

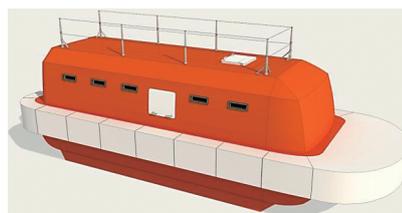
“Escape by Going with the Flow” Saves Lives

Completion of a new model with excellent comfort and all the robustness and crew safety features of the original model — Enhanced tsunami lifeboat for a massive earthquake

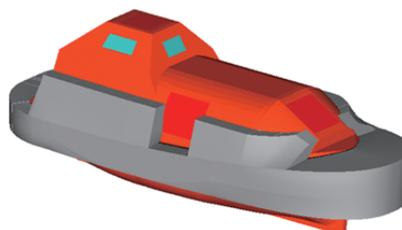
It is extremely important to evacuate to higher ground, a tsunami evacuation tower, or something in five minutes or less in order to avoid being the victim of a tsunami after a massive earthquake. However, what action should be taken in regions where there is no higher ground or evacuation facility or in facilities occupied by many elderly and other persons who are vulnerable in an emergency evacuation. One of the solutions to this problem is a tsunami lifeboat to be used to “escape by going with the flow.” In this paper, we describe a new boat model, which is an enhancement of the original boat developed in 2013.



Prototype model



New model (Lifeboat No. 2)



Original model (Lifeboat No. 1)

Pioneer in tsunami lifeboats who was also involved in the formulation of national guidelines

It has been about five years since the Great East Japan Earthquake, but our memories of the terrible destructive power of the earthquake and tsunami have not faded at all. It has been predicted that tsunami due to a massive earthquake occurring in the future will exceed as high as 30 m when it reaches the Japanese coast. Given these circumstances, the development of a lifeboat designed for evacuation from tsunami led by the Shikoku Transport Bureau of the Japanese Ministry of Land, Infrastructure and Transport began in 2012. There are several advantages of such a lifeboat. ① There is no need to design or place the lifeboat based on an estimation of tsunami height as its very premise is that it will float

through the tsunami. ② Lifeboats can be placed in the vicinity of places where regular activities are conducted. ③ Lifeboats can also be placed in places where neither a tsunami evacuation building nor tower can be built. ④ Lifeboats can easily be transferred when there is a change in the evacuation plan in the future.

Since the IHI Group was already manufacturing large passenger ships and tanker lifeboats, it applied for the national project and its proposal was adopted. The IHI Group was also involved in the formulation of tsunami lifeboat guidelines and completed its first lifeboat that provided safety well above the standards in the guidelines in 2013.

The main specifications of the tsunami lifeboat guidelines state that ① the body of the boat must maintain its shape and have the strength to withstand head-on collisions of 10 m/s and lateral collisions of 5 m/s (i.e., the boat must withstand

the impact of a head-on collision at an impact velocity of 36 km/h), ② the acceleration applied to the boat's body must be 15 G or less, and ③ the boat must not sink but exhibit sufficient overturning recovery at passenger capacity and a full load of equipment. When a tsunami arrives, the lifeboat will float up from the place where it was positioned, and when the Emergency Position Indicating Radio Beacon (EPIRB) switch incorporated into the Japan Coast Guard's relief system is turned on, it must transmit the position information to a satellite so that rescue teams can locate it.

Bringing together IHI's finest technologies to ensure collision safety

IHI's tsunami lifeboat complies with the guidelines while ensuring robustness and safety in accordance with its own specifications. With its second boat released in fall 2015, IHI devised additional features. First of all, IHI made sure that evacuees would be able to evacuate quickly, the key point in evacuation from tsunami. With the new model, which has a lower entrance opening at a height of 1 m from the ground and a larger door, passengers can enter the boat quickly. This is an outcome of its design that takes into consideration the elderly, handicapped persons, sick persons who cannot move freely, injured persons, and children. The height of the step at the entrance inside the boat is about 40 cm, and the interior of the boat where passenger seats are arranged has a full flat floor. In addition, the new boat has a higher ceiling and larger floor space inside. The toilet is worthy of special mention, and it has enough space for a user and carer. Assuming the case where passengers have to wait to be rescued in the tsunami lifeboat on the sea, the new lifeboat provides enough space to load water, food, and medical supplies for 25 persons for 7 days, improving the overall comfort during their time in the vessel.

Although the guidelines only define resistance to impacts from the front and side of the boat, it is expected in an actual tsunami situation that the boat may continuously receive impacts from all directions. IHI's original tsunami lifeboat model is already equipped with a cushioning material on the back of the boat. The second model has a structure in which

the utility room at the rear of the boat absorbs shocks (serves as cushioning space) and the seats are not affected even in the event of a stronger than expected impact from the rear. Furthermore, as for passenger protection, a special belt developed jointly with Takata Corporation, the top seat belt maker, retains the body of a passenger at four points. The seats are designed to minimize the movement of the lower back in an impact by inclining the seat back by 10 degrees instead of setting it perpendicular to the seating surface. Even from the original lifeboat, the headrest was designed taking the shape, mat material and thickness into consideration by calculating the distance between the passenger's head and the headrest so that there will no damage to brain even in the shock from a rebound. Moreover, IHI tested whether the seat belt, seat, and headrest as a whole keep the body safe.

Lifeboat No. 2 went through a major change in the exterior as well. Since the shape of the boat and the structure of the bottom do not need to be rounded for the purpose of reducing hydrodynamic drag, the shape of the boat is square like a bus. As a result, the lifeboat can stand upright without the need for a stand for mounting the boat, thus reducing the cost.

Basking in the attention of the communities and the facilities worried about difficulty evacuating from tsunami

IHI's lifeboat featuring robust boat body, passenger safety, and comfort of ride is receiving the attention of local governments, businesses, and the like located in coastal areas. For example, a company has a monitoring facility at the tip of a narrow pier extending about 1 km offshore where about 20 persons are stationed. The company valued the advantage of the lifeboat for reducing concerns about being isolated in the event of emergency and decided to install IHI's lifeboat. Many port facilities without higher ground nearby, kindergartens, nursery schools, hospitals, and other facilities for the elderly located in coastal areas are also interested in the boat.

The IHI Group has a department handling tsunami evacuation towers. Since placing several lifeboats near a tower may increase options for evacuation procedures, the department is actively promoting the use of the lifeboats and towers in combination.

In April 2013, the Resilience Project Department was established with the mission of solving important challenges in Japan's social infrastructure, namely, "preparing for and mitigating natural disasters" and "aging infrastructure." Going forward, the division will continue to aim at developing and expanding the customer base of products that protect people's lives and livelihoods.

Inquiries:

Resilience Project Department,
Operations Infrastructure,
IHI Corporation
Phone: +81-3-6204-7315
Website: www.ihico.jp/en/



Inside Lifeboat No. 2