

Cruise industry leaders
look ahead

River and expedition cruises:
a new frontier

How to avoid
cyber risks

SEAVIEW



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MAGAZINE

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Editorial

Welcome to Sea View, RINA's annual magazine focused on the cruise market. Sustainable innovation and close collaboration are recurring themes as we explore the opportunities and challenges that lie just over the horizon. This issue, we offer insights into China's booming cruise market and the fast growth of niches such as river and expedition cruises. Interviews with leading players in the industry reveal more about the future of LNG-fuelled cruise ships and innovations in cruise ship design and renovation. On the technology side, we provide a practical framework for combating cyber security threats, plus options for enhancing fleet performance monitoring through our InfoSHIP® EGO system. Thank you to CLIA Europe, Carnival Corporation, Holland America Group, Genova Industrie Navali and GEM Cruise Ship Design for their contributions.

Cruising smoothly into the future



Courtesy of Fincantieri

Past, present and future, there's much to be positive about in the cruise sector. It has continued to expand globally, and is predicted to carry on growing fast. It is resisting the difficult market conditions currently experienced by other shipping sectors. It's also winning on land - growth in the cruise sector outpaces land-based holiday options by a wide margin. Looking forwards, we see huge potential in the fact that cruising still represents a small percentage of tourism worldwide.

Why is the cruise sector expanding so successfully, from 15.8 million passengers in 2007 to an estimated 25.3 million in 2017, according to the CLIA (see page 4)? One reason is that younger generations are embracing cruising like never before, rating it better than all-inclusive resorts, holiday home rentals, camping and land tours. As these young people grow up, there's every reason to expect they will continue exploring the seas with their families and after retirement.

Looking east, the Chinese cruise market is booming (see page 2). Its phenomenal growth brings with it new customers, destinations, ports and possibilities for both international and Chinese cruise companies.

A third reason is diversification. Niches such as river cruising (see page 17) and expedition cruising (see page 15) are opening up fresh markets. Two new expedition ships, the "Celebrity Xperience" and "Celebrity Xploration", will explore the Galapagos in 2017. Up in Alaska and British Columbia, Lindblad Expeditions has partnered with National Geographic to operate the state-of-the-art "National Geographic Quest".

The industry's rapid growth is boosting cruise shipbuilding. The cruise ship order book for 2017 stands at 26 new builds, totalling more than US\$6.8 billion (€6.33 billion). By 2026, we can expect nearly 100 new cruise ships at an estimated investment of US\$53 billion (€49.4 billion).

This good news brings capacity issues. Major cruise shipyards have been full for years, with some consolidating in order to handle demand for larger ships. Other yards have entered or re-entered the sector, often aiming at the fast-growing market for river, expedition and smaller luxury ships. We are also excited about China's long-awaited entry into the cruise shipbuilding sector.

Rather than order new ships with delivery dates after 2021, the trend is now to upgrade and convert existing ships to meet rising environmental standards and customer expectations (see page 12). Major brands including Holland America Line and Norwegian Cruise Line are investing significantly in fleet-wide upgrades. Crystal Cruises' luxury "Crystal Symphony" will also get a makeover this year, while Silversea Cruises' "Silver Cloud" is set to embark on a new life as an expedition vessel.

Nobody can predict with certainty what lies beyond the horizon. For cruising, however, it looks like smooth sailing, favourable winds and many new places to explore.

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China's booming cruise market

The cruise ship market in China continues to develop rapidly. In 2016, the number of Chinese travellers to take an overseas cruise exceeded two million for the first time. This fast-growing interest in cruising is stimulating other areas of the country's cruise industry, from shipbuilding to port construction.

Impressive statistics were issued recently by the China Cruise & Yacht Industry Association (CCYIA). In 2016, mainland China's ten major port cities – Dalian, Tianjin, Yantai, Qingdao, Shanghai, Zhoushan, Xiamen, Guangzhou, Haikou and Sanya – welcomed 996 cruise ships, a 58% year-on-year increase from 2015. Of these, 913 were calls at homeports, up 69% from the previous year, while calls at visit ports fell 8% year-on-year to 83 voyages.

According to the CCYIA, the above-mentioned ten port cities alone received 2,261,400 Chinese and foreigners travelling by cruise ship in 2016. This represents an 82% increase from the previous year. Among these travellers, the number of Chinese tourists by outbound trip reached 2,122,600, up 91% from 2015.

The number of foreign travellers entering China by cruise ship was 138,700, up 8%. The figures are doubled if one counts outward and return visits.

China's booming cruise market is spurring rapid development in all sectors of the country's cruise industry. In November 2016, Shenzhen Prince Bay Cruise Homeport was officially opened in Shekou, Shenzhen, and its three major cruise berths were put into operation. Part of a transportation hub with extensive sea, air, road and rail links, it will be the homeport of Silversea's "Silver Shadow". The luxury cruise ship is the first of the Silversea fleet to have its homeport in China, and will operate several routes from the port.

First opened in 2007, the Sanya Phoenix Island International Cruise Terminal in Hainan is currently undergoing major expansion works. With an estimated annual passenger throughput of one million people per year by 2021, it has the potential to become the largest cruise port in Asia.



Courtesy of Diamond Cruise



Courtesy of Diamond Cruise

Reliable sources of finance are crucial to this rapid development. The first cruise industry development fund in China was officially established on 28th December 2016. It will focus on investment in China's cruise ship design, construction, operation and supporting services, in order to promote the Chinese domestic cruise industry.

The fund is led by the China State Shipbuilding Corporation (CSSC Group), and was launched jointly with China Construction Bank, Agricultural Bank of China, Bank of China, China Everbright Bank and Industrial Bank. The first phase is 30 billion RMB. The second phase will be decided in accordance with the needs of the development of the Chinese cruise industry.

China's domestic cruise shipbuilding industry is also going according to plan. In July 2016, CSSC Group and Italian shipbuilding company Fincantieri - Cantieri Navali Italiani officially signed a joint venture agreement to establish the CSSC Fincantieri Cruise Industry Company. In September 2016, CSSC Group, Carnival Corporation and Fincantieri jointly signed a letter of intent to build 2+2 units of 133,500 GT large cruise ships in Shanghai Waigaoqiao Shipbuilding Co., which belongs to the CSSC Group. Classed by RINA, the parent vessel of the project is currently under construction in the Fincantieri shipyard in Trieste, Italy.

Formed in April 2016 from a partnership between three state-owned enterprises, the Fujian Xiamen Luxury Cruise Investment Company plans to build three 75,000 GT cruise ships in Xiamen. Shanghai Merchant Ship Design And Research Institute (SDARI) will act as a general contractor for the project's design, while Finnish design company FORESHIP is expected to complete the conceptual design in early 2017.

China Travel Service (CTS) is planning to build one 50,000 GT cruise ship. Currently, the project is at the stage of market research and scheme demonstration. In a later stage, CTS intends to build two 75,000 GT cruise ships as part of a joint venture with China Communications Construction Company (CCCC) and the Sanya government.

With RINA's support, after the successful delivery of the "Glory of the Seas" conversion project, the Shanghai-based Diamond Cruise International Company approved a plan to build one 37,000 GT cruise ship in a Chinese shipyard. Currently, the project is at the stage of design verification. The owner has announced that the vessel will be classed with RINA.

RINA China and RINA Cruise Ships Excellence Centre have been heavily involved with all of the above-mentioned cruise projects, providing crucial technical support and consultancy services. This includes significant amounts of training. Retired senior experts from Fincantieri, RINA's site manager in the Mitsubishi cruise newbuilding project, as well as experts in the RINA rules and regulations department, are among those who have provided training and workshops to clients.

RINA China has also signed cruise cooperation agreements with the Wuchang Shipbuilding Industry Group and Hubei Chinese Institute of Marine & Offshore Engineering Company. A strategic cruise cooperation agreement is in place with China's largest design company, SDARI, deepening collaboration in the cruise field. Furthermore, RINA has submitted a cruise consultancy service proposal plan to the Xiamen and CTS cruise projects.

We at RINA China believe 2017 will be a remarkable year in the Chinese cruise market and shipbuilding industry. We are proud to have had some achievement in this exciting field and are looking forward to the future.

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Kyriakos Anastassiadis

Sustainable growth benefits us all

As the world's largest cruise industry trade association, the CLIA's membership spans cruise lines, ports, suppliers, travel agencies and more. In Europe and around the world, we are united around a common goal: to manage the rapid growth of the cruise industry safely, sustainably, and to the benefit of travellers, industry stakeholders and local communities.

The cruise industry is young but growing at a phenomenal pace. Almost 25 million people took a cruise in 2016, continuing an upward trend that has seen ocean cruising grow 62% over ten years. In the context of vacation numbers in general - 1.3 billion people in 2016 - cruising still has huge potential.

With this rapid expansion come new challenges. One is the sheer growth of both ships and fleets. The cruise ship order book is at a record high of 26 new builds for 2017. Ocean-going ships are also getting larger, often over 120,000 GT and carrying 4,000 passengers or more. Ports may need to upgrade their infrastructure, with issues ranging from supply and security to the logistics of getting passengers efficiently on and off ships.

In Europe in particular, these huge cruise ships regularly dock in historic ports in the heart of a city. It's inevitable that members of the local community sometimes react defensively and pose questions. How sustainable are the ships? What is the environmental impact? How about congestion caused by thousands of passengers disembarking en masse?

We can answer truthfully that modern cruise vessels are at the cutting edge of sustainable ship design and brim with eco-friendly technologies. Many new builds will be fuelled by LNG, for example, and often exceed Europe's strict environmental standards. Moreover, cruise ships are disproportionately blamed

BIOGRAPHY

Kyriakos (Kerry) Anastassiadis is the CEO of Celestyal Cruises and the current Chairman of CLIA (Cruise Lines International Association) Europe. Prior to taking the helm at Celestyal Cruises, Kerry distinguished himself as General Manager, CEO and President at renowned corporations such as The Coca-Cola Company, Procter & Gamble, Polaroid and Aujan Industries.

Mr. Anastassiadis's mother tongues are Greek and English, and he is also fluent in French, Italian and Portuguese. Born in the Democratic Republic of Congo and raised in Southern Africa, Kerry studied Commerce at the University of Witwatersrand and obtained his postgraduate title in Market Research and Advertising.



Courtesy of CLIA



Courtesy of CLIA

for causing congestion. The number of tourists arriving by cruise ship in popular destinations is usually a small percentage of the total. The massive ships, however, inevitably appear a bigger part of the problem than they really are.

We need to proactively spread these messages, and invite local communities to communicate with us about their concerns. The answer is not to burden the industry with yet more tax, as some destinations are considering. There are many practical ways in which we can collaborate to manage congestion, for example, such as coordinating schedules so that ships call on different days. Piling tax on an issue does not solve it.

Travel agents are key to spreading the message that cruising is both a rewarding experience and an environmentally sound choice. Although most people do some initial holiday research on the internet, many prefer the stress-free experience of booking via a trusted travel agent. Travel agents can also provide knowledgeable and personalised advice.

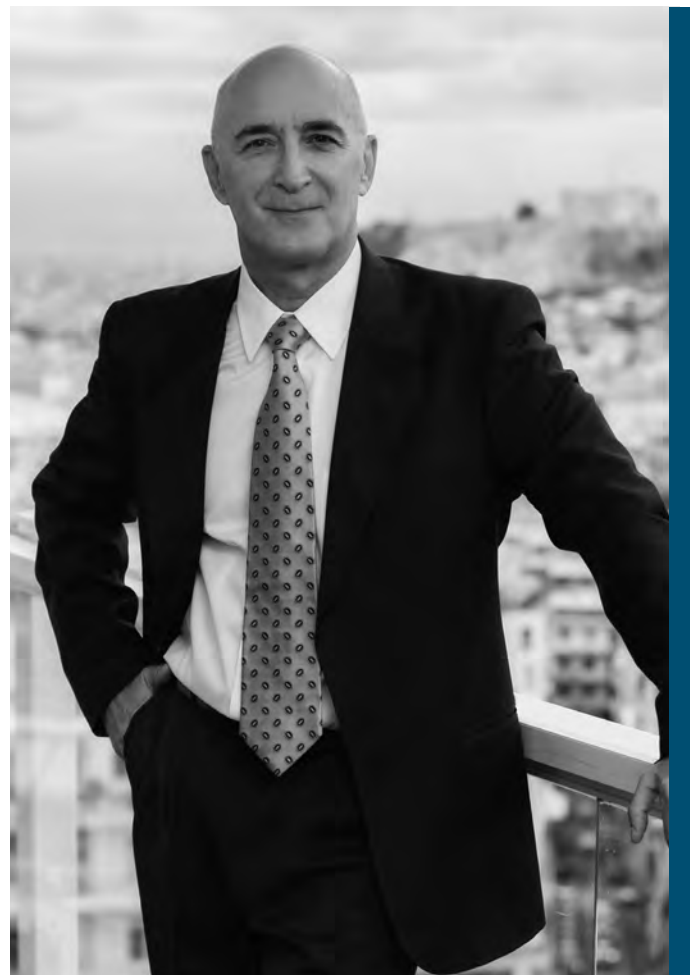
We are therefore expanding our successful travel agency training programme in the UK into Spain and France, and hope to roll it out to other European markets. The aim is to enable all travel agents to understand and explain the benefits of cruising and the different options available. This will help travellers take more informed decisions about whether, when, how and where to take a cruise.

As the cruise industry grows, the number and variety of destinations naturally expands. Political instability and fear of terrorism reduce the number of places that travellers can visit. In particular, we hope that popular destinations such as Tunisia, Egypt and Turkey open up fully once again. This will benefit not only the cruise industry, but also local economies. Cruise companies, ports and local communities have always needed to collaborate closely to mitigate threats. Now more than ever, we emphasise the need for security measures to be firmly applied, constantly reviewed and rigorously checked.

The natural tendency of any growing industry is to branch out into specialised areas. This is clearly happening in the cruise industry, with an increasing number of niche providers. These include expedition and river cruises, along with short-break alternatives to the classic seven-day cruise. One of my

aims as Chairman of CLIA Europe is to give a greater voice to smaller, independent and niche operators. The CLIA should be a platform to showcase ideas and share opinions from all stakeholders, of all sizes and sectors.

This participation is one aspect that makes RINA such a diamond executive partner. RINA is not just present but takes an active role at key events like our Port and Destination summit. This is so important to the success of CLIA and the industry as a whole: ongoing engagement from all members, allowing us to share creative proposals and find solutions to common challenges.



Tom Strang

Solving the challenges of LNG together

Of the many issues facing the cruise industry today, one of the biggest is developing a consistent and achievable clean energy strategy. There are many challenges involved in this, but also many opportunities. As ever, the key to unlocking them is to work closely with experienced and forward-thinking partners who are prepared to go the extra mile. Together we can achieve more than we can alone.

Close collaboration with partners has helped Carnival Corporation stay at the forefront of innovation in clean energy. In recent years, we have committed to install cutting-edge exhaust gas cleaning technology in more than 70% of our fleet of over 100 ships. This is in conjunction with numerous other energy efficiency measures.

Ships powered by Liquefied Natural Gas (LNG) are now one of the major focuses of our clean energy strategy at Carnival Corporation. LNG provides a reliable solution for meeting increasingly tough emissions targets, particularly involving particulate matter, carbon dioxide, nitrogen oxide and sulphur oxide in Emission Control Areas (ECAs).

The long-standing problem of bunkering infrastructure is gradually being solved, with LNG fuelling facilities in major ports expected to become more widespread as demand increases. Existing LNG storage facilities in some larger ports may be a part of the solution. There are already supply solutions in place for the ports in which we're currently operating the AIDAprima from our German AIDA Cruises line, which is equipped with a dual-fuel engine that allows it run on LNG while in port.

The first two of Carnival Corporation's seven new fully LNG-powered cruise ships are due to come into service in 2019, with Costa Cruises and AIDA Cruises each taking delivery of a 5,200-passenger dual-fuel ship. We will continue to collaborate with stakeholders to ensure that by then, there will be adequate, cost-effective shore- or ship-based LNG bunkering facilities wherever required.

BIOGRAPHY

Tom Strang is Senior Vice President Maritime Affairs for Carnival Corporation and plc, responsible for developing a group wide strategy for the supply of LNG for the next generation of cruise ships under order. He also provides representation for the Carnival group at various maritime authorities in Europe and other regions relating to marine and technical regulatory activities.

Tom began his career as a Naval Architect with Vickers Shipbuilding and Engineering Ltd and then moved to Lloyds Register where he rose to the level of senior passenger ship specialist before joining Carnival's Corporate Shipbuilding team in 2000.

Since then Tom has been involved in various areas of the business including Maritime Development and Compliance, HESS and Corporate Maritime Policy. Prior to taking up his current role, Tom was SVP Marine Operations at Costa with responsibility for marine and technical operations, manning and newbuilding for the Costa fleet.



Courtesy of Carnival UK



The design of LNG-powered cruise ships is another crucial area that requires close collaboration, expertise and vision. Here, it's even more essential to work with partners who can provide expert engineering support and detailed risk assessment. RINA has been very helpful in this regard. They are working closely with us and the Meyer Werft shipyard in Germany to develop the first ever LNG-powered cruise ship.

Although LNG carriers have run on the fuel for decades, the ships must be adapted to meet the very different design and safety requirements of cruise ships. These include the sheer number of passengers carried, space-saving considerations relating to the larger tanks and - despite all the recent improvements in energy efficiency - intensive power needs.

RINA's help in interpreting relevant guidelines, in particular the recently introduced IGF Code (International Code of Safety for Ships using Gases or other Low Flashpoint Fuels), is also a key issue for us. A high degree of scrutiny and oversight are necessary to ensure that new builds meet the standards. This oversight also helps us to avoid costly mistakes in the design, engineering and construction of the ships.

Problems are never new, even in fast-developing sectors such as clean energy. The key to solving them is to find people with the right experience and expertise to help. That's why long-standing relationships of mutual support, such as that between Carnival Corporation and RINA, are essential.

RINA's experts investigate technical issues, identify inspection priorities, support us in our dealings with maritime authorities, and provide certification and many other services. Their knowledge of how partners in Europe work has been very helpful in creating a strategy consistent with EU environmental regulations. Most importantly, they understand our needs and are often our first port of call. We can solve problems better when we work together.

A key topic currently under discussion with RINA is LNG training and certification for crew, suppliers and ports. We'll also be looking

for help developing procedures and processes for operation and maintenance of LNG-fuelled ships.

As we move into a new era of cruising, all of us in the industry face many challenges, of which developing a consistent clean energy strategy is only one. Those challenges give us the opportunity to work together with other stakeholders - flags, ports, classification societies, authorities, suppliers, trade associations like SEA\LNG, a multi-sector industry coalition created to accelerate the widespread adoption of LNG, and SGMF, the Society for Gas as a Marine Fuel which promotes safety and industry best practice and encourages training within the sector.

We need to keep everyone informed, improve education about clean energy, and gather everyone's ideas. It's all about working together to solve challenges and achieve our common goals and aspirations.





Courtesy of Holland America Line

Stein Kruse

Global growth, new technology

We all know this, but it's worth repeating. The cruise industry is the fastest growing segment of the travel industry in North America and globally. Plus, it's the segment with the biggest potential to expand. In North America and Australia, the penetration rate (cruise passengers divided by population) is around three percent. The growth opportunity is tremendous.

If this were true in one or two regions alone, it would be exciting enough. In fact, the same upward trend is happening all over the world. New markets are emerging, such as China, Japan, Taiwan, and, to a lesser extent, India. Some non-traditional markets like Argentina, Chile and Brazil are joining the party. There is also an expanded presence in Russia and South Africa. A growing middle class fuels both affluence and interest in travel. Cruising naturally becomes an attractive vacation choice.

Globalisation is a sign that the industry is maturing. In the coming years, we expect to see a continued expansion of the global diversity of our guest base. This will drive a broadening of our onboard offerings to meet the expectations of our multicultural guests.

A key part of those expectations is technology, which is constantly evolving at an ever-increasing pace. Guests are now demanding the same level of technology onboard as they enjoy on land. It is a challenge to remain at the cutting edge, delivering the latest technological experiences in an environment where structural changes are limited and the product is always on the move.

Princess Cruises recently announced it will be the first Carnival Corp. brand to debut the Ocean Medallion. This is a wearable, interactive device that enables a new level of personalisation previously not available in the cruise industry. It will be a game-changer.

BIOGRAPHY

Stein Kruse is CEO of Holland America Group, a division of Carnival Corporation & plc. He is also chairman of the board of MANCO, a UK-based entity that oversees the operations of Carnival Australia, including P&O Cruises Australia.

Kruse joined Holland America Line in 1999 as senior VP, Fleet Operations, with overall responsibility for operations and new builds. He was named president and COO in 2003, then CEO in 2004. In 2011 he was appointed chairman of Seabourn Cruise Line. He became CEO of the newly formed Holland America Group in 2013.

Before joining Holland America Line, Kruse was senior VP and CFO of North American Operations for global Japanese shipping company "K" Line. Prior to that, he was executive VP and COO for Radisson Seven Seas Cruises, and president and CEO of Seven Seas Cruise Line.

A native of Oslo, Norway, he holds a Bachelor of Science degree from Purdue University and is a graduate of Harvard Business School's Advanced Management Program.



Courtesy of Seabourn

Innovation in all other areas of the onboard experience will continue to raise the game. New ships, new brand partnerships and features not seen on ships before will reflect consumer trends on land. This might be cuisine, entertainment, music, technology or hardware installations that take eye-popping activities out to sea. This competitive innovation is good for both the industry and consumers.

Technology is helping to improve not only the guest experience but also our ability to comply with increasingly strict environmental regulations. Cruising is one of the most heavily regulated industries in the world. In addition, for such a globalised industry, there is a remarkable lack of consistency in regulations between countries.

Emission control areas are tightening and the control requirements are broadening, in North America as well as Europe and other areas of the world. We are looking at increased restrictions on emissions by 2020. We are doing what we can to mitigate this. Measures include minimising energy consumption, investing in environmental technology and adjusting itineraries to maximise efficiencies.

Driving performance and guiding the organisation through some of the challenges mentioned above are key parts of my job as CEO of Holland America Group. As leader of a diverse team of more than 40,000 professionals across four brands worldwide, I'm also responsible for ensuring safety.

In this regard, I am fortunate to have a very experienced team working day-to-day with RINA. Ultimately, however, I am responsible for the safety and security of our guests and crew. I therefore take an active role in the technical operations and certification of our vessels. Having spent many years at sea early in my career, I have a strong understanding of the operational side of our business.

RINA has assisted with the stability and floatability of Holland America Line's most recent ship, the 99,836 GT "ms Koningsdam". RINA is also the classification society for the day-to-day operations

of the Seabourn fleet. Two new Seabourn ships are under RINA class: the "Seabourn Encore" (2016) and the "Seabourn Ovation" (due April 2018). RINA conducted a risk assessment and reliability analysis for Seabourn's Odyssey Class vessels that provided great insights and added value to our operations.

Looking ahead, RINA and Carnival Corp. are collaborating on the development of new rules and design for LNG-powered vessels for Costa Cruises, AIDA Cruises, Carnival Cruise Line and P&O Cruises. These will most likely also be used on our next generation of new builds. RINA has always been a collaborative partner. We value their experience and extensive understanding of our business as we set sail into exciting, expanding yet sometimes unpredictable waters.





Ferdinando Garrè

The future of green ship recycling

Ship recycling and repair are important growth sectors, presenting new possibilities to Genova Industrie Navali (GIN) and to the industry as a whole. Working closely with expert partners such as RINA, we are currently expanding operations in Italy and France. Our aim is to build on our decades of experience and better serve the global shipping industry with safe, sustainable recycling, repair and conversion.

Vessel demolition activity has been rising worldwide. There are too many ships and not enough demand, partly as a result of the still-sluggish global economy. This is good news for the ship recycling industry, but has also fuelled one of its major challenges: cheap, unsafe and environmentally unsound ship breaking on the beaches of South Asia. Only adequate regulation and enforcement can counter this widespread, dangerous and unfair practice.

Our new shipyard in Tuscany, Piombino Industrie Marittime (PIM), is an important step towards the development of an industry that meets the growing demand for eco-friendly ship demolition in compliance with EU regulations. Expected to be completed in the second half of 2017, it covers an area of over 100,000 square metres and will employ around 200 engineers, technicians, administrative staff and workers. When operational, it is our intention to join the European Union list of facilities that meet or exceed strict European and international standards for ship recycling, maintenance and refitting.

Ship repair and conversion are other major growth areas in which we are proud to play a leading role. More and more merchant vessels are being built, and they have an increasingly longer lifetime. This raises demand for conversion, transformation and modernisation. The ships need to keep up with customer expectations, as well as the growing requirements of environmental protection, climate protection, energy efficiency and sustainability.

BIOGRAPHY

Ferdinando Garrè was born in Genoa on April 20, 1957. Following his high school diploma at the Naval Institute Morosini in Venice, Garrè graduated in Mechanical and Naval Engineering at the University of Genoa.

He held a managing position at Officine Meccaniche Navali e Fonderie San Giorgio del Porto until 2000. From 2002 to 2004, he was appointed Technical Director of the Prestige Cruises Management, a company based in Monaco. In the same period, he was also Technical Director and Member of the Board of Directors of Martinoli Consulting in Genoa, company leader in advising on technical shipbuilding and expert management.

In 2004, he returned to San Giorgio del Porto as its CEO, a position he still holds today. Currently, Garrè is also member of the Chantier Naval de Marseille's Board of Directors. Since the end of 2016, Garrè is president of the shipbuilding section of Confindustria Genova, the local section of the national association of entrepreneurs.



Courtesy of San Giorgio del Porto

In 2010, we created the Chantier Naval de Marseille (CNdM) where we partnered with the Costa Group. CNdM operates three dry docks in the Grand Port Maritime de Marseille, namely 8, 9 and 10. No. 10, the biggest graving dock in the Mediterranean. It is perfectly positioned – geographically as well as in terms of its size and cutting-edge facilities – to support the needs of the maritime, offshore and renewable energy sectors.

With an area of 90,500 square metres and a highly skilled workforce of over 100 people, the CNdM is equipped to deal efficiently with the very largest and most complex of vessels. This includes cruise ships, which every year become not only bigger but much more technologically advanced, particularly with regard to environmental aspects.

Our expertise in ship repair, maintenance, conversion and demolition has grown over the decades since 1928, when San Giorgio del Porto was founded in Genoa. We continue to develop our processes and know-how as we handle increasingly challenging recycling projects. We are proud to be considered an international reference for ship repair, conversion and demolition, capable of providing specialised service and assistance whenever and whatever is required.

Key to our continuous improvement and maintenance of high standards is close collaboration with classification societies, and in particular RINA. We have almost daily communication over issues ranging from standard activities in the docks to special projects such as the construction of the tanker, “Greta K”.

Another important and complex project in which RINA experts are closely involved is the recycling of the “Costa Concordia” cruise ship, which sank off the coast of Isola del Giglio in 2012.

We also rely on RINA for the implementation and certification of processes and procedures. For example, this helped San Giorgio del Porto to become the first Italian shipyard to receive the ISO 30000 certification for ship recycling. The proximity of our offices in Genoa helps us to collaborate more easily, and

the relationship dates back nearly a century. Ferdinando Garrè, my grandfather and founder of San Giorgio del Porto, was an engineer for RINA.

We will appreciate the expertise and professionalism of RINA’s engineers in three exciting projects scheduled for 2017: the refitting of the “Costa Magica”, “Costa Pacifica” and “Costa neoClassica” in Marseille.

Founded in 2008, Genova Industrie Navali (GIN) is a holding company that combines the experience of T. Mariotti (specialised in the construction of luxury vessels) and San Giorgio del Porto (European leader in ship repair, conversion and recycling).



Courtesy of San Giorgio del Porto



Lorenzo Mortola

Designing cruise ships of the future

Cruise ships are evolving fast and in every direction, from size and technology to passenger expectations. In addition, interior design trends are constantly transforming the way we think and feel about space. Combining these two evolving worlds is our challenge as an architectural firm specialised in cruise ship design and production management.

Staying at the leading edge of cruise ship design is not simply about using up-to-date materials and following the latest colour and design trends. There's a tension between preserving a cruise line's identity and introducing elements of innovation that enhance the passenger experience. You can't do that with a production-line mentality. Each ship has to be tailor made for the owner and, in the end, for the guests who will experience the ship.

Cruise ships are getting both larger and smaller. The huge ships of contemporary and premium brands are growing ever bigger, in an effort to improve operational cost effectiveness and drive higher returns. We were coordinating architects for Princess Cruises' "Royal Princess" and "Regal Princess", 142,700 GT vessels launched in 2013 and 2014. At that time, they were the largest cruise ships ever built in Italy. The market is now seeing more and more new builds that surpass that, up to more than 220,000 GT.

The wow factor is really important here, particularly for new market players such as China. Passengers on premium and contemporary cruises expect facilities at least as sophisticated as they can find ashore - and often more. Materials should be of the finest quality. Products should be high-end and by renowned brands.

On the other side of the scale, we are seeing fast growth in demand for small luxury expedition vessels from both existing and new market players. One example from

BIOGRAPHY

Lorenzo Mortola is an Italian naval architect and chartered engineer. As Project Manager at GEM - Design for Cruise Ships, he has been in charge of numerous cruise ship hotel refurbishment projects and dry-dock surveys between 2012 and 2017. At GEM, Lorenzo has been involved since 2014 in the design of the 40,200 GT Silver Muse, and as newbuilding superintendent, he is currently supervising its construction and outfitting at Fincantieri shipyard in Genoa.

He has also been involved in the coordination of the preliminary design phases of the first of three 110,000 GT cruise ships new builds for Virgin Cruises

Prior to his career in cruise ship design, Lorenzo gained experience in land-based hotel design at Studio Marco Piva in Milan. He has also consulted on several yacht design projects.

Lorenzo achieved a first class honours Master of Engineering (MEng) in Naval Architecture at the University of Southampton in the UK. This was followed by a Master of Interior Design at the Politecnico di Milano.



Courtesy of GEM Design for Cruise Ships

our portfolio is Silversea's 6,130 GT "Silver Explorer". The focus in these smaller expedition vessels is on comfort combined with understated luxury or opulence, depending on the approach.

Architecture is not so much about spaces and materials as about people. We strive to understand the guests and the experiences they expect to enjoy. Why have they chosen this product and this cruise line instead of another? This helps us to anticipate passenger expectations, and to consider where they want to go and what they want to do on board.

We combine our insights into the passengers with our profound knowledge of cruise ship production technologies. Simple solutions are usually best, whether it's about fundamental construction works or specific architectural details. It is also important to select materials carefully based on their functions and positions in the vessel. Sustainability and cost efficiency are the keywords throughout the process, without compromising on aesthetics or quality.

One trend in the cruise ship world that is gaining strength is to convert, upgrade and revitalise existing vessels. Although our core design activities revolve around new building projects, we see growing demand for our turnkey design and consulting services around cruise ship renovation. We are undertaking refurbishment projects for newcomers such as Chinese cruise line Skysea, as well as longstanding operators including Silversea.

Major projects such as converting a second-hand vessel to a cruise ship are highly complex. The first step in any such project is an initial feasibility study by a classification society such as RINA. We use this as a basis for collaboration with consulting engineering firms, logistics specialists and other experts. We are also thankful to be able to draw on our strong network of partner companies. Developed over the past 30 years, this pool of expertise allows us to cope with the diverse needs and know-how required to give new life to a vessel.

One example of a complex conversion project involving RINA is

Silversea's "Silver Cloud". The 16,800 GT ship will be transformed into an ice class expedition vessel carrying a maximum of 260 passengers. The work includes refurbishment of accommodation areas, plus the addition of a forward superstructure. We have also collaborated closely with RINA during the new building of Silversea's 40,700 GT "Silver Muse" in the Fincantieri shipyard in Genoa. This has been particularly important in the past eight months during testing and inspection activities.

We can expect many more evolutions in both the cruise market and interior design. The challenge is draw on solid experience and work with strong partners to anticipate these evolutions and steer them smoothly in the right direction.



Seabourn Encore showcases innovation

There is a lot of talk about innovation in cruise shipbuilding, and it is gratifying to see a prime example in action. The delivery of the ultra-luxury “Seabourn Encore”, bearing RINA’s Comfort class notation, was one such occasion.

The 210m cruise ship carries up to 600 guests in 300 suites, each with a private balcony. The ratio of staff to guests is nearly one-to-one. Interior decoration features smooth, curved lines and nautical design elements that give the feel of a private yacht.

Underneath the luxurious appearance is a highly innovative ship. With a Green Star3 Design class notation, the ship uses the very latest energy optimisation technologies. These range from special long-lasting antifouling paint that reduces hull resistance, to smart heating, ventilation and air conditioning (HVAC) solutions in cabins and public areas. A heat exchange system minimises energy wastage.

A Wärtsilä wastewater treatment system allows the vessel to discharge treated sewage without limiting service. Freshwater is generated using evaporators and reverse osmosis. Meanwhile, size-optimised Ecospray Technologies scrubbers keep the ship compliant with sulphur dioxide limits in emission control areas (ECAs).

Advanced automation systems, included under the additional AUT UMS class notation, allow the ship to operate efficiently and with the engine room unmanned. Levels of noise and vibration are the lowest possible under the Comfort class notation.

The ship’s design takes into account comfort in the case of emergency. It exceeds the standard Safe Return to Port (SRtP) requirements, which guarantee that a ship affected by fire or flooding can proceed to a port and evacuate safely. A dedicated generator and switchboard system not only keeps the ship running, but maintains passenger services such as all unaffected elevators and toilets. An emergency wheelhouse means that even in the case of loss of the bridge, the captain can safely run the ship.

The “Seabourn Encore” was christened in Singapore in January 2017. Its godmother, internationally renowned soprano Sarah Brightman, was present at the ceremony. It then departed on its inaugural 10-day Gems of the Java Sea cruise to Indonesia.

Italian shipbuilding company Fincantieri built the innovative ship for Seabourn Cruise Line, Carnival Corporation’s most exclusive luxury brand. At 41,825 GT, it is around 30% larger than the cruise line’s existing Odyssey fleet. A sister ship, the “Seabourn Ovation”, is scheduled for delivery in 2018, continuing a programme of modernisation.



Courtesy of Fincantieri



Courtesy of Fincantieri



Courtesy of Uniworld Boutique River Cruises

River cruises: intimate and innovative

Cruise ships are increasingly to be seen inland, sailing gently up and down the world's vast network of waterways. European river cruising is particularly popular, with more – and more exotic – routes every year. The potential for expansion is huge, with an almost infinite network of rivers lined with historic sights, natural features and unspoiled towns.

River cruising is and will always be a niche market. However, the number of people who demand this very different voyage experience is growing. What is the appeal of a river cruise?

First, it's small – and size matters. With an average of only 150 passengers, river cruises offer more attentive service and no long queues when boarding or leaving the ship. The easily manoeuvrable ships can dock right in the town. Passengers can simply stroll down the gangway and begin exploring.

Second, the ships are often comfortable and upscale without being ostentatious. The most recent river cruise ships can offer suites, balconies and even swimming pools. Some have art collections. Cuisine is often top quality, featuring local ingredients and wines.

Third, rough water is never an issue, and the slow pace makes for an even smoother sailing experience. The ship makes frequent stops in little known towns as well as more popular destinations.

This appeals to travellers who enjoy the in-depth experience of a land tour without having to worry about accommodation, luggage or transport.

River ships may be slow and steady, but they're often at the forefront of innovation in ship design. Some yards use them to develop, install and test new engineering and design solutions in restricted areas. One example is the "Viking Legend", launched in 2009 as part of the Viking River Cruises fleet. Its hybrid diesel-electric engines demonstrated a 20% decrease in emissions and a reduction in noise and vibrations.

Recognised by the EU in 2012 as a classification society for inland waterway vessels, RINA has been strengthening its network and competence in the river cruise industry in northern Europe in particular. Together with Italian software house IB, it has developed specific Planned Maintenance Scheme software for passenger ships involved in inland navigation.

The slow, intimate experience of a river cruise may not be for everyone. However, its rapid development offers interesting opportunities to cruise companies and the industry as a whole.

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A modern port for an ancient island

Lying 20 km northeast of Kuwait, the small island of Failaka is known for its pleasant climate and historical remains. Just a short ferry ride from the mainland, it's an increasingly popular getaway destination for both Kuwaiti and international tourists. Visitors can take bus tours around the island to visit archaeological and wartime sites, go fishing or practise water sports. To meet this rising demand, Failaka Island is now improving its harbour facilities with the help of RINA.

Failaka Harbour lies in the island's southwest cape. Two breakwaters protect a pier that divides the harbour basin (approx. 250 x 280 m) into two zones. The northern zone is for small private boats. The southern zone receives the small Kuwait Public Transport Company (KPTC) ro-ro ferries that connect the island to the mainland port in Salmiya. The central pier is also open to small and medium-sized vessels that offer services to the public, including yachts and catamarans.

Kuwait's Ministry of Communications (MoC), which controls the harbour, has identified two major areas of improvement.

The first major issue is siltation. Due to sea currents and a low sandy bottom, the southern zone is frequently silted. Ferries are forced to manoeuvre in tight spaces and can only enter during high tide to avoid grounding. Dredging has to be performed frequently in order to guarantee harbour accessibility and navigational safety.

RINA performed a morphodynamic study in order to understand the hydrodynamic conditions of the target area and identify the most effective solutions to mitigate siltation issues. The aim of the new layout is to ensure continuous accessibility and reduce the need for dredging and other siltation-related maintenance activities. An extension of the southern breakwater, plus a profile modification of the beach south of the harbour, will help to achieve this aim.

The second major issue is modernisation of the harbour infrastructure. Upgrade works will help bring the harbour up to the high standards expected by tourists. A modern port will also add value to the destination and foster economic development. RINA developed the basic design of the harbour's rehabilitation and modernisation works. The entire harbour area will be rearranged and refurbished. New services will complement the existing port facilities. These include improved fuel storage and supply systems, a new lifting platform, a travel lift area and a boat sewage disposal system. New fire-fighting, electricity and water supply systems will also be added.

RINA has prepared a tender package for the selection of a qualified contractor, and will provide technical assistance to Kuwait's MoC during the tender evaluation phase.





Courtesy of Silversea

Expedition cruises: a growing niche

Expedition cruises promise adventure, exotic environments and unique experiences shared with a small number of fellow passengers and crew. The compact, comfortable ships are a world apart from giant contemporary and premium cruise ships with their discos, casinos and 4D cinemas.

Expedition cruise travel began in 1966, when Swedish-American explorer Lars-Eric Lindblad led the first expedition to Antarctica aimed at tourists, not scientists. The ship was chartered from the Argentine navy. A first-hand experience, thought Lindblad, would help travellers understand more about the Antarctic and its role in the environment. "You can't protect what you don't know," he said.

This pioneering cruise was successful enough that three years later, he built the "Lindblad Explorer". Specially designed for Antarctic cruises, it launched a whole new concept of cruising and cruise ship design. Today, over 50 expedition vessels ply the waters with between 12 and 500 passengers each. Around 20 new builds are currently on order for the expedition cruise market.

Steel ships operating in polar waters need to be built with specially reinforced hull structures and materials. RINA's Polar Class is an additional notation developed in accordance with IACS standards. It defines different types of navigation in ice-infested waters, as well as the correct scantling and materials for hull structures and

relevant appendages. It also covers the design of machinery and systems required when operating in different ice conditions.

The ships must be built, or adapted from converted icebreakers and research vessels, to meet the expectations of modern travellers. These include not just an adequate level of comfort and services, but a desire for an exclusive "expedition" experience. Many vessels are equipped with inflatable motorboats, scuba-diving equipment and even helicopters for shore landings and tours.

The most popular destinations are the Arctic and Antarctic regions. However, larger expedition operators such as Silversea offer trips to all seven continents. The guides are experts in nature, geology, oceanography or history. In contrast to conventional cruises with their set itineraries and schedules, an "expedition team" has more freedom to plan activities and trips ashore.

Expedition cruising may always be a niche market, but it's growing rapidly and fusing with other sectors. Bigger ships have recently been used on expedition routes, in an attempt to merge the exploratory aspects of expedition cruising with the traditional cruise experience.

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Assessing ships for the Polar Code



The International Code for Ships Operating in Polar Waters (“Polar Code”) is one of the most interesting pieces of international regulation to come into force in 2017. It has major consequences for the fast-growing market of expedition cruises in the Arctic and Antarctic.

Adopted by the IMO in 2014, the Code was introduced as a result of melting in some areas of the North and South Poles during specific seasons. Reduced ice cover means new routes in these usually inaccessible areas are opening up. There’s a need to ensure the safety of ships operating in these harsh, cold conditions. The pristine environments in these areas must also be protected from pollution caused by ships.

The Polar Code is mandatory within clearly defined Arctic and Antarctic waters, and applies to new ships constructed on or after 1 January 2017. Ships constructed before 1 January 2017 and operating in the areas defined in the Code must meet its relevant requirements by the first intermediate or renewal survey, whichever occurs first, after 1 January 2018.

The focal points of the new Code are safety, pollution prevention, manning, training and qualification of the ship’s personnel. Since master and crew qualifications play a crucial role, the Seafarers’ Training, Certification and Watchkeeping (STCW) Code has been amended to take into account the Polar Code. Design, construction and maintenance are other key areas affected.

The core of the Polar Code certification is an operational assessment to establish procedures and operational limitations

for a particular ship. The assessment determines the content of the Polar Waters Operational Manual (PWOM), a manual that must be kept on board to support the master and crew when sailing in these areas.

The above procedure makes the application of the Polar Code very interesting to ships built before 1 January 2017. Certain modifications may make these ships eligible for Polar Code certification in restricted areas of great interest from a business point of view. There are some design- and structural-related operational limitations. However, modifications may sometimes consist of measures such as providing appropriate clothing, upgrading life-saving appliances and installing ice removal equipment.

RINA is deeply involved in activities related to the assessment of existing ships for the polar expedition cruise market. Our work includes tailoring the ships’ upgrade in order to comply with the requirements of the Polar Code on specific routes requested by operators.

In addition to the Polar Code assessment, surveys and certification process, RINA also assists with the application of flag administration requirements related to the Code, plus national requirements for waters where the ship is expected to sail.

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Enhanced fleet performance monitoring

In a time of rising fuel costs, strict environmental regulations and strong competition, precise fleet performance monitoring is more essential than ever. In the past, fleet performance monitoring and analysis were based on imprecise manual reporting of fuel consumption (noon reports) and naval architecture concepts. Nowadays automatic acquisition systems, continuously collecting data from sensors on board, are more and more common. They can provide a complete and accurate data set in order to analyse fleet performance.

InfoSHIP® EGO - Energy Governance is RINA's sophisticated fleet performance monitoring system. It unlocks the full potential of big data analysis applied to hull, engine and propeller performance. The latest version of InfoSHIP® EGO comes with many upgraded features. It tracks the ship's route and alerts the user when the ship enters ECA areas. It displays the engine load diagram with the real-time (current) point at which the engine is operating and automatically detects if the ship is drifting or at anchor. It also applies rules of alert to any signals or combination of signals above or below a certain threshold, thus focusing the user's attention on critical issues just at the right time.

Furthermore, the 'big data' recorded by InfoSHIP® EGO allows the use of the latest machine learning techniques to compute desired baselines. This is a new method of performance prediction compared to classical ITTC formulas and corrections. Typically, hull and propeller performance analysis is carried out by monitoring speed through the water, propulsive power, and environmental and loading conditions. The system benchmarks actual values from sensors with a target computed by the system, accounting for different operative conditions.

Dry dock intervention analysis or degradation analysis due to hull fouling are much simpler and more effective thanks to the new DSS (Decision Support System) module, that guides the user step by step to the right conclusion. The DSS module has been upgraded with a powerful scatter diagram dashboard that can interpolate data with various trend lines and histogram plots. There are also dashboards dedicated to emissions and the ship's cargo and loading conditions.

RINA is investing significantly to enrich InfoSHIP® EGO with additional data analysis services. Standard options are CFD analysis for trim optimisation, baseline computations through machine learning techniques on the big data recorded, and monthly analytics services. At the end of 2016, the number of installations on board reached 200. Considering that InfoSHIP® EGO was rolled out in 2014, this confirms it as one of the fastest growing fleet performance monitoring systems on the market.

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A practical approach to cyber security

Cyber security is one of the most critical – yet least well understood – topics in the industry. We are increasingly dependent upon cyber systems, i.e. the use of computers and networks to manage facilities, equipment, personnel, procedures and communications. These systems facilitate data transfer and protect sensitive digital information relating to the company, ship, crew, cargo and passengers. It's a mistake to consider cyber security as purely an IT issue.

The more dependent we are on these systems, the more urgently we need to make sure they are safe and secure. Computers and networks can be hacked, attacked, damaged or even shut down completely. Confidential data can be modified or stolen. Communications can be intercepted. On ships and offshore units, a cyber attack on operational technology could be extremely dangerous.

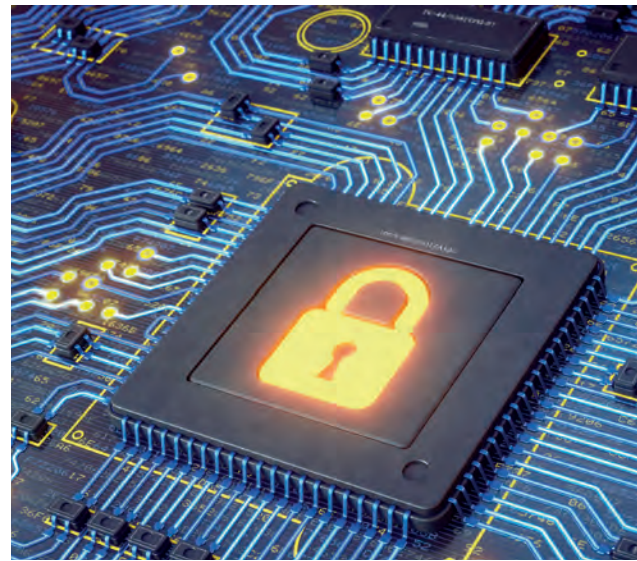
RINA has developed its own guidelines based on IMO recommendations, and proposes a third-party service to support owners in minimising the cyber risk. Adherence to the guidelines is recognised by a document of compliance.

The starting point is the identification of network access points such as ship-to-shore communications, internet/WiFi systems, mobile devices and external hardware. Where and how is a cyber incident possible? What is its potential impact? How can we mitigate this? The first phase focuses on vital systems; the second extends to all onboard information.

We recommend at least the following:

1. Study the IT system architecture.
2. Identify physical accessibility.
3. Evaluate the safety of the ship-shore information exchange.
4. Evaluate company policies on onboard software.
5. Check password and account management policies.
6. Evaluate and test backup management systems.
7. Verify procedures and records for tracking critical events.
8. Verify procedures and records for managing and tracking software modifications.
9. Assess the security of the onboard network architecture.
10. Verify training measures to increase the awareness of potential cyber risks.

Most experts agree that the real question is not if, but when a cyber incident happens. Taking the issues seriously and undertaking a thorough assessment will help keep us all prepared.





Courtesy of Snam

LNG feasibility study at Panigaglia

Amid rising demand for LNG, RINA engineers have completed a feasibility study for the existing onshore LNG regasification terminal in Panigaglia in northern Italy. The study looked at the technical possibility of carrying out small-scale LNG services at the terminal.

Activities included the assessment of residual life of the existing jetty (piles, concrete and LNG transfer lines) and analysis of required interventions to guarantee LNG supply through small vessels and trucks on barges. The study also included a pre-

feasibility project schedule and cost estimate, as well as analysis of the environmental and safety permitting path and identification of territorial constraints. RINA also assessed the pre-feasibility of installing new small-scale LNG storage terminals inside major Italian ports, taking into account port master plans, safety and environmental criteria, plus technical constraints such as space availability.

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SEAVIEW

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