers has left HSVA to take an early retirement from a professional life that had always been in close relation with HSVA. His direct employment started in 1976 and from 1988 on he was head of the seakeeping department, which was united with the manoeuvring department in 1989 and the ice-technology department in 1995 in the process of simplifying HSVA´s organisational structure.*
*Peter Blume´s high international reputation is based on his major contributions to the problem of capsizing of ships in following seas. With his efficiency and reliability Peter Blume has become a highly esteemed partner for our clients and received greatest esteem within HSVA.*

## MEMBER OF STAFF

WALTER KUEHNLEIN

*Dr.-Ing. Walter L. Kuehnlein has joined our staff as Director and Head of Department of Seakeeping and Manoeuvring, Ice & Environmental Technology.*
*Walter Kuehnlein received his diploma in civil & ocean engineering in 1989 from the Berlin University of Technology (TUB), where he stayed as research engineer until 1997 and obtained his doctoral degree.*
*After that he joined IMPaC Offshore Engineering GmbH, Hamburg, where he was involved in developing a concept for the first drilling exploration in the North Caspian Sea for OKIOC (consortium of 9 international operating oil companies). After this concept was contracted to Parker Drilling, USA he served as Engineering Manager to PKD in New Iberia, USA, responsible for design and engineering of this drilling rig (Sunkar), which is the world's largest barge drilling rig. Later on, he was Project Manager, responsible for the construction of Sunkar. He still is in charge for all de-grounding and grounding operations during relocation of Sunkar.*
*Walter Kuehnlein has published numerous articles, among others, about oil skimming vessels, ice engineering, and innovative model testing. His special interest over the last 15 years lies in transient wave packets. He was awarded the Georg-Weinblum-Price and the medal from the prestigious Werner-von-Siemens-Ring foundation in 1998.*