The swiftly changing seascape of ferry safety

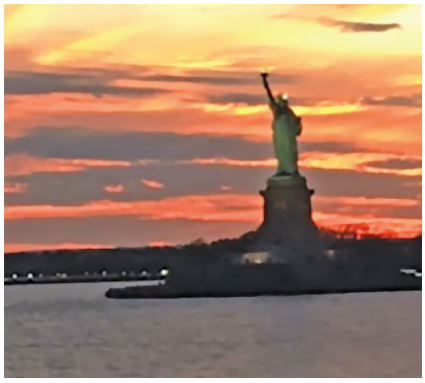
A leap forward in digitisation and technology, combined with fresh input from a new breed of architects, is helping to bolster ferry safety across the world. Dr Roberta Weisbrod, founder and executive director of the Worldwide Ferry Safety Association, reports on the group's Third International Ferry Safety Conference, which was hosted in New York earlier this year

The Worldwide Ferry Safety Association (WFSA) is in the midst of a decades-long quest to improve ferry safety – and, more specifically, to reduce ferry fatalities and to expand ferry service wherever in the world practicable. To that end, we commission, research and sponsor an international student design competition for a safe, affordable ferry, collaborate on innovative future-oriented projects and convene an international ferry safety and technology conference.

The Third International Ferry Safety Conference, which was held in New York between 11 and 12 May 2017, not only presented the latest in digitised technology and telematics in use but also featured technologies currently in development, such as Google Glass Nav and 3D- printed weather monitors for ferries. The future was also well represented by student presentations and the winning teams of the fourth international student design competition for a safe, affordable ferry.

Also in the future, but a very exciting prospect - and one which could have a global impact - is India's National Waterways 1 project, which will see further development of the Ganges for maritime transport of people and freight. And, finally, the ferry types judged as being the best prototypes for ferry development in the developing world – from Manila, Bangkok and Abidjan – were presented.

Sponsors of the conference included Chao Phraya River Express Boat, the New York City (NYC) Economic Development Corporation, Vesseltracker, New York Water Taxi, Marine Learning Systems, Hornblower, the Transportation Research Board, Staten Island Ferry, McLaren Engineering Group and the Port Authority of New York & New Jersey (NY/NJ).



New York played host to the WFSA's Third International Ferry Safety Conference in May, which focused on the latest developments in ferry safety and technology

Student design contest

The conference opened with the winning presentations from this year's international student design competition. The WFSA invited budding naval architects to submit plans for a brand new ferry type for use by Thai operator Chao Phraya Express Boat, which carries approximately 40,000 passengers daily along the Chao Phraya River, Bangkok, on a route covering 37 stops and 21km of river. As such, the company operates one of the most reliable and popular public transport services in the Thai capital – a highly valued achievement, if you've ever sat in a Bangkok road traffic jam.

Although this location is subject to negligible sea states and winds and low currents, the WFSA did impose some conditions on the participating design teams. Consideration had to be given to factors such as affordability, responsiveness, safety and the use of local facilities – it had to be achievable by existing Thai yards. To reflect operating conditions on the Chao Phraya River, the vessel's technical specs were restricted to: less than 25m in length; less than 7m in breadth; less than 1.5m in draught; and less than 4.5m in air draught, due to the number of bridges. Ideally, each submitted vessel would accommodate at least 200 passengers, 150 of whom would be seated, and would feature a service speed of 15knots, increasing to 18knots max, courtesy of twin diesel engines, twin generators and twin propellers.

The winning concept

The top prize was awarded to Syed Marzan Ul Hasan, originally from Bangladesh, who served as team captain (and crew) for the team drawn from the EMship course at the University of Liège, Belgium.

In a video presentation, recorded after the conference, Ul Hasan outlined some of the prime considerations his team undertook when drawing up plans for this particular vessel. Firstly, he said, it was essential to ensure that the design was able to "satisfy local needs" and appeal to ferry owners, operators and passengers – including local commuters and incoming tourists – alike.

The design also had to be "easy to implement and matched to the local operating conditions". In the case of the Chao Phraya River, he added, this meant responding to "reported cases of damage to riverbanks, due to high vessel speeds", thereby ensuring that the team paid as much attention to reducing wake and wash as it did to enhancing vessel stability.

Intact and damaged stability tests were conducted, taking into account factors such as wind heel and scenarios in which the passengers might be crowded together on one side of the ferry.

The EMship team's proposed vessel would meet the 200-pax specification and feature a catamaran hull form, as a safer, smoother alternative to less stable monohull alternatives. "Long-haul passengers", such as tourists and sightseers, would be allocated seats towards the front of the main deck, where they would be able to enjoy the best views, while short-hop commuters (such as locals) would be positioned at the aft, where there are "greater moveable areas and more rapid on-off access," Ul Hasan explained. Elderly and pregnant passengers, plus those with children and strollers and persons with mobile impairments, would be situated next to the doorways. The aft section would also serve as a marshalling/rescue area, for swift coordination of evacuation procedures in the event of an emergency. Foldable ramps would be installed, to speed up the embarkation/disembarkation process.

For optimal visibility, the wheelhouse, situated on a raised navigation deck, would offer the master all-round views. Ul Hasan continued: "Since the vessel has provisions to be operable at night, it must include a mast for signalling its position and movement to other vessels." This mast would be retractable, permitting the vessel to pass securely under low bridges.

The runners-up

Second prize went to the team from Webb Institute in New York State, US, comprising team captain Andrew Vogeler and teammates Brandon Louis and Nicholas de Sherbinin, working under the moniker of VHL Design Group. This team developed a 23.5m x 7m concept ferry, the VHL Steadfast, which would feature a draught of 1.25m, an air draught of 4m and meet the WFSA's speed and passenger capacity specs. Power would be supplied by a pair of 298kW Cummins QSM 11 405 heavy-duty engines driving two propellers, deemed to be preferable in performance to waterjets at speeds of less than 25knots, while a pair of Cummins generators would feed the vessel's lighting, PA system, and so on.

The VHL Steadfast was developed to meet not only ABS requirements, but also those of the US Coast Guard's (USCG's) Subchapter K regulations for small passenger vessels. The latter regulations were specifically used in designing the ferry's railings, which would prove essential to passenger safety given the design's lack of windows.

Opting for "simplified geometry" helped to keep costs down and, as with the EMship team, VHL Design Group

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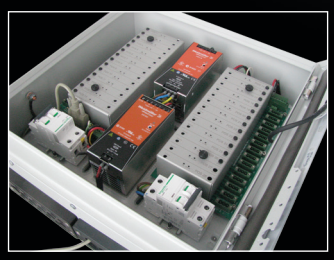

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Syed Marzan Ul Hasan (left), whose team at the University of Liège won the WFSA's international student design competition for 2017 with its proposed ferry concept (right)

opted for a catamaran hull form, to benefit from both greater stability and increased deck/passenger space. Additionally, Brandon Louis said: "The demi-hull design also allows for redundant machinery spaces: should machinery fail in one demi-hull on account of, say, flooding or fire, the machinery in the other demi-hull would enable the ship to keep operating."

A midship loading area was created, to increase passenger flow during the loading and unloading process, and two doors of approximately 1.2m in width were installed on each side of the vessel. Aluminium was chosen as the core material, as this metal helps to reduce weight-related costs and is commonly handled by local Bangkok boatyards, such as Sea Crest Marine and BPME – thus making it relatively easy to build the vessel, as well as to provide repair and maintenance services throughout its lifespan.

Special attention was also paid to trim adjustment. The team's Nicholas de Sherbinin explained that there was no ballast system as this would "add to the cost and the weight of the vessel". He continued: "Instead, we positioned the fresh water, black water and fuel tanks in such a way that they can be moved longitudinally during the furtherment of the design process, to ensure that the vessel has a reasonable trim."

The third prize-winning team, from Kharagpur in India, consisting of team captain Saurav Agarwal and teammates Harshdeep Singh and Rishank Kumar, was unable to attend.

The WFSA raised the funds to present the students with cash awards – US$5,000 for top prize, US$3,000 for second prize and US$1,000 for third prize –and provided the international cadre of esteemed judges with honorariums. Student travel and registration for the conference was provided by a grant from the visionary TK Foundation.

The VHL Design Group team: from left to right, team captain Andrew Vogeler, Nicholas de Sherbinin and Brandon Louis

A look at tomorrow

Another highlight of the conference was a presentation about progress with the Google Glass Nav (GGN) wearable integrated augmented reality devices. What you see when you put on the glasses (which aren't 'weird looking' anymore) is electronic display chart info superimposed over what you see in reality. Mariners are therefore untethered and able to remain 'out and about' on the deck, keeping their watch.

Martha Grabowski from Rennselaer Polytechnic and Le Moyne College updated attendees on her research about the utility and reliability of these glasses. The devices were being tested at the Maritime Institute of Training and Graduate Studies' (MITAGS') simulator by over 80 mariners. Going forward, as this is being written, the researchers are developing the design of both mobile and fixed devices (the latter to be applied to ferry windows, portholes and bulkheads) at MITAGS and, in the near future, on the Staten Island Ferry. This writer couldn't help but wonder if the incident in which the 47m Cape Cod ferry *Iyanough* crashed into a jetty at Hyannis Harbor, Massachusetts in June this year could have been avoided with GGN.

Further into the future are 3D-printed ferry weather monitors. 3D-printed weather monitors already exist, track and report in real time – and are being used in Zambia [1] and in Kenya, Barbados, Curacao and the US [2].

Separately, ferry weather monitors exist and are deployed on the Washington State Ferries, where they monitor temperature, wind speed and dew point (but not barometric pressure, although this is possible), and cost over US$20,000. Given that more than 50% of fatal ferry accidents are related to hazardous weather, the ability to make these monitors inexpensive, not to mention easily repairable (by 3-D printing), would be a boon to anticipating hazardous weather on the route in near time.

Given that land-based 3D-printed weather monitors cost between US$300-500, a similar affordable cost for the marine sector would be of enormous value. Catherine Lawson, professor at the University at Albany, NY and head of the Albany Visualization and Informatics Lab, is leading the effort to design and deploy 3D-printed weather monitors, alongside her multidisciplinary team.

'Developing world' developments

Linear urban ferries are the coming thing in urban planning (see, for instance, the new NYC Ferry) and the Chao Phraya River Ferry was one of the first – and best – of this type, going down the iconic waterway past beautiful temples and bustling commercial centres. Farn Sritrairatana, executive director of the Chao Phraya Express Boat Company, reported on the expansion of the service with an aggressive upgrade to intermodalism. The company is also taking advantage of the real estate value bump that ferries deliver by placing hotels and shopping centres and sports activities at the landings they control.

Archipelago Philippines Ferries, which runs the FastCat vessels in the Philippines, reported on its trialling of the online ferry crew training course that it developed with Marine Learning Systems. Archipelago has been a leader in improving tracking and communications with its vessels by offering space for Vesseltracker antennas. This company too has gone intermodal – partnering with a bus company to get people to and from its terminals – and is also taking advantage of the real estate bump and giving it a kick, by siting training centres and hotels at its landings. The hotels encourage visitors to stay, and so stimulate more ridership.

Paired with Archipelago, as it described its ferry training programme blending hands-on experience with online learning, Richard Paine, regional director for HSSQE at NYC Ferry Service operator Hornblower (see *Ship & Boat International* July/August 2017, page 8) presented use of a "crowded harbor simulator" for its training of captains, reflecting the reality of New York Harbor where 14,000teu containerships share the harbour with kayaks, tug barge combos, excursion vessels and numerous ferries.

Meanwhile, the Ivory Coast, Africa is in the midst of a huge build-out of ferries as part of its initiative to decongest the rapidly growing powerhouse of capital Abidjan. Damen's Jan van Ooijen and Jan van der Vorm made a presentation on the design of the vessels and the floating landings. The director of the government's Société de Transport Lagunaire, David Fofana, joined them as a participant in the conference.

VHL Design Group's VHL Steadfast concept scooped second prize

Ganges development

Along the 1,000-mile stretch of the lower Ganges that leads to the sea at Haldia, there is a population of about 350 million, roughly the same as the entire US. India's is growing at the highest rate of the G20, at over 7% per year, but is hampered by infrastructure bottlenecks, among other factors.

This long river is situated in a land where the trains and roads are dangerous, and where the industrious population is technologically advanced but hampered by a lack of water transport. For instance, only 0.5% of domestic freight is carried via inland waterway in India, compared to 8.3% in the US, 8.7% in China and 42% in the Netherlands. The World Bank has endorsed the US$800 million National Waterways 1 project: Amit Bhowmick, the Port Authority of NY/NJ's director of ferries, presented the context and Pratap Talwar of the Massachusetts Institute of Technology (MIT), consultant to the project, gave an update. There will be over 20 landings, many of them floating, and the infrastructure will support cargo vessels and passenger ferries.

Digitisation is key

When the WFSA first convened the conference in 2015, digitisation in ferries was sparse. By 2017, digitisation is as pervasive as electricity. There were presentations by: Rick Jeffress of fire suppression specialist Fike, on oil mist fire detection using CCTV and telematics; Vesseltracker's David Hewson, on the full suite of utilities embedded in AIS; and ferry operator NY Waterway, focusing on the application of its mesh network, utilising the Internet of Things (IoT) to enhance safety on its routes.

Tying it all together was the question – would all the information that is comprehensive, transparent and trackable sway maritime insurance underwriters to reduce premiums, as has been the case

with insurers for truck fleet operators? John Miklus, president of the American Institute of Marine Underwriters, fielded the question with nuanced answers, pointing out the differences between vehicle fleets and vessels while recognising changes wrought by technology.

The end of day one saw an award ceremony that featured judges Charles Cushing, Joe Hudspeth and Farn Sritrairatana, and members of the WFSA Board, such as Roberta Weisbrod, Len Roueche, John Waterhouse and Tom Fox. Conference moderators included: Joe Hudspeth; Len Roueche, formerly of FRS and the WFSA; Bill Grossman of the US Coast Guard; John Garvey, Staten Island Ferries; and Shea Thorvaldsen, McLaren Engineering.

This was followed by an indoor-outdoor, on-dock reception and a sunset cruise on the weather deck of the Staten Island Ferry.

Underlying factors

Day two started with a joint breakfast meeting at the headquarters of Staten Island Ferry in the Whitehall office of the Transportation Research Board Ferry and Maritime Safety Committees. There were presentations focused on measuring the underlying factors to ferry accidents. Todd Ripley of Marad, Kevin McSweeney of ABS and Brian Craig of Lamar gave great talks related to how to measure safety culture – what you can measure you can manage. Also, Siyu (Cathy) Xu of Shanghai Jiao Tong University, China made a presentation on relational databases, which can be used to understand the underlying causes of ferry accidents and then assembled in the same way one can sum a line of numbers on XLS. Martha Grabowski made a presentation on her research linking safety culture to safety performance across a series of companies.

From there, the conference participants walked up the Hudson shoreline to the World Financial Center pier to see NY Waterway's mesh network in operation in real time – and also to see the mechanicals in the 'basement' of the floating barge that is the World Financial Center Pier. NY Waterway provided a ferry to bring participants to Pier 11 on the East River, aka the Wall Street Pier, or 'the new Grand Central of all ferry lines'. There were presentations by Metal Shark, one of the two builders of the new NYC Ferry vessels (along with Horizon Shipbuilding), and James Wong, NYC Economic Development Corporation planner of the ferries, as well as a surprise guest appearance by the head of Hornblower, Terry MacRae.

After dockside presentations and a lively Q and A session, the conferees took what was then the newest ferry route for NYC Ferry and the most popular, the ferry to Far Rockaway. This vessel runs south out of the harbour of NY, out into the ocean and past Coney Island, to access the beaches of Rockaway and edge of the untamed sea. Upon return, participants could either walk to the historic Battery Maritime Building and take the ferry to Governors Island – NYC's newest park on an island settled in colonial times – or north up the East River to South Street Seaport, and then to take a NYC hop-on / hop-off water taxi tour of the greater harbour.

True to the tradition of all Ferry Safety and Technology Conferences there were breakfasts, lunches and a reception with good food and drink and time for networking. Success builds on success and the fourth annual conference will take place over three days in NYC and feature an exhibition of new technologies, between 20-22 March 2018. Meanwhile, the fifth annual conference is currently scheduled to take place in Bangkok in February 2019.

All the conference presentations are posted at: **http://ferrysafety.org/2017conference.htm**. *SBI*

For background, see:
[1]http://indico.ictp.it/event/a14297/session/1/contribution/7/material/0/0.pdf
[2]https://public.wmo.int/en/media/news-from-members/innovative-technology-low-cost-surface-atmospheric-observations-ucar

Fifth International Student Design Competition – open for entries

The WFSA is now accepting entries for the Fifth International Student Design Competition for Safe Affordable Ferries. This year's challenge calls for the design of a passenger ferry for operations in the Singapore Strait, in line with the association's requirement for a safe, affordable and ergonomic design that can be physically realised by local boatyards.

Student teams are invited to register before 15 November 2017, with entries due on 5 January 2018. The WFSA says: "Registration should be made by the team captain. Information to be provided includes team captain name, academic institution, address, phone number and email address; faculty advisor, name, address, phone number and email address; and the contact information for the other team members (team members may be modified at time of submission of design). Those teams that register will be provided with a registration number and will receive the Terms of Reference for the vessel to be designed."

Presentations by the winning student teams in previous competitions can be viewed at http://ferrysafety.org/ideas.htm. For the past four years, awards have been made to the student teams of US$10,000 annually, with US$5,000 awarded to the top team. For questions, kindly contact Dr Roberta Weisbrod, executive director of the WFSA, at ferrysafety@gmail.com. Participation should be registered via www.ferrysafetydesigncompetition.org.