CRUISE UPDATE

Royal Caribbean - RCCL **Carnival Corporation MSC Cruises**

DNV.GL

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Front cover photo: Quantum of the Seas © RCCL



OVATION OF THE SEAS

Ovation of the Seas, the last of Royal Caribbean's three 167,800-ton, 4,180-passenger next-generation Royal Caribbean cruise ships, will launch April 2016 in China.

Like Quantum and Anthem of the Seas, Ovation of the Seas will feature many first-at-sea innovations including RipCord by iFJy, a skydiving simulator; North Star, a jewel-shaped glass capsule that rises 300 feet above sea level, providing 360-degree views from high above the ship; and SeaPlex, the largest indoor sports and entertainment complex at sea with attractions ranging from bumper cars, roller skating and video gaming to a circus school complete with flying trapeze classes.

Currently under construction at Meyer Werft shipyard in Papenburg, Germany, Royal Caribbean has confirmed that *Ovation of the Seas* will be specially built with the Chinese cruise market in mind.





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CRUISE UPDATE

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EDITORIAL

Welcome to DNV GL's Cruise Update 2016.

For us in DNV GL, it is exciting to be part of the cruise industry. Its newbuilding order book is at a record level despite economic challenges around the world. We think this is driven by three factors: value for money, the industry's ability to innovate, and the industry's ability to open new markets and thus attract new passengers.

DNV GL is a classification society that plays a key role in the industry. Our key focus is on contributing to a high safety level and enabling new-building innovation. Over the last few years, we have challenged ourselves, asking how we can do an even better job.

We are constantly working to develop our global network of expertise that supports the fleet in operation. On 1 January this year, we published our new classification rules and have already received very good feedback about their user-friendliness and how they enable improvements.

We have also developed the Class+ concept for the cruise industry. Class+ gives the company a better overview of the technical standard and integrity of its vessel and overall fleet. Our pilot projects have shown that this provides senior management with better data to manage the vessels' integrity. Class+ is based on modern barrier management philosophy and we report the status of the barrier system for critical areas of operation. Class+ provides input to the company's performance management approach, is easy to understand, and gives the company a better way to understand and manage risk.

DNV GL is proud to state that it helped to start the modern cruise industry. We have been involved in, and contributed significantly to enabling, the modernization of the industry to include larger and more sophisticated vessels. We as a company are dedicated to future innovation in the industry to enable further growth and make cruise ships more attractive.

Our motto for 2016 is: It's time to expect more from your classification partner. We are ready to support the industry further in its efforts to create an even more exciting future.



Text: Magne A. Røe Magne.A.Roe@dnvgl.com

RCCL - LIVING THE PASSION

On 7 November 1970, the world's first purpose-built cruise ship, *Song of Norway*, left Miami on the first cruise ever. Royal Caribbean, RCCL, was open for business with this ship - 168 metres long, weighing some 18,416 tons and with a capacity of 724 passengers. It was soon joined by two sister ships, *Nordic Prince* and *Sun Viking*. RCCL was jointly owned by three Norwegian ship owners, I.M Skaugen, Anders Wilhelmsen and Gotaas Larsen. This was the start of what can only be described as a fantastic adventure in terms of innovation and passion for the cruise business. In 1978, Song of Norway was the first cruise ship to be cut in two and have a new midsection inserted, and increased its passenger capacity to 1,196. "DNV GL has been a partner for us in developing new rules and procedures to match our ambitions to be at the forefront - we needed a partner and DNV GL has always been with us, encouraging us to push innovations to new levels," says Richard D. Fain, Chairman and CEO of RCCL.



Quantum of the Seas.



Richard D. Fain, Chairman and CEO of RCCL

Today, *Harmony of the Seas* is close to 200 metres longer than *Song of Norway*, weighs 227,000 tons and has a capacity of 5,400 passengers. You have 22 ships in your fleet - one can wonder: how has this growth been possible?

"It has come about because we have a passion for cruise shipping in all we do," says Fain. He joined RCCL in 1979 as an outside director on the company's board and became the Chairman and CEO in 1988. Prior to joining RCCL, Fain spent 13 years as treasurer, chief financial officer and joint managing director of Gotaas-Larsen Shipping Corp., a London-based owner and operator of cargo ships. "What I discovered when I joined RCCL were truly outstanding people with a strong passion for the company, the passengers and our ships," he says. "So I also introduced my business strategy, which is still valid:

- 1 Don't screw it up
- 2 Improve revenue
- 3 Improve revenue
- 4 Control costs

"It's a very simple business strategy, but so far no one has been able to prove me wrong. We have not "screwed the business strategy up" in any way and when looking back at our history it can be seen that we have introduced science to the market in terms of technology. The new class of high-tech ships started with *Sovereign of the Seas* and from there on there has been no looking back. We had an opportunity to break new ground, and followed this up with the Voyager- and Freedom-class ships. There were a lot of questions, especially when we started the Freedom class with its inside open atrium. How large should the atrium be? Would it be too open? Too small? Would passengers like it? What makes an atrium comfortable? With the scaffolding still in place and with just the raw steel, I walked in with our project manager and we looked and then we literally danced on the floor: this was just right, just as we had visualized it. The proportions were just right and this became the design for all our new ships with an atrium. The Freedom class became the new standard for us, and this has been very successful."

You mentioned dedicated people as a success criterion for growth. Ships have now become a destination in their own right - where will this lead us?

"We have *Oasis*, *Harmony* and, within our Celebrity brand, we have *Edge*, a new ship at the forefront of technology to be delivered in 2018. Yes, they are destinations in their own right and *Harmony of the Seas* will set a brand-new standard for onboard entertainment, for example. The ship will feature the Broadway musical Grease and high-flying performances at the Aqua Theatre. In addition, we have Puzzle Break, an interactive, problem-solving group activity in a dedicated space fit for a Hollywood studio, where guests are challenged to "Escape the Rubicon." The main theatre is a spectacular, 21st century technology extravaganza. *Harmony* will also have the ultimate abyss, a water slide that is the tallest you can find anywhere at sea, spanning 10 decks. This is for the bravest of our guests, where they can prove their courage. This brings the cruise experience to brand new levels."

The large ships also pose safety questions. How do you handle these and what has DNV GL done to assist here?

"There are many risks, but we have worked closely with both the industry and DNV GL to ensure good solutions. The hi-fog sprinkler system is very effective and something we have worked closely with you on developing. This is especially important with our new ships which have an atrium, as this is a large area that we need to know how to handle if a fire should break out. Then there is the matter of ship stability, which is also a key issue with such large, open spaces. Instead of seeing this as a problem, we regarded it as a safety innovation matter together with DNV GL. We used probabilistic methodology as a basis for calculating the issue of the open atrium and ship stability and integrity. We have worked closely with DNV GL for some 48 years and DNV GL has been a partner in developing new and novel ships and solutions, but always with safety first. DNV GL makes us better! You have introduced Class+, which is a welcome direction from my and our point of view.

"We expect a lot from our class partner and I have another example as well where you have challenged us: life jackets. These are traditionally to be found in the passengers' staterooms. Looking at the logistics of this, if an emergency should arise, all passengers will first have to go to their staterooms, find and put the life jackets on the right way, and maybe even run around the ship to find



North Star, a jewel-shaped glass capsule that rises 300 feet above sea level, providing 360-degree views from high above the ship. This picture from Quantum of the Seas.

family members and kids who may be at other locations. Now, if the alarm should go, all passengers meet at their muster stations where jackets will be handed out and kids will also be brought to the right location to meet their families. The class rules specify jackets, but not where to keep them."

So you prefer a truly open discussion with us?

"Absolutely, trust and openness are key factors. Openness breeds trust! We need the best dialogue possible, in which no issue is too small to be discussed. We always work on finding solutions - the right solutions. We as an industry do not compete on safety. Any accident will hurt the entire industry, especially when it comes to safety and environmental matters."

You mentioned the environment - why is this important to the cruise industry?

"The environment is important to everyone. We have summarized this for our ships, starting with *Oasis*, that we shall have a zero landfill philosophy under three main headings: reuse, recycle and incinerate. We have installed the necessary equipment for this undertaking on 12 ships so far. We have also partnered up with the World Wildlife Fund (WWF) to underline that this is important to us. In addition, we are looking for technologies to reduce our fuel consumption, and the new *Harmony of the Seas* is for instance 20% more fuel efficient than its sister ships *Oasis* and *Allure of the Seas* - and these ships are not all that old, having been delivered in 2012 and 2013. So we utilize technology all the way in order to reduce our emissions."

Quantum of the Seas, which was delivered in 2014, has Shanghai as its home port. Where will the Chinese market take RCCL?

"China is a market with great potential. The middle class is a rapidly growing number of people who want the best the cruise industry can offer. You cannot send old ships to China, they must be the newest we can offer, with state-of-the-art technology for our passengers. They must have a large contingent of Chinese-speaking crew. The Chinese market is fast-moving and we need to make sure that what we offer is the latest of the latest. When looking at all the cruise ships now on order globally and intended for China, I don't know exactly where this will lead us eventually. The Chinese market, including the port infrastructure for our ships, is still in its early days. So for our activities in China and the Far East, I am back to my business strategy of not screwing it up!"

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INSPIRATION AND GUIDANCE TO MAKE THE RIGHT DECISIONS

"RCCL is a large, complex organization whose success or failure depends on thousands of people making the right decisions every day. We have 45 cruise ships at sea at any given time, with a total of 60,000 crew members. Of these ,6,000 are ship officers of varying ranks and backgrounds. This is a significant number of people and my main task is to reach out to each and every one of them with the right message to inspire and guide them to do just that - make the right decisions," says William Baumgartner, SVP of Global Marine Operations at RCCL.



William Baumgartner, Senior Vice President of Global Marine Operations at RCCL.

Rear Admiral William Baumgartner had an impressive career in the United States Coast Guard, which he left in 2013 to join Royal Caribbean He is today responsible for this company's fleet of 45 ships operating worldwide. His leadership experience from managing large, complex organizations is now used to ensure the safe and efficient operation of some of the most advanced vessels sailing the seven seas.

Safe ships

"Our goal is to have safe ships. To appear safe is not good enough for us. This means that when we say we have safe ships, we have safe ships. This again means that our onboard crew members are accountable for the safety level and that we have a common understanding of and framework for that. We have technically very safe and sound ships, and DNV GL has been a critical partner in making both our ships and our safety culture better. We operate in a transparent way and truly value the transparency we have with DNV GL. If we should have a problem of some kind on any of our ships, we must not only acknowledge this problem and deal with it, but must also share with DNV GL and work them on lasting solutions. Accountability is about actually being good, not just looking good. Now you have introduced Class+ to us, which is a structured, visual way to look at the status of individual ships and the total fleet. We believe this can be a good tool for us in our business performance management and enable us to improve our technical standards.

"We and our crew must understand the input from the Port State Control authorities and set priorities, and we must highlight the critical ones. We have a culture here where no one can turn their back on any issues - they must deal with them. This is a long and never-ending process in which we ensure that our officers understand that they serve their crew and their ship - not the other way around. Ultimately, this approach benefits the well-being of our guests who, after all, have paid to go on vacation safely and would like to do it again."

"This is all about trust between the crew members of any of our ships. We run them like small corporations with a group of executives where the captain is the President and CEO of the ship. Like in any corporation, it is essential that our captains maintain an inclusive culture that uses the intellectual ability of all and does not encourage a company culture of micromanagement. Have you ever heard of any successful corporation where the CEO is a keen believer in micromanagement? Our crew members must trust each other and each other's sound judgment, but at the same



North Star is a special feature on RCCL's Quantum class ships.

time, of course, actively contribute to a culture of safety and operational excellence. At RCCL, safety is our core, our culture and the foundation of our business. We can never forget that

As for BRM, we promote an airline-style approach to this, but we strongly encourage our crew members to speak up and share their thoughts. By this, we mean that they are accountable for not speaking up on issues where they should have. All crew members must understand that speaking up is not a choice, it is required. I need captains and chief engineers who appreciate and value input from their crew. Of course there is no doubt that the captain is in charge, but the culture must be one of cooperation and transparency. It is important here to underline that transparency leads to self-correcting behavior.

"We have partnered with DNV GL to ensure that we can assess and measure what we do to have the right safety culture in which all crew members are proud of our track record based on how we work," concludes Baumgartner Text: Hans Eivind Siewers and Helge Hermundsgård Hans.Eivind.Siewers@dnvgl.com, Helge.Hermundsgard@dnvgl.com

EXPECT MORE FROM YOUR CLASSIFICATION PARTNER

Excellence in maritime capabilities is more important than ever. However, we still see very traditional approaches to maintenance and repair, safety and technology innovation. The maritime industry is a traditional industry. However, it is now time to develop and implement strategic changes in order to improve business by putting maritime excellence back on the executive and board agendas and applying industrialisation principles and best practices from other industries.

The cruise industry is one of the optimistic maritime segments. We have seen more vessels delivered in a year, but have also never seen an order book at this level. Companies and investors have a positive view of the future.

Ten new cruise ships will be delivered this year, representing a passenger capacity of more than 27,000. There are only a handful of brands that can order ships at this capacity level. Looking into the order book, both confirmed and underlying options, the deliveries of cruise ships over the next five to eight years are nothing less than impressive. The four majors - Carnival Corporation, Royal Caribbean Cruises, Norwegian Cruise Line Holdings and MSC Cruises - dominate the market, both the fleet in service and new buildings. But we also see that smaller operators are planning new buildings and that also new companies will soon be entering the industry.

This stretches the capacities and capabilities of owners, yards and suppliers. We in DNV GL believe that the cruise industry deserves that class societies step up and make their capabilities and experience available to the industry in a better way. Classification societies are knowledge hubs. Most classification societies leverage their knowledge and experience of the market in different services like additional follow-up schemes, advisory services, IT systems, etc. We believe it is about time to expect more from your classification partner. In the future, verifying compliance and issuing the necessary certificates will be the basic service. These activities will always be there, but how can the class society's knowledge and experience base be used to improve key parameters such as safety performance and environmental performance, and at the same time improve the business performance in a sustainable way?

Newbuildings, a booming market and significant opportunities ahead

Today, we see that it is difficult to get a new building delivered within the next five years, and there are most probably not too many slots available in the following years.

A key challenge, if you want something earlier, is to find a yard that is willing and able to build a modern cruise ship. We in DNV GL expect to see either yards returning to building cruise ships or "new" yards entering the market. The big question is probably: When will the first delivery be seen from a Chinese yard? We do not believe this will have a significant impact on capacity during the next ten years, but it might change the market on a 20-year horizon.

Starting new projects with inexperienced yards could be a very attractive idea, but it also represents a risk. Safeguarding the quality and standard will require more thorough follow-up from the owner and class.

We frequently see announcements of new passenger experiences and features on a modern cruise ship. The need to introduce new and novel features is increasing. Novel solutions always represent an increased risk. One of the lessons learned in the industry is that even if a solution works in a land-based environment, this does not prove that it works as intended on board a ship in a maritime



environment. It is very important to manage this risk and qualify the technology in an effective way to ensure a successful delivery.

Safety and efficiency - a top operational priority

As a classification society, DNV GL is dedicated to the success of its customers and to ensuring that it maintains and improves the safety standard in a business-sustainable way. DNV GL is therefore usually involved from an early stage in a project and our followup is increasingly tailored. In the past, we very much focused on the standard scope of class, but this is not enough anymore and we are increasingly involved with yards, owners and suppliers to secure the success of projects beyond the standard scope of class. Together with customers, we are today involved in qualifying new technology, advanced analyses to produce fuel savings, in-depth technical analyses, advanced simulator testing of control systems, etc. We as a company enjoy these challenges and they drive our contribution to the industry.

Introducing Class+ to the cruise industry

Over the past year, we have challenged ourselves on how we can better contribute to the management of a vessel's integrity. We used 2015 to pilot test our new Class+ concept, which will be introduced to our cruise customers in 2016. This provides more relevant management information on the integrity of individual vessels and of the fleet as a whole.

A well-used statement is that you cannot manage what you cannot measure. We asked executives how valuable the traditional survey reports are and were clearly told that we need to find a new way of reporting our insights on the status of a vessel and fleet. We then used our lessons learned from the offshore industry and tailored them to the cruise industry. We are today able to report back on the technical integrity of engine room fire and stability issues. During 2016, we will develop further focus areas.

Continued revitalization and upgrading of existing ships

Over the last five years, we have seen increased activity in this area. This is driven by many factors, such as wear and tear, the roll introduction of new features on older tonnage to keep up with the brand identity, the upgrading of vessels to better meet new rules and regulations (e.g. ECA and ballast water requirements), or the changing of spaces and adding of more capacity to improve the vessel's business performance.

In our experience, early involvement in these processes is beneficial, so we are dedicating local contact persons for owners' revitalization projects. We see that, through early involvement and planning, we are better equipped to contribute to the success of the projects. Over the last few years, our competence and experience have added value to help ensure that the technology is fit for purpose, to reduce the risk of introducing new technology, and to effectively manage the risk inherent in major conversion projects.

www.MyDNVGL.com - a modern digital interface with your class partner

Our new MyDNVGL.com is a portal for online interaction between customers and DNV GL. This portal gives you access to a wide range of features - survey data, certificates and the vessel's data and full history. You can order surveys and audits and obtain access to preparatory notes. You have a total overview of the status of your vessels. This is also where we have embedded DATE (Direct Access to a Technical Expert), and you can track and follow up your requests for support.

For us, this is not a substitute for personal interaction and collaboration but an add-on to make it easier for you as a customer to gain access to your vessel's data in our production system, and you will always have access to the most recently updated documents in addition to the ship's history.

DNV GL launched new classification rules on 1 January 2016

Its rules are fundamental to a classification company. Traditionally, these rules have been developed over time and improved in small steps. We believe that the new DNV GL rules represent a paradigm shift.

We are not the one to evaluate the result of these rules, but the feedback from our customers and other users has so far been that they have experienced significant gains with respect to cost, safety, efficiency and flexibility as a result of our new rules. We are very excited to share these rules with the cruise industry.

Competition between classification societies is good

The competition between classification societies is tough, and it should be. When we are discussing issues with existing and poten-



tial customers, they all have some different expectations. But some of their expectations are the same. On the technical side, they of course expect a partner that helps them to stay out of trouble and contributes to their future development. A common expectation is that the class society must be available to them 24/7, wherever they are operating.

The cruise industry is becoming increasingly global, and a ship operating out of China should receive the same local support as if it was close to our Global Cruise Centre in Miami or our other cruise centres. For this reason, we have opened a Cruise Centre in China to better serve and support our customers operating out of that country.



In our service packages, our cruise customers have dedicated contact persons who are responsible for global delivery, and we have regular technical meetings where both current and potential challenges are discussed.

Over the last few years, we have invested heavily in data analytics. We are now able to provide systematic data and information on trends linked to Port State Performance, Class Performance, Integrity Status, Operational Data using AIS data, etc.

We have also learned that ships hesitate to call a contact person on the other side of the world unless they are facing a major challenge. DATE is a global helpdesk that is now operating 24/7. Our customers can contact DATE and obtain support within defined service levels. This helpdesk is the interface to 400 of our best experts through five different locations around the world.

Challenge us

We know that our customers set high standards for both their own and their partners' performance. If you have needs beyond the old way of working with class, challenge us! We are ready to enter into a detailed dialogue with you and tailor a classification programme that is designed to suit your company's needs. We believe in collaborative efforts. Our Key Account Manager and Technical Service Manager have personal KPIs that are aligned with owners' KPIs related to safe and sustainable operations. We are ready to deliver on these - it is about time to expect more from your classification partner. Text:Tobias King, Fernando Pinto and Helge Hermundsgård Tobias.King@dnvgl.com, Fernando.Pinto@dnvgl.com, Helge.Hermundsgard@dnvgl.com



INTRODUCING CLASS+

Through the PSSC surveys, our class surveyors gain valuable insight into the safety status of individual cruise ships. We asked ourselves: how can we better utilize this knowledge to provide more relevant information for those who are in charge of safety management at fleet level? The result is our Class+ reporting for cruise ships that we are launching.

When it comes to surveys and inspections in the maritime industry, they do not get much more extensive than the annual PSSC survey. Two or three surveyors live and work on board the cruise ship for up to a week, systematically working their way through the ship from stern to bow. For a major cruise operator, class surveyors will spend a four-digit number of man-hours on board per year, exclusively assessing the status of safety barriers.

The basic scope of the PSSC survey is to check that selected technical systems are in compliance, but those who have been involved in such a survey know that it also provides a forum in which surveyors and officers have open and valuable discussions regarding all aspects of major accident risks. The main findings and conditions are captured in the report following the survey, but the thorough and in-depth knowledge-sharing takes place at the daily meetings between surveyors and officers, as well as during the tests and walk-throughs.

So how can we utilize this information to provide relevant input for those in charge of managing the fleet? What if we had a system that could systematically extract, sort and analyse the information from these discussions? A Vice President or Fleet Manager makes critical decisions that have a huge impact on safety, in both the short and long term but particularly in the long term. A traditional survey report provides important information for officers and the vessel manager. However, it is hard for those in charge of managing dozens of ships to capture the big picture by reading through dozens of survey reports which are not designed to, for example, separate the severe findings from the non-severe or show whether a finding is a "one-off" or is repeated over time, or is limited to a specific ship or applies to the ship class or the fleet as a whole.

The Class+ is structured according to safety barriers and utilizes DNV GL's long experience of barrier management in the offshore oil and gas industry. Each of the surveyor's findings is sorted into a system of safety barriers and a process has been developed to assist the surveyor in determining the severity of the finding. Furthermore, a system of colour coding is utilized to illustrate the degree to which a finding impacts a safety barrier's functionality. We collected and analysed such data for 23 cruise ships in the pilot test in 2015 and are now able to thoroughly and efficiently present safety trends and discuss high-impact risk-control measures with our customers. The next step is to use the Class+ survey report as input for measuring the effectiveness of the risk-control measures. Such a process is currently being tested in close cooperation with Royal Caribbean Cruise Lines.

Hazard	Prevent Fire	Last assess. 0	~	End of survey of	Detect and Extinguish Fire	Last assess.	Start of survey B	End of survey up.		ess.	Start of survey B	End of survey B	Escape from Fire	 Start of survey B	End of survey 5	Consequence
	Oil piping system				Fire detectors				Insulation of fire boundaries				Alarm systems			S C
	Jacketed high pressure fuel piping				Manual call points				Fire doors in machinery spaces				Escape signs and lights			
	Shielding of oil piping and equipment				Fixed fire extinguishing				Bulkhead- and deck penetrations (fire integrity)				Escape routes and hatches			1
	Insulation of hot surfaces				Local fire extinguishing				Quick closing valves				EEBDs			1
	Cleanliness, oil spills				Fire main systems				Fire dampers in machinery spaces							
	Unauthorized storage				Portable fire extinguishing				Emergency shutdown (vent. and fuel syst.)							
	Machinery automation system (MAS)				Mobile fire stations				<u></u>							
	Electrical installations								Fire control plan				Other (fire in machinery space)			

Figure 1: Class+ report for a ship, Fire in Machinery Space (not real data, made for illustration only)



Figure 2: Class+ report for a ship, Loss of Stability (not real data, made for illustration only)

The figures below are examples of what a Class+ report may look like for a ship. Those familiar with basic safety barrier philosophy will recognize the Swiss cheese model in the main barriers, and this is further broken down into barrier elements that are assessed by the surveyor. The current focus areas for Class+ are the following major accident risks: Fire in Machinery Spaces (figure 1) and Loss of Stability (figure 2). The three columns with colour coding show the condition at last year's PSSC survey, the condition upon locating the deficiency, and the condition upon completing the survey (many findings are rectified during the course of a PSSC survey). The report on Fire in Machinery Spaces would certainly lead to an onboard discussion on fire prevention; how the combination of weaknesses in the shielding of oil piping, missing insulation of hot surfaces and oil spills is increasing the likelihood of an engine room fire. For the Loss of Stability report, the watertight doors are set as colour red based on one watertight door at one of the control locations failing to close. The acceptance criteria are discussed in advance with the customer so there is consensus on the meaning of the colours.



Figure 3: Class+ fleet report (not real data, made for illustration only)

The figure below is an example of a Class+ fleet report's executive summary. This one slide provides the shore-side management with:

- a fleet score which can be used as input for tracking safety over time and measuring the effect of risk-reducing measures
- a list of the most vulnerable barrier elements fleet-wide.
- a list of the ten most vulnerable ships in the fleet, and how they are performing on the most vulnerable barrier elements.

With the Class+ reports, we want to join our customers in a spiral of continuous safety improvement by providing relevant data and the flexibility to focus on the areas in most need of attention. For further information and to explore this issue, contact your local DNV GL station or service manager or our Cruise Center in Miami.

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THE NEW DRV GL RULES -CREATING A NEW, FUTURE-READY STANDARD FOR SHIPPING





Stian Sollied

Since DNV and GL joined forces, a huge effort has been made to consolidate our existing knowledge and further enhance our standards to serve as a reference for the maritime industry. The know-how and experience of both legacy companies have been incorporated into the new DNV GL rules which are now available to support state-of-the-art ship newbuilding and operation.

The new rules, which represent the best of the combined expertise and experience of two leading classification societies, have been evaluated for critical issues and improvement potential by our most experienced technical experts. The rule set, consisting of more than 20,000 pages, has been scrutinized with respect to clarity, practical application and how it contributes to the overall safety of vessels and thus supports safe and reliable shipping. The review has resulted in the most modern rule set published by any class society. The process has involved more than 200 technical experts in DNV GL and the rule set has been improved by extensive input from more than 800 shipyards, designers, ship owners and managers. The total effort made to establish these rules is unprecedented in the industry and has resulted in a new rule set which is efficient, future-ready, consistent, transparent, modern and adaptable.

Harvesting operational experience

With around 13,000 ships classed by DNV GL, the experience we gain through supporting our customers in their day-to-day operations constitutes an unrivalled knowledge database. We continuously apply our experience in the development of our rules.

In connection with the development of the new DNV GL rules, we launched a research project in which we performed a thorough statistical review of our fleet. The aim was to identify possible areas where the rules could be further improved. More than 3,000 ships in service were closely monitored, looking for design-related defects. Typical defects and their frequency of occurrence were



studied and the know-how achieved was incorporated into the new rules.

A new and improved technical foundation

The introduction of Equivalent Design Waves (EDW) in the DNV GL rules marks a significant change in the way dynamic loads are calculated. The advanced load concept is a major step towards a more realistic and accurate representation of the environmental loads.

Along with our state-of-the-art capacity models, this concept will increase the consistency in the safety level applied to the complete hull structure. In addition, this approach will accommodate challenges related to the development of innovative designs.

This provides a foundation for an ideal distribution of structural strength, ensuring every ton of steel is used efficiently.

Increased accuracy in the rules for loads and more advanced capacity formulations require more extensive computational capabilities. DNV GL rules are therefore supported by powerful software tools that ensure an efficient design process.

New and enhanced notations

To enable owners to efficiently customize vessels to their needs, the new rules offer a variety of additional class notations. These are tailored towards ship types and additional features, and ensure that vessels are designed and equipped for their intended operations. In addition, they are made and continuously developed to support the application of the latest technology.

Gas ready and scrubber ready

As the regulatory and technology outlook can be complex and unclear, DNV GL offers "Ready" notations to owners that want to prepare their vessel in the newbuilding stage for the future installation of new technology. By obtaining such a notation, owners can postpone initial investment costs while ensuring the necessary preparations are in place for a smooth and cost-efficient retrofit at a later stage. In addition, they may benefit from a higher degree of technology maturity (and possibly lower prices) on the actual installation date.

TMON (closed loop water) and TMON (open loop water)

The revamped class notations for water-lubricated tail shafts are another example of how we are now offering greater flexibility to ship owners. These two notations allow ship owners and operators the possibility of unlimited intervals between tail shaft withdrawal surveys of water-lubricated systems. With these two voluntary class notations, DNV GL is the first classification society to use a condition-monitoring-based survey process that eliminates the requirement for tail shaft withdrawal surveys at pre-determined intervals. The notations can be assigned to both newbuildings and ships in service.



"We have no doubt that the maritime industry will benefit from our new DNV GL rules. In particular, our stateof-the-art hull rules will ensure the right amount of steel at the right places."

Hans Eivind Siewers, Business Director for Passenger Ships, DNV GL

INDUSTRY INVOLVEMENT

The aim of developing the DNV GL rules was clear: to develop a unique rule set that meets the needs and expectations of the maritime industry. Stakeholders have been involved throughout the development and implementation phases. More than 800 leading shipyards, designers, manufacturers and ship owners worldwide have contributed more than 2,000 comments and items of constructive criticism, enhancing the quality and relevance of the rules.

A TOTAL REVIEW AND UPDATE

The development of the DNV GL rules gave us an opportunity to completely review the entire rule book and look at how the rules are structured. We have grouped the rules in a more logical sequence, complementing a typical design process. Documentation and certification requirements are clearly summarized in each part of the rules. This makes it easier to navigate and find what you are looking for. To give shipyards and designers starting out on a new project an easy entry point, all ship notations and specific requirements can be found in Part 5.

CALCULATION TOOLS - FREE OF CHARGE IN 2016

Calculation tools are essential for developing modern ship designs. The new DNV GL rules for Hull Structures are supported by both the POSEIDON and Nauticus Hull software tools. These already have a strong reputation among designers and yards and have now undergone major updates to provide more efficient support for the design process and make it easier to apply the new rules. Please contact your local DNV GL Software representative for details.

For more information and access to our new rules, please visit our website: https://www.dnvgl.com/dnvglrules More details of these and the other 70 additional notations can be found in DNV GL Rules for Ships, Part 6.

Impact on design

Based on new state-of-the-art capacity models, we see that many existing designs have the potential to be optimized with respect to steel weight. In general, steel will be added where really needed and reduced in a structure when less critical, based on more accurate dynamic load patterns. The scope for direct assessments is unchanged, but alternative load application methods have been introduced.

The ship-type rules contain ship-type specific requirements beyond the general part for the main class and clarify the required scope with respect to loads, direct calculations and ship-type specific issues such as pillars, glass structures, balconies and system requirements. The supporting class guideline for passenger vessels describes an acceptable method for assessing the scope of the structural calculations.

The maritime industry welcomes the new rules

"We have no doubt that the maritime industry will benefit from our new DNV GL rules," says Business Director for Passenger Ships Hans Eivind Siewers. "In particular, our state-of-the-art hull rules will ensure the right amount of steel at the right places!" Text: Magne A. Røe Magne.A.Roe@dnvgl.com

AIRLINE-STYLE SAFETY MANAGEMENT FOR CARNIVAL CORPORATION

"Carnival Corporation consists of ten cruise brands which operate independently around the globe. There are some areas which are coordinated though an 'all brands' department, one such area is safety and bridge resource management," says Captain David Christie. He is Carnival Corporation's Senior Vice President, Maritime Quality Assurance, for the entire 100-ship-strong fleet, which handles more than 11 million cruise guests per year.



Captain David Christi, Senior Vice President, Maritime Quality Assurance, Carnival Corporation

"Safety is the essential parameter for us all and to drive a safety culture throughout the enterprise, a change management philosophy and practice was put in place. Without a strong safety culture, our charge to create a function-based bridge team management would not have succeeded. Failure is not an option for us. To continue and enhance our safe operations, Carnival has invested in CSMART - a dedicated training facility located in Almere, Netherlands. All Deck and Technical officers from each of the brands attend one week of training at CSMART each year. We have invested over \$78 million USD in the training centre and this will be a state-of-the-art facility."

When did you start your career in the cruise industry?

"I started my career at P&O as a cadet in 1966 and through the years I have worked in different areas throughout the organization."

"After my cadetship, I sailed in many P&O ships in various ranks until 1975 when I joined Pacific Princess as First Officer. I worked my way up from First Officer Navigator and became Captain in 1992. After this, I sailed for the next ten years in command of many Princess and P&O ships. In 2002, I moved ashore to the Princess Cruise headquarters in California, where I took up a position as VP of Marine Operations. In 2006, I was appointed Senior VP Fleet Operations for Princess Cruises. During 2007 and 2008, Princess began focusing closely on the root cause of any incidents. All indications pointed to our training and our understanding of human factor failings, and Princess decided to invest in in-depth training and implementing a function-based bridge team management culture. This is the operational model that has been used successfully by airline crews since the 1980's. CSMART was born in 2009.



The New CSMART Centre being built in Almere, The Netherlands

Princess Cruises was acquired by Carnival Corporation in the fall of 2002. I was invited to join the corporate group in 2012 and became the SVP for Maritime Quality Assurance (MQA) for all brands, operating under the corporate umbrella.

Why was Almere chosen as the site for this training facility?

"There are several reasons - we are an international company with a large international crew, with our Deck and Technical officers predominantly coming from European countries. We needed a facility close to an airport, with a good air bridge between major European cities. The Operational language on all Carnival Corporation ships is English, so we also needed to build our training centre in an area where English is well understood. Captain Hans Hederström is the Managing Director at CSMART. He is a Swedish national; and previously he was head of the Marine Department at Chalmers University of Technology in Gothenburg. Hans has a long history, not only as a master mariner, but also as a marine pilot. He successfully built the original training facility at Almere from scratch."

CSMART - why can't you just buy this service from external companies?

"We visited many training centres including airline training centres. I visited American Airlines in Dallas, Texas; Delta Airlines in Atlanta; and British Airways in London. My colleagues have been to the SAS (Scandinavian Airlines) in Stockholm. All these airlines have



CSMART Centre in Almere, The Netherlands

their own training centres to ensure that cockpit crews operate in accordance with the operational procedures and have a requirement for annual recurrent training. To draw a parallel, we are the world's largest cruise operator and we must ensure the same or higher safety standards as the airlines - and all our corporate brands now share a common SMS (Safety Management System), so training and standards of all our bridge and engine crews is at the same level. The new task based management systems we put in place, is very similar to the airline cockpit management system, which includes checklists, and the captain and his team work closely together, including checking each other's actions, with a focus on open communication between all operational crew members. This is the core of the navigator/co-navigator system with all having assigned tasks, based on procedures and not rank. Yes, the captain has the ultimate responsibility for the ship, but everyone on the team needs to share this responsibility.

All ten brands of the Carnival family now operate with a functionbased bridge team management system as a core philosophy to their operational practices as we now require annual recurrent training and proficiency testing for all Carnival operational officers. Our present facility is too small. While it can comfortably train 3,000 students, in 2017, our corporate standards will require some 6,500 students to be trained each year. Our new facility will handle this with a little spare capacity."

Airline cockpit crews are normally taken in for simulator training every nine months to ensure that their competence is fresh. Are you planning the same frequency?

"Yes, absolutely. There is a lot of research on the topic, all of which confirms that a frequency of about a year is good - any longer interval between training is too long and people forget. Like airline pilots, it is possible to fail our courses and this is as it should be. We need our bridge crews to perform, but not in a stressed manner. When I started out years ago, there was quite often a lot of shouting on the bridge, especially if the situation was stressful. Today, bridge operations are professional and quiet and each crew member knows exactly what to do and what is expected of him or her. Communications are kept on a professional level to solve the tasks at hand. Bridge crews, unlike airline cockpit crews, work together for longer periods of time, so it is perhaps easier to drive the 'team' philosophy. We have raised the level where we operate to the highest professional standards, and we will continue to drive professional development and operating standards, in our pursuit of continuous improvement"

"To draw a parallel, we are the world's largest cruise operator and we must ensure the same or higher safety standards as the airlines ... "

Is it a challenge to make the bridge crew think like airline cockpit crew?

"There are always a few who have been operating the bridge in a certain way for the last 20-plus years. Some arrive at CSMART with scepticism written all over their faces. But they are normally sold after a couple of days. Previously, the master was very close to "God" on board, but now he or she must be collaborative and with his team share the operational plan and the final execution of that plan. If there is a close call, or near miss then we need to understand what the root cause for the failure was and put process in place to try and stop this type of incident from recurring. Modern cruise ship management demands the highest level of safety, and, within all of the Carnival brands, we strive to meet or exceed these safety standards. Our safety culture is at the core of our business. If for some reason any officer cannot live with our standards, then maybe a job on a Carnival Corporation ship is not for him or her."

Is your training facility for the exclusive use of Carnival Corporation brands?

"We operate CSMART as a non-profit organization that offers courses to external companies too. As a result, we have crews from other cruise lines as well. We also try to get as many harbour pilots as possible to attend courses at CSMART to try and integrate them our way of working and avoid any miscommunication between our crew and the pilots. The feedback from pilots attending our training has been very positive."

So CSMART is a success - where does safety go from here?

"The success of CSMART has only been possible because of the support we have been given by the highest level of our management team. They listened to the sailors, and gave us the responsibility and authority needed to put in place the new concepts of bridge and engine room team management and allow us to buy the very best training available. We are alongside the airline industry by also introducing a "fair blame" culture that fosters cooperation, rather than finger pointing among the operational crews. We



CSMART, THE CENTER FOR SIMULATOR MARITIME TRAINING

CSMART is a newly established maritime training facility located in Almere, Netherlands. Centrally located and adjacent to Amsterdam, our new facility provides easy access to all of Europe's major airports.

CSMART features the latest state of the art equipment and instructional tools to provide participants with a superior maritime training experience that will foster critical thinking, problem solving, ethical decision making, and confidence. CSMART offers two full mission bridge simulators, six part-task bridge simulators and the ability to simulate fixed propeller and azipod simulation. On the engineering side CSMART offers two full mission Engine Control Rooms with four machinery outstations and 16 part-task Engine Room simulators. Our facility also features large instructional classrooms, meetings rooms and a catering facility.

Certain CSMART courses are accredited by the UK MCA (Maritime and Coastguard Agency) and other regulatory bodies.

The CSMART facility is also available for use by other maritime professional instructors.

CSMART is a service mark of Carnival plc. CSMART operates as the Dutch branch of Carnival plc, which is part of the Carnival Corporation & plc group.

will continue to focus on our safety culture and are developing operational centres, to assist ships teams to perform to the highest standards. The Costa and AIDA brand, have recently built a stateof-the-art fleet operational centre in Hamburg, where their entire fleet is monitored in real time around the clock. Our other operating lines plan to follow suit.

Where we go from here is a good question, but remote-controlled, unmanned bridges are perhaps not pure fantasy. These new capabilities will probably come to the freight fleet first. Most of us have been on unmanned trains at airports or other locations and we are not concerned about their safety. Ships will become increasingly automated, and bridge crew may play more of a monitoring role in the future since they will always play an important role in my view. It is certainly exciting times for the entire industry." Cruise ships calling at the popular Greek island Santorini.





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HIGH-TECH SUPPORT FOR THE COSTA AND AIDA SHIPS

The Costa Group's Fleet Operations Centre (FOC) in Hamburg is the most advanced, well-planned and impressive FOC to be found anywhere. Here the entire fleet, consisting of 12 Costa Crociere vessels, three Costa Asia vessels and all ten AIDA vessels, is digitally monitored on a 24/7, 365 days a year basis.

When you enter the FOC control room, you feel you are at a mission control centre any space organization, not to mention any other shipping company, would be envious of. "We all depend on the operational safety of the industry, so this is a key focus area for us, but there are also many environmental benefits to increase operational efficiency," explains Jens Lassen, Executive Vice President and Managing Director of Carnival Maritime GmbH, of the Costa Group that runs the Hamburg FOC. The Costa Group is the leading cruise company in Europe. It has a global workforce of 27,000 employees working onboard and in its 20 offices in 14 countries. The Costa Group is part of the Carnival Group of cruise companies.





"Our main task is to protect ourselves from bad decisions and avoid errors. The captain is responsible on board and we see that the ship officers value the support we give without ever questioning the captain's authority."

Jens Lassen, Executive Vice President and Managing Director Carnival Maritime

Jens Lassen has been leading Carnival Maritime, the new Marine Operations Unit of the Costa Group, as Executive Vice President and Managing Director since the corporate division was founded in 2015. He is responsible for 150 employees in Hamburg.

Lassen started his career in 1982 with the classification society Det Norske Veritas and gained experience in various positions with renowned companies such as Stolt-Nielsen and Royal Caribbean. From 2010 to 2012 he was at Rickmers Holding as International Head of Maritime Services and Managing Director before joining the Costa Group in 2013 and taking the position of the Senior Vice President Marine Operations at AIDA Cruises. Here the native Norwegian was already responsible for the cruise company's technical operations, destination management, fleet management, security, energy and environment and health and medical.





One of the large displays shows one of the vessels travelling along the Vietnamese coast and we see the same radar and bridge map that the officers on board see. We see the other ships in the vicinity, we see the route the crew has selected and we see any deviations from the intended route. "The entire centre can see all 25 ships in real-time," explains a very enthusiastic Jörgen Strandberg, Director of the FOC. "It is always manned by two operators. The 14 professionals running the FOC as a shift operation are also nautical officers and can advise the ship crew on any matter - from weather routing, safety issues and ship performance to any problems arising from deviations. The latter may be induced by weather and sea conditions, for instance."

Three main purposes

The centre's first purpose is to ensure that the fleet operates according to the highest safety standards in the marine indus-

try. This includes the latest and most advanced technologies for safety and crisis management and leading standards for safety management, environmental protection, health and workplace safety procedures.

Secondly, the centre is responsible for implementing the highest efficiency standards for energy and resource management. This is done by continuously improving the carbon footprint and using state-of-the-art technology to supervise and optimize the use of energy, fuel, water and waste.

The third main area is the optimized focus on repair and maintenance costs. This is done using the virtual warehouse principle, trend analyses and an early warning system.

Improving performance

"Our main task is to protect ourselves from bad decisions and avoid errors. The captain is responsible on board and we see that the ship officers value the support we give without ever questioning the captain's authority. He is the one running the ship. We are the ones providing decision support when it comes to all operational matters. We are also on board to work with the ship's management, and we go through all the matters that are important for operating the ship. We assist the ship's crew in making the right decisions and, for instance, a matter like weather routing has prevented a lot of sea sickness and consequently complaints from passengers. Weather routing also leads to additional savings on fuel consumption," says Lassen. "This is all an integrated operation. Using a programme, we have carefully calculated the fuel consumption of ship engines and found out that this is not necessarily related to speed. This is new to most people, but as a result of this study our overall fuel consumption is declining. Most ships typically have four main engines and two smaller ones. By carefully adjusting each engine's load, we have managed to disprove the well-known 'truth' that the higher the speed, the higher the consumption. Every ship has a 'sweet' spot."

Safety

"We have a modern bridge management system (BRM) in place. It is airline style, with a navigator and co-navigator (the airlines' captain and co-pilot). Soon a new training facility for the entire Carnival Group in Almere, the Netherlands (see separate story, page 22) will be opened. Our bridge crew is used to modern operations through our current training centers and the FOC here in Hamburg. They don't see us as a party intruding on the captain's and ship crews' ability to run a ship, but as a party contributing to their successful operations. We can see trends, we can examine performance and we can present weather routing options. Quite often, the ship crew will consult us on the best options."

"We see the Captain as the Managing Director and CEO for his ship. He has a management team, the executive committee on board, and they meet regularly to discuss management topics. The executive committee consists of the captain, hotel director, chief engineer, HR manager and staff captain and anybody else they want to involve. We let the ships manage themselves and don't "invade" them. But the support cascades down the ship's organization and this is how we want to run this - there is always someone to call in order to ensure the best operational practices," says Lassen. "We've implemented a zero incident policy within risk management."

Digital

"Another priority for us is the best use of digital solutions and one of our key goals is to ensure the implementation of digital ship management. Through GPS and navigational aids, we can actually dock a ship with a pretty small margin. Shipping lags behind here and there is also some resistance to going completely digital. We have to prove that it works. Here we can again look to the airlines. After take-off, the cockpit crew engage the autopilot and may also choose to land the aircraft at the other end using the autopilot. The cockpit crew monitors the process, but the plane can fly itself. We've all been on driverless trains and most of us don't have a problem with that. I don't think we will see bridges with no ship officers on them in the near future, but there will be more digital impact on the way we operate ships," says Lassen. ■

CARNIVAL MARITIME AT A GLANCE

FACTS AND FIGURES

- Carnival Maritime is a corporation of the Costa Group
- (Costa Crociere, AIDA Cruises)
- Location: Hamburg
- Employees: 150
- Foundation: April 2015, fully operational since beginning of October 2015

ORGANISATION

- Carnival Maritime consists of 7 technical departments, like medical,
- security, HSE and audit management and investigation. • The centrepiece and control centre is the fleet operations centre (FOC)
- The FOC is 24 hours on duty, 365 days per year

Text: Magne A. Røe Magne.A.Roe@dnvgl.com

MSC CRUISES - WITH AN ITALIAN FLAVOUR RUNNING LIKE A SWISS CLOCK

"We have 12 ships today and there are another seven more to come," says Gianni Onorato, CEO of MSC Cruises. "We're a privately owned cruise line - it's like a family affair," he says, referring to the company's ownership by the Aponte family.



MSC was founded by Gianluigi Aponte in 1970 and is now the world's second-largest container ship operator, with a total fleet of more than 465 ships. MSC Cruises in its modern form was started in 2003 with the acquisition of *MSC Lirica*. Following a €6 billion investment plan in ten years, we now have a fleet of 12 ships. "Currently, we have a €5.1 billion investment plan for the first four of a planned seven new ships, making our fleet very modern and moving us up to third position in terms of fleet size and capacity," says Onorato, who has been MSC Cruises CEO for close to three years now. MSC Cruises is headquartered in Geneva, Switzerland and the rapidly expanding cruise operations have moved into their own office building in this city as they need more space.

You mentioned that MSC is a family affair, but I have the impression there is more behind that than just the ownership of the Aponte family.

"That is absolutely correct. We are a different cruise company, with a strong human touch. Our guests don't just come on as passengers, they are greeted and treated like family members and can visit me and any members of our crew. We like to describe ourselves as a family operation with an Italian flavour that runs like a Swiss clock. Our heritage is Italian and our approach is global. New crew members are taken on as family members and we include them in our approach: 'Come to visit me at home as a passenger'. We have one brand, which is MSC Cruises, and we want to be perceived as authentic and genuine in all our behaviour to support our brand values."

Entertaining is an important part of the cruise ship experience what are you doing in this field to differentiate MSC from other operators?

"Our newest class of ship and the most recent vessel, *MSC Meraviglia*, which will set sail on its inaugural season in the Mediterranean in the summer of 2017, will have the latest in technology and entertainment. We have a brand-new, long-term agreement with Cirque du Soleil. We will have a specifically designed venue on board this new class of ship, representing a €21 million investment per ship. The 1,000m2, 450-seat aft lounge will have a 200seat dining area where guests can enjoy dinner and drinks before the world-class artists from Cirque du Soleil perform two shows per night. The technologically state-of-the-art 167,500 GRT *MSC Meraviglia* will be able to carry 5,700 passengers and have home ports in Genoa, Marseille and Barcelona."

You have also added new and novel destinations to your itineraries, such as Cuba - can you please tell us more about this?



Gianni Onorato, CEO of MSC Cruises

"We are the biggest cruise operator in South America and as such it is timely to add Cuba now that relations between this country and the US have improved. For next winter 2016/17 we have added one more ship with Havana as its home port, *MSC Armonia*, to join *MSC Opera* that started sailing there in November 2015. We have two ships sailing separate seven- and eight-night itineraries from Havana throughout the winter season. Havana has a lot to offer, even to our experienced cruise guests, and that this is a popular destination is evident in that we have added a second ship so quickly. In order to be a local company, we have employed Cubans as crew members in Cuba, just as we also have Brazilian crews in Brazil."

What about the Chinese market?

"Here we have added some 200 Chinese crew members on our fleet to better serve the Chinese market. We were among the pioneers in China and this is an interesting market. The Chinese work hard and this is why it is important for them to spend their vacations in a carefree and nice manner. China's upper to middle class is huge - 250 million people- and they are eager to travel and go on cruises – not only to and from China." Reducing the environmental footprint is important both in terms of emission regulations and for MSC's brand image. Please elaborate on this topic.

"As you point out, this is an important area for us, and we've brought our fleet up to date by installing scrubbers and burning clean fuels. Our ships more than exceed all the MARPOL and ECA requirements. In addition, we're exploring the use of LNG as fuel. We've also prepared all our ships for cold ironing, but there are unfortunately no common solutions to this in the many ports world-wide. So our ships are in compliance and this is an important issue for the entire industry. We are also working actively on this through the Cruise Lines International Association (CLIA).

Hi-tech is a key success factor - what does the future hold?

"Access as if you were at home is important - high level and cheap. No doubt about that, but on the other hand an increasing number of guests are going on a cruise to be 'disconnected' - to truly be on vacation. So we will introduce 'detox' programmes where you are not connected, where your smart phone, tablet or PC is and will remain offline - where you can even leave your watch behind



MSC Seaside out at sea

and enjoy the company of your family and friends - or just enjoy the ship and the sea. Ships of the future must be big and provide multi-purpose rooms with a truly high-tech profile."

Finally, what do you expect from a class society?

"I expect class to help my company become better in all safety and operational aspects. Class should be at the forefront of developments, ensuring we are aligned with all rules, helping us to understand how to improve our business and, through this, improving our business performance. Class needs to be a "yes or no" business and to be 100% clear on what we are to do today and tomorrow to always be a safe way to travel for our ships, crew and guests."

FUN FACTS

More than 12,000 MSC Cruise guests celebrated New Year's Eve 2015/2016 at Rio de Janeiro's Copacabana beach: MSC ships *Splendida, Lirica, Armonia* and *Poesia* at anchor formed a stunning backdrop to the world's most spectacular fireworks display. Twenty-four tons of fireworks were launched from some 11 ferries moored off the beach.

MSC Cruises signed an agreement with the Bahamas for a 100-year lease of an island to create Ocean Cay MSC Marine Reserve, which will co-exist with the local ecosystem. The Cay will have some of the finest beaches in the world.

MSC Cruises was given some 30 different awards and recognitions in 2015, ranging from the 2015 German Cruise Award for the best family product to the Best Cruise Company at the Travel Media Awards in Dublin.

MSC CRUISES

MSC Cruises is headquartered in Geneva, Switzerland. It is a subsidiary of the MSC shipping company, which has a turnover of USD 28bn. Its modern cruise fleet has 12 ships, and seven more are on order. More than 11 million guests have been on a cruise with MSC. Text: Sacha Boff Sacha.Boff@dnvgl.com

STATE-OF-THE-ART SIMULATORS

-21

Cruise-ship owners are now using Hardware-in-the-Loop (HIL) technology to test Exhaust Gas Cleaning (EGC) systems

Scrubbers being installed in the cruise ship Norwegian Escape




Sacha Boff

When performing HIL testing, the control system is isolated from the real system and instead connected to a virtual environment. The necessary actuators, dynamics and sensors are simulated in order to make the control system believe it is connected to the real system. The control system (with software from the specific vessel) is then thoroughly tested in this virtual set-up.

Motivation

Exhaust gas cleaning (EGC) systems, also known as scrubbers, are being widely used in order to comply with Annex VI of the MARPOL Convention and other regulations regulating emissions from ships. The purpose of a scrubber system is to reduce sulphur oxide (SOx emissions) from the exhaust. In order to reach the desired level of performance and comply with regulations, the EGC control system has to work seamlessly with sensors, pumps, valves, PLCs and other integrated systems on board the vessel. Hardware-in-the-loop (HIL) testing technology helps to detect hidden software errors, erroneous configuration parameters and design flaws in the EGC control system.

Scrubbers are relatively new to the maritime industry and the combination of new technology, new vendors and new rule sets leads to a challenging environment for all parties concerned.

Many ship owners struggle with operational issues relating to their scrubber systems. These may be linked to electrical, mechanical or software errors. The first two items can to a certain extent be fixed by the onboard crew, but software issues require software

MARINE CYBERNETICS (MC)

- Established in 2002 as a technological "spin-off" from the Norwegian University of Science and Technology (NTNU)
- Headquartered in Trondheim, Norway
- Acquired by DNV GL in May 2014
- 60 employees (majority at MSc/PhD level)
- Introduced Hardware-in-the-Loop testing of computer control systems to the maritime and offshore industries
- Independent third-party verification
- +11,000 findings from MC HIL testing to date
- Over 150 customer-project references
- 300 systems tested
 60 000 test cases performed
- 60,000 test cases performed

"To ensure the proper and safe operation of the scrubber system currently being developed and installed on the NCL fleet, we decided to partner with Marine Cybernetics, a DNV GL company."

Massimiliano Marotta, Director Electrical Services, NCL



Norwegian Cruise Line is one of the cruise ship owners that have used HIL testing for their exhaust gas cleaning system.

"We were positively impressed by the professionalism and expertise of the Marine Cybernetics engineering team involved. This type of HIL test could be very helpful in several areas during major project developments or retrofits."

Massimiliano Marotta, Director Electrical Services, NCL engineers from the EGC system supplier to come on board. This will in most cases take some time. It is also well known that fixes done on any complex control system on board can lead to the introduction of new failures in the system that appear at a later stage.

At Marine Cybernetics, we believe in doing thorough testing on a virtual set-up at a lab facility as a complement to onboard testing. The Marine Cybernetics simulators used for the initial test can then be re-used to test system upgrades and troubleshooting during operations. With more than 10 years' experience of testing complex control systems in the offshore industry, Marine Cybernetics is now looking forward to working in the shipping market as well.

Cruise ships tested

Norwegian Cruise Line is one of the cruise ship owners that have used HIL testing for their exhaust gas cleaning system. According to vendors and these two ship owners, such tests reduce the systems' onboard commissioning time and, most importantly, reduce the risk of failures during operation. Issues found could potentially have led to incidents causing onboard damage to equipment or scrubbers that were not in compliance with regulations.

Some examples of findings that it would be challenging or timeconsuming to discover using traditional test methods are as follows:

- Shutdown sequence does not complete
- Scrubber does not shut down when the valve fails
- Pumps do not stop when the emergency button is pressed
- System does not switch correctly from one mode to another
- Scrubbers running in different modes some in open loop while others in closed loop
- Gas analyser values not updated right after mode change

NCL's experience

"The scrubber system to be installed on cruise vessels must be considered as a major project involving new technologies and therefore represents a challenge.

"To ensure the proper and safe operation of the scrubber system currently being developed and installed on the NCL fleet, we decided to partner with Marine Cybernetics, a DNV GL company.

"As a first step, the Cybernetic HIL Simulator was developed and connected to the scrubber manufacturer's main control system (PLC) and we verified that all sensors, actuators, channels and communication configuration had been done correctly.

"We proceeded to develop the "Test Programme" with conditions and events to be simulated based on Cybernetics' expertise and taking into consideration suggestions from all parties, including NCL and the scrubber's manufacturer. We had the opportunity to attend the HIL test at the scrubber manufacturer's laboratory in order to simulate the "scrubber system functionality" and possibly prevent or correct any malfunctions or discrepancies affecting the equipment and/or vessel environment that could be encountered during commissioning. We were positively impressed by the professionalism and expertise of the Marine Cybernetics engineering team involved. This type of HIL test could be very helpful in several areas during major project developments or retrofits." says Massimiliano Marotta, Director Electrical Services, NCL

HIL TECHNOLOGY

Hardware-in-the-Loop (HIL) testing is a well-proven test methodology used by the automotive, avionics, space and other industries and targets the software part of the control system. HIL testing is accomplished by isolating the control system with its operator stations from its surroundings and replacing all actual input/output (I/O) with simulated I/O from an HIL simulator in real time. The control system cannot sense any difference between the real world and the virtual world in the HIL simulator. This facilitates the systematic testing of the control system's design philosophy, functionality, performance and failure-handling capability, both in normal and off-design operating conditions. HIL benefits all involved parties:

- Ship owner: fewer issues during operation, a safer and more robust system
- Yard: fewer issues during commissioning
- Vendor: fewer issues during the warranty period, better basic software

TEST CASES AND PROCESS

A typical EGC-HIL test is performed over a five-day period during the factory acceptance testing (FAT) stage at the EGC-system supplier site. The test will typically reveal many findings related to non-compliance with Annex VI of the MARPOL Convention. The test scope covers functional tests (about 30% of the scope), followed by failure tests (70% of the scope). Some example of tests are shown below.

Operation modes

- Pump failure during open loop water treatment
- Scrubber nozzle valve not opening on command
- Pump failure of the alkali pumps during closed loop
- Stuck remote valve when in closed loop mode
 Overboard valve fails to close when the effluent stream is contaminated

Sensor and signal monitoring

- Tank level measurements out of range during closed loop water treatment
- Out-of-range water pressure measurement
- Out-of-range temperature measurement from scrubber outlet
- Out-of-range flow meters
- Failed pH measurement used for alkali dosing

Network storm test

HIL TEST ON CRUISE SHIPS

Many complex systems on board cruise ships could benefit from HIL testing:

- Power management system
- Steering and propulsion
- Navigational systemsLNG as a fuel system
- Integrated control and monitoring system (ICM/IAS/VMS)
- Other integrated automation systems, such as HVAC, ballasting, cargo handling, heave compensation/stabilizers, cranes, scrubbers, ballast water treatment, etc.
- Advanced entertainment/amusement systems

Text: Magne A. Røe Magne.A.Roe@dnvgl.com

FROM COASTAL SHIPPING TO ALSO EXPLORER CRUISES

Hurtigruten is about as Norwegian as you can get when it comes to the transport of goods and people, and most people living along the coast, from Bergen in the southwest to Kirkenes in the north, have a relationship with this coastal steamer company.



Daniel Skjeldam, CEO of Hurtigruten.



Skjeldam enjoys canoeing and offers passengers the same opportunity.

Traditionally, it has served the long, rugged Norwegian coast, but it has now expanded its operations and has 12 ships with one more on the way, owns and runs three hotels and has some 300 sleigh dogs and 200 snowmobiles. "Our goal is to be the world leading supplier of explorer cruises in polar waters and 82% of our turnover now comes from these." says CEO Daniel Skjeldam. This explains the dogs and snowmobiles, which are not typical assets for any ship owner.

Unique history

"Hurtigruten was founded in 1893 by Richard With, a visionary businessman who ran a shipping company called Vesteraalens Dampskipsselskap (Vesteraalen Steamship Company). Travelling in Norway at that time was a huge challenge, as roads were rough trails for horses, or horses and carriages. It could take days just to make a small trip that now lasts a few hours. Travelling by sea was much better, but the Norwegian coast, with all its fjords, islands and reefs, was not all that easy to sail along at that time either. The whole coastline from Trondheim and northwards had only 28 lighthouses at the time, making travel at night risky at best during



MS Spitsbergen.

the wintertime darkness this far north. The summer, when the midnight sun shone all the time, was a different story. However, Mr With and coastal pilot Anders Holte wanted to partake in mapping the coast, and Mr Holte made the whole coastal trip personally in a rowing boat to familiarize himself with the treacherous waters. Many times after Hurtigruten started to sail this route, Holte would be rowing in front with a light in his boat to guide the first ship, DS Vesteraalen, safely on its journey to the many ports of call on the coast," explains Skjeldam. "Our company history and DNA go back to this time." "Mr With managed to transport a prefabricated hotel to Svalbard in 1896 and located it close to Longyearbyen. The ship travelling this route was DS Lofoten and its master was the legendary Otto Sverdrup, who later became famous for his polar expeditions with Norwegian polar explorer (first to the South Pole, among other achievements), Fridtjof Nansen and the vessel Fram. One of our newest and best polar exploration ships is called Fram," says Skjeldam. "This ship sails in Antarctica during the winter season in the northern hemisphere. We've added a second ship, the Midnattsol, to the Antarctic expeditions. We are true to the founders' concept, but now have a fleet of 12 ships offering explorer cruises



Hurtigruten's explorer map for 2017.

to Spitsbergen, Iceland, Greenland and Antarctica - in addition to providing a coastal service from Bergen to Kirkenes every day of the year."

From Norwegian to Hurtigruten

"As Chief Commercial Officer (CCO), I took part in the fantastic growth of the airline called Norwegian from its start in 2002. At the beginning, we had four Boeing 737s and now the company has no fewer than 85 of the same type and also offers long-haul flights with a fleet of Boeing 787s (Dreamliners). My tasks included sales, marketing and creating a route network that could match our ambitions. I kept an eye on the traditionally loss-making Hurtigruten and finally could not resist the thought any longer and contacted the Board of Directors and the majority owner at the time, Norwegian publisher and businessman Trygve Hegnar." Skjeldam joined Hurtigruten in 2012 and the company has since been taken through a very successful turnaround. For instance, the fourth quarter 2015 is Hurtigruten's best ever quarter. "I asked myself the question: "What could I do to introduce changes to a



Olav Orheim is a Norwegian glaceologist and former director of the Norwegian Polar Institute offering lectures to passengers.

120-year-old brand like Hurtigruten?" To learn about expeditions first-hand, I went out travelling to Svalbard, where I went on my own expeditions with a friend, taking a canoe, tent, gear and a rifle in case any polar bears should come too close. I did this for a couple of months and it provided valuable and self-experienced input to my future with Hurtigruten."

Exploring

"The first thing we did was to restructure by moving the headquarters from Narvik to Tromsø, and now we have also moved the commercial functions to Oslo, closer to the customers. We cut costs by 30%, but simultaneously opened offices where our customers are located - London, Hamburg and the US - in addition to Norway. We have invested in the customer experience, and have also adjusted the price levels as we do offer unique and premium experiences. Our guests are not looking for a cruise on a 4,000-passenger cruise ship, but for the unique experience of travelling to locations most people will never come to. Here we offer dog sleigh trips, climbing, mountain summit tours, ATV



Waiting for passengers to come ashore at Svalbard. Rifles are a safety measure if polar bears should come too close.

tours and overnight stays in addition to lectures by specialists on what we are actually seeing, or on matters of historic interest, the environment and so on. We follow in the legacy of our proud Norwegian ancestors, such as Roald Amundsen - we are explorers by nature here in Norway and Hurtigruten is proud to share this experience with customers. We are building up our expertise in explorer cruises to become the largest supplier of this niche product world-wide. Part of this package is also to offer local food and traditions, and our ships make short stops to take on board fresh food from suppliers. This is part of the adventure for our customers.

"To be able to offer this, we have initiated a programme to upgrade our existing fleet, and placed the contract for four refurbishments of our ships built in the 1990s with the Norwegian yard Fosen, which is located close to Trondheim. We have also purchased a ship built in Portugal that will be configured into a new, full-fledged Hurtigruten explorer ship. The ship will be named MS Spitsbergen and can carry 320 passengers," says Skjeldam.

Environment

"We operate in ecologically delicate environments, so a focus on the environment and reducing our footprint is a top priority for us. We don't use heavy fuel oil on any of our ships, and we have installed equipment for cold ironing on three of the ships. More environmental regulations will come into force in all the areas where we currently offer trips, and I do welcome this as we need to keep these environments pristine for the future too. In Antarctica, the passenger limit for any ship is 500, with a maximum of 100 ashore at any time. But we are also looking into hybrid solutions so that we in future could offer close to zero-emission tours close to shore. Here, we would like to influence developments. DNV GL can also play an active role here, and we know it has a lot of expertise in solutions for the future. DNV GL is our class partner and has been so since our first ship, the Vesteraalen," says Daniel Skjeldam, CEO of Hurtigruten. ■

For more information, please visit www.hurtigruten.com

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IAATO - ENSURING GREEN TOURISM IN ANTARCTICA

"Visiting Antarctica is a powerful wilderness experience, and ensuring visitors can have that experience in a safe and environmentally responsible manner is an important challenge to meet head on. Politically, Antarctica is unique, as an international treaty, that works on the basis of consensus, governs it. The Treaty is very effective in setting goals and policies for the continent, but the need for consensus can sometimes make decision making a slow process. Our role is to ensure that tourism activities in Antarctica are conducted safely and in accordance with industry best practice, exceeding or in line with the international treaties governing travel by ship or air to the continent," says Dr Kim Crosbie, Executive Director of the International Association of Antarctica Tour Operators (IAATO).

"Tour operators have been offering expedition-style trips and cruises to Antarctica for fifty years, and for the 2015/2016 season we expect a total of about 40,000 tourists. Most will come by sea and disembark in Antarctica (28,000), while another 8,900 will cruise only, without disembarking, while a few will go to the interior (530). Evidence shows that this level of traffic is sustainable and that if managed carefully there is room for more," says Crosbie.

"Many assume that the polar regions are 'remote'. This is the case in some areas, but in certain locations this is not the case. Coordinating the vessels is much like a chess game," she continues. "The passengers don't like to see other ships when they are in the Antarctic. It's an exclusive experience and part of this exclusivity is to be there 'alone' - meaning just nature and penguins. So while the operators compete for passengers, they don't compete on the passenger experience once passengers have booked. Rather the opposite, everybody knows where everybody else is and coordinates their movements principally to safe guard that all important wilderness experience. There are other reasons, of course, as the operators are also committed to support each other in the case of any incidents or accidents - the safety of the crew, passengers and ships is paramount in this sometimes hostile operating environment. It is quite unusual, I believe, to have a group of competitors effectively operating as one fleet."

The high season for Antarctic travel is November through to March. The continent has no permanent inhabitants and is surrounded by the Southern Ocean. At 14,000,000 square kilometres, it is the fifth largest continent, but about 98% of it is covered by on average almost two-kilometre-deep ice. It is the coldest, driest and windiest continent, with an average temperature of -63°C during the coldest part of the year. Antarctica is governed by the Antarctic Treaty System, which was signed by 12 countries in 1959 and later signed by another 38. This global partnership of 50 countries ensures that the entire continent is designated "a natural reserve, devoted to peace and science.

Against this backdrop, IAATO is doing an excellent job of ensuring that tourism supports the fragile ecosystem in Antarctica. After almost 50 years of tourism, no impact can be seen and this is greatly due to IAATO's members efforts over the last 25 years.

In recognition of her work, Crosbie was recently awarded the Queen's Polar Medal for "her outstanding contribution to the knowledge of Polar visitor management". In total, some 900 such medals have been awarded since the start just prior to Scott's expedition, among others, in the late 1800s - and only 15 have been given to women. Crosbie, a British national, holds a PhD on the ecological monitoring and management of visitor sites in the Antarctic. She joined IAATO in 2005 as Environmental Manager and was promoted to Operations Director before being appointed Executive Director in 2013.

"We see huge value in working closely with regulatory administrations and their recognized organisations, such as classification societies. By working together with classification societies we can share extensive polar experience and practical knowledge to help develop strong, realistic and practical implementation methods. The closer the partnership between class and ship operators, the better in terms of safety" says Crosbie.





Dr Kim Crosbie, IAATO

Another new instrument that will contribute to safe operations and the protection of the environment in both Arctic and Antarctic waters is the new IMO Polar Code, which will become mandatory for all SOLAS vessels entering polar waters as from 1 January 2017. It addresses all the main additional challenges in polar waters and has been developed to supplement existing IMO instruments in order to increase the safety of ship operations and mitigate their impact of visitors on the environment in the remote, vulnerable and potentially harsh polar regions.

"We welcome this code and work closely with our members and class to ensure compliance. Our goal is to ensure that shipping in the Polar Regions in the future continues to operate in a safe and environmentally responsible fashion. All in all, I'm pleased that we can continue to visit and experience the great wilderness of the polar regions and look after these global assets for generations to come," concludes Crosbie.

Since the beginning of the modern Antarctic tourism industry in 1969, the number of tourists in Antarctica has grown from a few hundred to more than 30,000 each year. Recognizing the potential environmental impacts that such growing numbers of tourism could cause, seven private tour operators conducting excursions in Antarctica joined together in 1991 to practice and promote safe and environmentally responsible travel in this remote, wild and delicate region of the world.





IAATO

IAATO is a member organization founded in 1991 to advocate and promote the practice of safe and environmentally responsible private-sector travel to the Antarctic.

A summary of IAATO Member Antarctic Tourism Trends						
Seasons	2015-2016	2014-2015	2013-2014	2012-2013	2011-2012	2010-2011
Seaborne tourism with landings	28,304	25,341	25,526	23,305	20,271	18,534
Seaborne tourism, no landings	8900	9459	9670	9070	4872	14,373
Air and cruise combination, with landings	2294	1471	1848	1587	860	531
Air and land tourism, Antarctic interior	531	431	361	354	516	386
Over-flights, no landings	0	0	0	0	0	0
Total	40,029	36,702	37, 405	34,316	26,519	33,824

Passenger numbers for 2014-15 and 2015-16 (estimate) as of April 16, 2015, subject to change. See also www.iaato.org/tourism-statistics.

Currently, more than 100 Antarctica-bound outfitters are voluntary members of the organization, the International Association of Antarctica Tour Operators (IAATO). Together they have established extensive procedures and guidelines that ensure appropriate, safe and environmentally sound private-sector travel to the Antarctic: regulations and restrictions on numbers of people ashore; staffto-passenger ratios; site-specific and activity guidelines; wildlife watching; pre- and post-visit activity reporting; passenger, crew and staff briefings; previous Antarctic experience for tour staff; contingency and emergency medical evacuation plans; and more.

IAATO is an industry group that has resolved to set the highest possible tourism operating standards in its effort to protect Antarctica. This effort is unique, and the challenge to maintain environmentally responsible tourism exists to this extent in no other region of the world. The membership comprises ship operators, land-based operators, ship agents, travel agents, one government office and travel companies that charter ships and airplanes from existing operators.

Most of their members also operate expeditions to environmentally sensitive areas such as the Arctic and the Amazon, as well as educational excursions to all seven continents. The experience and awareness these tour operators have gained through their membership in IAATO has allowed the spirit of environmentally safe and responsible travel to extend to nearly every remote region of the world. Text and illustration: Atle Ellefsen Atle.Ellefsen@dnvgl.com

THE WORLD'S FIRST MODERN CRUISE SHIP

Squinting against the low Nordic winter sun, I saw towering above me this unbelievable ship. She had a flying saucer perched on her funnel and a bow designed to break the sound barrier! And thrillingly, I was actually waiting in line by the gangway with a visitor pass in my hand, a ticket to board Royal Caribbean's brand-new first purpose-built cruise ship, the *Song of Norway*. Nobody had ever seen anything like it. Straight from her builders, she was docked in Oslo for her inaugural celebrations.

My parents had been invited, and since my mother declined my father brought me along instead - his skinny 13-year-old son. I decided there and then, on the pier, to become a naval architect.



Atle Ellefsen, Chief Naval Architect



In the 45 years that have elapsed since my revelation on that chilly November afternoon, cruising has transformed from slow days for wealthy retirees to action-packed family vacations for the masses. Last year, 22 million people decided to spend their holidays on a cruise - and this figure is increasing not only in the West but significantly in Asia in general and China in particular. The ships have changed from outdated ocean liners to spectacular machines specially designed to offer pure entertainment and regale their guests. Nothing is left to chance, every knob and handle, every technical detail and the location of every room and amenity have been scrutinized over and over by executives, sales specialists, naval architects, engineers, mariners and architects. So, naturally, now and then somebody asks "What was the first cruise ship?" It's a good question, because several ships have been credited with that distinction!

To find out, we need to go back in time, but first we should agree on what a cruise ship is. In my opinion, a cruise ship is not a liner in other words, not an ocean-going passenger ship built to serve transportation needs between scheduled ports. There are, in fact, no such ships in operation today. A cruise ship does not carry merchant cargo and is not a Ro-Pax ferry either. A ferry is designed to transport passengers, vehicles and goods back and forth between A and B, like a liner. Any entertainment offered on a ferry is an added bonus, more or less. Converted ships are out because they are not originally built for cruising, and so are the cargo-passenger ships common before the era of the container. A cruise ship is purposely planned, designed, constructed and deployed for the sole purpose of "sailing people safely around, just for fun". The World's First Modern Cruise Ship should reflect modern cruising as we know it today. So where did it all start? To find out, we need to travel over 150 years back in time, when most people avoided going to sea at all costs, unless it was absolutely necessary.

Victorian times 1850 - 1900

In January 1842, the famous novelist Charles Dickens crossed the North Atlantic on the paddle steamer *Britannia* to give lectures and visit friends in New York. His account of the lengthy voyage in



Song of Norway remembered by a 13-year-old kid



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Prinzessin Victoria Lusie
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Wilhelm Gustloff

We should agree on what a cruise ship is. In my opinion, a cruise ship is not a liner - in other words, not an ocean-going passenger ship built to serve transportation needs between scheduled ports. A cruise ship is purposely planned, designed, constructed and deployed for the sole purpose of "sailing people safely around, just for fun".

his subsequent book North American Notes is a most enjoyable read and retells vividly ocean-travel conditions in the mid-19th century. Dickens likened the Britannia to a claustrophobic "gigantic hearse". And indeed, rolling and pitching in the dim lighting from fuming oil lamps in nauseating, damp and cold interiors, the endeavour was far from a pleasure cruise. There was no running water or electricity but there were rats, cockroaches and spoiled food. The steam engine had barely been invented and, fired by coal as it was, the entire ship was constantly sprinkled by a downfall of soot, soiling the lace and silk worn by the passengers and making it difficult to breathe. Dickens was terrified when he saw sparks from the funnel landing on the sails; fire safety was nonexistent and still another generation would pass before lifesaving appliances were available for all on board. Nobody undertook such a voyage voluntarily; it was a necessary torment in order to get to America.

The Belle Époque 1900 - 1920

The concept of putting people on board ships for leisure would evolve with the progress of technology and with British Peninsular and Oriental Steam Navigation Company (P&O) in the forefront. P&O is still a major cruise line. Operating liner services to the Orient, the company realized that new technology and enhanced luxury would also start to attract wealthy vacationers who wanted adventures in Egypt, dance parties, deck games and fine dining. In 1880, P&O took delivery of the Ravenna, the first ship ever built with a steel superstructure. She carried 80 passengers in first class and 30 in second. Nine years later, the Valetta became the first passenger ship fitted with electric lighting. Only the greatest luxury was offered, with opulent interiors in mahogany and brass, Persian rugs and exotic art. The guests brought with them their own butlers and servants, and cart-loads of luggage - enough to change attire four or five times a day. By the turn of the 20th century, cruising had become an arena exclusively for the aristocracy of Europe. But they were still sailing on regular liners.

In those days, the British never built a new ship exclusively for cruising. In fierce competition with Germany, they had to stay on top of their liner services. By the end of the 19th century, however, the Germans were leading the race for size, speed and luxury – especially on the transatlantic route. Albert Ballin, managing director of the Hamburg-America Line, was a kingpin behind Germany's success and one of those visionaries who had the drive necessary to convince stakeholders to invest in cruising. Ballin was troubled by the fact that his transatlantic liners lay idle much of the winter due to adverse weather. So, in 1899, overcoming a great deal of resistance, he managed to deploy the 8,000-ton liner *Augusta Victoria* on a two-month cruise to the Mediterranean and Far East. An instant success, more of the company's liners were painted white and set sail for warmer waters. But, then as now, liners were not well suited for cruising due to their class divisions, lack of amenities, poor ventilation and cluttered decks. Realizing the potential for year-round cruising, Ballin commissioned the first purpose-built, 4,400-ton luxury cruise ship. Launched in January 1900, she was named *Prinzessin Victoria Lusie*.

After four years of successful cruises to the West Indies, Baltic and Black Sea, she ran aground off Jamaica. After failed attempts to back her off the rocks, the ship foundered and the captain shot himself.

Heading for cataclysm 1930 - 1939

The next milestone in the history of cruising is to be found in the darkest parts of history. Established in 1933, the state-operated Nazi-organization "Strength through Joy" had the objectives of closing the gap between the social classes and boosting the German tourist industry following the Great Depression. One measure was to offer cruises for the masses. On 5 May 1937, the Wilhelm Gustloff - the first of two purpose-built cruise ships - was launched at Blohm & Voss Shipyard in Hamburg. "Built by the workers for the workers" announced the organization, and as such the Gustloff has been claimed to be the first purpose-built, mass-market cruise ship. The second ship, the Robert Ley, was launched the following year. They are unique in history as their accommodation had one class for all on board: passengers, officers and crew had the same status and cabin and public space standards. Both ships' careers were very short. "Strength through Joy" collapsed in 1939, the Robert Ley was bombed to pieces in Hamburg and the Wilhelm Gustloff would, as we know, become synonymous with the worst disaster ever in maritime history.

Post-war boom 1950 - 1960

The fifties and sixties constituted the golden era of the passenger ship. Mass air travel was in its infancy, so going by ship was the only way to cross unless you were rich enough to afford a plane ticket. New ships were built to feed the market boom and every maritime nation boasted a prestigious liner. Cruising also grew in popularity, offering liners an afterlife. As they aged and grew unprofitable and air travel became increasingly common, the ocean greyhounds were transferred to cruising. However, ocean liners were not built for cruising, no matter how much classic elegance they boasted. Only limited areas offered first-class standards suitable for sun-seeking vacationers with high expectations. The ships were enclosed to protect passengers against North Atlantic winter storms, they lacked air conditioning and proper service amenities and were often stuffy, smelly and worn. The famous superliners Queen Elizabeth and Queen Mary both shared such a fate at the end of their careers. With their cavernous, old-fashioned and dark interiors, the ever-declining numbers of people on board felt like they were on a spooky ghost ship. The liners had no future as cruise ships and by 1960 airplanes accounted for 70% of the traffic across the Atlantic Ocean.

Despite the collapsing passenger-ship market, Cunard optimistically took delivery of the *Queen Elizabeth 2* in 1969. She was designed as a dual-purpose transatlantic liner and cruise ship. Probably still the most prestigious and stylish modern liner ever built, it did not take long before her sun decks had to be expanded, additional windscreens fitted and balcony cabins added - aesthetically cluttering up her original sleek profile. She operated for forty years and was the only cruise ship regularly crossing the Atlantic for fun. Many contemporary liners experienced success in the seventies' cruise market, including P&O's evocative sisters, the *Canberra* and *Oriana*, the smaller ships owned by Greek companies Epirotiki and Chandris (now Celebrity Cruises) and the ships of Germany's Hapag Lloyd, to mention a few. It was in the late sixties and seventies that the forerunners of today's market standards really started to evolve.

The birth of cruising as we know it

In 1966, Norwegian ship owner Knut Utstein Kloster was struggling with a passenger/car ferry he operated between England and Spain. A success at first, some national political events unfortunately rendered the service unfeasible and a new trade had to be found. Designed as a car ferry - with a car deck - the *Sunward* nevertheless boasted the lines of a yacht. Fully air-conditioned with en-suite bathrooms and a double occupancy of 400, she caught the eye of American cruise-ship pioneer Ted Arison, who needed to replace his ageing, refurbished liners. Arison, the



Queen Elizabeth 2 entering New York in the 70's

founder of today's largest cruise company Carnival Corporation, was instrumental in attracting more families and the young crowd to go cruising, challenging the myth that cruising was only for "blue-haired widows". Kloster and Arison's joint venture became NCL and so successful that another three ships were ordered. Unlike her older fleet mates, the third sister ship, the *Skyward*, had cabins instead of a car deck. Thus, she was in effect NCL's first pure cruise-ship newbuilding.

The concept of Royal Caribbean's *Song of Norway* was primarily master-minded by Ed Stephan. Coming from the hotel business, Stephan realized the potential of cruise ships specially designed for Caribbean waters and the branding of Scandinavian seamanship as a hallmark of safety. The sixties had seen a number of fatal accidents and the industry's reputation for safety was fraying. Smaller cabins encouraged guests to spend more time in the spacious restaurants and bars, enabled by placing the funnel aft. Wide, terraced decks with glass screens provided an expanse around the swimming pool and shade against the sun. Orange and earth-coloured interiors matched the warm, exotic palette of the Caribbean. Her bold, futuristic design gave her an instant advantage. Subsequently, one purpose-built cruise ship after the other entered the market - which has since grown by 7% annually.

So which was first?

Looking back, determining the World's First Modern Cruise Ship does not seem to be that straightforward. The guests cruising on



the *Prinzessin Victoria Lusie* were exclusively the extremely rich. In our day, people with such wealth prefer the privacy of their own yacht, and in 2014 there were at least twenty private yachts that were larger than the *Prinzessin*. Therefore, the *Prinzessin Victoria Lusie* is hereby awarded the title of "The Forerunner of the Superyacht". On one of my last cruises, our dinner table included a Miami port longshoreman, a housewife from Kentucky and a real-estate big-shot from Boston. The *Wilhelm Gustloff* may have been the first purpose-built cruise ship to cater for all the people, but she was disconnected from the market, contradictory to her intended function and built to support a sinister political agenda that culminated in global war. I prefer to disqualify the *Gustloff*, even though she was an honest piece of fine naval architecture.

Cunard's Queen Elizabeth 2 was a hybrid, since re-invented with the Queen Mary 2 and as such hereby awarded the title of "The World's First Dual-purpose Cruise Ship".

Thus, it seems we are left with NCL and RCCL. NCL's *Skyward* was in fact delivered a year ahead of RCCL's *Song of Norway*. However, one can argue that technically the *Skyward* was a modified car ferry. The *Song of Norway* was not, she was a unique idea, designed and delivered for the single purpose of "sailing people safely around, just for fun". She was the benchmark of today's mass-market cruise-ship design, a concept that can now be fifteen times larger, with arrays of food options and "amusement park" rides that were beyond imagination 45 years ago. I give my vote to the Song of Norway, however I admit to being biased - so to balance this opinion, NCL is hereby awarded the title of "The World's First Mega-cruiser" - for the Norway. The risks associated with purchasing a twenty-year-old superliner were significant and this was a big surprise, even to those who followed the industry. Many people believed it would be impossible to fill such a large ship with cruise guests! The French national maritime symbol of pride, the France, had spent the last five years in lay-up when Kloster bought her in 1979. Her specification was magnificent; with quadruple screws and a steam turbine plant with 150,000 horsepower, she could travel at 35 knots. No cruise liner needed anywhere near that speed. Her closed configuration had to be opened up to the tropical sun and her cabin classes had to be merged. Thrusters had to be retrofitted so that she was independent of tugs. Truly a major conversion, after she entered service in 1981 the Norway remained the largest cruise ship in the world for seven years.

Both these pioneering ships are recycled and gone, but their legacies and the heritage from the countless classic passenger ships of many nations constitute the foundation of today's cruise ships - ships that were setting new standards in their time. And maybe one day, in a distant future, environmental legislation and fuel prices may again revive the great ocean liners.



SUCCESSFUL COLLABORATION BETWEEN COSTA CROCIERE AND MARITIME ACADEMY ITALY

ENHANCING THE SAFETY CULTURE ON BOARD CRUISE SHIPS

Maritime Academy Italy and Costa Crociere worked together to enhance safety culture on board of cruise ships. Starting in January 2014 the training has been carried out on board of all 15 Costa Crociere ships and involved about 1.400 crew members.

The content of the course was explicitly developed and customized for Costa Crociere. After a brief introduction giving an overview of the regulatory background and a familiarisation of the participants with the concept of risk management on board of ships, the training focused on the specific company Occupational Health and Safety (OHS) procedures and the related tools that are currently implemented on board of the Costa Crociere fleet.

The main objectives of the training project (as agreed with the Costa Crociere OHS and shore-based training staff) were:

- To raise the awareness of crew members about onboard hazards and risks in their workplaces and respective safety measures to be adopted to ensure that such risks are mitigated.
- To develop a better understanding of safety culture in order to help implement this concept on board.

The course comprised a classroom part followed up by a practical module. During the practical part Maritime Academy trainers Capt. Reuben Lanfranco and Ing. Giulio Riva visited the work areas onboard several vessels (i.e. engine department, galley, restaurants, laundry, battery room) and provided respective personnel with a demonstration of what risk assessment is about and of related safe practices when carrying out daily activities. The training was aimed at all heads of departments, from masters to the house-keeping managers, with an average attendance of about 50-60 people on each vessel.

In order to ensure maximum flexibility and to enable all on-board personnel to take part in the training without negatively affecting daily duties and activities the classroom course was split into several sessions.

The practical approach provided by Capt. Lanfranco and Ing. Riva during both classroom and practical sessions was highly appreciated by all crew members attending the training and reflected in the participants' feedback: The overall satisfaction for the training and course content were both rated with 9.1 on a 10 point scale and were only exceeded by a 9.4 for the trainer performance and expertise.

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