

SEAVIEW



RINA MAGAZINE - CRUISE EDITION



FUTURE VISIONS
of ships, yards and ports

KEY INNOVATIONS
in safety and efficiency

MARKET TRENDS
and how to stay ahead

Welcome to Sea View, RINA's annual magazine on cruise market trends and opportunities. This year, with positive signs and growth in the cruise sector almost across the board, there is a lot to celebrate.

The magazine takes a broad perspective on issues driving today's cruise market. Interviews with industry leaders explore technological developments in propulsion and shipbuilding, the transformation of ports to host the giant ships of the future, and what cruise lines can learn from ultra-luxury yacht charters.

RINA experts offer contrasting insights into digitalisation – the power of data and dangers of cyberattacks – plus predictions for China's future cruise industry development. Further articles explore how cruise shipowners can approach environmental and safety regulations through modelling and new additional class notations.

Many thanks to Fincantieri, Borgo Santo Pietro Group/Satori Yacht, MAN Energy Solutions, ABB and the Eastern Ligurian Sea Port Authority for their valuable contributions.

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Cruising in 2019: upwards and outwards

With 30 million passengers expected in 2019 and 115 vessels currently on order – representing 270,000 berths and a value of USD 70 billion – the cruise sector remains in a strong growth phase. Both capacity and the pace of newbuilding are increasing as cruise lines report record earnings across the board. The average size of ships on order is over 90,000 GT with capacity for 2,250 guests, at an average cost of USD 250,000 per berth.

Overall, 35 brands are represented in the current orderbook, led by MSC with 12 ships on order, Norwegian Cruise Line with eight and Royal Caribbean with five. Looking at the countries of build, 36 percent of the berths on order are in Italy, 25 percent in Germany and 20 percent in France. Notably, two ships (10,500 lower berths) are on order at SWS shipyard in Shanghai for Carnival Corporation.

The view remains positive when we look at 2019. During the year, 24 cruise ships will be delivered, bringing an increase of over 40,000 lower berths. This year's deliveries will grow the fleet by 7 percent and represent an investment of USD 10 billion.

Three striking aspects of the orderbook confirm our previous predictions on market trends:

- 50 percent of deliveries in 2019 are expedition vessels, and numerous operators are ordering new ships. The expedition segment is continuing to boom.
- There are 25 LNG-fuelled cruise ships on order, compared to 15 ships last year, stimulated by emissions regulations due to enter into force in 2020.
- The number of vessels specifically designed for the Asian market

is growing and currently stands at seven ships and 33,000 lower berths.

Growth in the number and size of refurbishment projects is also accelerating and the refurbishment market is increasingly playing an important role in yards' strategic growth plans.

The main cruise destinations remain the Caribbean – with over a third of global capacity deployed in the area – followed by the Mediterranean and northern Europe. Asia, including China, is fast increasing to over 9 percent of global destinations. In line with growth in the expedition market, we also see that Arctic and Antarctic cruises combined represent just over 7 percent of destinations. These are attracting not only traditional cruise passengers but new Chinese market segments, with Chinese expected to surpass US guests on these routes by 2023.

Focus on RINA

- Cruise orderbook: 19 ships, 2.6 million GT.
- Recent delivery (November 2018): AIDAnova, the first LNG-fuelled cruise ship ever built. The first of a series of nine ships built by Meyer Werft (Papenburg) and Meyer Turku for Carnival Corporation's Carnival Cruise Line, P&O, Costa Cruises and Aida brands.
- Recent delivery (February 2019): Costa Venezia
- Upcoming deliveries: Carnival Panorama and Costa Smeralda (first sister ship of AIDAnova).

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Paolo Moretti,
Executive
Vice President
Marine Strategic
Development, RINA



Building the cruise ships of the future

Several years ago, as the global shipbuilding sector started to enter a period of crisis, Fincantieri adopted a strategy of internationalisation and diversification of both our product portfolio and client base. Today, we are delighted to see that our strategic approach is paying off. In 2018, we received orders for 27 new vessels, 14 of which are cruise ships. In fact, our orderbook hit a record high of EUR 33.8 billion last year. These orders came from eight different clients, and our client portfolio now includes all four of the largest cruise operators worldwide. In addition, our experience in the high value-added sectors of shipbuilding is enabling us to seize opportunities in new segments.

Offering high value-added solutions tailored to the needs of the cruise industry will be one of our major challenges – and opportunities – in the next years as the cruise sector booms. This is why we are constantly developing new design concepts and monitoring technological tendencies that might impact market trends. As well as internal R&D activities, we are

also focused on promoting innovation within our business perimeter and collaborating with suppliers to produce innovative solutions. This is in addition to the basic (but not simple) challenges of any shipbuilder: consolidating relationships with clients and continuing to deliver ships on time and within budget.

What is fuelling this excellent performance in the cruise shipbuilding segment? In December 2018, the worldwide orderbook counted a record high of 103 ships (including those with an MoU or Letter of Intent) with deliveries stretching to 2027.

That is an exceptionally long timescale. It seems likely that the increased investment is driven by positive trends in demand for cruises in both traditional and emerging markets, plus the entry of new operators and the need to replace vessels built in the early 1990s. The Cruise Lines International Association has set a target of 30 million cruise passengers for 2019, thus predicting a growth rate of over 6 percent. These are exciting times.

Interview with
Luigi Matarazzo,
Director, Merchant
Ships Division,
Fincantieri



Costa Venezia, courtesy of Fincantieri

Innovation, technology and digitalisation are big topics in the cruise industry right now. This is good, because innovation is key to the long-term success – or even survival – of any organisation. Innovation around both products and working methods is fundamental to Fincantieri. We know that it is essential to continue investing in developing advanced solutions for all stages and fields of shipbuilding if we wish to maintain our position.

This focus on innovation is something I have noticed since I joined Fincantieri in 1991. It contributes to the passion and motivation I have for my work and for my commitment to supporting young people. After all, they represent the future of our company and the future of innovation in our industry.

Current focuses of our research and innovation processes relating to ships are environmental sustainability and energy efficiency (green ships), digitalisation (smart ships) and automation (autonomous ships). The value of this innovation becomes clear when you look at recent deliveries such as – to name just two – Carnival Vista and Costa Venezia. Both vessels are based on well-proven technical and naval architecture platforms and offer outstanding operational and technological performances. The key difference is how the cabins, public spaces, catering services and entertainment on the Costa Venezia have been tailored to the specific tastes of Chinese passengers.

As well as innovation to continuously improve the performance of the ships, we are also working on the introduction of innovative solutions for the so-called blue economy (smart offshore infrastructures) and the development of more efficient, safe and sustainable production facilities and processes (smart yards). Similar to other industries attempting to align with the new concepts of Industry 4.0, our main aims are to improve safety and productivity.

Computer models, virtual product methodologies, additive manufacturing, robotics, logistics and quality control procedures will drive the evolution of the shipyard in the coming years. Ships will be designed and



Fincantieri shipyard in Monfalcone, courtesy of Fincantieri

produced with greater consideration to the complete lifecycle, from design to decommissioning. We are looking forward to the introduction of innovative and more cost-effective techniques and methods for our production sites, particularly for welding and joining procedures.

Certification of production sites is just one of the services that form the basis of the relationship between Fincantieri and RINA. RINA is also responsible for the classification of many of the cruise and other vessels built by our Group and the implementation of cybersecurity measures. These services underlie our more strategic and deeply rooted relationship focused on technological innovation. In fact, we are jointly participating in research and innovation projects both at a national and European level, and we have developed cooperation projects focused on specific technological innovations. Watch this space.

BIOGRAPHY

Luigi Matarazzo was appointed Director of the Merchant Ships Business Unit at Fincantieri in August 2018. After graduating from the University Federico II in Naples in 1990 with a degree cum laude in naval and mechanical engineering, he joined Fincantieri's project engineering department for cruise vessels. He was appointed Chief Designer in 1998 and Lead Project Engineer for HAL Cruise Vessels in 1999. In 2002, he assumed responsibility for hotel areas at Fincantieri shipyard in Marghera. Back in Trieste in 2004, he became project manager for HAL/P&O/Cunard ships, a role he performed up to 2006, when he assumed responsibility for engineering and design for both Merchant and Cruise business units, integrating them in 2007. In 2010 he became Deputy Chief Operating Officer and Executive responsible for Engineering before assuming responsibility for New Building Cruise Ships in 2016. Throughout his career at Fincantieri, Mr Matarazzo has sat on various boards and committees including EUROYARDS, CETENA and VARD.

“Innovation is key to the survival of any organisation.”

 www.fincantieri.com



Satori Yacht, courtesy of Borgo Santo Pietro Group

The meaning of luxury at sea

Interview with
Claus Thottrup,
 Co-owner, Satori
 Yacht & Borgo Santo
 Pietro Group



Ask most people what a “luxury cruise” looks like, and they might talk of cocktails and silver service, shiny gin palaces and flashy destinations where people go to be seen and surrounded by A-list celebrities. This attitude is changing fast, especially for our guests, who are among the growing number of people who are cash-rich and time-poor. Those few days they choose to spend on a boat out at sea are precious.

So, what is luxury for these guests? It is being able to sail into calm bays and hidden lagoons where the turquoise water is translucent and there are no ships or tourists destroying the view. It is deciding whether you prefer to spend the day sailing and playing in the waves or simply wake up at a new destination each day. It is choosing whether to drop anchor close to the shore or in deeper waters for diving – and having a captain who can do this quickly and safely.

This type of freedom and control is partly what makes Satori Yacht so unique. She is a 41.5-metre schooner with custom North Sails and interiors swathed in teak and mahogany, which my wife Jeanette and I personally

designed for a maximum of ten guests and nine crew. Along with her ‘20s and ‘30s aesthetic and exquisite features – walnut panelling, marble en-suites, vintage silverware from the Italian navy – she has the latest technology and water toys. This season she’ll sail from the south of France across to Tuscany, around to Corfu and Montenegro, up to Venice, then play a little around the Cyclades islands and Turkey.

Thanks to Satori’s high-end systems both above and below deck, our captain can truly tailor-make our guests’ experience depending on their wishes and the weather conditions. If it is too windy in one bay, he can sail to a more sheltered one. If the guests have a sudden desire to visit a destination, he can sail all night so they can wake up there. After all, a luxury cruise should not be like a bus service with fixed timings and destinations, nor like a hotel fixed in one spot.

Nor should it be like a canteen. When my wife and I first chartered a traditional gulet boat in Turkey 12 years ago, we had control over the sailing but not over the food. We

believe those looking for an exclusive sailing experience shouldn't have to eat a hamburger, unless they want to, or wake up for breakfast at a set time or use a plastic plate.

Our two chefs and hostess join us for the season from our boutique Borgo Santo Pietro hotel estate in the Tuscan hills, where we have a cooking school and one of our two Michelin-starred restaurants, Meo Mondo.

Synergies with our other hospitality businesses therefore allow us to take a broader view of luxury at sea: it's about the sailing experience, but also

Firstly, by thinking carefully about how to tailor the ships and experience to the desires and expectations of the guests, whatever their budget.

Secondly, by looking at how to differentiate the experience of guests on the same ship who are prepared to pay more for their holiday. And thirdly, by employing 5-star crew and staff. Just as our guests should be treated as individuals with their own ideas and desires, so our crew are individuals and not simply roles. Interaction with crew members, chefs and other staff is fundamental to a guest's experience whatever the size of the ship.

Talking of people who provide a 5-star service, it is appropriate to mention RINA. When we had Satori hand-built in Bodrum, Turkey, we were determined to have her certified in Europe by RINA because the safety and well-being of our guests is fundamental. Collaborating closely with ourselves as the designers and with our captain, RINA helped us to build safety into the very design of Satori and the mindset of our crew.

What, then, is luxury at sea? I'd say it is all about the human touch, about flexibility and individuals who go above and beyond to give their clients the best possible experience. And that applies to 8,000-pax cruise ships as much as it does to Satori Yacht.

BIOGRAPHY

Claus Thottrup is the CEO, co-founder and co-owner of the Borgo Santo Pietro Group together with his wife, Jeanette Thottrup. This collection of luxury lifestyle companies comprises the five-star Borgo Santo Pietro boutique hotel estate, high-end design and construction company PN Homes, Michelin-starred restaurants Meo Modo and La Bottega del Buon Caffè, luxury yacht Satori, the Borgo Cooking School, and the line of natural skincare Seed to Skin. Originally from Denmark, he also owns and runs PN Homes Italy and PN Homes UK, designing and constructing boutique hotels and high-end private residences.



very much about the service. This may be a growing trend, as we are not the only ones moving from high-end hotels to high-end hospitality on the water.

Clearly, such an exquisite vessel as Satori cannot be extended into a giant cruise ship carrying 8,000 passengers. Nor can our concept of exclusive hospitality at sea simply be expanded to a mass market. But I believe that even larger cruise companies can provide a 5-star service for all their guests.

“Interaction with crew members is fundamental to a guest's experience.”

 www.satoriyacht.com

Driving the marine energy transition

The greatest challenge for marine engine manufacturers is a basic one: how to offer highly efficient propulsion and energy systems at a reasonable price. Our teams of engineers at MAN Energy Solutions are not just working to solve complex technical challenges around gas-to-liquid conversion or exploring the future possibilities of alternative fuels. Rather, we are focused on becoming the frontrunner in sustainable propulsion technologies in the widest sense, developing solutions that are not only fuel-efficient but also cost-efficient and make sense for both customers and the environment.

We shifted up a gear in our drive towards clean marine propulsion technologies when we launched our Maritime Energy Transition programme in 2016. Sparked by the COP 21 Paris Agreement on climate change, the programme seeks to engage shipowners, classification societies, NGOs and other stakeholders to better understand what needs to be done to achieve a climate-neutral marine industry. The Maritime Energy Transition

programme is also an umbrella for our activities in the area of sustainability, from retrofitting ships for dual-fuel gas operation to developing synthetic fuels. And it is a really big umbrella, because there is no single, simple solution to our challenge of offering efficient propulsion and energy systems at a reasonable price.

It may sound obvious, but the “right” solution is different for different ships with different needs. In the cruise sector, we expect more large cruise ships to adopt LNG as a fuel because of its clear emissions benefits, so we have worked hard to optimise dual-fuel engines for both high-efficiency and high-power configurations. In smaller cruise vessels, we expect owners will continue to choose diesel systems with scrubbers and selective catalytic reduction systems, which we have also greatly optimised in the last years. In the growing expedition market, hybrid systems allow small explorer vessels to carry enough fuel to travel to remote areas and then run on battery power in sensitive conservation areas.

Interview with
Lex Nijsen,
Vice President and
Head of Four-Stroke
Marine at MAN
Energy Solutions



Courtesy of MAN Energy Solutions

Thanks to advances in battery technology, hybrid systems in fact make a lot of sense for larger cruise ships, too. They can act as boosters for ships with lower installed engine power. They can also provide silent, emissions-free energy in ports with no shore power supplies. This increases the number of ports that a cruise ship can visit – a great advantage in times of growing competition for berths and expanding routes and destinations in both standard and niche markets.

Another significant area for cruise ships right now is the digitalisation of ship monitoring. We are seeing fast-growing demand for our PrimeServ Online Service, which offers 24/7 real-time monitoring of ships' engines and turbochargers to assist owners and crew with predictive maintenance and operational efficiency. When there are changes or warning signals in the data, we can analyse the issues and advise crew on corrective actions while underway or help plan maintenance interventions at their next port of call. The real-time monitoring works via a satellite internet connection and integrated data interface, so it is easier for cruise ships – which almost all have high-tech communications equipment already installed – to implement this.

Digitalisation is benefiting many other areas of marine engine performance and sustainability, too. When people talk about optimising engines, it is easy to think only of physical machinery like turbochargers and fuel injection systems. But the advanced control system software we have developed in-house is proving an increasingly powerful way for ships' crews to control emissions, efficiency and operations at the touch of a button.

This type of technical and digital innovation allows us to go above and beyond simply responding to customer requests or obvious trends in market demand. Innovation allows us to challenge the market with new solutions, and that is where we most value the input of classification societies and consulting engineers. As we develop products for marine applications according to classification requirements, our engineers exchange regularly with surveyors working with



our quality departments, not just ticking boxes but helping to improve processes.

RINA is one of our most highly appreciated "sparring partners". Our RINA colleagues help us to understand not just what the rules require, but the reasons behind them. In the other direction, we can explain our concepts to RINA's experts and get their input not just on whether the solutions are compliant with the rules, but on better ways to achieve our ultimate goals.

This kind of healthy exchange between experts supports the aspect that I enjoy most about this job: meeting customers around the world, sharing ideas and helping find the best energy and propulsion solutions for their needs as we jointly navigate the global marine energy transition.

BIOGRAPHY

Lex Nijssen is Vice President and Head of Four-Stroke Marine at MAN Energy Solutions SE. Based in Augsburg, Germany, MAN Energy Solutions is the world's leading provider of large-bore diesel and gas engines and turbomachinery.

After studying Marine Engineering in Rotterdam, Netherlands, Lex started his career in 1990 sailing onboard tankers on global trading routes. In 1996, he joined MAN B&W as sales representative for the Benelux market. After 10 years at the company, he established MAN Diesel & Turbo Benelux and became a member of the management team. In his role as Director of Sales, he was responsible for sales for the complete product portfolio and services for turbomachinery in Belgium, the Netherlands and Luxembourg.

In 2011, Lex moved to Augsburg, Germany to become the Head of Global Sales Medium Speed. His current position since January 2015 is Head of Four-Stroke Marine.

 <https://man-es.com/marine>

"Digitalisation benefits many areas of marine engine performance and sustainability."

Powering the next generation of ships



Courtesy of ABB

Interview with **Daniele Patuelli**, Vice President Marine & Ports Italy, ABB



At ABB, we believe the next generations of ships will be electric, digital and connected. This vision drives our Marine & Ports business, as we strive to equip the marine industry with solutions that maximise the full potential of vessels and promote safe, efficient and sustainable shipping globally. This is nothing new. In fact, we have provided electrical systems for vessels for more than 110 years. Today, well over 1,300 ships use ABB's electric system, and a wide range of vessels depend on our Azipod® propulsion, from cruise ships to icebreakers and mega-yachts. An electrical backbone coupled with the latest automation and control systems will bring new levels of efficiency and reliability.

As well as having our own marine- and ports-specific products and solutions, we integrate products from other ABB business units into our solutions. From the perspective of the end customer, it is an advantage from the supply chain and quality standpoint to have a wide range of products and solutions under the same brand. Additionally, the cross-industry ABB Ability™ decision support software suite gives vessel

crews the right tools to monitor and optimise vessel efficiency. It also helps owners and operators to optimise route planning, comply with environmental regulations and improve the safety of both crew and cargo.

This type of synergy and collaboration also supports our research and innovation activities. ABB is actively involved in collaborative development of fuel cell technology for marine applications, including research, testing and a pilot installation implementation. Recently, ABB signed an MoU with Ballard Power Systems on developing the next-generation fuel cell power system for sustainable marine e-mobility. Together, we will leverage the existing kilowatt-scale fuel cell technologies and optimise them to create a pioneering megawatt-scale solution suitable for powering larger ships. We are also working with Scandinavian research organisation SINTEF to explore the viability of fuel cells as a main energy source for ship propulsion on both cargo and passenger ships.

Speaking of battery power, it is evident that it is establishing itself as a force

for change in an important part of the shipping market. In November 2018, the largest emission-free ferries in the world officially went into service, after the conversion from diesel to all-electric power of the ForSea vessels Tycho Brahe and Aurora. The vessels are fitted with a 4160-kWh battery to propel them on the 4km crossing between Helsingborg, Sweden and Helsingør, Denmark. Could we soon be seeing something similar in cruise ships?

Investment in sustainable technologies is essential to all sectors of the transport industry. Global pressures of climate change, emerging-market economic development and growing urbanisation demand new and more environmentally sustainable ways to move people and goods. We are determined to deliver safe, efficient and environmentally friendly solutions to vessels sailing anywhere in the world.

As ships become more digital and more connected, some people are asking whether we might have fully autonomous ships in the future. We believe that an autonomous vessel is not necessarily unmanned. That said, it may have a periodically unmanned bridge under certain strict conditions. It will take a while until technology is capable of doing all the things that humans currently do to a high enough standard.

However, that doesn't mean we cannot use technology to augment seafarers' skillsets and enhance the overall safety of marine operations. ABB is already providing solutions where technology is used alongside competent ship's officers to improve decision making – ABB Ability™ Marine Pilot Vision situational awareness solution and ABB Ability™ Marine Pilot Control next-generation dynamic positioning system. These solutions were trialed in the Suomenlinna II passenger ferry in November 2018.

The marine market is, without a doubt, very challenging. However, we retain a strong sense of family at our workplace. Our company truly values people on a personal level, which makes the hardest days just as great. There is a genuine spirit of cooperation and shared goals, all revolving around helping and



supporting our customers. It is exciting to be involved in driving innovation and developing new technologies that maintain customers' assets throughout the entire lifecycle.

Maintaining high-quality products and services in our business means having consistently high-quality deliveries. This is obtained partly by working in close cooperation with certification societies. Among these, RINA helps us to maintain the highest standards of quality and efficiency in our product and solutions. Our collaborations range from Marine Academy training courses to the certification of upgraded automation systems and verifications to renew our ISO 9001:2015 certificate. We look forward to many more.

“We can use technology to augment seafarers' skillsets and enhance safety.”

BIOGRAPHY

After completing a degree in electrical engineering, Daniele Patuelli joined ASEA Automation commissioning department in 1986, shortly before the company's merger with Brown, Boveri & Cie to form ABB. After some years in the field and a sales role in the metallurgical sector, in 1997 he took over responsibility for building up the Marine Service organisation in Italy. In 1999 he opened several service stations, including in Genoa, Venice, Naples and Malta, developing the turbocharging service business.

Mr Patuelli became Global Service Manager for Automation and Control Systems in 2014. In this role, he is responsible for supporting and developing new solutions with a focus on the lifecycle of automation products and solutions for the marine market. In parallel, he continues to perform his additional role of Vice President of the Marine & Ports business unit.

 www.abb.com

Clear visions for cruise ports

The number of passengers taking cruises in the Mediterranean is growing as more and more people realise the attractions of this type of holiday. And as the cruise market grows, so does the size of cruise ships. Many of the larger vessels on order right now will be sailing around the Mediterranean in the coming years.

Where will these ships dock? The most important factor for cruise companies is, of course, the port's strategic location near attractive tourist destinations. This is a major advantage for our two ports, La Spezia and Marina di Carrara. They are set in the northern Tyrrhenian Sea, in the Gulf of Poets, so-called because of the great number of poets and writers drawn to the area's dramatic beauty. Passengers can disembark for day trips to historic Tuscan cities like Florence, Pisa and Lucca, and to the quarries of Carrara, capital of the marble trade. Close by is the Cinque Terre national park with its five car-free coastal villages, plus other towns, beaches, cliffs and diving sites. These features make our ports very

interesting for all cruise companies, big and small.

Italy is of course a prime destination in the Mediterranean, and we are not the only port system located in an area of interest for tourism. But larger ships need ports with adequate piers and drafts, as well as facilities for handling the corresponding larger number of passengers. This will be the major challenge for cruise companies operating not just in this area, but all over the world.

In fact, our ports were not originally designed for the cruise market. La Spezia is mainly for container ships, while Marina di Carrara specialises in breakbulk and project cargo. As a result of a strong increase in cruise traffic over the last two years, we decided to consider some major infrastructure interventions to expand our port facilities with large cruise ships in mind. And since the major cruise companies have an interest in developing solid and sustainable facilities for their ships, we invited them to the table.

Interview with
Carla Roncallo,
President, Eastern
Ligurian Sea (La
Spezia & Marina
di Carrara) Port
Authority



Marina di Carrara, courtesy of the Eastern Ligurian Sea Port Authority

In La Spezia, we presented a successful project financing proposal by Royal Caribbean, MSC and Costa Cruises to develop new facilities for cruise ships, including a new terminal building and the redevelopment of La Spezia's waterfront. We are in the process of discussing improvements to cruise ship facilities within Marina di Carrara port as well.

It hasn't been a totally simple process. I mentioned the beautiful area around La Spezia and Marina di Carrara, and in particular its historic and natural attractions. It is not surprising that there is often controversy about large cruise ships calling at ports in sensitive areas. However, rather than see the cruise industry as a threat, I believe it is more constructive to analyse the risks and see how best they can be managed.

In terms of environmental risks, the cruise companies we work with have strong policies and systems in place to reduce emissions, for example scrubbers to remove sulphur oxides. Environmental laws are becoming ever stricter, approaching full protection.

The biggest issue in my opinion is the increased number of people visiting historic areas like La Spezia's city centre or small villages like those in Cinque Terre. Again, I believe here we should work together with cruise companies and industry associations like the Cruise Lines International Association and MedCruise. By analysing the issues openly and collaboratively, we can come up with serious and effective policies to mitigate these risks.

This is something my team and I at the Eastern Ligurian Sea Port Authority are focused on doing. Coordinated by the Secretary-General, we are all working efficiently and cohesively to achieve the successful development of our ports for both cruise companies and communities. I think the results of our work are already visible and will become even more so in the next years, thanks to these new investment projects.

As President of the Port Authority, it is a complex task to deal with so many

local and international stakeholders and to juggle all the different aspects: logistics, intermodal transport, rail traffic, infrastructure... We are very satisfied to have such a strong partner as RINA, with whom we have worked very well in various sectors. So, while



this role is challenging, I greatly enjoy the variety and am truly looking forward to seeing the development of a strong and sustainable cruise business in La Spezia and Marina di Carrara in the next months and years.

BIOGRAPHY

Carla Roncallo is President of the Port System Authority of the Eastern Ligurian Sea, which combines the ports of La Spezia and Marina di Carrara. She has a strong background in public administration, with a particular focus on public works projects. She started her career in 1986 at ANAS, the Italian state-owned company for motorways and highways, where she worked in various regions and held the position of District Head for Liguria between 2007 and 2012. She subsequently became Manager of the Infrastructure and Ports Sector of Liguria. In November 2016, she was appointed Commissioner of the Port Authority of La Spezia before taking on her current role.

“As the cruise market grows, so does the size of cruise ships. Where will they dock?”

 www.adspmarligureorientale.it

What's next for China's cruise market?

The explosive growth we saw in the early years of China's cruise sector is a thing of the past. In 2018, the number of cruise ships calling at Chinese ports declined 17 percent compared to 2017. Now is the time not to panic, but to analyse the situation and identify where the opportunities lie. It is natural that as the market matures and transforms from simple cruise tourism to a solid cruise economy, this early volatility is entering a period of optimisation and adjustment.

Despite the sharp decline in the number of ships last year, the number of passengers remained almost constant with a fall of only 1.2 percent. Cruise ships are getting larger and the destinations are becoming more concentrated, with the top five cruise ports – Shanghai, Tianjin, Guangzhou, Xiamen and Shenzhen – receiving nearly 80 percent of all cruise ships and 93.5 percent of passengers. Thanks to huge investment over the past decade, these ports have significantly improved their capacity and service quality for large cruise ships.

Investment has also fuelled the

development of a cruise ship construction industry in China, with major players like Shanghai Waigaoqiao Shipyard entering the market. As well as building new ships, China's domestic cruise companies have been actively acquiring second-hand ships to convert.

So far, Chinese cruise passengers remain mostly elderly groups and families, with short voyages dominating the market. There are signs that this is gradually changing, and we believe that the proportion of individuals taking a cruise will rise. The average voyage length will become longer and routes will stabilise, spreading out naturally from Southeast Asia to international destinations.

Two things will support this trend. First, the tailoring of ships, brands and facilities to meet the needs of different market segments within China. China's huge size and diversity in lifestyle, consumption habits, food, drink and language make this essential. Local cruise companies hold the advantage here, with a home-grown ability to develop cruise concepts with

unique Chinese elements that appeal to different segments of domestic tourism. Secondly, quality is the main objective for most cruise operators, ports and travel agencies in China right now – not quantity.

International cruise lines that have, until now, mainly been testing the waters in China will have to work hard to compete. And that is exactly what Costa Cruises is doing with the launch of the Costa Venezia, the first ship by an international cruise line tailored specifically to the Chinese market. Other global players will no doubt be watching the market's reaction to the Costa Venezia with great interest. With China's strategic attractions – a vast coastline and population, a growing middle class and high-speed railways connecting inland cities to cruise ports – and Costa Cruises' strong brand and many years of operational experience, we believe the Costa Venezia will launch a new phase in the Chinese cruise industry.

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Courtesy of Costa Cruises

How to streamline ship surveying

Surveying the newbuilding of cruise ships is always an exciting challenge. Firstly, modern cruise ships are often highly customised and innovative, pushing boundaries in terms of size, environmental performance and technological solutions. Secondly, the shipyards chosen for these complex newbuilding projects are – of necessity – technically advanced and well organised. Lastly, the tight schedules and strict regulations and standards mean that surveying operations have to be thoroughly streamlined and efficient.

The AIDA Helios project exemplifies all three of these elements. Originally conceived for AIDA Cruises, a brand of Carnival Corporation, the platform subsequently expanded to other brands including Costa Cruises, P&O Cruises and Carnival Cruise Line.

RINA was awarded the contract for the supervision of the nine giant newbuildings plus one option, based on the AIDA Helios platform. The ships really push the boundaries. They are over 180,000 GT with a capacity of around 6,000 passengers plus crew. The world's first LNG-fuelled cruise ships, they are packed with innovative features such as 420-person lifeboats and a beach club with an air-cushioned roof.

The first ship, AIDAnova, was built and delivered at Meyer Werft shipyard in Papenburg, Germany. Even faced with this challenging project, the yard lived up to its reputation as one of the most advanced shipyards in the world. Each construction phase was organised and completed to a tight schedule, not unlike the assembly line of a car manufacturer but on a larger scale. Each of the ships must be built within a 24-month timeframe so the schedule has very little room for manoeuvre.

The second ship, Costa Smeralda, is currently under completion in Meyer Turku shipyard in Finland. There is an additional area at Meyer Rostock in Germany where the FERU (Floating Engine Room Unit) and LNG tanks are built.

Supervising these complex and fast-paced operations requires the surveying team to be equally well-

other, but it makes sense for them to coordinate closely due to the ships' common platform. And while technology helps greatly to increase efficiency in surveying operations, some things cannot be automated. A RINA project manager therefore makes sure the teams' activities are in harmony and that work is neither duplicated nor missed, as well as coordinating with experts from other



organised. Two RINA teams are dedicated to supervising the various stages of the newbuilding process, one in Papenburg and one in Turku. Each has a team leader and 6–8 surveyors and specialists with a range of experience, who take care of activities related to the hull outfitting, engine and electrical automation tasks. The LNG system is supervised closely by specialist gas experts. Surveyors from RINA's Hamburg office are also at Rostock to supervise construction of the FERU and LNG tanks.

Flexibility and coordination are essential. The Papenburg and Turku teams are independent of each

RINA offices where needed.

When all three elements come together – innovative ships, advanced yards and streamlined surveying operations – the result is the timely delivery of a spectacular new cruise ship. We look forward to seeing Costa Smeralda joining her sister later this year.

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Cruises calling at La Spezia

Italy's natural attractions, heritage sites and relaxed lifestyle make it a popular tourist destination. However, companies that wish to develop business initiatives in Italy's travel and tourism sector first need to navigate its complex administrative and legal frameworks.

A recent cruise industry initiative around La Spezia port (see page 10) is the perfect example of how a multidisciplinary approach that takes into account all stakeholders' interests can lead to success.

The booming cruise industry in the western Mediterranean needs more port infrastructure, and it needs it fast. As more and more people choose to take a cruise, they need to be distributed over a greater number of ports and different cruise routes.

Royal Caribbean International, MSC Cruises and Costa Cruises jointly identified the Italian port of La Spezia as the ideal location to implement this strategy. They selected RINA as the lead consultant for a challenging project to promote La Spezia as one of the top cruise ports in the area.

La Spezia lies in the Gulf of Poets in

the northern Tyrrhenian Sea, a short drive from Florence and Pisa. It is near the Cinque Terre national park and UNESCO World Heritage Site, as well as the coastal towns of Portofino and Santa Margherita Ligure. Besides the strategic geographical position, La Spezia was an attractive choice thanks to the Port Authority's plans to strengthen its cruise business and return part of the fine waterfront area to the city.

RINA took advantage of its multidisciplinary skill base to help develop a project proposal that was consistent and coherent from a technical, financial and administrative point of view.

This pioneering initiative is the first ever public-private partnership scheme in the Italian cruise terminals sector. It aims to achieve an exclusive cruise service concession in the port of La Spezia, through private investment amounting to USD 46 million in an area that will be transferred from the port to the city.

The Port Authority will finance and build the cruise pier, while private investment will cover construction of the terminal building plus one building

with cruise-related commercial activities and the corresponding section of the urban waterfront.

Thanks in part to RINA's multidisciplinary approach, the interests of all stakeholders converged. Private investors and cruise companies can quickly develop their business, the Port Authority can implement its development plans and the city gets back a valuable area of land. La Spezia is a win-win situation.

Sensitive topics such as environmental sustainability and urban mobility required detailed attention and negotiation. The solution is a fusion of cruise and non-cruise functions that aims to prevent conflicts and achieve fruitful integration.

La Spezia received just 500,000 passengers in 2014 and is expected to welcome over 1,200,000 by 2030. Reception of the project proposal by the authorities has been positive, showing that an integrated approach and local knowledge are key to achieving advantages for all.

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RINA DOLPHIN for quieter ships



Ships make a lot of noise. Much of the noise is emitted underwater, so passengers and the wider public are often unaware of this. Marine mammals, on the other hand, are very much aware. Although the long-term impacts of noise on marine mammals are not yet known with certainty, it is clear that increased noise interferes with an animal's ability to hear. This has serious implications for reproduction and survival.

Ocean noise is a global problem, especially since the amount of shipping is increasing and expecting to expand into new areas such as the Arctic. It is also a growing problem. The International Workshop on Shipping Noise and Marine Mammals, held in Hamburg back in 2008, highlighted that with the advent of modern shipping,

low-frequency ocean noise has been doubling approximately every decade.

These days, it has finally been recognised that sustainable growth and preserving our environment are among humanity's biggest challenges in the next years. In the shipping sector, the IMO, EU and other regulatory bodies have recently raised the bar, with the aim of making the transport of goods and passengers significantly more environmentally friendly.

Although it receives less attention than other issues such as emissions, noise reduction is crucial to improving the sustainability of cruise ships and lowering their environmental impact. As an industry, we have to reduce the amount of incidental underwater noise from ships to mitigate the impacts of

noise on marine mammals. To achieve this, we need a global effort to reduce the contributions of shipping to ambient noise in the low-frequency (10–300 Hz) range by 3 decibels in 10 years and by 10 decibels in 30 years, compared to current levels. The only way to achieve this goal is to reduce the amount of noise produced by individual ships.

RINA DOLPHIN is an additional class notation that demonstrates particular attention to the marine environment. Specifically, the RINA DOLPHIN notation sets two limits for commercial vessels:

- DOLPHIN Transit, for normal seagoing conditions. This is aimed at reducing overall global noise from shipping.
- DOLPHIN Quiet, for ships travelling at 10 knots. This applies to areas of high environmental importance, for example areas with a high concentration of marine mammals.

DOLPHIN noise limits are set in accordance with underwater radiated noise measurements of ships and the results of research projects on this topic.

The benefits of reducing underwater noise are significant, and not only for in terms of ensuring the long-term survival of marine mammals. There are also reputational benefits and, in some cases, commercial advantages such as the Port of Vancouver's discounted harbour rates for vessels that meet voluntary environmental best practices including the RINA DOLPHIN class notation.

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Targeting cruise ship cybersecurity

For better or for worse, all modern ships rely on onboard digital systems connected with each other and with the shore. The advantages are great, particularly for cruise ships with complex operations and large numbers of passengers. But equally great are the risks of cyber attacks or unintentional misuse.

How can shipowners and operators best protect themselves against maritime cyber risks and vulnerabilities? The International Maritime Organization (IMO), as well as other national and international institutions, has been thinking about this question with increasing interest and concern. As technology speeds ahead, it is becoming more and more urgent to find the right answer to keep crew, passengers, companies and information safe from cyber risks.

In truth, there is no single right answer. Cyber threats may come from anywhere and anyone: nation states, terrorists, cyber criminals – whether organised or opportunistic – competitors, activist groups and in many cases careless or malicious insiders. All have different aims and ways of attacking a ship's cyber systems. Each cruise or shipping company, and each ship, faces different risk scenarios that need to be outlined carefully on a case-by-case basis.

But although specific cyber risk management plans address different needs, they must all be based on a solid, common and comprehensive approach. At RINA, we consider cyber risk management to be a strategic matter and an essential part of an organisation's risk management process, involving all staff both on board and on shore. When applied to ships, it relates to two main issues: protection of a ship's essential systems

and protection of information.

To achieve these two cyber risk management goals, it is not enough to implement only technological solutions such as encryption, separation of trusted and untrusted networks, firewalling and continuous monitoring through intrusion detection/prevention systems. Just as important are company-specific awareness and training, contingency plans and processes such as software updates and data backups.

To help shipowners and others in the maritime industry control their specific cyber risks, RINA offers a comprehensive range of services.

- The "Cyber resilience" additional class notation, available since January 2019, can be applied to both ships in service and new builds. Based on NIST Cybersecurity Framework concepts, it assesses efforts by shipowners and operators to minimise and manage

cybersecurity risks and support safe and secure ship operation.

- Gap analysis based on recognised industry standards and government cybersecurity regulations.
- Support for companies in implementing IMO Resolution MSC.428(98) on maritime cyber risk management in safety management systems.
- A variety of tailored training courses on cyber risk management.

In addition to client-specific services and guidance, RINA has also published free guidelines for assessing marine and offshore security risks on the RINA web portal. These provide an overview of cyber threats and actions essential to maintain the security of on-board systems on cruise liners as well as other ships and offshore structures.

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Is data the new oil?

Think of today's tech giants – Google, Amazon, etc. – and industry-leading companies. It is data that is driving business and fuelling growth for these companies. Technology now enables the automated, cost-efficient collection of increasing amounts of data, both in the physical and digital worlds. By

today's highly competitive commercial environment.

RINA DIGITAL SHIP is a new additional class notation that will be of interest to shipowners who understand the importance of collecting data related to their assets and making operational decisions based on these.

system. The system should enable the automated collection of navigation and machinery data and their transmission to shore. This allows the ship to be continuously monitored according to a minimum set of parameters. The collected data should be filtered to eliminate anomalies and averaged using statistical techniques that



analysing and acting upon accurate and timely data, company leaders are able to take better business decisions and continuously enhance their commercial strategies.

Companies in the shipping and cruise sectors are slowly following their counterparts in the civil aviation and automotive industries and coming around to the data revolution. It takes time, because transforming a company is not only about adopting new technologies. It needs a change in mindset in employees at all levels, embracing more transparency in decision-making and more efficiency in everyday tasks. Continuing to do things the old way simply because “we have always done it like this” is not the mindset of successful companies in

There are countless situations where data can help make better decisions in shipping. A common scenario is measuring the effects of a refitting action carried out during a dry dock. By closely monitoring different aspects of the ship's performance before and after, the owner can clearly understand the increase in efficiency and the payback time of the refitting operation. Another example is measuring the level of hull degradation to see if the ship can continue sailing or should stop for hull cleaning. These types of decision should be based on accurate data, not on rough estimates or dates in a calendar.

The DIGITAL SHIP additional class notation is assigned to ships fitted with an automatic data collection

depend on the type of parameter. This must take place over a timeframe of not more than 10 minutes.

To maintain the DIGITAL SHIP additional class notation, the data collection system should be surveyed yearly via a remote connection to the RINACube digital platform. The process is simple, fast, efficient and based on data. Which is exactly what we hope to see more of in the cruise sector, and other shipping sectors, in the months and years to come.

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New class notation for Man Overboard



A passenger falling overboard is both serious and, sadly, not uncommon. Whether it is accidental, intentional or malicious, it is very often fatal. Even with well-trained crew and clear procedures to handle man overboard emergencies, search and rescue operations are always complex. Most of the time, this is due to the significant delay between the person falling overboard and the crew being alerted.

One way to make emergency man overboard procedures more effective – and potentially save lives – is to automatically detect the person falling overboard and trigger immediate action.

As cruise companies worldwide explore available technologies for detecting passengers or crew falling overboard, RINA has developed a dedicated additional class notation, Man Overboard Detection System (MOB). Effective since November 2018, the MOB class notation is designed to be a benchmark for the implementation of

MOB detection systems onboard ships and to address concerns about the reliability of these systems.

The notation covers the main features of the system, such as how it monitors the ship's perimeter, the main design specifications and layout, MOB event alarms and validation, as well as presentation of the incident data to decision-makers.

Following a review of drawings and technical manuals, a test campaign is carried out onboard to check the reliability of the system from both a technical and a procedural point of view. This involves dropping mannequins into the water in different light and environmental conditions and assessing MOB audible and visual alarms. The test also includes simulation of system failures such as sensor disconnection and power failure. The main objectives during the testing are to evaluate the probability of detecting a person falling overboard, the potential for false alarms, and in general the accuracy and effectiveness of the system.

RINA's experience with systems already installed onboard ships is that there are technologies on the market that fulfil all the requirements. These have a detection rate of nearly 100 percent and a very low average frequency of false alarms. The improvement in the frequency of false alarms is thanks to advanced video analytics that are able to filter out common objects that are not a real MOB, like seagulls, cigarettes, light reflections and waves.

The RINA MOB additional class notation is not only focused on the system itself, but also includes the implementation of onboard safety procedures, training for relevant personnel and a maintenance plan in line with best practices.

Following a successful documentary review and testing process, RINA can award the MOB additional class notation or issue a certificate of compliance for a system installed on a specific ship.

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Making cruise ships safer and greener

Lessons learned from past experience, research studies and ever-increasing environmental consciousness among the international community have all boosted the development and adoption of stricter safety rules and environmental requirements in the marine industry.

Similar to the Safe Return to Port regulations, which in 2010 introduced a completely new approach to the design and construction of passenger ships, the forthcoming 2020 SOLAS amendments represent a step change in damage stability regulations.

According to the new damage stability formula, the required subdivision index

participate in a damage control drill at least every three months on both new and existing passenger ships. They prohibit new passenger ships from navigating with any watertight door continuously open. They also require an evacuation analysis – previously required for ro-ro ships only – to be carried out for all new passenger ships early in the design process, taking into account the revised IMO Guidelines (MSC.1/Circ.1533).

Moreover, passenger ships' environmental performance is set to be further enhanced by MARPOL amendments. From 1 June 2019, new passenger ships are not allowed to discharge sewage in the Baltic

chlorofluorocarbons will be definitively prohibited, but also and especially because the sulphur content limit in any fuel oil used on board is reduced from 3.5% to 0.5%. This implies switching to compliant fuels (i.e. traditional fuels with 0.5% sulphur content or alternative fuels like biofuels, LNG or methanol) or the installation of an approved exhaust gas cleaning system, commonly known as a scrubber.

Not only the use, but also the carriage of non-compliant fuel is prohibited from 1 March next year, except for ships fitted with scrubbers. Shipowners therefore need to carefully plan the management of high-sulphur fuels during 2019, taking into account that



R – representing the ship's capability to remain stable and afloat in the event of flooding after a collision – significantly increases. It no longer depends on the length of the ship but only on the number of people on board and is the same for all passenger ships with a capacity of up to 400.

The 2020 SOLAS amendments also require that crew members with damage control responsibilities must

Sea Special Area, unless they have in operation an approved sewage treatment plant whose effluent does not produce visible floating solids nor cause discoloration of the surrounding water. This requirement will be applicable to existing passenger ships too, but from 1 June 2021.

1 January 2020 is an important date for the marine industry, not only because installations containing hydro-

by the end of the year such fuels can no longer be used and any remaining fuel on board will have to be de-bunkered by 1 March 2020.

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Modelling safety on cruise ships

You don't have to be an experienced seafarer to understand that equipment failure could impact the safe operation of a ship, that collision and grounding are serious risks and that the sea is a dangerous environment. But do cruise shipowners and operators always fully understand the potential implications of cumulative failures – when several things go wrong at the same time? What information is needed to decide which safety controls to put in place? How can an owner minimise capital expenditure on safety-related investments while maximising safety outcomes?

The ISM Code requires the identification of “equipment and technical systems” whose “sudden operational failure ... may result in hazardous situations”. A typical way for shipowners and operators to identify safety-critical systems and risks is to use a regular hazard log. However, there is growing awareness that hazard logs are too simplistic for the complex risks of a seagoing voyage. Two techniques often used in the defence industry can supplement this approach and provide greater evidence, justification

and accuracy around safety-related decision-making.

Bowtie analysis allows shipowners and operators to more clearly visualise the relationship between threats, hazards, consequences, safety controls and barriers. This helps them to understand the functional safety status of a vessel and the integrity of the controls and barriers that prevent hazardous events occurring.

The technique is used in a wide range of safety-critical industries, such as the closely regulated defence aviation sector, to articulate potential safety, financial and socio-economic consequences. The aim of bowtie modelling is not to provide a high level of detail, but rather a strong framework for safety-critical decision-making at sea.

The ISM Code also requires the analysis and prioritisation of fault conditions in key systems. Again, the situation is more complex than a hazard log allows. The failure of a propulsion engine may be quantified by its impact on resilience or cruising speed. But how does this contribute to “whole-vessel” hazards?

In the defence sector, a functional safety model is used to capture the relationships and interdependencies between equipment, systems and reversionary modes. One top-level hazardous event, such as grounding, is underpinned by fault trees and event trees that allow users to understand the impact of a fault – or the cumulative impact of multiple faults – on safe and efficient vessel operation. In addition, this technique enables users to simulate changes in equipment conditions in order to focus investment in areas that provide the greatest positive impact.

RINA has been building, maintaining and managing safety models for both defence and non-defence applications for years. Our experience shows that bowtie analysis and functional safety models are two techniques with the potential to help cruise shipowners and operators make informed, risk-based decisions and focus safety-related investment on areas that will have the greatest impact on their risk exposure, liability and bottom line.

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Fire resistance and new ship designs

Recent evolutions in yacht and cruise ship design trends, in particular with designs that involve very large and curved windows, have implications for fire safety. RINA has been carrying out tests on materials involved in the structural fire protection of ships since 1965. In the last years we have seen growing demand for our more specialised tests for these types of large, curved windows, which are often set in aluminium structures.

The fire resistance and fire reaction tests we carry out are mostly related to the certification of products for passenger ships in accordance with the EU Marine Equipment Directive. The majority of the fire resistance tests are on doors and windows. Special tests for windows include the hose stream test, which involves heating the glass to a certain temperature before spraying it with water from a hose.

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