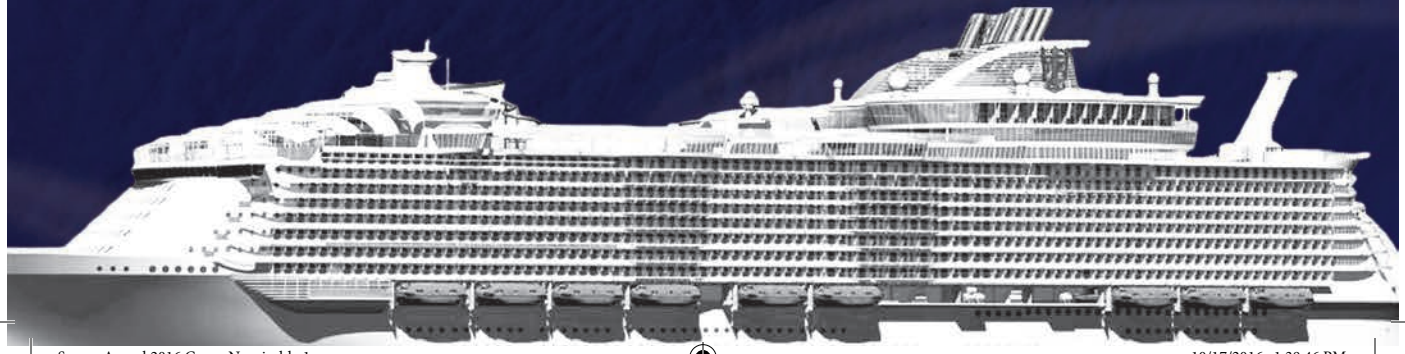
The Elmer A. Sperry Award

For leadership in the engineering and design of the most advanced and trend setting cruise ships, ships that integrated "quantum jumps" in cruise ship safety, operational efficiency, features to suit passengers of "all ages," and diverse onboard activities. And, for being the driving force behind the Cruise Ship Safety Forum that brings together owners, builders and calssification societies to ensure specific targeted areas of safety improvement are developed and impelemented.



Presentation of
The Elmer A. Sperry Award
For 2016

TO

Harri Kulovaara, DSc.

BY

The Elmer A. Sperry Board of Award

REPRESENTED BY THE:

American Society of Mechanical Engineers
Institute of Electrical and Electronics Engineers
SAE International
Society of Naval Architects and Marine Engineers
American Institute of Aeronautics and Astronautics
American Society of Civil Engineers

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At the SNAME Maritime Convention 2016
Bellevue, Washington· November 3, 2016

Harri Kulovaara, DSc.

Executive Vice President
Maritime & Newbuilding
Royal Caribbean Cruises Ltd.

Harri Kulovaara, DSc. Executive Vice President, Maritime & Newbuilding, has led the design and construction of several of the world's most innovative cruise ships for all of the various brands within the Royal Caribbean Cruises Ltd. family.

Under Harri's leadership and vision, Royal Caribbean International launched the world's first "smart ship," *Quantum of the Seas*, in 2014. He led the design and innovation behind the world's largest and most revolutionary cruise ship, *Harmony of the Seas* in 2016, *Oasis of the Seas*, in 2009, and her sister-ship, *Allure of the Seas*, in 2010—all of which introduced unique industry "firsts" that redefined the cruise vacation experience. Harri is also the creative force behind Celebrity Cruises' five Solstice Class ships heralded for their stunning and stylish design. He also recently led the revitalization of the two ships in the Azamara Club Cruises fleet.

A cruise industry veteran of more than 40 years, Harri previously served as senior vice president, Marine Operations and Fleet Operations, when Royal Caribbean Cruises Ltd. combined its marine operations and quality assurance functions. Prior to joining Royal Caribbean in 1995, Harri served as executive vice president and chief operating officer for Oy Silja Line AB—a leading cruise ferry operator based in Finland. He was also named executive vice president for Silja Line's parent company, Effjohn Oy Ab.

In addition to being the chairman of Royal Caribbean's Maritime Advisory Board, Harri is one of the founding members of the Cruise Ship Safety Forum and the current chairman of its Steering Committee. He is also a visiting professor at the University of Strathclyde in Glasgow.

Harri is a naval architect and holds a Master of Science degree in Civil Engineering from the Technical University of Helsinki in Finland. In 2015, Harri received an honorary Doctor of Science degree from the University of Strathclyde in recognition of his continuous safety improvement efforts through innovation in the maritime industry.

A Passion for Ships

Harri Kulovaara's passion for ships and the sea dates back to his early youth. Born in Helsinki in 1952, he spent his summers sailing near his family's summer house by the sea. Harri lived in Turku for some time and graduated in 1974 from the Technical University of Helsinki. During his time there, he witnessed the *Song of Norway* completion at the Wärtsilä Helsinki shipyard. At the time the *Song of Norway* was the most innovative and trendsetting cruise ship. The *Song of Norway* was the first purposefully built warm weather cruise ship in the world. Prior to this the industry was made of passenger liners. The experience to witness this ship completion, for Harri, was like love at first sight, and in that moment he decided to one day become involved in cruise shipping.

This dream eventually came true, though Harri could not have imagined he would one day lead the same company that ordered the groundbreaking *Song of Norway*.

Career Highlights

Harri's career spans over 40-plus years with his stamp on thirty-five cruise ships, six cruise ferries and a number of cargo and RoPax vessels. These ships mark evolutionary changes in the cruise ship industry and include the world's largest cruise ships ever built: *Harmony of the Seas*, *Allure of the Seas*, and *Oasis of the Seas*.

During his time as the executive vice president and chief operating officer of the cruise ferry operator, Silja Line, he played a key role in the design and building of the cruise ferries *Silja Serenade* and *Silja Symphony*. These ferries introduced the now well-known cruise ship feature, the "Promenade"—a wide street-like neighborhood running through the heart of the vessel. A quarter of a century after their delivery, the *Silja Serenade* and *Silja Symphony* are still extremely popular on the Helsinki–Stockholm service.

For this passionate naval architect, Royal Caribbean Cruises Ltd. (RCCL) opened up a new world. In 1995, the company launched the prestigious Project Eagle, which encompassed the development of the Voyager Class of vessels. Four years after joining RCL, Harri introduced the first of the company's five Voyager Class vessels, which showcased a record large cruise vessel design—a true game changer for the entire industry.

Accolades:

- "Chevalier de l'Ordre du Merite Maritime" from the government of France, 2016
- Royal Institution of Naval Architects/Lloyds Register Safety Award for introducing "The Safety Command Centre" onboard ships to focus on effective management of emergencies, 2015
- Honorary doctorate degree from the University of Strathclyde, 2015
- Visiting Professor at the Department of Naval Architecture, Ocean and Marine Engineering, University of Strathclyde, 2006-2013; 2016 - onwards
- "The Commander of Lion of Finland Order" from the President of Finland for services in the Maritime Industry, 2006
- Founding member and Chair of the RCL Maritime Safety Advisory Board—an expert group to support safety initiatives and developments for safety enhancement in RCL, 2006

Royal Caribbean Cruises Ltd.

Representing over 40-years of experience, Royal Caribbean Cruises Ltd. comprises six distinctive cruise brands that share a vision anchored in excellence. These include the innovative Royal Caribbean International known for redefining cruise vacationing and Celebrity Cruises where luxury meets immersive cruising experiences.

In a global industry that serves over 23,000,000 passengers a year, RCL is the second largest cruise line in the world. The company employs over 60,000 people from 120 countries that work on land and at sea on its 48 ships. With a passion for creative thinking, innovative engineering, and outstanding guest service, RCL is responsible for a variety of industry "firsts."

For the first time ever, cruise ship guests could climb rock walls perched above endless oceans, surf a FlowRider atop a ship deck, practice their jump shots on the basketball court, challenge their family and friends riding bumper cars, or float on air in an indoor sky-diving wind tunnel. Guests on Royal Caribbean's ships watched the first-ever Tony Award-winning Broadway show at sea. These are now common features of Royal Caribbean International ships.

With *Quantum of the Seas* Royal Carribean International pushed the envelope even further creating a zenith of technology and guest experiences that can only be measured in "WOWs." This marvel of naval engineering features a host of never-before-seen entertainment and ship advances, including a jewel-shaped capsule on the end of a crane-like arm called the North Star, which rotates 250 degrees out over the side of the ship where it floats 303 feet above sea level.

These innovations stem directly from the work of Harri Kulovaara and the Newbuilding team that he has led since 2005. His philosophy drives an engine of change that cannot be stopped: "When you innovate, you really let your wildest ideas come to the table. You don't immediately apply filters and say, no, no, that cannot be done. You start first with a bold idea. Step-by-step, you go through and validate it, think it through, and you ask, is this technically feasible?"

Advances in Engineering

Split Superstructure

The introduction of the split superstructure is Harri's daring out-of-the-box design and engineering accomplishment. It is a main feature of the Oasis Class ships. Between the five-deck high split superstructure in the very center of the ship is an open space for a promenade and "Central Park" with an atrium. These ships feature living green-walls, lush gardens, real trees, plants and bushes, shops, and restaurants. There is also a "Rising Tide Bar" that has a mechanism to slowly move the entire locale up and down between three different decks.

The unusual design of Oasis Class ships called for novel and advanced structural engineering based on the latest structural modeling technology. No less of a priority was the engineering and design for fire protection, personnel evacuation, and compartmentalization for damage stability.

Novel Lifeboats

After incorporating every design feature and equipment imaginable to ensure that the Oasis Class ships are the safest ever built, Harri knew that these ships must also be prepared for the unthinkable event of an evacuation at sea. Evacuation must be accomplished safely and in the shortest time possible. Extensive model tests were conducted to simulate adverse conditions of magnitudes much greater than the worst conditions that would result in abandoning the ship.

Passenger and crew size indicated the number and capacity of required lifeboats. The boats on these ships are unlike conventional lifeboats; they are truly rescue boats with a catamaran hull, twin engines, and twin rudders, capable of carrying 370 passengers. Their structural strength is such that they can be lifted at two points, which allows smooth and rapid lowering.

Enhanced Energy Efficiency

When RCL sets out to build a new ship, Harri ensures that the process results in a product characterized by maximal energy efficiency. He takes pride in being a leader in the use of new technologies to engineer ships that are more efficient than imaginable.

For many years, through implementation of advanced designs and technologies, RCL and Harri have built some of the lowest emission-producing ships in the industry. The newest ships emit about 20 percent less carbon dioxide per person per day than ships built only a few years ago. RCL has also upgraded their existing ships with new mechanisms that have improved propulsion efficiency by up to 10 percent.

It takes a lot of energy to move a ship through water. Transporting cruise ships demands more energy than anything else onboard. Improving the way ships move through the water is a critical element and the primary focus in Harri's quest for energy efficiency and sustainability.

Royal Caribbean International's *Quantum of the Seas*' hull, one of the most energy efficient ever built, was designed to reduce drag as the ship moves through the water by generating a carpet of micro-bubbles. These also limit marine species' ability to attach to the hull and be transferred to other ecosystems as the ship moves from port to port. A new hull design and new coatings were also introduced on Celebrity Cruises' Solstice Class ships.

Harri leads shipbuilding that operates more efficiently with less impact on the environment. His team finds other uses for 100 percent of all operational waste, and wastewater purification levels on many of RCL ships exceed national and international standards.

TUI Cruises' *Mein Schiff 3*, a ship under the RCL umbrella, and Royal Caribbean International's *Quantum of the Seas* are the first vessels to have all engines use a multi-stream exhaust gas cleaning system—referred to as the Advanced Emissions Purification (AEP) system—designed to treat exhaust gases created by the ship's generators. By injecting water into the exhaust stream, the cleaning system removes approximately 98 percent of sulfur dioxide emissions and 60 to 80 percent of particulate matter. The cleaning system is also designed to treat nitrogen oxides. The company's decision to use scrubbers allow the vessels to continue using current fuels, which contributes to reducing the world's demand for distillate fuels and satisfy environmental regulations. All New Build ships introduced by RCL are now delivered with these AEP systems being a standard feature. Additionally, the Newbuilding department is currently retrofitting the AEP systems on 20 cruise ships around the world.

On October 10, 2016, under Harri's leadership, Royal Caribbean International announced that its new Icon Class of ships will be powered by Liquefied Natural Gas (LNG) and will introduce the use of fuel cell technology to dramatically reduce greenhouse emissions. The delivery of these ships is anticipated to begin in 2022.

The Cruise Ship Safety Forum

Harri's deep desire to enhance the safety of cruise ships was not limited to RCL ships—far from it. In 2007 he was a founding member and chair of the Cruise Ship Safety Forum—a group of key industry stakeholders who foster and promote maritime safety. RCL co-funds a Safety and Risk Centre of Excellence in partnership with the University of Strathclyde and the leading classification society DNV GL. The vision behind the creation of this intra-university-industry partnership is to support the development and implementation of Life-Cycle Risk Management as a vehicle to drive continuous safety improvements.

Trend Setting Designs

Under Harri Kulovaara's leadership and vision, RCCL has launched a sequence of remarkable newbuildings. He has led the design and innovation behind the world's largest and most revolutionary cruise ships.

1999 – 2003 : Voyager Class, five ships by Masa Yards: The most advanced cruise vessels at the time, surpassing the 5,000 people on-board barrier with verifiable evaluability using advanced evacuation simulation tools; the first ships with diesel-electric podded propulsion offering dynamic positioning capability; the first half-ship concept offering maximum redundancy and safety.

2001 – 2004 : Radiance Class, three ships by Meyer Werft: The first ultra large cruise vessels deployed in Europe, year-round. Particular emphasis placed on safety and energy efficiency, as well as speed and technological advancements. These ships were intended for longer cruises than the traditional seven-day cruises in the Caribbean. The first environmentally-friendly, turbo-electric machinery with heat recovery installed onboard a cruise ship.

2006 – 2008 : Freedom Class, three ships by Masa Yards: Initially designed as larger Voyager Class ships, these became the focus of development for worldwide service, in particular Southeast Asia with more emphasis on safety and environmental performance. These were also the first cruise ships designed for "all ages" with "neighborhoods"—distinct environments or areas on board where people with similar expectations are able to do things that they like together.

2008 – 2012 : Solstice Class, five ships by Meyer Werft: The first ships designed to a known safety level. Introducing this concept to the International Maritime Organization (IMO) created the platform for goal-based standards. Celebrity Cruises' Solstice Class ships will be followed by the new Project Edge, which is currently under way. This ship series will take the Celebrity Cruises' modern luxury experience to a higher level.

2009 – 2010 : Oasis Class, three ships, two by STX Finland and one by STX France: These are the largest cruise ships ever built, capable of carrying 8,500 people on board. These are also the first ships designed on the belief that the ship itself is the ultimate lifeboat—the concept of Safe Return to Port. The design of these ships introduced safety innovations in damage stability, and fire and Life-Safety Appliances that helped establish equivalent safety at IMO—a landmark in safety legislation. The ship has redundant main and secondary power plants, propulsion systems, and electrical and HVAC systems. It is believed there are more safety and environmental innovations on one single ship than had ever been added on one single cruise ship ever before.

2014 – 2016 : Quantum Class, three ships by Meyer Werft: A ship concept with two unique innovations. One in safety with an Integrated Safety Command Centre onboard equipped and manned to address emergencies. Royal Caribbean received the RINA/LR Safety Award for this innovation. The second in energy efficiency by introducing the first full-scale "air lubrication" feature—a layer of micro-bubbles maintained on the ship's flat-bottom that reduces resistance and power consumption drastically.

2016 - 2024 : Icon Class announced on October 10, 2016. The new ships by Meyer Turku are anticipated for delivery in 2022 and 2024. They will be powered by Liquified Natural Gas (LNG) and introduce the use of fuel cell technology, which will usher in a new era of shipbuilding that will dramatically reduce greenhouse emissions.

Nurturing Innovation in Cruise Ship Design

Harri's motto is "safety through innovation," which has served him, his company, and the cruise ship industry exceedingly well. His visionary leadership has helped refine RCL's goals. He pursues cutting edge maritime technical developments and industrial environmental protection systems to incorporate onboard cruise ships. His efforts produce direct return on investment through operational efficiency, high guest satisfaction, and enhanced safety.

Harri's success is rooted in his approach to ship design and shipbuilding. He states, "I understand that with my two hands, I cannot build a ship. It is a tremendous team effort. It involves endless categories of people. Ships bring in components from suppliers all over the world. We have more than 100 architects and 200-300 technical designers. My job involves making sure that people have a clear vision of what we are trying to accomplish, so it all happens in-sync, in the right time and place. My role is to be a catalyst, to help others think outside the box."

Harri maintains his leadership and responsibility from concept design of ships through meticulous attention to detail, building supervision, delivery, and operational start-up. Harri believes in bringing together the best minds on large and small topics to pick up the best ideas.

"It is a very focused team effort. We are focused on our partnerships with the shipyards, architects, and designers. We are constantly bringing in new people and new talent. We believe that besides having a well-organized and structured work process with people who have the right mindsets, we also need to have disruptors. These are people who come with different thoughts and force us into thinking differently," says Harri.

It is extremely important to manage the risk, the quality, and the novel technology and designs of each cruise ship. Harri underlines that this part of the work is a pure, well-planned process—not art. The art piece applies to the composing of a team that can generate new ideas: "We create art supported by science. You must have a systematic approach and a process that you know works. You have machinery where you make everyone follow that process. You need to be a little bit of an artist and combine it with that of a science element. People get together and come up with something creative and find solutions to challenges. That is our way of working."

Equally important is Harri's continuous commitment to safety and environment. "Through our pioneer and revolutionary efforts, aligned with the latest technology available, we work closely with the greatest minds in the industry, as well as with safety authorities to ensure all relevant standards are both met and exceeded," Harri stresses.

In the end, what perhaps makes Royal Caribbean unique is the ability to combine its own minds with those of its strong partners to relentlessly look at different ways to deliver results and never compromise the company's ultimate goal to provide its guests with the best experiences in the cruise industry.

"Come Seek"

Twenty-two years ago, the Newbuilding department consisted of two people. Today, there are nearly 200 working at Newbuilding—the key player in the design of new vessels. Harri's leadership at the department has exemplified innovation and thinking outside-the-box. He has made bold thoughts and ideas part of the company's DNA and corporate culture, and he has done so without compromising safety and environmental stewardship.

The Newbuilding department continues to invest in new ships and facilities. In 2016 the department unveiled its plans for a new cruise terminal at the Port of Miami. In 2017 it will introduce the Innovation Lab—a high-tech center that will host a 3D visualization lab that will allow architects and designers to literally walk through their ideas before a single rivet gets pressed down. And of course, new ships are underway, including Celebrity Cruises' Project Edge and Royal Caribbean International's newly-announced Icon Class. These projects, those of the past, and those to come will ensure Harri's permanent mark on the cruise industry.

Harri has defined and refined the processes that lead to the successful design and innovative engineering of modern cruise ships. He speaks about well-defined processes as the core to a successful ship build. Over the years, Kulovaara and his department have developed and implemented these specific processes to make the future of cruising become a thing of the present.

When Harri first dreamed of building cruise ships, standing in front of the Song of Norway, he ventured on a path that would lead him to uncharted waters. He transformed ship design by introducing the split superstructure, among other key innovations. He also maximized guest safety with the advent of lifeboats engineered like no other. His leadership has led to the incorporation and development of breathtaking technologies and innovations. Through it all Harri Kulovaara has kept his team focused on a simple principle: better, safer cruise ships provide guests with more awe-inspiring vacation experiences.

Elmer A. Sperry, 1860–1930

After graduating from the Cortland, N.Y. Normal School in 1880, Sperry had an association with Professor Anthony at Cornell, where he helped wire its first generator. From that experience he conceived his initial invention, an improved electrical generator and arc light. He then opened an electric company in Chicago and continued on to invent major improvements in electric mining equipment, locomotives, streetcars and an electric automobile. He developed gyroscopic stabilizers for ships and aircraft, a successful marine gyro-compass and gyro-controlled steering and fire control systems used on Allied warships during World War I. Sperry also developed an aircraft searchlight and the world's first guided missile. His gyroscopic work resulted in the automatic pilot in 1930. The Elmer A. Sperry Award was established in 1955 to encourage progress in transportation engineering.

The Elmer A. Sperry Award

To commemorate the life and achievements of Elmer Ambrose Sperry, whose genius and perseverance contributed so much to so many types of transportation, the Elmer A. Sperry Award was established by his daughter, Helen (Mrs. Robert Brooke Lea), and his son, Elmer A. Sperry, Jr., in January 1955, the year marking the 25th anniversary of their father's death. Additional gifts from interested individuals and corporations also contribute to the work of the board.

Elmer Sperry's inventions and his activities in many fields of engineering have benefited tremendously all forms of transportation. Land transportation has profited by his pioneer work with the storage battery, his development of one of the first electric automobiles (on which he introduced 4-wheel brakes and self-centering steering), his electric trolley car of improved design (features of its drive and electric braking system are still in use), and his rail flaw detector (which has added an important factor of safety to modern railroading). Sea transportation has been measurably advanced by his gyrocompass (which has freed humans from the uncertainties of the magnetic compass) and by such navigational aids as the course recorder and automatic steering for ships. Air transportation is indebted to him for the airplane gyro-pilot and the other air navigational instruments he and his son, Lawrence, developed together.

The donors of the Elmer A. Sperry Award have stated that its purpose is to encourage progress in the engineering of transportation. Initially, the donors specified that the award recipient should be chosen by a Board of Award representing the four engineering societies in which Elmer A. Sperry was most active:

American Society of Mechanical Engineers (of which he was the 48th president)
American Institute of Electrical Engineers (of which he was a founder member)
Society of Automotive Engineers
Society of Naval Architects and Marine Engineers

In 1960, the participating societies were augmented by the addition of the Institute of Aerospace Sciences. In 1962, upon merging with the Institute of Radio Engineers, the American Institute of Electrical Engineers became known as the Institute of Electrical and Electronics Engineers; and in 1963, the Institute of Aerospace Sciences, upon merger with the American Rocket Society, became the American Institute of Aeronautics and Astronautics. In 1990, the American Society of Civil Engineers became the sixth society to become a member of the Elmer A. Sperry Board of Award. In 2006, the Society of Automotive Engineers changed its name to SAE International.

Important discoveries and engineering advances are often the work of a group, and the donors have further specified that the Elmer A. Sperry Award honor the distinguished contributions of groups as well as individuals.

Since they are confident that future contributions will pave the way for changes in the art of transportation equal at least to those already achieved, the donors have requested that the board from time to time review past awards. This will enable the board in the future to be cognizant of new areas of achievement and to invite participation, if it seems desirable, of additional engineering groups representative of new aspects or modes of transportation.

The Sperry Secretariat

The donors have placed the Elmer A. Sperry Award fund in the custody of the American Society of Mechanical Engineers. This organization is empowered to administer the fund, which has been placed in an interest bearing account whose earnings are used to cover the expenses of the board. A secretariat is administered by the ASME, which has generously donated the time of its staff to assist the Sperry Board in its work.

The Elmer A. Sperry Board of Award welcomes suggestions from the transportation industry and the engineering profession for candidates for consideration for this award.

Previous Elmer A. Sperry Awards

1955 To ***William Francis Gibbs*** and his Associates for design of the S.S. United States.

1956 To ***Donald W. Douglas*** and his Associates for the DC series of air transport planes.

1957 To ***Harold L. Hamilton, Richard M. Dilworth*** and ***Eugene W. Kettering*** and Citation to their Associates for developing the diesel-electric locomotive.

1958 To ***Ferdinand Porsche*** (in memoriam) and ***Heinz Nordhoff*** and Citation to their Associates for development of the Volkswagen automobile.

1959 To ***Sir Geoffrey de Havilland, Major Frank B. Halford*** (in memoriam) and ***Charles C. Walker*** and Citation to their Associates for the first jet-powered passenger aircraft and engines.

1960 To ***Frederick Darcy Braddon*** and Citation to the Engineering Department of the Marine Division of the Sperry Gyroscope Company, for the three-axis gyroscopic navigational reference.

1961 To ***Robert Gilmore LeTourneau*** and Citation to the Research and Development Division, Firestone Tire and Rubber Company, for high speed, large capacity, earth moving equipment and giant size tires.

1962 To ***Lloyd J. Hibbard*** for applying the ignitron rectifier to railroad motive power.

1963 To ***Earl A. Thompson*** and Citations to ***Ralph F. Beck, William L. Carnegie, Walter B. Herndon, Oliver K. Kelley*** and ***Maurice S. Rosenberger*** for design and development of the first notably successful automatic automobile transmission.

1964 To ***Igor Sikorsky*** and ***Michael E. Gluhareff*** and Citation to the Engineering Department of the Sikorsky Aircraft Division, United Aircraft Corporation, for the invention and development of the high-lift helicopter leading to the Skycrane.

1965 To ***Maynard L. Pennell, Richard L. Rouzie, John E. Steiner, William H. Cook*** and ***Richard L. Loesch, Jr.*** and Citation to the Commercial Airplane Division, The Boeing Company, for the concept, design, development, production and practical application of the family of jet transports exemplified by the 707, 720 and 727.

1966 To ***Hideo Shima, Matsutaro Fuji*** and ***Shigenari Oishi*** and Citation to the Japanese National Railways for the design, development and construction of the New Tokaido Line with its many important advances in railroad transportation.

1967 To ***Edward R. Dye*** (in memoriam), ***Hugh DeHaven,*** and ***Robert A. Wolf*** for their contribution to automotive occupant safety and Citation to the research engineers of Cornell Aeronautical Laboratory and the staff of the Crash Injury Research projects of the Cornell University Medical College.

1968 To ***Christopher S. Cockerell*** and ***Richard Stanton-Jones*** and Citation to the men and women of the British Hovercraft Corporation for the design, construction and application of a family of commercially useful Hovercraft.

1969 To ***Douglas C. MacMillan, M. Nielsen*** and ***Edward L. Teale, Jr.*** and Citations to ***Wilbert C. Gumprich*** and the organizations of George G. Sharp, Inc., Babcock and Wilcox Company, and the New York Shipbuilding Corporation for the design and construction of the N.S. Savannah, the first nuclear ship with reactor, to be operated for commercial purposes.

1970 To ***Charles Stark Draper*** and Citations to the personnel of the MIT Instrumentation Laboratories, Delco Electronics Division, General Motors Corporation, and Aero Products Division, Litton Systems, for the successful application of inertial guidance systems to commercial air navigation.

1971 To ***Sedgwick N. Wight*** (in memoriam) and ***George W. Baughman*** and Citations to ***William D. Hailes, Lloyd V. Lewis, Clarence S. Snavely, Herbert A. Wallace,*** and the employees of General Railway Signal Company, and the Signal & Communications Division, Westinghouse Air Brake Company, for development of Centralized Traffic Control on railways.

1972 To ***Leonard S. Hobbs*** and ***Perry W. Pratt*** and the dedicated engineers of the Pratt & Whitney Aircraft Division of United Aircraft Corporation for the design and development of the JT-3 turbo jet engine.

1975 To ***Jerome L. Goldman, Frank A. Nemec*** and ***James J. Henry*** and Citations to the naval architects and marine engineers of Friede and Goldman, Inc. and Alfred W. Schwendtner for revolutionizing marine cargo transport through the design and development of barge carrying cargo vessels.

1977 To ***Clifford L. Eastburg*** and ***Harley J. Urbach*** and Citations to the Railroad Engineering Department of The Timken Company for the development, subsequent improvement, manufacture and application of tapered roller bearings for railroad and industrial uses.

1978 To ***Robert Puiseux*** and Citations to the employees of the Manufacture Française des Pneumatiques Michelin for the development of the radial tire.

1979 To ***Leslie J. Clark*** for his contributions to the conceptualization and initial development of the sea transport of liquefied natural gas.

1980 To ***William M. Allen, Malcolm T. Stamper, Joseph F. Sutter*** and ***Everette L. Webb*** and Citations to the employees of Boeing Commercial Airplane Company for their leadership in the development, successful introduction & acceptance of wide-body jet aircraft for commercial service.

1981 To ***Edward J. Wasp*** for his contributions toward the development and application of long distance pipeline slurry transport of coal and other finely divided solid materials.

1982 To ***Jörg Brenneisen, Ehrhard Futterlieb, Joachim Körber, Edmund Müller, G. Reiner Nill, Manfred Schulz, Herbert Stemmler*** and ***Werner Teich*** for their contributions to the development and application of solid state adjustable frequency induction motor transmission to diesel and electric motor locomotives in heavy freight and passenger service.

1983 To ***Sir George Edwards,*** OM, CBE, FRS; ***General Henri Ziegler,*** CBE, CVO, LM, CG; ***Sir Stanley Hooker,*** CBE, FRS (in memoriam); ***Sir Archibald Russell,*** CBE, FRS; and ***M. André Turcat***, L d'H, CG; commemorating their outstanding international contributions to the successful introduction and subsequent safe service of commercial supersonic aircraft exemplified by the Concorde.

1984 To ***Frederick Aronowitz, Joseph E. Killpatrick, Warren M. Macek*** and ***Theodore J. Podgorski*** for the conception of the principles and development of a ring laser gyroscopic system incorporated in a new series of commercial jet liners and other vehicles.

1985 To ***Richard K. Quinn, Carlton E. Tripp,*** and ***George H. Plude*** for the inclusion of numerous innovative design concepts and an unusual method of construction of the first 1,000-foot self-unloading Great Lakes vessel, the M/V Stewart J. Cort.

1986 To ***George W. Jeffs, Dr. William R. Lucas, Dr. George E. Mueller, George F. Page, Robert F. Thompson*** and ***John F. Yardley*** for significant personal and technical contributions to the concept and achievement of a reusable Space Transportation System.

1987 To ***Harry R. Wetenkamp*** for his contributions toward the development and application of curved plate railroad wheel designs.

1988 To ***J. A. Pierce*** for his pioneering work & technical achievements that led to the establishment of the OMEGA Navigation System, the world's first ground-based global navigation system.

1989 To ***Harold E. Froehlich, Charles B. Momsen, Jr.,*** and ***Allyn C. Vine*** for the invention, development and deployment of the deep-diving submarine, Alvin.

1990 To ***Claud M. Davis, Richard B. Hanrahan, John F. Keeley,*** and ***James H. Mollenauer*** for the conception, design, development and delivery of the Federal Aviation Administration enroute air traffic control system.

1991 To ***Malcom Purcell McLean*** for his pioneering work in revolutionizing cargo transportation through the introduction of intermodal containerization.

1992 To ***Daniel K. Ludwig*** (in memoriam) for the design, development and construction of the modern supertanker.

1993 To ***Heinz Leiber, Wolf-Dieter Jonner*** and ***Hans Jürgen Gerstenmeier*** and Citations to their colleagues in Robert Bosch GmbH for their conception, design and development of the Anti-lock Braking System for application in motor vehicles.

1994 To ***Russell G. Altherr*** for the conception, design and development of a slackfree connector for articulated railroad freight cars.

1996 To ***Thomas G. Butler*** (in memoriam) and ***Richard H. MacNeal*** for the development and mechanization of NASA Structural Analysis (NASTRAN) for widespread utilization as a working tool for finite element computation.

1998 To ***Bradford W. Parkinson*** for leading the concept development and early implementation of the Global Positioning System (GPS) as a breakthrough technology for the precise navigation and position determination of transportation vehicles.

2000 To those individuals who, working at the French National Railroad (SNCF) and ALSTOM between 1965 and 1981, played leading roles in conceiving and creating the initial TGV High Speed Rail System, which opened a new era in passenger rail transportation in France and beyond.

2002 To ***Raymond Pearlson*** for the invention, development and worldwide implementation of a new system for lifting ships out of the water for repair and for launching new ship construction. The simplicity of this concept has allowed both large and small nations to benefit by increasing the efficiency and reducing the cost of shipyard operations.

2004 To ***Josef Becker*** for the invention, development, and worldwide implementation of the Rudderpropeller, a combined propulsion and steering system, which converts engine power into optimum thrust. As the underwater components can be steered through 360 degrees, the full propulsive power can also be used for maneuvering and dynamic positioning of the ship.

2005 To ***Victor Wouk*** for his visionary approach to developing gasoline engine-electric motor hybrid-drive systems for automobiles and his distinguished engineering achievements in the related technologies of small, lightweight, and highly efficient electric power supplies and batteries.

2006 To ***Antony Jameson*** in recognition of his seminal and continuing contributions to the modern design of aircraft through his numerous algorithmic innovations and through the development of the FLO, SYN, and AIRPLANE series of computational fluid dynamics codes.

2007 To ***Robert Cook, Pam Phillips, James White,*** and ***Peter Mahal*** for their seminal work and continuing contributions to aviation through the development of the Engineered Material Arresting System (EMAS) and its installation at many airports.

2008 To ***Thomas P. Stafford, Glynn S. Lunney, Aleksei A. Leonov,*** and ***Konstantin D. Bushuyev*** as leaders of the Apollo-Soyuz mission and as representatives of the Apollo-Soyuz docking interface design team: in recognition of seminal work on spacecraft docking technology and international docking interface methodology.

2009 To ***Boris Popov*** for the development of the ballistic parachute system allowing the safe descent of disabled aircraft.

2010 To ***Takuma Yamaguchi*** for his invention of the ARTICOUPLE, a versatile scheme to connect tugs and barges to form an articulated tug and barge, AT/B, waterborne transportation system operational in rough seas. His initial design has led to the development of many different types of couplers that have resulted in the worldwide use of connected tug and barges for inland waterways, coastal waters and open ocean operation.

2011 To ***Zigmund Bluvband*** and ***Herbert Hecht*** for development and implementation of novel methods and tools for the advancement of dependability and safety in transportation.

2012 To ***John Ward Duckett*** for the development of the Quickchange Movable Barrier.

2013 To ***C. Don Bateman*** for the development of the ground proximity warning system for aircraft.

2014 To ***Bruce G. Collipp, Alden J. Laborde,*** and ***Alan C. McClure*** for the design and development of the semi-submersible platform.

2015 To ***Michael K. Sinnett*** and ***The Boeing Company 787-8 Development Team*** for pioneering engineering advances including lightweight composite wing and monolithic fuselage construction and advanced systems that have led to significant improvements in fuel efficiency, reduced carbon emission, reduced maintenance costs and increased passenger comfort.

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