SEASPEED NEWS

INDEPENDENT SPECIALISTS IN HIGH SPEED CRAFT PERFORMANCE

Enhance your vessel's performance with Seaspeed.

Wind Farm Access Research and Development
New fast CTV performance benchmarking
- read the full story on page 2.

Performance Prediction and Hull Form Development
See the next generation of high performance vessels
- more info on page 4.

Vessel Performance Monitoring
Gain new insights into your vessel with the Seaspeed VMS
- see page 7 to find out how.

SEASPEED
MARINE CONSULTING

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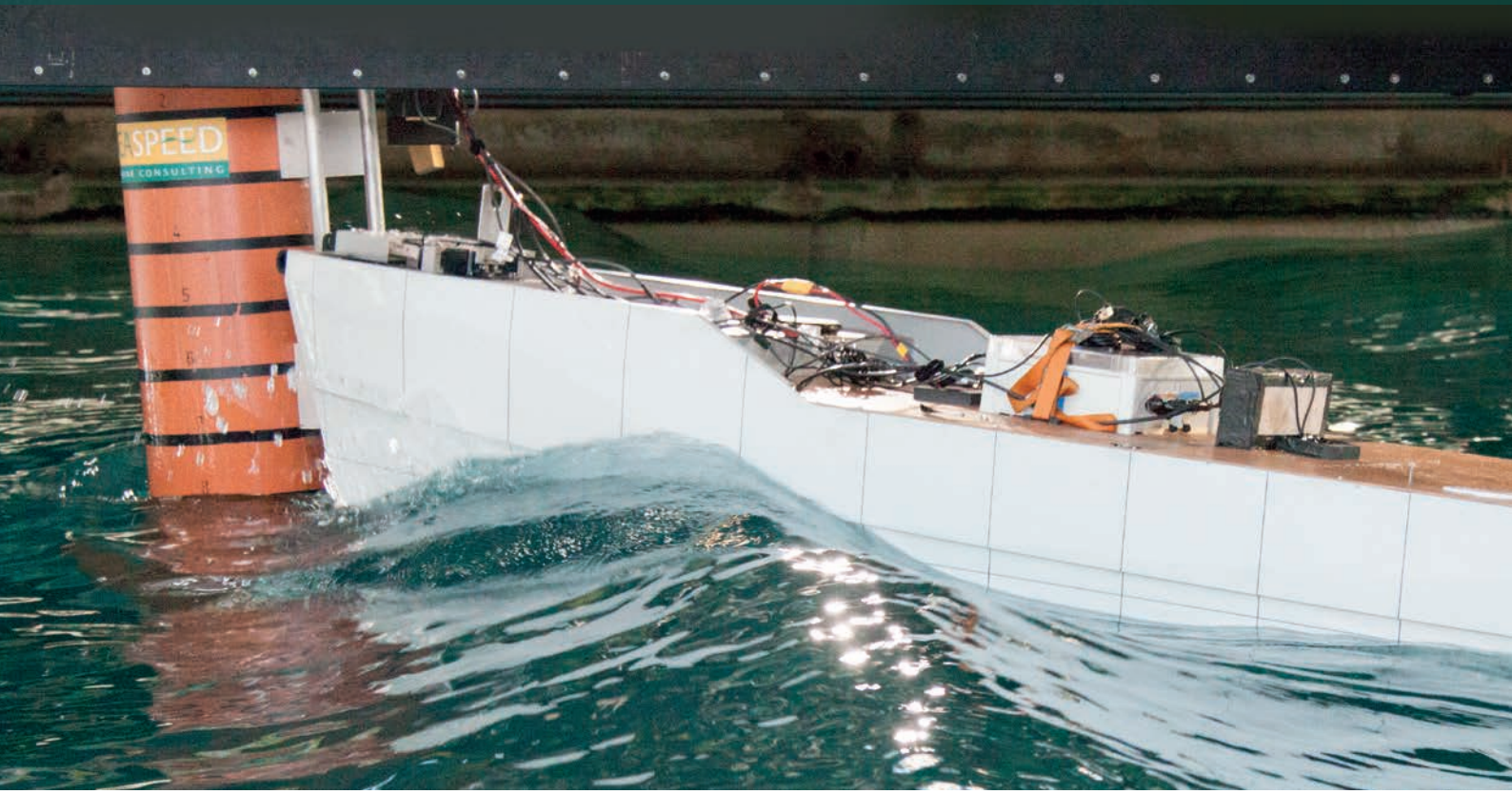
Wind Farm Access R&D

Seaspeed completes fast crew transfer vessel performance benchmarking for The Carbon Trust.



With extensive experience in vessel performance modelling, Seaspeed won a European tender to benchmark the performance of existing fast crew transfer vessels (CTVs) and propose guidance for likely areas of improvement

The ability of CTVs to transfer personnel to and from offshore wind turbines is particularly sensitive to weather conditions. Any design changes that could enable them to work across a wider weather window would increase their operability and contribute to reducing the cost of offshore wind energy – this being a prime consideration for the Carbon Trust's Offshore Wind Accelerator research programme.

The research process

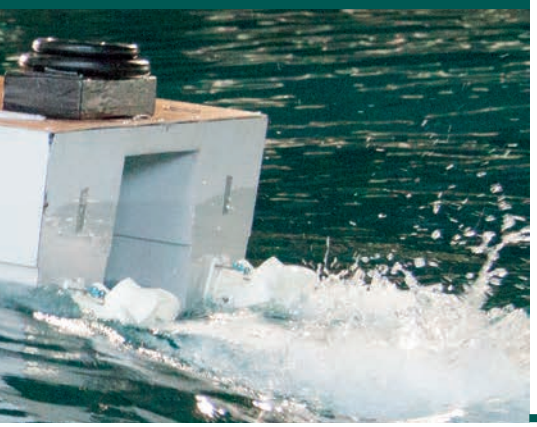
The focus of the research was to understand and improve the operability of CTVs and this involved not only monitoring the performance of existing vessels during their normal operations, but also studying their performance using computer simulations and physical hydrodynamic scale model testing.

The performance of these craft was studied over three main operational phases:

- **Transit**
  medium to high speed transit between ports and wind turbines
- **Approach**
  low speed manoeuvring up to the wind turbine docking areas
- **Transfer**
  a vessel thrusting up against the docking poles to enable the transfer of personnel to and from a turbine tower

For the full scale sea trials, Seaspeed installed its vessel monitoring system (VMS) on a range of vessels to monitor and record vessel motions, accelerations, speed, course, heading and fender forces.

Fender slip mechanisms were studied in detail over a wide range of sea conditions, tides, headings, docking pole inclinations and bollard thrust values.



To facilitate the computer simulation and scale model testing, a study was made of the offshore industry to establish what typical CTVs in operation looked like: their dimensions, hull forms and propulsion systems, and also what the designs of their successors were likely to be. Using this study, four baseline hull forms were generated – two catamaran forms (one waterjet powered and one propeller powered), a monohull and a SWATH (both propeller powered). Calculations and tests were undertaken on these hull forms for three different sizes (18 metres, 22 metres and 26 metres in length) at a range of displacements and propulsive thrust values, in order to cover the full spectrum of CTVs in use within the industry.

In a parallel industry study with Classification Society DNV GL, the typical parameters (and their threshold values) that limited acceptable operations were investigated, for both the transit and transfer phases.

The outcomes

The results from the instrumented sea trials, computer simulations and scale model tests, along with threshold limitations derived from industry experience, allowed Seaspeed to establish a series of Baseline Performance Plots (P-Plots) which indicate the typical limits of operations of current CTVs. This now provides an industry baseline standard against which the performance of other vessels can be compared.

The data also provide insights into vessel design parameters that have been seen to limit operations, such as low bow freeboard, poor fender arrangements and inadequate bollard thrust. The end result is a series of guidelines produced by Seaspeed for initiatives that can improve marine access using CTVs. These have been disseminated to the industry via technical seminars, and also in recent technical papers through the Royal Institution of Naval Architects. For more information, please contact us.

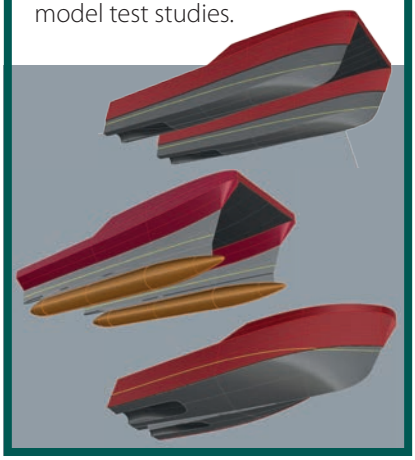
This improved understanding of performance benchmarking is equally valuable in other sectors where vessel availability is sensitive to environmental conditions. These include fast ferries, fast patrol craft, tugs and pilot craft.

CARBON TRUST

The mission of Carbon Trust is to accelerate the move towards a low carbon economy by facilitating appropriate innovation. Their partners include Dong Energy, E.ON, Mainstream, RWE, Scottish Power, SSE, Statkraft, Statoil and Vattenfall and their collaborative Offshore Wind Accelerator programme has funded a number of research areas, including this most recent performance benchmarking programme.

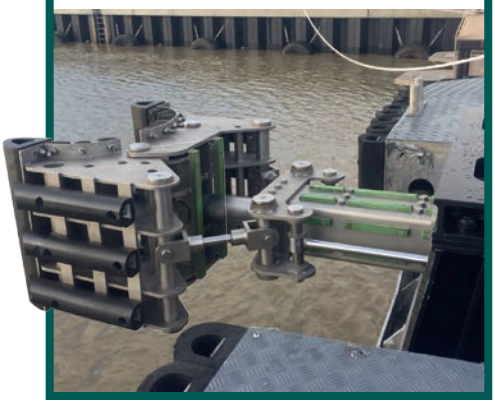
Hull Form Designs

Baseline hull forms were designed to represent typical industry practice at the time of the study and were used for the computer simulation and scale model test studies.



Access Systems

Seaspeed has previously undertaken tests and trials for a range of innovative access systems for The Carbon Trust including, Maxcess, TAS, Autobrow, TDD and Vgrip.



Performance Prediction & Hull Form Development

Photo: Incat

Seaspeed is working closely with clients from around the world on developing the next generation of high performance vessels

At Seaspeed, one of our core areas of expertise is the provision of independent performance predictions, including advice on hull form development, covering a range of issues from resistance, powering and wash to dynamic stability, manoeuvring and seakeeping.

Fast ferry development

We have recently assisted Virtu Ferries of Malta and Incat Australia in the development of a new 110-metre fast ferry, now under construction in Hobart, Tasmania. Much of the prediction and development work was undertaken by Seaspeed using self-propelled, free running, hydrodynamic models in an Ocean Basin. We have found that such test matrices provide the most realistic, comprehensive and cost effective information directly relevant to ship designers and operators. Here we also provided direct visual comparisons with existing and well-proven designs to add further confidence to this assessment technique.

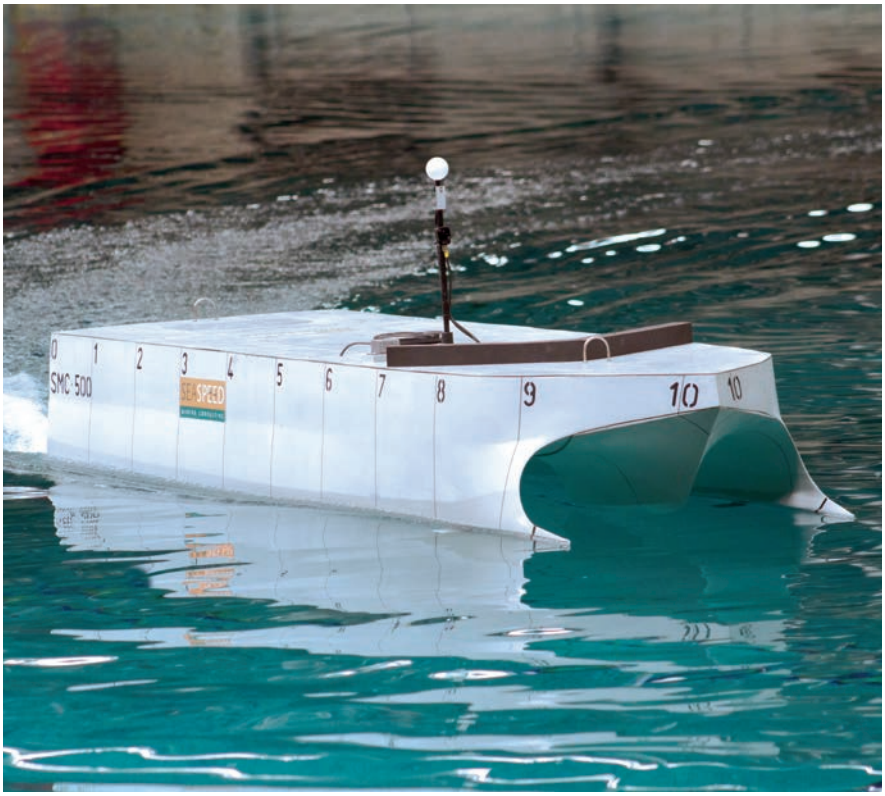
All our models are built and instrumented in workshops and tested by Seaspeed staff in suitable facilities, be they ship tanks, ocean basins, shallow water tanks or the open sea.

In a recent fast ferry project for the BMT Group, constructing the model using 3D printing reduced the total project time to just three weeks from contract signing, through resistance testing and analysis to the full reporting of the results.

Measuring every variable

Modern instrumentation allows us to monitor just about any parameter on our free running models including all motions, speed, force, pressure, wave elevation, flow rate and shaft torque, thrust and rpm. A range of propulsion systems have been modelled including conventional propellers, waterjets, surface piercing propellers, azimuth thrusters and oscillating foils, as have actively controlled systems such as ride control and motion compensated gangways.

We undertake the majority of data analysis in the context of time and frequency domains, thereby ensuring that as much as possible is learnt from the results. Recent advances in impact analysis are also deployed for the investigation of specific events such as slamming, broaching and bow-diving. Computational fluid dynamics is now playing a more dominant role in our performance prediction and hull form development. We find that it significantly expands on and complements the understanding and results that we derive from traditional methods.



Fast Ferries

Fast ferry hull form development, testing and performance prediction has always formed a core area of the company's business, most recently for large fast ferry fleets such as those operated by Fred Olsen in the Canaries and Virtu Ferries in the Mediterranean. The economics of these craft are particularly sensitive to fuel usage and their ability to cope with poor weather and thus the primary challenges are to minimise both fuel consumption and vessel motion whilst maintaining an acceptably high operational speed. Hydrodynamic scale model testing continues to provide the highest level of confidence for the definition of these parameters.

Specialist Crew Transfer Vessels

The design of CTV hulls needs to account for the unique requirements of these craft. They need to transit at moderate to high speeds in relative comfort carrying technicians and a wide range of containerised turbine parts and tools. They then have to approach and push up against wind turbine towers in order to safely transfer the personnel and equipment - and to do all this in the widest range of sea-states and tidal conditions possible. The test techniques and depth of knowledge available at Seaspeed, generated from a variety of focussed R&D programmes, has allowed the company to assist a large number of clients in the development of their craft.

Photo: Iceni

Photo: RNLI

Rescue Craft

In support of the design and development of the RNLI's most recent fast lifeboat, the Shannon Class, Seaspeed undertook all the open water free running model testing of a wide range of waterjet powered hull forms to investigate their seakeeping, manoeuvring and powering characteristics. In particular, their fast up-sea performance was evaluated in detail, this being crucial for their required operational availability. The final hull form was selected based on the results of this comprehensive test programme.

High Speed Craft Wash

Fast craft, particularly when operating in or near shallow water, can generate unwanted levels of wash. Research into such wash in deep and shallow water has allowed Seaspeed to provide wash data for the operation of the RNLI E-Class lifeboats on the River Thames, public fast ferry services on European lakes, inland waterways and rivers, and approved risk assessed passage plans (RAPPs) for navigation of many of the large fast ferries operated from UK, French and Irish ports.

Photo: RNLI

Photo: ARES

Patrol Craft

In 2015/16 ARES Shipyard of Turkey asked Seaspeed to undertake seakeeping, manoeuvring and powering tests for a series of four waterjet powered patrol craft designs up to 50 metres in length and with max speeds up to 60+kts. Detailed free-running models were constructed, instrumented and tested over these speeds at all headings and in a range of sea conditions. Vessel motions, shaft power, speed and speed loss in waves, slamming and green-water-over-the-bow frequencies, margins of dynamic stability and directional stabilities, turning circles and crash stops were all analysed and assessed as part of the contractual requirements. The craft are now under construction at the ARES shipyard.

High Speed Superyacht Stability Testing

Seaspeed has been retained to study the safety and performance of superyachts at extreme speeds. The hydrodynamics and aerodynamics associated with such speeds introduce particular challenges with respect to operational safety and dynamic stability.

Vessel Performance Monitoring

Gaining new insights with the Seaspeed Vessel Monitoring System (VMS)

Our VMS allows the performance of any craft to be continuously monitored, on board and remotely. The equipment can be fitted for a limited time or as a permanent installation, allowing monitoring to take place either during specific trials programmes or as part of normal commercial operations. The standalone Seaspeed VMS is designed to provide high quality comprehensive automated data analysis normally only associated with managed sea trials. In particular, analysis of the vessel's relative heading to the wind and waves (e.g. whether in a head, beam, quartering or following seas) is undertaken along with measurement of the sea state and vessel loading conditions to facilitate the provision of automated performance assessment.

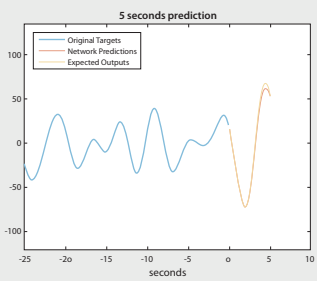
Seaspeed VMS have been in operation on a variety of crew transfer vessels in support of the Carbon Trust's research programme. An upgraded system has recently been fitted to additionally and automatically monitor fender forces and transfer performance.

On-board and on-shore analysis

We have used our monitoring systems for many years during sea trials on fast ferries, patrol craft, workboats and superyachts, but our latest interactive equipment now provides automated on-board analysis, the results of which can either be read directly from the display and/or emailed each day, week or month for remote assessment. This new equipment is now being fitted on large fast ferries where control of passenger comfort and fuel consumption is of such commercial importance.

Motion Prediction

Seaspeed is developing a motion prediction algorithm to allow the accurate prediction of vessel motions five to ten seconds in advance of when they happen. The underlying theory has been recently proven on trials – and the technology is expected to have a wide range of applications in addition to the current focus on personnel transfer safety to and from CTVs.



The Seaspeed VMS can be installed with a built-in touch screen or can be locally accessed via a separate touch screen or wireless tablet – and of course remotely over the internet from our offices.

Photo: Fred Olsen

Fuel Consumption

The proper analysis of 'Big Data' is crucial if the cost of its monitoring is to be recovered. Seaspeed is analysing fuel consumption data for a series of fast ferries and relating this to a range of other monitored vessel parameters in order to determine the most cost-effective methods for future fuel consumption reduction. An interactive graphical interface is also being developed to aid involvement of crew in the optimisation process. The effect on fuel usage of small changes in operational parameters can be viewed on this interface and compared with past performance, so as to encourage the crew to demonstrate their skills at maintaining the lowest possible fuel consumption for any speed, displacement and sea condition.

Special Projects

Having built a name for technical ability, independence and a motivated approach to technical assignments, Seaspeed is often approached to provide technical support for special projects.

Wave Foils

In 2016 Seaspeed teamed up with Rolls-Royce Marine and Autonaut in an INNOVATE UK funded research programme to develop foil technology aimed at providing forward thrust for vessels operating in waves. The objective was to reduce fuel consumption. The resulting combination of reduced vessel motion and net forward thrust indicated significant potential for this technology as a retrofit device.

Unmanned Systems

Seaspeed was contracted by the MOD to provide a series of unmanned surface drones for use as high speed marine targets. The success of these USVs and the rapid expansion of the robotic sector led to the formation of a spin-off company, ASV Ltd, which was sold to Global Fusion Inc in 2010. Seaspeed continues to provide independent hydrodynamic research to the marine autonomy sector.

Lifesaving Systems

The development of inflatable marine escape systems has revolutionised life saving appliances for ships over the past 25 years and is now challenging the traditional ship's lifeboat in the form of inflatable AES (alternative escape systems). Seaspeed has been involved in the design, development and testing of such technology for a range of clients and continues to advise on the performance of inflatable structures in extreme conditions at sea.

HSC Survey

Seaspeed was formed in 1988 at the height of large fast ferry developments and has been closely involved in this sector ever since. As a result of this association with their design, build, operation and safety, and in particular their ageing process, Seaspeed provides independent advice and vessel surveys for this niche sector, most recently for the refit of HSC The Cat for Bay Ferries of Canada. Seaspeed also maintains the only incident database specifically for high speed ferries (1985 to present).

Ride Control Systems

Seaspeed has been retained to develop active ride control system algorithms and graphical user interfaces. These have been implemented on a number of HSC and have been tested at model and full scale, covering T-foils, roll damping fins, interceptors and transom flap systems. A Seaspeed research programme is now underway investigating the use of predictive algorithms for control on the new Incat 110m fast ferry.

SEASPEED
MARINE CONSULTING

Performance Monitoring
Instrumented sea trials and long term performance monitoring and data analysis.

Performance Assessment
Speed, power, seakeeping, manoeuvring, dynamic stability and wash prediction.

Naval Architecture
Hull form development, CFD investigations, physical model testing and research programmes.

HSC Survey
Specialist high speed craft condition surveys and incident analysis.