



The Maritime Simulation MAGAZINE

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We are creating a maritime simulation community - join K-Sim Connect now!



Empowering the simulator instructor in the cloud

K-Sim Connect is the most significant addition to Kongsberg Digital's K-Sim portfolio in years. It is a cloud native service platform created to support the community of simulator users by providing easy access to simulation and supporting services. This opens a whole new world of simulation opportunities.

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KDI's International Simulation User Conference 2019 - A Voyage of Discovery



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Digital twins yield safety and cost savings for Heerema Marine Contractors



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MEET US HERE:

We are participating at a range of conferences and exhibitions worldwide. Below is a selection of some of them:

Mari-Tech 2020

Victoria, British Columbia, Canada
April 28-30

CrewConnect Europe

Amsterdam, The Netherlands
May 18-20

Education, Crewing & Manning

Odessa, Ukraine
May 20-21

IALA VTS & eNavigation Symposium

Rotterdam, The Netherlands
May 25-29

CANSEC

Ottawa, Canada
May 27-28

High Speed Boat Operation Forum

Gothenburg, Sweden
June 2-4

Posidonia

Athens, Greece
June 1-5

MARSIM 2020

Svendborg, Denmark
August 10-13

Nor-Fishing

Trondheim, Norway
August 18-21

Welcome to the Maritime Simulation Magazine 2/19

Dear reader,

Cloud-based platforms, simulation as a service and the application of advanced algorithms for detailed testing, pre-mission planning and prediction are all transforming the maritime simulation technology landscape.

There are a number of articles detailing the advanced use of KONGSBERG simulators in this issue of the Kongsberg Digital Maritime Simulation Magazine. You can read how Heerema Marine Contractors has used digital twin technology to radicalise heavy lift operations, or how Kongsberg Digital simulators are enabling the development of the world's first truly autonomous ship.

Of course, expanding the scope of simulator technology is only possible based on industry-wide collaboration. This was shown in full effect at our Simulator User Conference in Rotterdam in September, and we've taken community building one step further with the introduction of K-Sim Connect, which you can read more about in this issue and hopefully join the community soon!

It's exciting to be so involved in shaping the future of the maritime industry, and we are proud of the cutting-edge applications that we see KONGSBERG simulators being used for today.



With such an amazing community, we are positive that more innovations are on the way, and look forward to continuing our collaboration in the new year, and for many more years to come.

Join the K-Sim Connect community now!

Enjoy reading!

Tone-Merete Hansen

We are creating a maritime simulation community - join K-Sim Connect now!

BY: GULLIK JENSEN, DIRECTOR TECHNOLOGY, MARITIME SIMULATION, KONGSBERG DIGITAL

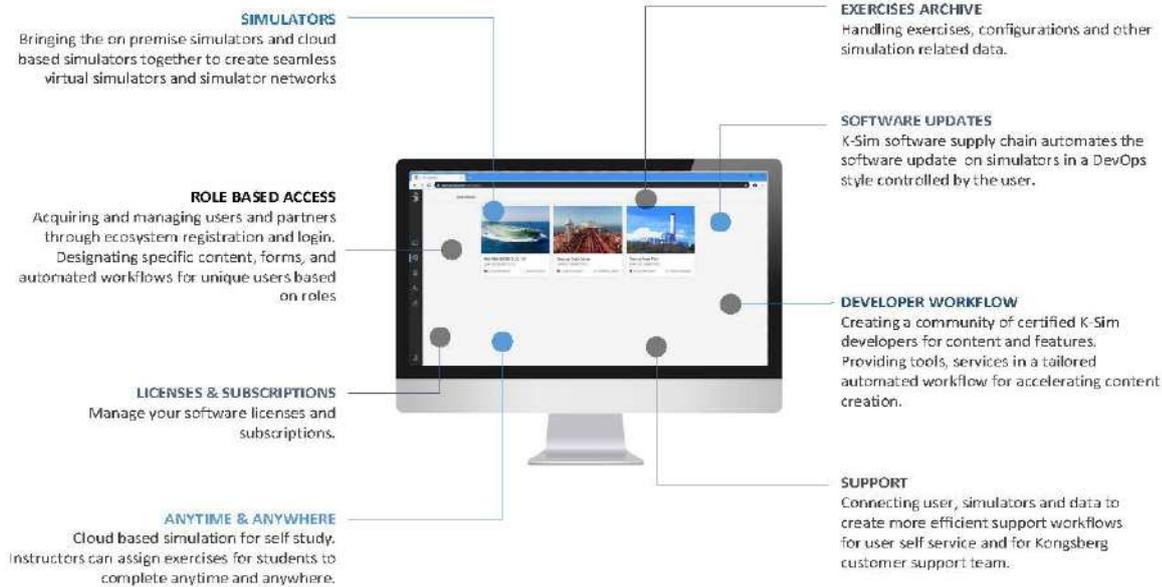


Figure: K-Sim Connect opens a whole new world of simulation opportunities by leveraging KONGSBERG's many years of expertise in simulation and creating simulation services in the digital cloud.

Empowering the simulator instructor in the cloud

K-Sim Connect aims to create a new simulation user experience based on the simulators you already have, so that you can use and operate them in a better way. Just like the name promises, Connect creates a connection between each of the parts necessary for a successful simulation learning experience; the student, the instructor, the exercise, the simulators and the simulator content.

Digitalization trends in maritime training and education

Digital technologies are changing maritime simulation, and their effects will mostly be related to creating a more compelling user experience, in delivering and supporting simulators efficiently and renewing the business model. Digitalization is not going to create new simulators, make old simulators obsolete or remove the need for full mission simulators in training centers. Instead, digital services are going to complement physical simulator experiences to form

a seamless mesh of physical and digital exercises in a new way that increases the benefits derived from simulators which customers are already deploying.

In the future, we will see operational efficiency improvements motivated by the new digital technology. Simulators will go online to receive the latest software release or security update. Instructors and service engineers can monitor system performance and get notifications in good time if service or support is required. For some applications, the entire simulator operation will migrate to the cloud, not unlike what is currently happening with many major commercial software vendors.

The focus will shift towards the community, which in turn will become the driver of new applications for simulation. The emphasis will evolve from individual effort to community efforts, from competition to collaboration.

Business models will change from own-

ership to subscriptions and leasing, progressing from pure products to a mixture of products and services. For schools, renting provides a much higher degree of flexibility, not to mention impacting beneficially on cashflow.

K-Sim Connect is our solution

The best way to predict the future is to invent it, and since 2017 Kongsberg Digital has taken the leading role in the digital transformation of the maritime training and education industry. We do this based on our core belief that knowledge is the key to addressing challenges at sea in the domain of safety, risk, operational performance, the environment and innovation. Leveraging our "world leading" simulation technology, we have helped to remove operational constraints so that students and crew can train in new and unfamiliar situations to build this knowledge using our simulators. Emerging digital technologies will position us to deliver even more efficient solutions.

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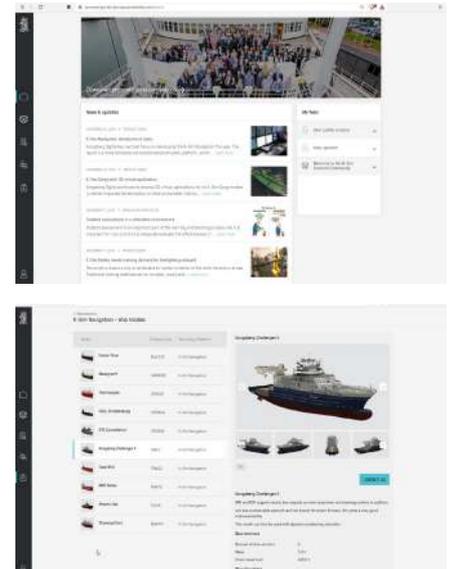


PHOTO: K-Sim Connect is mainly tailored to the instructor, who can benefit from getting a full overview of the always up-to-date simulators, exercises and a marketplace for downloading engine and cargo models; or additionally K-Sim Navigation's vessel models and geographical areas, plus common spare parts. The instructor also has the opportunity to assign exercises to students, who can train either at the school or anytime and anywhere at their own pace.

K-Sim Connect is our platform created for the purpose of driving the transformation of our industry. We have started this by leveraging our entire existing portfolio of simulation technology, fusion with the new cloud native technology and inviting all users to join us and contribute to the transformation.

If asked, any instructor can show you their physical simulator; but what about a cloud simulator? The answer to that can be found at www.ksimconnect.com. This is the focal point where we invite you to join us in the transformation and become a part of the online community. Here, both students and instructor have personal user profiles that provide access to available services and products.

K-Sim Connect is tailored to the simulator instructor's daily tasks and responsibilities

There are three categories of users that receive special attention in K-Sim Connect on the domains of usability. These are the instructors, the students, and the content developers. The instructor is the educator, the professional who uses the simulator as a tool for building knowledge in students preparing them for a professional career. The students, who take the simulation training, and finally the content developers who make models and exercise areas.

Since the instructor has the most responsibilities and represents the core of the simulation community, we have tai-

lored the K-Sim Connect portal mainly to the instructor's needs.

Easy access to the simulators

The simulators are no longer confined to computer labs in simulator centers or to regular office hours. The digital technology of connectivity enables the site simulators to become smarter and more accessible by interfacing to K-Sim Connect for remote access and management by the instructors. Connectivity will also allow for virtual computer networks that lets simulators connect in common exercises independent of the participants geographic locations.

Cloud computing will allow simulator servers to run on demand in the cloud and make local servers obsolete. Simulations scheduled and running in the cloud allow students to run simulations anytime and anywhere, and on their own computers. This form of self-study is ideal for familiarization, system training and basic skills. By letting the students prepare on their own in advance, the time spent in the full mission simulator can be far more efficient.

Full overview of the exercise library and the possibility of sharing exercises

The exercises are what turns a simulator, which in fact is little more than an advanced tool, into a powerful learning experience for the students. Since instructors invest time and effort in creating, planning and implementing exercises, they should be handled as the valuable assets that they are. The

exercise archive in K-Sim Connect offers safe handling and storage of the exercises in a personal archive for each instructor. 'If desired, instructors can collaborate and share exercises with colleagues or others in the global community. Imagine the possibility of saving time by accessing a library of exercises which exactly fit the curriculum?'

Meeting today's students expectations

The digital age has amplified the students' expectations, who take instant access to digital services for granted. To them it seems evident that the same availability and usability should apply to training on a simulator as it does for listening to music from Spotify or watching a new series on Netflix. Special attention is given in K-Sim Connect creating a modern user experience for students, and a slight touch of gamification has been added to trigger engagement and motivation.

Today, instructors can give their students access rights in K-Sim Connect to carry out cloud simulation training. The automatic assessment and other data collected from the exercise are stored and made available to the instructor and student. Since most educational institutions already have a learning management system (LMS) in place to track the performance and progress of their students, K-Sim Connect will also have the option of seamlessly integrating to these systems. However, support for various LMS solutions will be implemented on demand.

Simulation anytime and anywhere – how does it work?

By using new cloud technology to deliver traditional simulation training in a new way, K-Sim Connect enables students to run simulators on their own devices anytime and anywhere and at their own pace. By allowing the same simulators to be accessible, unrestricted by the simulator center premises or opening hours, it significantly increases the usability of the existing K-Sim product portfolio. Since the same familiar simulators are being used, this provides a huge benefit for instructors and schools since all developed exercises as well as training material developed to meet the curriculum can be used with absolutely no modifications.

The instructor simply logs into the K-Sim Connect portal to select suitable exercises and assign them to the class of students. The instructor can assign free-play exercises that the student can use for repeated training or assign scheduled exercises for testing. As the students progress, instructors can monitor the performance and results of each student to provide individual guidance and support. The students similarly log into K-Sim Connect to find the exercises assigned to them, with guidance, training objective and deadlines. With a single click, the students can start the simulations. Students will also have access to past simulations and performance results.

For the tech-savvy reader, the solution is based on the latest technology infrastructure. Students simply install an app on their laptop and log in to let the system manage the technical orchestration. Once done, the student simply launches cloud simulators in a Kubernetes cloud cluster from K-Sim Connect, and the app will work seamlessly under the hood to install and launch for clients as required to give a smooth simulation experience. The technical solution earned Kongsberg international recognition by Microsoft when introduced in 2018.

By the end of 2019, the first three simulators were made available for cloud

simulation. These are all based on the renowned K-Sim Engine and K-Sim Cargo product range, namely the K-Sim Engine MAN B&W 5L90MC VLCC 11-V model, K-Sim Cargo SCCII Suezmax crude carrier and the K-Sim Thermal Power Plant (TPP) simulator. Additional simulators are scheduled for cloud availability in 2020.

Digital services

We envision a growing portfolio of services in K-Sim Connect. The services will vary in size and specialization: some will be used by everyone, and some for special needs. In general, there will be four areas of services related to the community, to simulation, and to content development.

The community services will focus on the instructor's daily work, including managing and organizing students, simulation assignments and exercises. This will also include news updates, information and the potential for instructors to collaborate. The simulation services will be focused on running simulators efficiently and include, for instance automated software updates, connected simulators and cloud simulation. The content developer services will facilitate and support the development and distribution of new content. Kongsberg will offer tools for development, access to our systems for deployment and quality and also distribution.

Rethinking the business model

Along with a growing K-Sim Connect user group and service availability on the platform, new business models will emerge. The traditional business model

of purchasing, owning and running your own simulator is ready for an overhaul. Specifically, for smaller schools and commercial training centers it may be hard to justify large investments in simulation equipment and having dedicated employees handling the technical operation of the simulators. When simulation can be delivered as a service, running the infrastructure is no longer required on the premises.

Moving the operation of simulation to the cloud allows Kongsberg Digital to take over this responsibility from the individual school or training center, so that instructors can stay focused on their core activity of education. The service of offering cloud simulation will in the future be subscription and lease-based. Hence, the need for employing one's own technical resources is reduced, and the risks posed by using old computer equipment is eliminated.

Become a member now

K-Sim Connect supports K-Sim simulators and products together with all our users in a comprehensive ecosystem. We now invite all KONGSBERG simulator users to become members of the community. As a member you will be the first to learn about the new advancements and services as they are created, and you are also invited to start contributing towards building the platform together with us.

No one knows for sure how tomorrow's education and training will take shape, but through K-Sim Connect we are sure that we will be able to deliver it. This process starts at www.ksimconnect.com.

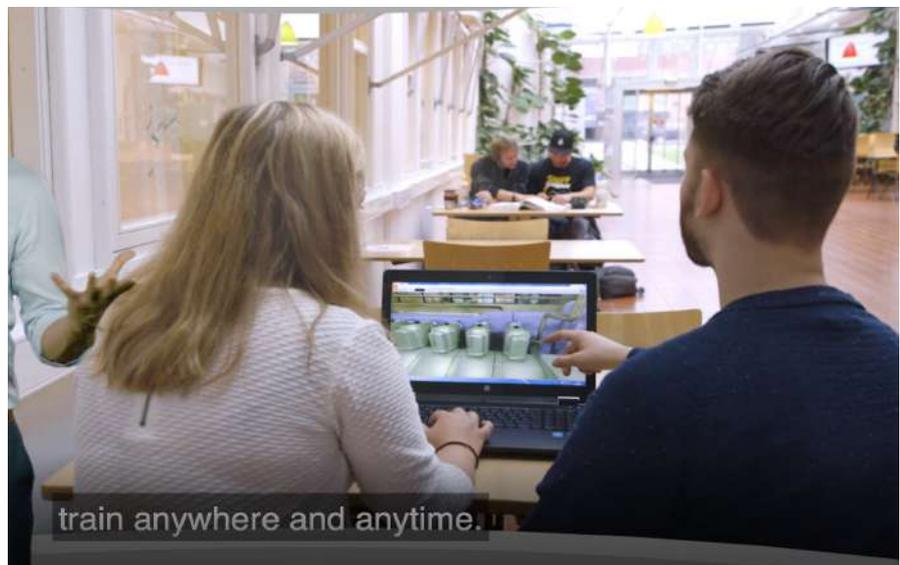


PHOTO: K-Sim Connect enables students to train anytime and anywhere, repeating difficult aspects while learning at their own pace. This will reduce time spent at training centers and enable better utilization of instructor-based simulation training.

KDI's International Simulation User Conference 2019 - A Voyage of Discovery!

BY: ANNE VOITH, MARKETING MANAGER, MARITIME SIMULATION, KONGSBERG DIGITAL



A Voyage of Discovery

Kongsberg Digital's annual Simulation User Conference (UC) took place in Rotterdam, The Netherlands, September 25-26. The conference gathered close to 200 delegates from all over the world and was located on board the unique and historic ocean liner *SS Rotterdam*. The ship was built in 1953 for the Holland America Line and is ideal for our "Voyage of Discovery", which was the theme for this year's event.

Launching K-Sim Connect

The aim of the UC is to facilitate the sharing of ideas in order to enhance the collective knowledge of the international simulation community. Highlighting increased safety, sustainability and digitalization initiatives in the maritime industry requires new perspectives, training tools and methods for the training providers. Kongsberg Digital's Tone-Merete Hansen addressed this in her opening speech, which was followed by several product news presentations and the launch of K-Sim Connect, a brand new digital platform providing cloud-based services to KONGSBERG's maritime simulation community.

Built on the vision of creating an eco-

system for maritime training, K-Sim Connect will enable a wide range of possibilities within simulation products and services, connectivity and cooperation among users including new business opportunities benefitting not only the single simulation user, but the entire maritime training community.

The maritime simulation community

Kongsberg Digital is in the process of developing the portal and encourages the instructors to join and start using it for distributing exercises to students, allowing them to train outside school hours - anytime and anywhere. In addition, instructors can benefit from being the first to receive simulation news and invitations and to get an overview of which models and exercise areas are currently available. Soon, it will be possible to purchase and download all of these (including spare parts) through the portal, making it easier for instructors to quickly get access to what fits with the curriculum.

A few customers have already started using the system and one of these is Mr. Sjoerd Notting, lecturer at the Amsterdam University of Applied Sciences. "It is far more convenient for the student to use the anywhere and

anytime training solution in K-Sim Connect than waiting for access to the K-Sim Engine desktop system at the school," he said when sharing his experience from the stage. Tone-Merete Hansen, Senior Vice President, Kongsberg Digital, is confident that this is the way forward, and commented: "We are the facilitators of the platform, but we need to further develop K-Sim Connect together with you, our customers, in order to include the right type of services for the maritime simulation community".

Additional K-Sim Connect development plans include connecting simulation users and simulators for collaboration and co-training purposes, as well as facilitating subscription modules for simulation models, features and exercises which will be part of the ecosystem. All of this will provide invaluable education and training benefits for students, instructors, institutions and, ultimately, the entire maritime industry.

Product news and updates

The conference program featured several K-Sim product presentations where delegates could dive into topics of particular interest. K-Sim Engine Product Managers presented the

growing library of engine room and cargo handling simulator models, highlighting the new full mission version of the DEDF LNG cruise ferry model for LNG bunkering, which meets the requirements of the IGF code. Focus was also placed on the high-voltage training solutions, which delegates could explore at the visit to Simwave on the second conference day.

On the ship's bridge simulator side, KDI's Program Manager, Owen Brine, presented the new instructor user interface design that enhances the user experience significantly. Our vision is to develop features and an interface that reduces exercise creation time, lowers instructor task load in the exercise, and seek out efficiencies in debriefing and analysis. Recent advances include features such as better communication, improvements to our sensor suite and model library enhancements. In addition to this, Bjarne Wulff gave an update on the strategy and roadmap for the new K-Sim GMDSS, which will be officially launched in 2020.

Updates on the product launched at last year's User Conference

Last year, Kongsberg Digital launched several new training systems, including K-Sim Fishery, K-Sim Safety and K-Sim Fast Craft. At this year's conference, delegates were able to find out more details about the products and learn about the latest developments and improvements.

K-Sim Fishery is a complete fishing ves-

sel bridge simulator fully equipped with navigation and manoeuvring equipment in addition to sonar, an echo sounder and a catch monitoring system. It was initially launched with trawl functionality. Now Kongsberg Digital has also started developing purse seine training capability, which will be ready for delivery in 2020. The training solution is developed for safer and more sustainable fishery and complies with the STCW-F training standards for fishing vessel personnel, which came into force in 2012. "We will continue to develop K-Sim Fishery based on requests from the industry, which has shown great interest in the simulation system after the launch last year," comments Kjetil Venås, Project Manager in Kongsberg Digital.

Kongsberg Digital also gave an update on its new K-Sim Fast Craft simulator, which is designed for highly realistic and immersive training in "high-speed" navigation, boat handling and tactical operations. The simulator system is now delivered to the Singapore Police Coast Guard. It meets the demanding training needs associated with highspeed boat operation and allows for effective and repeatable training which reduces risk to personnel safety and equipment damage.

Last but not least, Kongsberg Digital issued an update on the new K-Sim Safety concept, which is a simulation system specifically made to practise the management and execution of procedures for firefighting as well as

search and rescue operations on board a vessel. With an immersive 3D virtual environment, the system provides a realistic, safe and cost-effective enhancement of live practical training for safety professionals. New features this year are improved visual details and avatars which can take part in the training scenario. K-Sim Safety was installed at Simwave and delegates had the opportunity to observe a thorough demonstration during the visit on the conference day two.

Users sharing experience

One of the main reasons why Kongsberg Digital arranges annual User Conferences is to facilitate the sharing of ideas and enhancing users' knowledge across the global simulation community. Thus several training institutes were invited to present their ideas, user experiences and research projects. Johan Eliasson Ljungklint, lecturer at Chalmers University of Technology, presented his experience with using the new K-Sim Engine DEDF Cruise Ferry model to facilitate mandatory training according to the requirements set by the IGF Code. A. Rune Johansen, CEO at Simwave, spoke about their courses using K-Sim Offshore in training to prepare course participants for "ship-to-ship" operations. Professor Paul Santamauro from the U.S. Merchant Marine Academy and LCDR Ian Manson from the Royal Australian Navy focused on their experience on progressing crew's qualifications through an extensive use of simulation training.

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PHOTOS: This year we had the pleasure of cooperating with Simwave for a trip to its training facility in Barendrecht. Here delegates could enjoy a tour of the new and impressive facility, fully equipped with K-Sim simulators. In addition, the instructors at the facility had prepared an interesting program including several different presentations as well as "hands on" demonstrations at several of the simulators at the site.



Innovations in Simulation technology

The User Conferences also cover insight into new technology projects that improve maritime training, and this year was no exception. Steven C. Mallam, Ass. Professor from the Department of Maritime Operations at the University of South-Eastern Norway, presented the ongoing research project, called InnoTraining, which is investigating the use of Virtual Reality headsets for maritime simulation training. This research program is developing and testing new Kongsberg Digital's VR simulator prototypes for navigation and marine engineering education.

InnoTraining is investigating training effectiveness, skills retention and automated performance assessment techniques, such as eye-tracking, of this promising technology. Since the research project is still in progress and will be completed in 2021, we look forward to presenting the final results in a future conference.

Simulation used for predicting the behaviour of autonomous vessels

Simulation is a vital part of the digital twin concept used for vessel prototyping, operational verification, prediction, analysis and the training of operators. As autonomous vessel projects have started to permeate the maritime industry, the request for operational verification of the vessel as well as training of onshore operators has be-

come a new way of using the simulators. KONGSBERG is in the forefront when it comes to autonomy studies. An-Magritt Tinlund Ryste, Project Manager in Kongsberg Maritime, gave a most interesting presentation about several autonomy projects, including the benefits, challenges and the need for thorough simulation testing and training.

"You can imagine that the autonomous vessels we are actually looking to develop are quite expensive assets. Taking any kind of risk with them is unacceptable and is not going to happen. That is why we need to train extensively using the simulators to make sure that the technology and products we are taking forward are safe enough to be used on these types of ships," An-Magritt explains. "In the simulator you have better control of what the input is and the expected output, and if that differentiates you can always go in and see what happened in that space, almost like a black box."

Requirements for improved safety, efficiency and sustainability drives the autonomy projects. However, It's not like autonomy is all or nothing, An-Magritt concludes. "There are so many facets in between. All ships will not be autonomous in the future and not necessarily unmanned either,"

Back to the 50s

One of the highlights during the conference was the cocktail & dinner party on the Wednesday evening, which had a 50s theme in line with the glorious days of the SS Rotterdam. Delegates were encouraged to dress up as captains, chiefs, other crew members or passengers. Although there were many excellent candidates for the coolest attire awards, four lucky winners really stood out and went on to receive the prestigious prize.

The Simulation User Conference 2020

"We are pleased that so many found time in their busy work schedule to meet, network and contribute their knowledge towards building a strong simulation community," comments Senior VP Sales, Tone-Merete Hansen.

"In 2020, Kongsberg Digital plan to have one Global User Conference, which will be located in Singapore. We are very much looking forward to bringing the community together again and to continue exploring new training methods, innovations and opportunities together with the members."

Dates for the User Conference in Singapore will soon be released. Please log into K-Sim Connect to receive further information. ■

PHOTOS: Main photo: the winners of the coolest award attire, from left Veerle Van Driessche, Dirk Reedijk, Helga Van Noten and Miguel Ferguson. Pictured left are several members of Kongsberg Digital's sales and business team, from left: Svein Holmboe, Erik Hovland, Lars Klemmetsby, Clayton Burry and Owen Brine. Photo to the bottom left: Tone-Merete Hansen used the opportunity during the dinner to thank Simwave for its good work in co-hosting the event, from left: Tone-Merete Hansen, Senior Vice President, KDI, Cinthya Lopes, Instructor, Simwave and Marcel Kind, Managing Director, Simwave. (Note: the pink colour in some of the photos is because of the lightning in the room during the award ceremony.)



Kongsberg Digital and SeaCross team up to deliver end-to-end solutions for high-speed navigation and simulator training

PRESS RELEASE

Kongsberg Digital and SeaCross, the company behind the advanced SeaCross navigation system for safe and effective high-speed craft operation, announced a new partnership at the DSEI (Defence & Security Equipment International) exhibition and conference in London in September. The pairing forms the basis for the coming together of two cutting-edge technical innovations, with the focus on developing unique and effective products and end-to-end solutions for high-speed navigation and fast craft simulation by utilizing the joint strength of the two companies.

The training aspect is comprehensively covered by Kongsberg Digital's K-Sim Fast Craft Simulator technology. Designed to provide trainees with a realistic perception of operating in a real-life environment, the simulator utilizes an advanced physics engine, motion system and hydrodynamic vessel modelling capabilities to replicate the behavior of high-speed vessels in various sea states and at all speeds. This allows military and professional fast craft operators to perform efficient, safe and repeatable training in tactical scenarios that would be dangerous, expensive and resource-draining to carry out in real life.

The SeaCross navigation system has been developed for use in craft which can attain speeds of up to 100 knots in the challenging environments of littoral



ILLUSTRATION: The K-Sim Fast Craft layout is configurable to mirror onboard operator positions of specific craft, allowing real controllers, indicators and displays to be integrated, while a low-radius, cylindrical visual projection system provides a greater vertical field of view. The training objectives which are met go beyond boat handling and high-speed navigation to also include full-scale tactical scenarios, thanks to the system's ability to incorporate the firing of multiple weapon types; and the entire training process is overseen by a leading-edge instructor, monitoring and assessment system.

ral waters or open seas. the SeaCross system has been developed based on experience and knowledge derived from operating high-speed craft in this exceptionally demanding navigational environment. The SeaCross navigation system is a modular, scalable and fully integrated system, specifically designed to meet the requirements for high-speed operations and includes unique capabilities that are specific to operators of high-speed interceptors, SAR vessels and patrol vessels, or any operator requiring accurate real-time data they can trust.

Since the first product launch in 2006, SeaCross has evolved into a platform with unique functionality, expressly designed for the most demanding environments and end users. The navigation system is currently in use on a large number of vessels around the world. The primary customers are Special Forces, Police, firefighting vessels, Coastguard, SAR and Naval Forces.

"KONGSBERG and SeaCross have already been cooperating with common clients," says Lars Klemmetsby, VP Business & Development Defense, Kongsberg Digital, "and this exciting new partnership arrangement further strengthens our cooperation and allows us to benefit from SeaCross' vast knowledge and experience within high-speed navigation and fast craft operations. Jointly we are able to offer the highest quality solutions for navigation and simulator training within this segment."

"KONGSBERG's K-Sim Fast Craft simulator technology offers a unique addition in the training programs our customers conduct to secure safety and effectiveness when using the SeaCross navigation system," adds Axel Törneman, SeaCross Marine AB. "By combining our expertise and technology, users will be able to leverage the power of the SeaCross system when they come to deploy it in real-life situations." ■



PHOTO: Lars Klemmetsby, Vice President Business & Development Defense, Kongsberg Digital and Axel Törneman, SeaCross Marine AB

Digital twins yield safety and cost savings for Heerema Marine

THIS ARTICLE WAS FIRST PUBLISHED IN OFFSHORE SUPPORT JOURNAL'S DECEMBER 2019 ISSUE



PHOTO: Dave Woessner and the team at Heerema Marine Contractor's (HMC) simulation center are using digital twin technology delivered by Kongsberg Digital to realistically simulate complex operational scenarios. To HMC, the digital twins are a "force multiplier" for the company's offshore operations.

Digital twins are transforming the decision-making and planning processes in the offshore oil and gas, renewables and maritime sectors. As virtual replicas of physical assets, digital twins make it possible to realistically simulate complex offshore installations, train for and anticipate multiple operational scenarios months or weeks in advance and yield significant safety and cost benefits. Using fully connected simulations, operators can even glimpse a few minutes into the future during an actual operation.

Heerema Marine Contractors (HMC) was an early adopter of digital twin technology. The Dutch offshore oil and gas marine contractor owns and operates a fleet of specialised crane and construction vessels and has been using digital twin solutions from Norway's Kongsberg Digital (KDI) at the Heerema Simulation Centre to support complex heavy-lift projects.

By applying KDI simulators to explore and test challenging and critical installations in the lab before going off-

shore to start the project, HMC says it can reduce risk and simultaneously improve safety and efficiency, providing its workforce with a clear picture in advance of operations commencing. This had led HMC to label KDI's digital twins as a 'force multiplier' for offshore operations.

"By adopting this methodology, HMC can subject new and innovative concepts to rigorous pre-testing in the virtual realm before committing to the expense and logistical issues involved when turning such concepts into reality," says HMC simulation and visual design team lead Dave Woessner.

HMC's Kongsberg Digital simulators use a DNV-GL-certified K-Sim offshore simulator facility with two offshore crane operator domes, winch operation stations and a full mission bridge that has DP simulation capability.

Using the K-Sim Offshore technology as a platform, Kongsberg and HMC developed detailed models of the HMC deep-water construction vessels *Sleip-*

nir, *Thialf*, *Balder* and *Aegir* in addition to several support assets and vessels. Used for operator training, the models are constantly being improved and refined with data captured from live operations. The fidelity of the models ensures that HMC can trial any planned operation in its simulators and find out exactly what will happen at sea under various conditions.

Mr Woessner says: "The simulators also enable concepts to be safely developed away from harsh offshore environments, where operations can be seriously compromised by unpredictable weather patterns." He adds: "By the same token, the simulators enable comprehensive training programmes to be pursued – a crucial preparatory step when evaluating complicated project plans. KDI's digital twins also allow HMC to run through failure cases and create mitigating actions, thereby minimising the risk of unexpected issues arising. This in turn improves execution predictability and timing. The logical outcome of these stringent, pre-emptive, simulated scenarios is that operational effi-

ciency becomes increasingly enhanced, leading to substantially reduced overall costs."

With high confidence in the accuracy of the results at the simulator centre, HMC optimises complex operations before their ships leave port. They can test different approaches, in different weather and sea states, to ensure they are ready for various conditions on the day.

HMC used the digital twin approach in establishing installation aids, tugger positions and clearance for a flare installation on the Culzean gas field in the North Sea.

"Heerema has been heavily involved in the Culzean gas field project," says Mr Wossner. "Our client Maersk Oil North Sea UK Limited awarded us the engineering, procurement and construction contracts for the central processing facilities platform, the utility and living quarter platform, the wellhead platform jacket, the wellhead access deck and access ways."

According to Mr Woessner, while a digital twin of the Maersk Highlander jack-up drilling rig helped crews anticipate problems that might arise in the drilling of wells, KDI's simulators assisted HMC in planning the fabrication, assembly and installation of the grillage and sea fastening for the jackets and piles to allow "every stage of each process to be carried out with pinpoint accuracy."

KDI's digital twin technology was also used in the pre-trialling stages of a project intended to demonstrate the effectiveness of HMC's quad lifting concept.

In quad lifting four cranes are deployed in parallel, simultaneously, as a means of enabling topside structures to be built onshore as a complete item during commissioning, saving significant man-hours and reducing project costs.

Digital twin technology allowed HMC to test its quad lifting concept in advance of actual operations.

The KDI simulators in the Heerema Simulation Centre were initially used to assess the feasibility of the quad lifting procedure before being tasked with evaluating its practical worth through subsequent simulation testing. The tests covered various aspects of the projected operation, from rehearsing communication protocols to acknowledging that human intervention could impact upon mission outcomes, and building failure cases into the programme to prepare trainees with as wide a range of scenarios as possible.

Operating in dynamic positioning mode, HMC's semi-submersible crane vessels *Balder* and *Thialf* performed a successful quad lifting trial in the Gulf of Mexico in October 2018. Plans are now under way for what HMC is calling "the ultimate quad lift," with a combined lifting capacity of 34,000 tonnes, with the firm's *Sleipnir* semi-submersible crane vessel – the largest ever constructed.

"It effectively opens up a whole new array of possibilities from the commissioning and design phases of jackets and topsides onwards, leading to a situation whereby these structures can be routinely installed on all types of foun-

dations," says HMC chief executive Koos-Jan van Brouwershaven.

Other HMC projects where KDI's digital twin has delivered enhancements include a FEED study for the installation of a 1,000-tonne module on a floating production unit, where concept design of bumpers and guides, verification of complex set-down behaviour and studies of the DP behaviour and settings were all explored. For Statoil's Peregrino project in Brazil's Campos basin, HMC used the system to test the set-down of several modules, enabling it to define the sequence and test concepts with local conditions, among other factors.

The system is also being used to test applications such as a new back-loading project which had never been carried out before. With no data available from real-life operations, HMC was able to receive accurate verification of all aspects of the job, from concept design of the cones and receptor, and improved workability within the design concept, to weather limitations and alignment of engineers and operators.

"Our in-house Simulation Centre can adapt a variety of 3D models, such as the jackets and topsides for the Culzean gas field project, to our clients' real component characteristics," says Mr Wossner. "Three-dimensional drawings are produced by our engineering department and uploaded to the Simulation Centre system, after which offshore crews can perform a dry-run of a given operation, co-operating with the client and our project team." ■

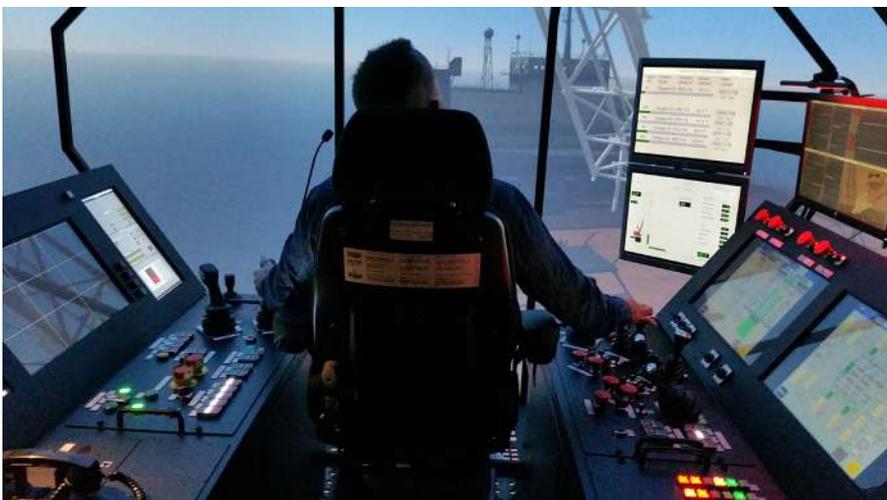


PHOTO: Verification, testing and training prior to mission is carried out in KONGSBERG's K-Sim Offshore Crane simulator at HMC, to improve safety and efficiency in the often demanding operations.



PHOTO: From the actual quad-lift operation, this shows the four lifts are pictured in cooperation.

New full mission DEDF Cruise Ferry simulator model in the K-Sim Engine portfolio

BY: LEIF PENTTI HALVORSEN, VICE PRESIDENT PRODUCT, MARITIME SIMULATION, KONGSBERG DIGITAL



ILLUSTRATION: 3D view from the K-Sim Engine Diesel-Electric Dual Fuel (DEDF) Cruise Ferry simulator model.

The new K-Sim Engine full-mission DEDF (Diesel-Electric Dual-Fuel) Cruise Ferry simulator model will provide integrated, real-time training in areas such as ERM (Engine Room Management), high-voltage systems and advanced & basic IGF code to meet STCW standards.

The model's main objective is to familiarise trainee crews in the operation of all engine room systems on board diesel-electric passenger ships running on LNG. It is based on Wärtsilä's 8L50DF medium-speed (four-stroke), dual-fuel gas and/or diesel oil/heavy fuel oil engine, generating power to a high-voltage switchboard. In addition, the model realistically simulates ship-/truck-/shore-to-ship interfaces and the required checks and operations for bunkering.

The model's LNG bunkering simulation training also covers onshore LNG connection/disconnection; flow rate and purging control; emergency shutdown implementation; and the effects of excess line pressures and resulting actions.

DNVGL Statement of Compliance

The handling of LNG and other low-flash-point fuels became a part of maritime training standards in 2017: KONGSBERG launched the first K-Sim Engine DEDF Cruise Ferry simulator model the same year, and it has now been further devel-

oped to meet DNV GL Class A standards.

The model received a Statement of Compliance this September based on the DNVGL ST-0033 May 2019 Class A standard referring to STCW Table A -III. The model also received Class S (Special Task) certification with additional requirements for simulators used for training electrical officers (STCW Table A-III/6 -7) and ship's officers on board vessels using LNG fuel.

The model deploys KONGSBERG's K-Chief user interface for the integrated automation system and the latest KONGSBERG K-Power user interface for the electrical power supply. A 6.6kV vacuum circuit breaker can be interfaced to the software to represent the generator's No. 1 breaker. In addition to covering standard operation, the model includes arc fault detection and an interface to the trapped key interlock system.

The simulator can be delivered with KONGSBERG's BigView large-screen software as well as 3D virtual presentation of systems such as the dual-fuel engines, and is already making its presence felt: the UK's South Shields Marine School took delivery of a full-mission DEDF Cruise Ferry Engine Room Simulator (ERS) model in June.

The DEDF Cruise Ferry simulator model

is now among the most sophisticated resources in the K-Sim Engine portfolio, covering all engine room procedures and sub-systems:

- Propulsion plant integrated automation system
 - Alarm and safety warning system
 - Power management system
 - Propulsion control system
- Electric power supply, including switchboards and distribution centre
- Propulsion System
- Thrusters
- Dual Fuel Diesel Generator Sets and Support Systems
- Fuel Oil and Gas supply system for Diesel Generators
- Fuel Oil Bunkering, including Storage and Settling Tanks
- Fuel Oil Separator System
- Lubrication Oil Service System
- Lubrication Oil Separators
- Sea Water Cooling System
- Fresh Water Cooling System
- Fresh Water System, including Fresh Water Generator
- Emergency Generator
- Steam Generation Plant
- Starting and Service Air System
- Bilge Water System, including Oily Water Separator
- Ballast Water System
- Stern Tube System
- Steering Gear System
- Onboard LNG storage and Bunkering System
- Shore side mimic: Selection of Barge, Tank and Truck (Including Fuel Quality, Methane Number, Wobbe Index, Density)
- LNG Monitor system for bunker operation
- LNG Emergency Shutdown (Gas Trip)
- Gas Heating
- Ventilation Control System in Machinery Space
- Gas Detection System
- Fire Detection System
- Water Mist System
- Deck Machinery
- Watch Calling System
- Simulated CCTV

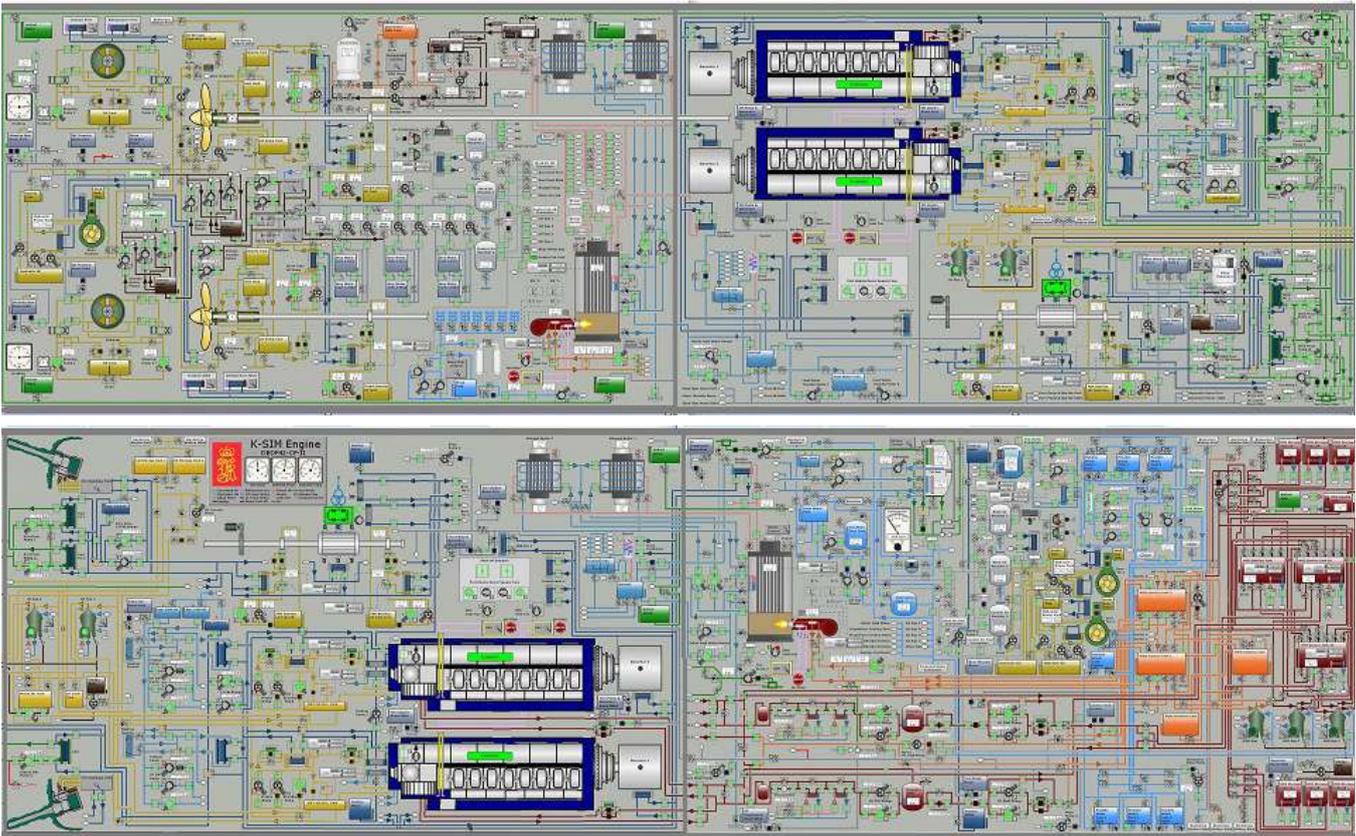


ILLUSTRATION: BigView display of the new sophisticated K-Sim Engine DEDF Cruise Ferry simulator model.

K-Sim GMDSS - from vision to reality

BY: ANNE VOITH, MARKETING MANAGER, KONGSBERG DIGITAL

GMDSS (Global Maritime Distress and Safety System) simulators have been on the market since the system itself took effect in 1999, and KONGSBERG has been at the forefront of GMDSS simulator technology for decades. Accordingly, the company finalised a decision in 2018 to produce a new GMDSS simulator that would combine the most up-to-date functionality with the user-friendliness of the K-Sim Instructor interface that has become such a familiar and popular resource for our customers.

KONGSBERG's procedure whenever we develop new hardware or software is to team up with users that have first-hand knowledge of the product area. In this instance, we are collaborating closely with the Maritime Institute Willem Barentsz (MIWB) trade school. Henk Spanjer, a lecturer at the institute, has a great deal of experience in topics related to sea safety and survival, and his advice has been an invaluable aid to decision-making during the development stages of the new GMDSS simulator.

This is an important aspect, as we are aiming considerably higher than merely achieving the minimum standard. Mr. Spanjer has an impressive breadth of knowledge when it comes to SAR and pedagogic requirements, so his input will help to ensure that the final product will be adapted to meet users' needs. "Our vision for the new simulator has been very clear," observes Product Advisor Bjarne Wulff. "Most of the specification work has already been completed, and the programming is well under way. The final product is still a little way off, but the parts that are ready are highly encouraging. We have implemented 3D technology with mouse and/or finger interaction on our student stations, while the EPIRB is already done and looks amazing."

The plan is to integrate all GMDSS requirements in layers on the instructor station. The instructor will then be able to turn these layers on and off as appropriate, according to the learning objectives in each exercise. All radio systems will operate realistically when it comes to user

settings such as frequencies, squelch settings, gain and power, which is just one area in which the new simulator will surpass standard requirements. The new Inmarsat I-4 satellite constellation will be implemented, and the simulator system will be ready for next-generation connectivity when services become available.

"We are working systematically with the GMDSS features," Bjarne Wulff adds, "and expect testing and final tuning to take place next year." The plan is to offer the product to customers in two formats, either as a K-Sim GMDSS simulator or as an integrated part of a K-Sim Navigation system: The K-Sim GMDSS simulator classroom edition, where there are typically one instructor and several student stations, can be integrated with other K-Sim Navigation trainers, e.g. ECDIS and radar. "I'm very much looking forward to the product's official release," Bjarne Wulff concludes, "when the vision has become reality and all the fantastic details and features can be revealed." ■

Kongsberg Digital simulation and software selected to fast-track R&D at new autonomous ship centre in Korea

PRESS RELEASE

UIPA, the South Korean Information and Communication Technology Promotion Agency, has awarded Kongsberg Digital the contract to supply a fully-featured bridge simulator for a new, state-of-the-art autonomous ship research facility in Ulsan, South Korea. The Korean government has committed to invest 130 billion won (US\$110 million) in the project over the next three years, with a goal of starting operations in 2023. The simulation contract is being delivered through maritime ICT convergence specialists eMARINE Global.

The simulator will be used primarily for research and development of navigational equipment and display systems, and will facilitate testing of autonomous vessel technologies in a safe virtual environment before trials in a designated autonomous ship test bed. Based on Kongsberg Digital's industry-proven K-Sim Navigation platform, the new system will deliver high-fidelity visual and physical simulation, a radar signal interface function and software for navigation analysis, equipment testing and evaluation.

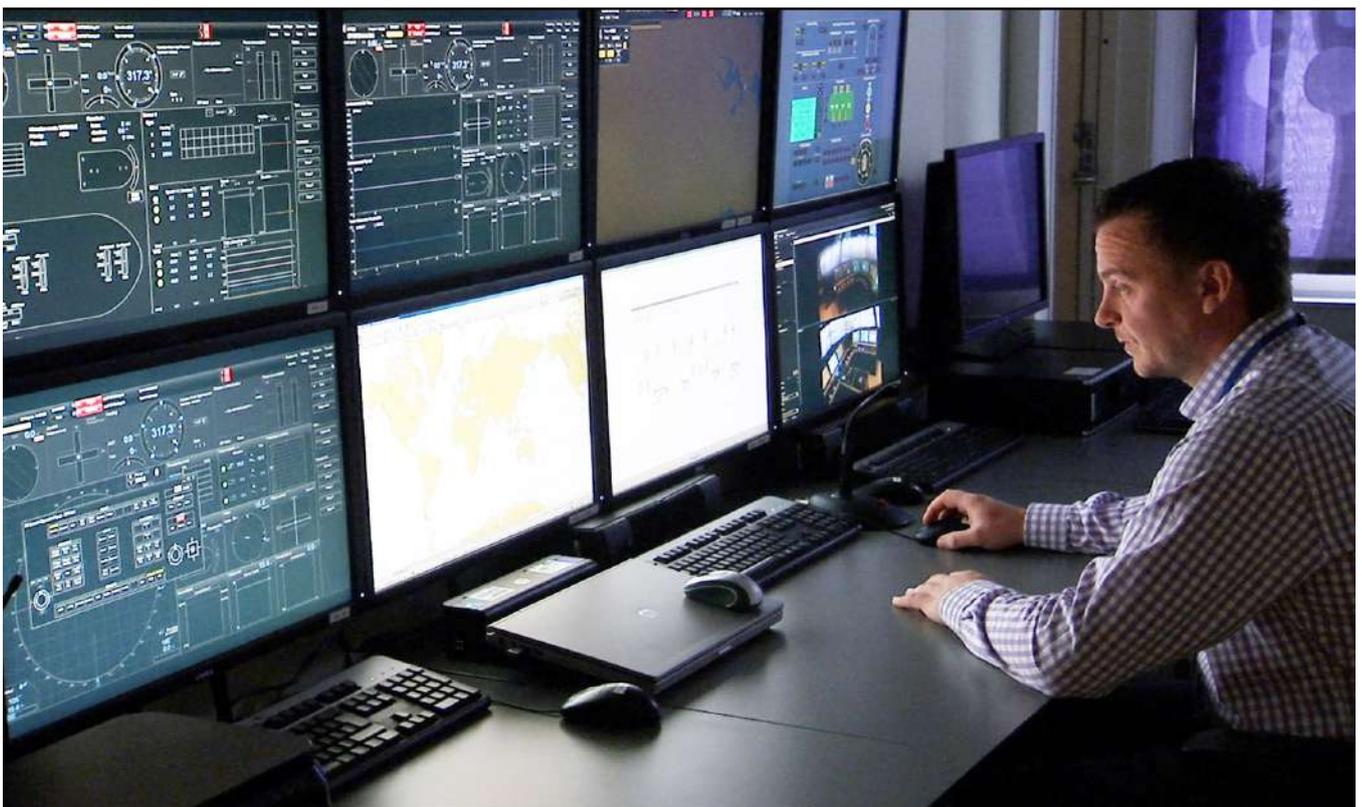
The high-fidelity simulator is due for installation in November this year. In addition to K-Sim Navigation, the delivery will include development of new software to integrate external inputs such as GPS

and wave sensors, as well as an API interface to permit simulation data transfer to other systems. Kongsberg Digital will also supply an area database for the virtual 'Ulsan Port', and a modelling tool enabling new simulator vessel models to be built from the ground up.

Kongsberg Digital's senior vice president Tone-Merete Hansen said: "Kongsberg Digital's suite of simulators have a huge potential in the maritime research and development sector. The K-Sim technology platform, with its physics-based modelling, incredibly realistic vessel behaviour and virtual environment, enables testing and verification of operations to a very high level. Our simulation technology will support UIPA to test, verify and shape in-

novations in the field of autonomy. Other international autonomy projects have recently selected our simulation technology to carry out advanced autonomy studies, so we see a growing new market for advanced simulation."

Kongsberg Digital is recognised as the technology leader in simulators for crew training and a driving force behind the growing use of digital twins in maritime applications. The company's flexibility to deliver a customized service including research-focused software development for the new autonomous ship research facility in Ulsan reflects its central role as an enabler of new safety and performance-enhancing technologies for both manned and unmanned vessel operations. ■



A royal welcome for The King of Malaysia when visiting the simulator at the National Defence University of Malaysia

BY: MOHD ANWAR SADAT, HJS MARITIME SDN BHD



PHOTO: The King of Malaysia was accompanied by Minister of Education Dr Maszlee Malik, The Secretary General of Ministry of Defence Datuk Seri Mohd Zuki Ali, the Vice Chancellor of National Defence University of Malaysia Lieutenant General Datuk Abdul Halim Jalal and board of directors as well as top management of NDUM and other dignitaries when visiting the simulator delivered by Kongsberg Digital earlier this year.

His Majesty The Yang di-Pertuan Agong XVI Of Malaysia Al-Sultan Abdullah Ri'ayatuddin Al-Mustafa Billah Shah Ibni Al-Marhum Sultan Haji Ahmad Shah Al-Musta'in Billah (The Sixteenth King of Malaysia) was given a royal welcome by more than 1,500 guest during his visit to the Ship's Bridge Simulator at National Defence University of Malaysia (NDUM) on 26th September 2019.

During the visit, His Majesty was given a brief on the simulation facility and was

able to experience the simulator's capabilities, which were demonstrated by Cdr Heman Buang RMN (R) at the ship's bridge and assisted by Mr Mohd Anwar Sadat and team at the Instructor Station. Various challenging scenarios were showcased through realistic simulations.

The scenarios also demonstrated that the hydrodynamic ship models respond realistically to the effects of main engine and steering gear forces, current and wind direction and velocity, waves,

water depths, squat, channel and bank suction effects, close proximity to other vessels and vessel interactions. The simulator also demonstrated realistic simulated 'own ship' dynamics in open water conditions, including the effects of weather, tidal streams, currents and interaction with other ships.

The event underlined His Majesty's passionate belief in the high quality training, skill development and education for the future of Malaysia. ■



Fishing companies donate millions to new K-Sim Fishery simulator in Greenland

PRESS RELEASE



PHOTO: The new K-Sim Fishery simulator includes instruments and an aft deck view enabling training in avoiding risk elements associated with aft deck operations on board fishing vessels.

Nine commercial fishery companies have donated DKK 3.2 million in total to Danish training institute, the Greenland Maritime Center, for investment in a state-of-the-art K-Sim Fishery simulator from Kongsberg Digital.

A first of its kind in the Kingdom of Denmark, the K-Sim Fishery simulator will enable students to gain vital competence in diverse fishery situations, including aft deck operations, and is scheduled for installation in 2020. Introduced by Kongsberg Digital in 2018, K-Sim Fishery is based on sophisticated K-Sim Navigation simulator technology, with added functionality and instruments specific to commercial fishing, including Kongsberg Maritime (Simrad) echo sounders, sonars and trawl monitoring systems.

Reflecting Kongsberg Digital's ability to adapt to customer requirements, the new K-Sim Fishery simulator will be built upon one of Greenland Maritime Center's existing K-Sim Navigation bridge simulators. The upgrade will include a

highly detailed fishing vessel model with advanced hydrodynamic modelling for ultimate realism in behavior and a new customized sailing area to accommodate exercises in Greenland waters. Additionally, the extension will feature new consoles and instruments for training on maneuvering, fish finding and fish catching. Also included are instruments for aft deck operations, to address the risk elements associated with working outside on the stern of the vessel.

"K-Sim Fishery addresses all aspects of safety and catch performance on a fishing vessel. Students will become familiar with operations at the bridge both for navigation and best practice in using the hydroacoustic systems to locate and detect the ideal catch. Furthermore, the aft deck simulation will help to prepare crews for the hazardous work they face at sea," says Bent Olesen, Head of Education, Greenland Maritime Center. "I am proud that the industry is supporting us to deliver the most advanced training for fishing vessel crews, and I am

very grateful that they are committed to enabling young people to build vital sea skills."

The companies donating and enabling Greenland Maritime Centre to augment its Commercial Fisheries Maritime Safety and Maritime Safety for Skilled Commercial Fishermen courses are; Royal Greenland, Polar Seafood, Arctic Prime Fisheries, Ice Trawl Greenland, Niisa Trawl, Qajaq Trawl, Qaleralik, Sig-guk A/S and Sikuaq Trawl.

"We are proud to work with Greenland Maritime Center and deliver training solutions that support sustainability in fishery operations. Interest in K-Sim Fishery keeps growing as more companies and training organisations understand the unique training benefits it enables," said Tone-Merete Hansen, Sr. VP, Kongsberg Digital. "We continue to develop the system based on the industry's training requirements and have some significant updates that will broaden the simulator's application scope in the coming years." ■

Norwegian Seafood Research Fund supports additional functionality for K-Sim Fishery to prevent loss of fish

PRESS RELEASE

Kongsberg Digital (KDI) has signed a new contract with FHF (the Norwegian Seafood Research Fund) to initiate a new phase of development on its groundbreaking K-Sim Fishery simulator system. One of the goals is to enable research and training on release in purse seine operations to prevent the loss and reduce the death rate of fish.

Launched in 2018, K-Sim Fishery is a state-of-the-art fishery simulator, which introduces a whole new level of detail, authenticity and applicable content for crewtraining in the techniques and processes of trawl fishing. The new project will include development of additional purse seine capabilities for research purposes, with the aim of improving safety and efficiency in operations and enhance the fishing gear and -methodes as well as the catch and storage procedures needed to improve the fish quality and reduce the environmental impact. The new simulator system will in addition be ideal for education and training in purse seine fishery.

The project, which is scheduled to begin this year, will be handled by Kongsberg Digital in partnership with Hordaland Vocational School, Mørenot Austevoll AS, Austevoll Seafood ASA and Sørheim Holding AS. In addition to sharing indispensable advice and indus-

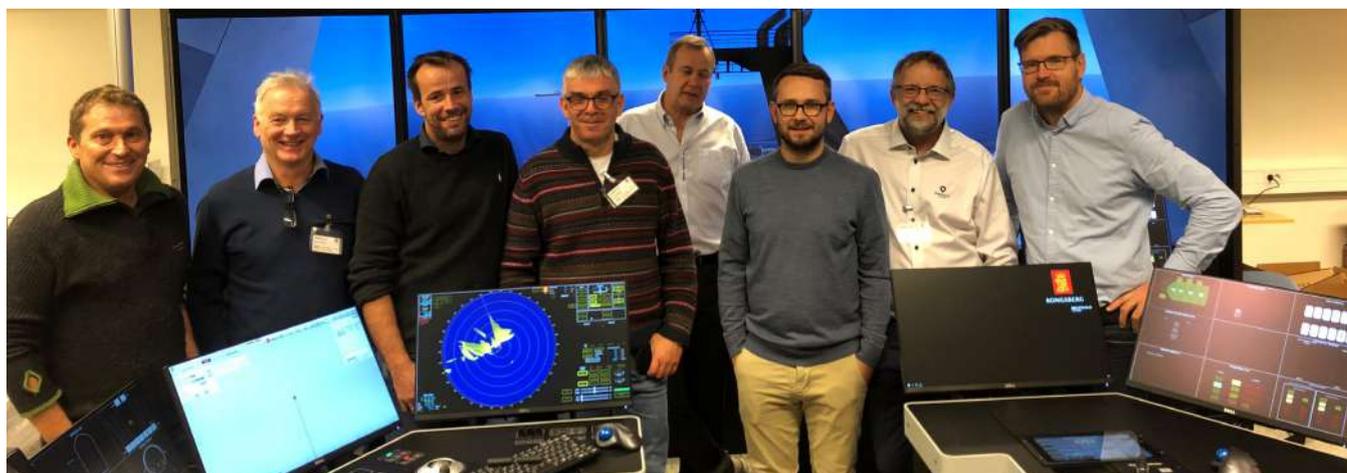


try knowledge, these partners will provide data input and assist with system testing and verification.

Following completion of the project, the K-Sim Fishery simulator will be installed in several educational establishments. Trainees using the K-Sim Fishery simulator will build competence and benefit from the realistic and immersive exercises of purse seine fishing. Advanced hydrodynamic modelling of the vessel and purse seine will, for example, precisely replicate the effects of waves and tidal currents affecting the execution of their tasks. The consequent honing of skills among crew members will further improve the safety, efficiency and economy of these types of fishery operations.

“The simulator allows crews to train on all phases of purse seine operations without exposing them or the equipment for any risk. It is important to be able to practice procedures so as to avoid bursting of purse seine, which would result in a huge loss of fish.” adds Roar Pedersen, Manager, Vessel Technology, FHF. “It’s vital to provide modern fishing crews with the thorough training they require to carry out their work as safely and efficiently as possible,” says Jan Ståle Kauserud, Vice President Products, Maritime Simulation, Kongsberg Digital, “We are proude that we can contribute to this, and will continue to develop the K-Sim Fishery simulator to meet demands direct from the industry.” ■

PHOTO: The team kicking off the project at Kongsberg Digital’s site in Horten, from left: Håvard Endre Waage, Department Manager, Austevoll Vocational School, Roar Pedersen, Manager Vessel Technology, FHF, Ole Bjarte Austevoll, Instructor, Austevoll Vocational School, Egil Sørheim, Manager, Sørheim Holding, Stig-Einar Wiggen, Manager of Research Projects, Kongsberg Digital, Amund Møgster Hatlevik, Manager, Mørenot, Lars Tor Silnes, Corporate responsible for purse seine, Mørenot, Kjetil Venås, Project Manager, Kongsberg Digital.



ENHANCE - research project to enhance human performance in maritime industry

BY: HAZEL BRYAN SIVORI, PHD CANDIDATE, LIVERPOOL JOHN MOORES UNIVERSITY

In the interest of maintaining and improving safety standards, there is a crucial need to equip crews with the skills needed to carry out tasks in increasingly more complex systems. As part of Kongsberg Digital's commitment to embracing collaborative ways of working, the company has engaged with an EU Horizon 2020 project - ENHANCE.

The ENHANCE project is based on knowledge-sharing activities between the process and maritime industries. Over a four-year period, it will bring together the academic and industrial expertise of engineers, psychologists, human factors specialists, maritime professionals and operators from seven countries to generate solutions to marry with technological developments.

Kongsberg Digital's Partnership with Liverpool John Moores University

Kongsberg Digital's involvement to date has been to facilitate research into enhancing human performance with maritime simulation training, focused on the topic of maritime navigation. As a doctoral researcher from Liverpool John Moores University's (LJMU) Logistics Offshore Oil and Gas Maritime (LOOM) research centre, exploring human factors, risk management and performance in the maritime field, I have been seconded to Kongsberg Digital's office in Horten, Norway this autumn.

A Voyage of Discovery

Accidents give partial insight into the subjective and retrospective perceived understanding of events when they go extremely wrong. However, it is important to remember there are significantly far more occurrences of near misses - known as incidents - than there are accidents. Significantly, key academic researchers estimate there to be 600 times as many near-misses, than there are more serious incidents.

An effective safety culture can often be taken for granted. A truly efficient safety culture is made up of persistent daily professionalism, but we are harsh-



PHOTO: Hazel Bryan Sivori, a doctoral researcher from Liverpool John Moores University's (LJMU) Logistics Offshore Oil and Gas Maritime (LOOM) research centre. Hazel has been seconded to Kongsberg Digital's office in Horten during her study as part of the EU's ENHANCE project.

ly reminded of the latent risks when an event occurs to indicate something has gone wrong. Understanding what circumstances and behaviours caused an incident which became an accident is vital. But even more importantly, perhaps we need to focus on what went right and prevented a disastrous escalation if we are to enhance human performance in the maritime domain. It is with this positivist and human-centred perspective that the secondment work plan has been designed.

Knowledge Mobility

Kongsberg Digital's Research Manager, Stig-Einar Wiggen, has jointly approved a plan which keeps maritime professionals at the heart of the organized research, including a structured workshop bringing together experienced navigators and simulation trainers from the Norwegian maritime community to gain key insights into 'expert knowledge' and capture experiential knowledge from the participants.

"It was clear from the outset that Hazel shares Kongsberg Group's eagerness to analyse some of the more difficult questions related to an increasing level of automation and autonomy in order

to take maritime digital technologies to the next level by embracing cooperation between industry and academia," comments Stig-Einar.

The objective was to find ways to train the watchkeeper better, whether that be related to navigation, the engine, the control room, or DP watches. The starting point has been based around the context of navigational watchkeeping. My efforts under this project have been dedicated to knowing what needs to be done to get tacit, nuanced, insider, and experienced insider knowledge transferred to those who need it.

Simulation training

It is a known fact that simulation training provides an initial safe basis on which to facilitate learning in a little-to-no risk environment. Finding a tailored simulation training solution, with a robust assessment system, for the high-risk maritime and process industries is a long term goal of the ENHANCE project. It was clear from the outset we needed to know what the high-risk operations in each discipline are and how the operators currently manage and mitigate the risk. Only then can we strive for a more "world class" stan-

standardized simulation training solution accessible to all. Based on the results of the first maritime navigation workshop (see below), we are now better able to appreciate human performance under routine as well as emergency situations.

Human Performance

Human physical behaviour, and indeed human physical performance, is driven somewhat by cognitive behaviour, which in turn is driven by social perspective, technical knowledge, resources, skills and abilities. Therefore, if we can gain insight into how maritime watchkeepers carry out tasks and identify elements of cognitive performance and train to improve these mechanisms, it follows that we can then improve high-risk simulation training for high-risk operations, in ways that have yet to be implemented in maritime and process industries.

Throughout my research under the ENHANCE project, the fundamental focus has been based around elements of experience in applying technical knowledge and understanding into how reliable, effective and experienced watchkeepers think and act., especially in high-risk situations.

Maritime Risk

The first stage in gaining a thorough and usable understanding of maritime risk is knowing the high-risk circumstances in which incidents occur. Some lessons can be learned from accident databases and reports. Yet, in fact safe execution of high-risk tasks occurs far more frequently than failure.

As indicated by vessel traffic figures for Norway: in the second quarter of this year, 2019, Norwegian ports facilitated the safe movement of 1,668,999 passengers, whilst welcoming 15,260 vessel arrivals, which for the mariners out there, equates to 83,549,948 Gross tonnage, in a four-month period alone. Unfortunate occurrences on the Costa Concordia or Herald of Free Enterprise scale of disasters happen once, possibly twice a decade. Nevertheless, we do hear of incidents such as the KNM Helge Ingstad Frigate — Sola TS Oil Tanker Collision, during the early hours of 8 November 2018, which resulted in extensive damage to the frigate and minor damage to the tanker.

High profile cases and fatalities do of course occur more frequently than we are comfortable with, and significant improvements can be made. However, disasters on such a scale are relatively rare because, day in, day out, the human operator or human navigator carries out their duties sufficiently, despite often difficult and challenging circumstances. This research is concerned with finding ways to improve training for circumstances in which critical tasks become difficult to manage and indeed to enhance ways to mitigate the current latent safety risks.

Stakeholder Engagement

The workshop on maritime navigation was held on 31st October 2019, at the University of South-East Norway, Vestfold Campus. A hearty discussion around maritime navigation and the impact of automation unfolded to identify ways of improving maritime simulation training.

Despite being unfamiliar with the research methods, the participants' contributions were extremely valuable. Most importantly, the lessons learnt from that day will go on to aid future work. This workshop was the first step in gathering the experienced maritime professionals' and future watchkeepers' views to understand the demands that they face.

By capturing all the subtle, important, knowledge and experiences we mariners may take for granted, it is hoped the watchkeeper workload can be better appreciated. This is of great significance to future manning requirements, training, skills, job descriptions and the way shipping works, especially when considering future successful incorporation of automation technology in more marine operations.

Future Research

This research is only just beginning, and these efforts form the basis on which to take forward intelligent comprehensive information to those who are developing and regulating automation technology and training solutions for the maritime industry. It is my mission to ensure that the mariner's voice is heard and communicated effectively. You can expect this research to delve deeper, to capture what it is to be a modern-day professional watchkeeper. ■

ABOUT ENHANCE

This project forms part of a research deliverable under the EU ENHANCE project, led by the University of South-East Norway (USN), partnered with Kongsberg Digital (KDI) and Liverpool John Moores University (LJMU), UK. Within the ENHANCE project, this research aims to account for the vital function of the navigator or maritime operator in an ever-evolving role. This human-centred research in work package one is designed to capture the key functions and interactions on the bridge, with the overall wider aim of the full project being to develop transferable knowledge to enhance training protocols for maritime operations that minimise operational risks at sea, and in the process industry.

If you would like to keep up to date with the ENHANCE project developments, please visit the website on the link below. For anyone wishing to participate in future works or even voice their current ideas or concerns, please do not hesitate to get in touch.

<https://enhanceh2020.eu/index.php/press/>

ABOUT HAZEL BRYAN SIVORI

Hazel sailed as a First Officer, Navigation Officer, Senior Watchkeeper, Safety Officer and Senior Dynamic Positioning Operator (DPO) during her time as a seafarer. In her time ashore she has worked in Software Consultancy, Lecturing, Training, and as a Business Analyst, Project Manager and in Port Planning Services Coordinator roles. Hazel embraces a strong maritime heritage, having grown up in the North East of the UK, in the once mighty fishing town of Grimsby. She now lives and works on the west coast of the UK in the Merseyside region.



Jiangsu Maritime Institute selects K-Sim Offshore and K-Sim Engine simulators for major facilities expansion

PRESS RELEASE

Students at the Jiangsu Maritime Institute (JMI) in China are to become the latest beneficiaries of KONGSBERG's most advanced K-Sim simulator technology, with the recent signing of a contract for a major delivery to the institute's Navigation Simulation Training Center and Maritime Engineering Simulation Training Center.

With installation scheduled for December 2019, the delivery will consist in part of one full-mission K-Sim Offshore simulator including one aft bridge with Kongsberg Dynamic Positioning (DP) system and one forward bridge. This will be complemented with a full-mission K-Sim Engine room simulator with two models certified by DNV GL, the MAN 6S70ME-C SCC and Wärtsilä RT-Flex Container L-11-I. A desktop simulator with up to 40 student stations is also part of the delivery.

The K-Sim Offshore vessel simulator with DP system is the first of its kind to be delivered by Kongsberg Digital to China and is designed to integrate with the K-Sim Engine full mission engine room simulator to provide a complete ship simulation training solution. The new delivery complements KONGSBERG's existing hardware at the institute, which consists of a recently upgraded and expanded full-mission bridge simulator with 14 bridges and one desktop bridge simulator handling 20 student stations.

"The JMI, which is applying to become a national seafarers' assessment centre, is recognized as a key cultivator of talent for all branches of the maritime industry," says Mark Stuart Treen, Vice President Sales, KONGSBERG, "so it's a credit to the effectiveness of our K-Sim simulator technology that the in-

stitute should have opted to continue basing its training programs upon our market-leading simulator technology to prepare its students with confidence for their future careers."

"We have enjoyed a rewardingly cooperative relationship with KONGSBERG since 2006," adds by MIAO Keyin, Vice President, JMI, "during which time its simulators have accrued an impeccable reputation both within and beyond the institute as unparalleled training and assessment aids. As we coach new generations and senior seafarers alike in the operational processes and techniques required to successfully hold down roles in sectors ranging from shipbuilding, ocean transportation and inland navigation to offshore engineering, it's reassuring to know that KONGSBERG will be assisting us every step of the way." ■

PHOTO: K-Sim Offshore with integrated Kongsberg Dynamic Positioning system is specially designed for advanced offshore operations and will be vital in JMI's future training programs.



Dreams have become reality with the opening of new world-class training facility in Lowestoft, UK

BY: ANNE VOITH, MARKETING MANAGER, MARITIME SIMULATION, KONGSBERG DIGITAL



PHOTO: Stuart Rimmer, Chief Executive of East Coast College, student Jasmine Allen and Chris Starkie, Chief Executive of the New Anglia Local Enterprise Partnership in front of the visitors at the launch of the new Energy Skills Centre at East Coast College in Lowestoft. Picture: Neil Didsbury.

A new energy skills centre was officially opened in Lowestoft on the 12th of November. The centre is home to the innovative new East Coast Energy Training Academy, which will cater for around 1,000 students in the year ahead. With the energy sector seen as a key priority for the region's growth, the new centre will play a significant part in providing appropriately trained and qualified employees for the future. To accommodate high quality training, the academy has, among others, invested in a broad range of simulators from Kongsberg Digital, includ-

ing 3 full mission and 4 desktop K-Sim Navigation bridge simulators, 6 DP K-POS Class C simulators and K-Sim Engine simulators, including 3D walkthrough and High Voltage training capabilities.

Cutting the ribbon to officially open the new facility, were Stuart Rimmer, Chief Executive of East Coast College, Chris Starkie, Chief Executive of New Anglia LEP who funded the project and East Coast College engineering student of the year 2019 Jasmine Allen. "With this centre of national excellence, we really

are passing on the baton to the next generation and this is just the beginning of a really exciting future," said Mr Rimmer, before thanking Kongsberg Digital for the cooperation on the simulator project and for the gift handed over by Kongsberg Digital's representative, Sølvi Opthun, (Area Sales Manager in the UK). "We have been working closely with this project for a long time and are proud of what we have achieved together. The new simulator park will benefit the students, the industry and the region for many years from now," she said. ■



AMC and KONGSBERG eye potential for VR training with renewed support program

PRESS RELEASE



PHOTO: Kongsberg Digital and Australian Maritime College (AMC) have signed an agreement on a further commitment of simulation support. Left, Paul Gilkison, Area Sales Manager, Kongsberg Digital; right, Michael van Balen, Principal of AMC.

Kongsberg Digital AS has cemented its long-standing position as the primary supplier of simulation software and hardware to the Australian Maritime College (AMC), with the recent confirmation of a new Long-Term System Support Program (LTSSP).

Kongsberg Digital (KDI) Area Sales Manager Paul Gilkison and AMC principal Michael van Balen signed the agreement – the third successive five-year contract between the two parties. Mr van Balen explains, the continuing relationship with KDI provides stability in AMC's training methodology. "Simulation is an integral part of our training," he says. "It gives us the capability to run any number of scenarios in a repeatable fashion, which not only benefits the students but also enables us to learn in the teaching environment as well."

Mr Gilkison adds that the agreement demonstrates Kongsberg Digital's ongoing commitment to meeting the diverse technology and support needs at the AMC. "Our continuing engagement allows the AMC to make sure that the product we

are delivering is actually going to address the needs of the maritime community," he says. Mr Gilkison points out that software is continually subject to improvements over the life of the LTSSP. "This year, we hope to be able to roll out the new K-Sim Navigation platform for the AMC, which will provide more offshore simulation scenarios as well as handling traditional ship navigation training."

Damien Freeman from the AMC's Centre for Maritime Simulations says K-Sim

Navigation represents a groundbreaking move into next-generation platform functionality, including virtual reality interactions (VRI). "VRI enables a student to be placed in simulation exercises on the deck of a ship, in the engine room or on the bridge, experiencing and interacting with the simulated environment as they would in the real world." K-Sim Navigation is based on a cutting-edge technology platform and will enable more realistic training scenarios and enhanced user benefits for both instructors and students. An advanced new physical engine and state-of-the-art hydrodynamic modelling will allow vessels, objects and equipment to behave and interact as in real life. Mr Freeman adds that K-Sim functionality will enable all AMC simulators to be integrated seamlessly to enable common exercise for full crew resource management training.

AMC's Maritime Simulation Centre features a full mission ship's bridge simulator, two 360° tug simulators, a full mission engine room simulator, an advanced DP simulator, six basic DP simulators, six ship operations cubicles and an 18-seat electronic chart display laboratory. The facilities bridge the gap between practice and theory and are used for research into port development, ship manoeuvring, improving ship and port safety, training seafarers and teaching undergraduates.



New approach to ensure STCW compliance of your simulators

BY: **AXEL DAVID NORDHOLM**, MANAGER SIMULATOR CERTIFICATION, DNV GL SEASKILLS

STCW requires that all simulators used for STCW related training and assessment of seafarers shall be approved by the respective MET (Flag) State. Most MET States fulfil this requirement by simply accepting copies of DNV GL approvals issued to the manufacturers for a specific simulator type (Statement of Compliance, SoC). However, since the scope of delivery of a simulator to a training centre can deviate significantly from the scope of the SoC, STCW compliance is often not fully ensured.

The DNV GL SeaSkill™ simulator Product Certificate was introduced in January 2000 to fill this gap. However, it was infrequently requested due to the cost and time-consuming work. The MET States often neglect this existing void with respect to STCW compliance. Through an renewed initiative for simulator Product Certificates, DNV GL helps to give effect to the STCW Convention and contributes to the quality of maritime training.

The standard for certification of maritime simulator systems DNVGL ST-0033 is the basis for certification and has the following target groups:

- a) A training provider, which uses a simulator for examination.
- b) A training provider, which uses a simulator for mandatory simulator training.
- c) A training provider, which uses a simulator for demonstration of continued proficiency.
- d) A training provider, which is in the process of buying/installing a new simulator, which shall be used for examination or mandatory simulator training.
- e) A manufacturer or end user offering a simulator for use in science, or planning of maritime operations, examination or mandatory simulator training, and shall document the compliance of the simulator to the buyer.

There are different type of approvals based on the target groups, as follows:



PHOTO: Through a renewed initiative for simulator Product Certificates, DNV GL helps to give effect to the STCW Convention and contributes to the quality of maritime training.

Product Certificate for Maritime Simulators to the training providers

Maritime simulators that comply with the requirements of the standard will receive a Product Certificate for Maritime Simulator. The simulator's function area and the simulator class according to this standard will be stated on the certificate.

The product certificate will make reference to the appropriate competencies, which are the simulation objectives of the simulator. The Maritime simulator product certificates will have a validity period of five years provided the results from annual tests are satisfactory.

Statement of Compliance to the manufacturers

A manufacturer offering a simulator for science, planning, examination or mandatory simulator training that complies with the requirements of this standard may request verification to obtain a statement of compliance.

The statement of compliance will make reference to the appropriate function and competence areas, which are the simulation objectives of the simulator. The statement of compliance will have a

validity period of five years. Provided the results from renewal tests are satisfactory, the statement of compliance may be renewed for another five-year period.

DNV GL and Kongsberg Digital has an agreement that enables KDI to add a DNV GL Simulator Product Certification to their scope of supply for the simulator systems that is in possession of a Statement of Compliance. Based on this, worldwide training centres using simulators installed by Kongsberg Digital can obtain DNV GL simulator Product Certificates in a simplified and cost effective way. The new DNV GL certification process makes use of the documentation of the Site Acceptance Test of an installed simulator together with "as built" documentation to issue Product Certificates.

With this new approach, training centres can achieve cost savings of approximately 50% compared to the traditional way of certifying. In addition, worldwide Maritime Education and Training (MET), as governed by IMO through STCW, benefits through a clearly stated compliance for each certified installed simulator. ■

K-Sim Training Courses in 2020



Kongsberg Digital's course offerings include courses as part of the LTSSP agreement, or upon request. They can be arranged either on site as closed courses, or at an open course at our premises in Horten. Below is an overview our open courses for simulator operators and maintenance personnel.

K-Sim Engine & Cargo Instructor Course
3-5 March 20-22 Oct

K-Sim Navigation Operator Course 1
4-7 Feb 17-20 March 21-24 April
5-8 May 9-12 June 4-7 Aug
10-13 Nov

K-Sim Navigation Operator Course 2
23-27 March 18-22 May 15-19 June
10-14 Aug 16-20 Nov

Ship Modelling Porting Course (HDMT 1 / VMT 1)
4-8 May 1-5 June

Database Modelling Course
20-24 April 8-12 June

K-Sim Navigation Technical Maintenance Course
15-19 June 18-21 Aug



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