



The Ship Use at the Time of the Disaster

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Abstract

In large-scale disasters, ships played an extremely important role in the afflicted areas for emergency transportation of support materials, SDF, police, fire department, and vehicles. The high capacity of the ship was reaffirmed. The ship originally has four unique functions: transportation, accommodation, living, and communication. The ship is self-contained with these functions that are necessary for disaster relief. Therefore, in the event of a major disaster shredding the overland or lifeline, if the environment where the ship can be used is prepared, we should actively utilize the ship to support disaster relief, as a shelter, a hospital ship for emergency medical care, transportation and a base station for communication.

Subject Areas

Emergency, Critical Care

Keywords

Ship Use, Transportation, Shelter, Ship Hospital, Communication

1. Introduction

During large-scale disasters such as the Great East Japan Earthquake and the Great Hanshin-Awaji Earthquake, ships played a crucial role—facilitating the emergency transport of relief supplies to affected areas and moving personnel and vehicles from the Self-Defense Forces, police, and fire departments—thereby reaffirming their immense potential.

With the anticipated occurrence of future large-scale disasters—such as a Nankai Trough earthquake or a direct-hit earthquake in the Tokyo metropolitan area—there is a risk of widespread disruption to land transportation networks; consequently, the role of ships as a means of delivering effective support to disaster-stricken areas is becoming increasingly important.

By their very nature, ships possess four inherent functions: transportation, accommodation, living facilities, and communication. They are self-sufficient in providing these functions, all of which are essential for disaster relief. Given that Japan is prone to natural disasters, it is only logical to actively utilize ships for disaster support whenever the necessary conditions allow for their operation. This paper examines the use of ships during disasters, drawing upon existing literature.

2. Living Conditions in Evacuation Shelters

In Japan, it has long been standard practice to use facilities like gymnasiums—which lack privacy and are highly stressful—as evacuation shelters during disasters. While people accept these as temporary refuges, the Great Hanshin-Awaji Earthquake drew attention to “disaster-related deaths”, where the stress of prolonged, cramped shelter life triggered fatal health issues. Regarding living and sleeping arrangements, securing adequate space is crucial. Even among those sheltering in vehicles, minivan occupants experienced a lower incidence of Deep Vein Thrombosis (DVT) compared to those sleeping on the floor in communal shelters [1] [2]. This difference is likely attributed to the ability to rest in a minivan without keeping the lower legs in a bent, hanging position. Conversely, sleeping on the floor in communal shelters prevents people from fully extending their legs, thereby increasing the risk of DVT. Given that simple disaster cots are widely used overseas, there is a growing view that Japan should actively adopt them to ensure every disaster victim has enough space to rest comfortably [1] [3].

The cardboard beds originally prepared for the Tokyo 2020 Olympic Village are now being supplied to evacuation shelters; these beds promise to facilitate a more comfortable and safe living environment. Compared to metal-frame cots, cardboard beds offer several advantages: they are inexpensive, can be assembled by hand without tools, are easy to dispose of and recycle, provide warmth due to the air layers within the cardboard, and keep the sleeper sufficiently elevated off the floor to prevent body heat loss and the inhalation of dust.

Ships, meanwhile, serve not only as vessels for transporting people and goods but also as living environments; they allow disaster victims to sleep in actual beds, which helps prevent DVT. The people on board the ship can fully stretch out their legs to sleep and avoid staying in the same position. Ships are fully equipped with essential amenities—including electricity, water, food, bathing and toilet facilities, laundry services, climate control, kitchens, and sleeping quarters. By leveraging the functions of these self-contained “micro-societies”, ships can be utilized directly as evacuation shelters for disaster victims during emergencies. Furthermore, the vessel can provide facilities essential for maintaining health and daily living—such as meals, water supplies, bathing, restroom, and laundry services—to disaster victims. Beyond serving victims, the ship can accommodate recovery personnel (such as DMAT teams) and function as a “doctor ship”, serving as a base for medical operations in collaboration with medical professionals.

However, a potential issue with ships is that damage to the quay can prevent

docking. In the case of inland earthquakes like the Great Hanshin Earthquake, quays may be damaged and unusable; in events involving tsunamis, such as the Great East Japan Earthquake, the port facilities themselves may be rendered inoperable. Nevertheless, in those instances, the quays became usable again within a month of the disaster.

Therefore, if the quay remains undamaged and docking is possible immediately following the disaster, large ferries or cruise ships with high passenger capacities can be brought alongside to shelter large numbers of people. Conversely, if the quay is damaged, conventional facilities like gymnasiums would serve as evacuation centers initially, with the ship brought in to act as a relief hub only after the quay has been repaired.

3. Utilizing Ships for Emergency Medical Care

Drawing lessons from the Great Hanshin Earthquake, the Japanese government and local municipalities have focused on organizing Disaster Medical Assistance Teams (DMATs) and establishing disaster base hospitals to handle emergency medical needs. Thanks to these efforts, DMATs are now dispatched to disaster zones immediately following a disaster—depending on its severity—to provide emergency care on-site, while critically ill patients are transported to hospitals outside the affected area, primarily via helicopter.

The standard operating procedure envisions medical personnel, including doctors, standing by at disaster base hospitals immediately after a disaster strikes. Meanwhile, there is ongoing debate regarding the construction of dedicated hospital ships to handle care during the hyper-acute and acute phases. Although similar proposals emerged after both the Great Hanshin Earthquake and the Great East Japan Earthquake, issues such as construction and operational budgets, as well as how to utilize the vessels during peacetime, have prevented their realization.

In contrast, the US Navy's hospital ship *Mercy* [4] treated 107,000 disaster victims over a five-month period following the 2004 Indian Ocean Tsunami. At 272 meters in length and with a displacement of 70,000 tons, the *Mercy* is the world's largest hospital ship; commissioned in 1984 after being converted from a used tanker, it is a veritable floating general hospital, featuring 12 operating rooms, X-ray and CT scanning equipment, 80 intensive care beds, and a total capacity of approximately 1000 beds. During peacetime, the *Mercy* is maintained at its home port in San Diego, California, with a minimal crew of 60 medical staff and 12 ship crew members; however, in the event of a disaster, 1200 personnel—including civilians—are mobilized from various locations to board the ship, enabling it to become operational within five days of receiving orders. The crew aims, in particular, to assume their duties within 72 hours.

Japan, also, should urgently construct hospital ships like the *Mercy*—vessels capable of providing surgery and advanced medical care during the critical hyper-acute and acute phases within the first 72 hours following a disaster.

In the event of a major disaster, the vessel would immediately deploy to waters

near the affected area; if damage to the quay prevents docking, it would anchor offshore, transporting critically ill patients by helicopter and other patients by small boat to the anchored hospital ship. How to utilize the vessel during peacetime is also a matter for consideration. Potential uses include conducting health checkups and providing medical care on remote islands, as well as contributing to international aid efforts; however, the vessel's large size makes it ill-suited for remote island operations, and deploying it for international aid raises the issue of an inability to return quickly should a disaster strike at home. Nevertheless, for a nation surrounded by the sea like Japan, the use of ships as hospital ships during disasters is an issue that warrants further exploration.

4. The Minimum Operational Conditions for Ship Deployment

When using a vessel, we verify the local damage situation and the usability of the port. We must estimate available vessels and transport capacity. In December 2025, the Japanese government concluded a cooperation agreement on the operation of hospital ships with Miyazaki Car Ferry and Shin Nihonkai Ferry. In the event of a disaster, the government charters ferries from both companies based on requests from the affected local governments.

The government has also concluded an agreement with the Japanese Red Cross Society regarding the dispatch of medical personnel; these teams-comprising DMAT members and Japanese Red Cross medical staff will operate either on evacuation vessels that provide care during transport or on relief ships that remain anchored to administer treatment. The government will cover the costs associated with these operations.

5. Use for Transport

When road networks are damaged by disasters, making overland transport difficult, utilizing large passenger ships or ferries is a viable option. In such scenarios, the rapid and appropriate selection, procurement, and deployment of vessels are crucial. To facilitate the quick selection of ships that best meet specific needs, the Domestic Shipping Division of the Ministry of Land, Infrastructure, Transport and Tourism's Maritime Bureau developed a database of private vessels and created guidelines for ship utilization manuals in 2014 [5].

A notable recent example occurred on September 4, 2018, during Typhoon Jebi (Typhoon No. 21). Kansai International Airport (KIX) was forced to close after storm surges flooded its runways; additionally, strong winds caused a tanker to collide with the bridge connecting the airport to the mainland, damaging the structure and rendering both rail and road links unusable. This effectively turned the airport into an isolated island, leaving approximately 3000 travelers stranded overnight. Starting on the morning of September 5, Kansai Airports deployed three high-speed vessels (each with a capacity of 110 passengers) to operate as "disaster relief vessels", transporting those who wished to leave from KIX to Kobe

Airport. Television footage showed large numbers of people waiting for long periods to board these high-speed vessels; this raised the question of whether using larger passenger ships or ferries could have enabled the evacuation to be completed in less time. In the situation at the scene, I thought that large vessels could not be used due to berthing limitations and navigational constraints.

6. Ship-Based Base Stations

Another characteristic of ships is their capability for uninterrupted communication. Ships are typically equipped with a wide range of functions for gathering and transmitting information, including international VHF, wireless ship-to-shore telephony, maritime satellite communications (such as Marinet), fax, television, and radio reception.

Drawing on the experience of the 2011 Great East Japan Earthquake—where severed roads and cut fiber-optic cables made it difficult to restore land-based base stations—KDDI has conducted field trials using ship-mounted base stations to restore service from the sea in coastal areas. These trials aimed to enable mobile phone usage in surrounding areas where land-based base stations were not fully functional due to the earthquake. Subsequently, following the 2018 Hokkaido Eastern Iburi Earthquake, and given the uncertainty regarding power supplies to communication facilities in the disaster zone, KDDI positioned its submarine cable-laying vessel, the KDDI Ocean Link, off the coast of Hidaka. This marked Japan's first attempt to restore service coverage using a ship-based base station, successfully enabling the use of mobile phones and Wi-Fi in surrounding areas where land-based base stations were compromised.

7. Discussion

In the event that roads and railways become unusable due to a disaster, the use of ferries and passenger ships should be considered. However, realizing this concept is impossible without navigating complex administrative procedures: procuring vessels generally requires requests to the Maritime Bureau via affected local governments; vessel relocation falls under the jurisdiction of the Transport Bureau; mooring requires permission from the port authority; information regarding the clearing of shipping lanes is managed by the Port Bureau; and utilizing ships as evacuation centers or for providing medical and welfare services necessitates detailed coordination with the respective supervising ministries. Therefore, to establish a functional framework for disaster relief vessels during normal times—before a crisis strikes—a collaborative system involving the national government, local authorities, and operational groups must be built.

8. Conclusion

Ships inherently possess four distinct functions—transportation, accommodation, daily living support, and communication—making them self-sufficient platforms for the capabilities required in disaster relief. Given that Japan is prone to

natural disasters, I believe that if the necessary conditions for their deployment are met, ships should be actively utilized to support disaster relief efforts.

Conflicts of Interest

The author declares no conflicts of interest.

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