

White Paper

SEAHAVEN APPLICATION STUDY

The applications of the world's largest inflatable lifeboat



“ THIS WHITE PAPER WITH FORESHIP’S TECHNICAL ANALYSIS IS AN IMPORTANT REFERENCE FOR CRUISE LINES CONSIDERING INTEGRATING SEAHAVEN INTO THEIR FLEETS, GUIDING THEM TO HELP VALIDATE THE SYSTEM’S APPLICATION. ”

- Claude Sada, Chief Operating Officer, Survitec



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Chief Operating Officer
Survitec

A Foreword from Survitec

At Survitec, we have been at the forefront in maritime safety for over a century, committed to our purpose: We Exist to Protect Lives. While our expertise in Survival Technologies is well-established, our latest innovation, Seahaven, is set to redefine safety at sea.

Seahaven represents a significant advancement in maritime safety, which century-old regulations have largely governed. The International Convention for the Safety of Life at Sea (SOLAS), established in 1914, continues to govern maritime safety today.

Classification society Lloyd's Register awarded Seahaven type approval in September 2022. This followed the successful completion of heavy weather sea trials (HWST), carried out in line with the SOLAS requirements for Novel Appliances, which require the test to be performed in conditions that do not drop below six on the Beaufort Scale, and the International Maritime Organization (IMO) A.520 physical tests as required by Lloyd's Register.

This latest application study, conducted by Foreship Naval Architects, adds another dimension to the use cases of Seahaven. Their independent analyses have shown that the efficiencies and enhancements in safety are evident, particularly for medium to large vessel types

Seahaven is an advanced, fully automated inflatable system designed to evacuate up to 1,060 passengers in under 22 minutes. It has multiple helical slides, a technology that Survitec has refined over the past two decades. This system simplifies the evacuation process by removing the complexities associated with traditional davit and release-hook mechanisms. It also optimises deck space by eliminating the need for large, rigid lifeboats, allowing cruise owners and operators to redesign passenger areas.

We appreciate the insights and expertise that Foreship has brought to evaluating Seahaven's technical application. We understand that selecting lifesaving appliances is never a one-size-fits-all decision; each application requires careful consideration of its specific requirements, operational context, and safety standards.

It is important to clarify that safety was not the primary focus of this white paper. The safety aspects of Seahaven have already been well-documented through other independent reports, demonstrations, and approval body tests.

The Brookes Bell report highlighted a 15% to 33% reduction in evacuation time compared to traditional lifeboats. It also found that Seahaven achieved a 100% success rate in optimal conditions, significantly outperforming the 73% success rate of traditional lifeboats. The report concluded that Seahaven reduces potential loss of life by nearly 50%, ensuring maximum safety for both passengers and crew.

The Lawes & Co report outlined key operational efficiencies. Seahaven reduces onboard inspections and maintenance time from 150 hours per month for traditional lifeboat systems to just 8–10 hours per month, freeing up crew resources for other critical operations. Seahaven lowers training requirements by 75% by using controlled environments and advanced simulators, removing the risks associated with lifeboat drills. The state-of-the-art enclosed design also improves reliability by reducing mechanical issues and green water damage, helping to minimise operational disruptions.

For further benefits, please scan the QR code located at the end of this document

This white paper with Foreship's technical analysis is an important reference for cruise lines considering integrating Seahaven into their fleets, guiding them to help validate the system's application.

Seahaven reflects our vision for the future of maritime safety, where automation, efficiency and Survival Technology go hand-in-hand.



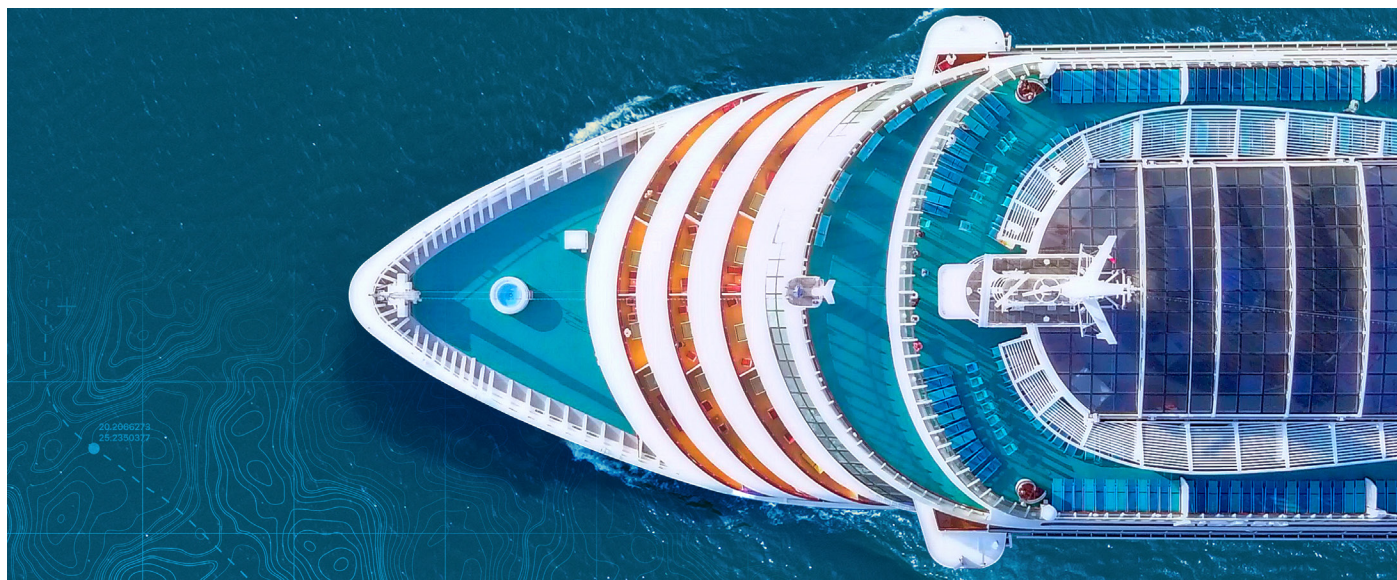
Introduction

With a capacity of 1,060 people, Seahaven by Survitec is the world's largest inflatable lifeboat. It represents an innovative approach to lifeboat provision which, in the right application, offers compelling design flexibility compared to conventional lifeboats.

This white paper summarises findings from the Survitec Seahaven application review conducted by Foreship. The results are based on an in-depth analysis of the design's application and integration into a range of passenger vessels. The review is underpinned by the expertise of Foreship's multidisciplinary team of naval architects, marine engineers, and Life Saving Appliance (LSA) experts, and represents a comprehensive and balanced evaluation.

By examining the application of the Seahaven system on medium, and large passenger vessels, this review provides a holistic assessment of its adaptability and efficiency. The goal is to show the potential of the design as a beneficial alternative to traditional lifeboats, highlighting its advantages in terms of space utilisation and design flexibility.

Foreship's global team of independent naval architects and engineers typifies its agnostic approach to consulting. Whilst efforts were made to ensure this analysis considered a representative range of vessels in operation across the cruise industry, it is not possible to maximise specificity across all potential ship types. All parties are encouraged to seek independent advice which can be tailored to needs, objectives, and circumstances.



Background and objectives

The impetus for the Seahaven design is rooted in a perceived desire for change in the cruise industry, moving away from the standard and toward a more innovative approach to lifeboat provision. Survitec appointed Foreship to independently review the application characteristics of the Seahaven design with the following objectives in mind:

- Evaluating the integration of the Seahaven system in place of traditional lifeboats across different vessel sizes and arrangements
- Assessing the impact on escape routes and muster station configurations
- Quantifying the technical benefits, such as additional cabin and public space gains

The primary aim of this report is to highlight the advantages of the Seahaven lifeboat design for enhancing vessel design opportunities, particularly in freeing up deck space and reducing overall weight.





LSA OPTIMISATION

Matching Life-Saving Appliances (LSA) to a vessel's design and maximum Persons-on-Board (POB) requires the balancing of regulatory standards, design constraints, maintenance costs, and crew training needs.

Selecting the appropriate LSA configuration is important. Foreship's review has evaluated four main configurations for integrating the Seahaven system:

Seahaven Only:

This configuration uses the Seahaven system to ensure 100% POB coverage with the loss of one unit.

It simplifies LSA management by utilising one system type, potentially reducing maintenance and crew training needs.

Seahaven + MES:

Combines Seahaven with Marine Evacuation Systems (MES). This setup can reduce the number of required Seahaven systems when overcapacity is high, offering cost and space savings, though it may increase complexity with multiple LSA types.

This configuration was found to balance flexibility and redundancy while ensuring SOLAS compliance and operational efficiency.



Seahaven + (Tender) Lifeboats:

Integrates Seahaven with traditional tender lifeboats and extra liferafts as needed. It provides tender capabilities and improves the efficiency of the evacuation system but increases maintenance and training complexity because of the mix of LSA types.

The optimal configuration varies by ship size and design needs. Small passenger vessels do not currently align with the target vessel type for the current design of the Seahaven system as they often favour simpler setups because of space constraints. Medium ships benefit from the possibility of including tender boats in the evacuation system, and large cruise ships benefit from the large capacity of Seahaven in either the Seahaven only or Seahaven + MES configurations in maximising efficiency.

Seahaven + (Tender) Lifeboats + MES:

The most comprehensive setup, combining Seahaven, tender lifeboats, MES, and extra liferafts. It offers maximum flexibility and redundancy, ensuring SOLAS compliance even in challenging scenarios, but entails the highest complexity in maintenance, operation, and crew training.

Capacity analysis

A detailed analysis of capacity was completed, analysing the alignment of the Seahaven lifeboat system capacity with different vessel sizes and configurations. This assessment measures how much, in percentage terms, an optimised Seahaven system matches the maximum persons on board (POB), comprising passengers and crew.

Each configuration is calculated to match the maximum POB as closely as possible. If the lifeboat capacity and maximum POB are equal, the overcapacity rating is minimal.

Table 1: Capacity of 1060persons Seahaven system only LSA system above 100% of POB taking regulations and alternative design requirements into account

Total POB	No. of 1060p Seahaven	Over Capacity	Total POB	No. of 1060p Seahaven	Over Capacity
1500	4	183%	6250	6	2%
1750	4	142%	6500	8	30%
2000	4	112%	6750	8	26%
2250	4	88%	7000	8	21%
2500	4	70%	7250	8	17%
2750	4	54%	7500	8	13%
3000	4	41%	7750	8	9%
3250	4	30%	8000	8	6%
3500	4	21%	8250	8	3%
3750	4	13%	8500	10	25%
4000	4	6%	8750	10	21%
4250	6	50%	9000	10	18%
4500	6	41%	9250	10	15%
4750	6	34%	9500	10	12%
5000	6	27%	9750	10	9%
5250	6	21%	10000	10	6%
5500	6	16%	10250	10	3%
5750	6	11%	10500	10	1%
6000	6	6%	10750	10	18%

Seahaven's large capacity presents an alignment challenge in some scenarios because it is less divisible than traditional LSA options. Foreship's analysis reveals where a 1,060-person capacity aligns well and where it would pose varying degrees of misalignment, with associated effects on efficiency and suitability. Below is a high-level summary of the distribution:

Mid-Sized Ships (3,000–6,499 POB):

These vessels align with the Seahaven system as the 1,060-person unit can be utilised more efficiently.

Large Ships (6,499–8000 + POB):

Larger vessels suit the Seahaven system's high capacity well. Vessels can effectively integrate the Seahaven system, potentially reducing the number of required LSA units.

LSA deployment

Foreship examined Seahaven's deployment characteristics and compared them with traditional lifeboats, addressing SOLAS requirements for a 20-degree heel deployment capability.

For medium-sized cruise ships, the Seahaven system integrates well, with no significant issues related to SOLAS deployment requirements. The system's minimum helical slide length is not limiting for most designs, and deployment can be managed without major modifications.

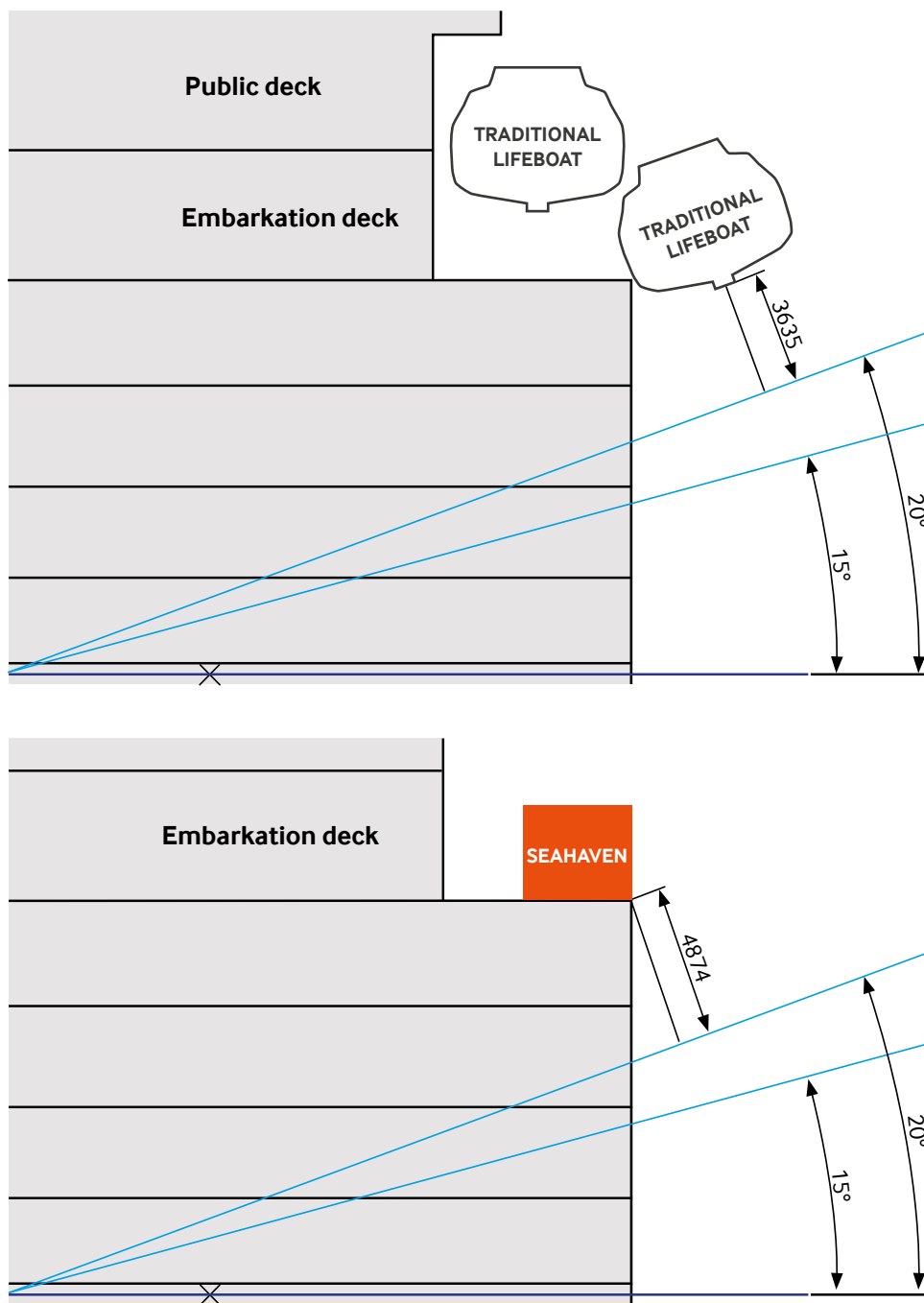


Figure 2:
Traditional lifeboat deployment at 20 degrees (top) Seahaven deployment at 20 degrees (bottom) for a medium sized cruise ship

Deck layout options

The layout of the lifeboat embarkation deck is critical for ensuring efficient and safe evacuation on cruise ships. Integrating the Seahaven lifeboat system offers various deck layout options that optimise space utilisation while still meeting the critical safety requirements of the lifeboat embarkation deck.

Foreship's study reviewed traditional and integrated layouts. Traditional layouts replace conventional lifeboats with the Seahaven system, maximising deck space without requiring significant structural changes. Configuring these within the hull width or with partial overhangs frees up valuable space for additional cabins or public areas.

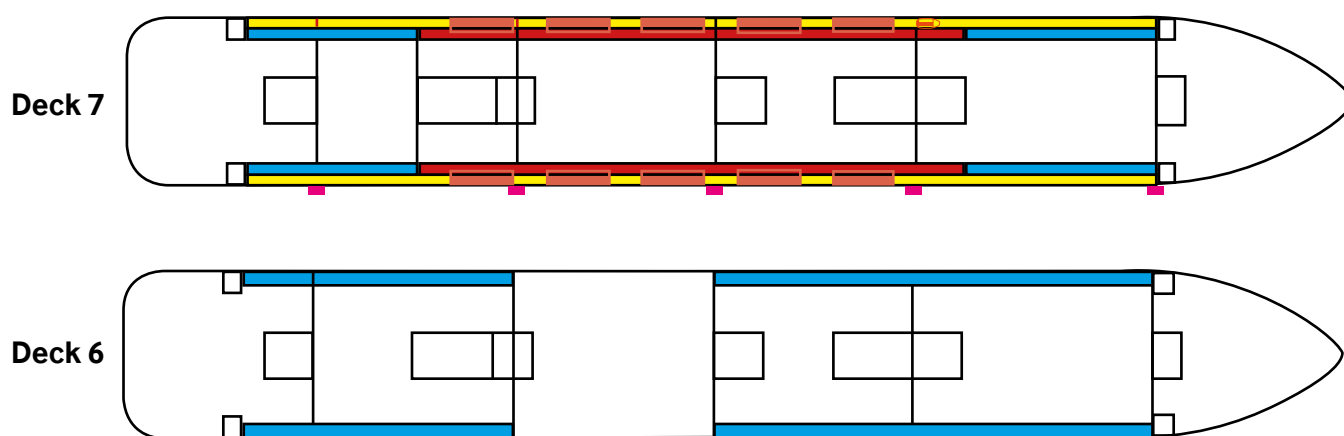
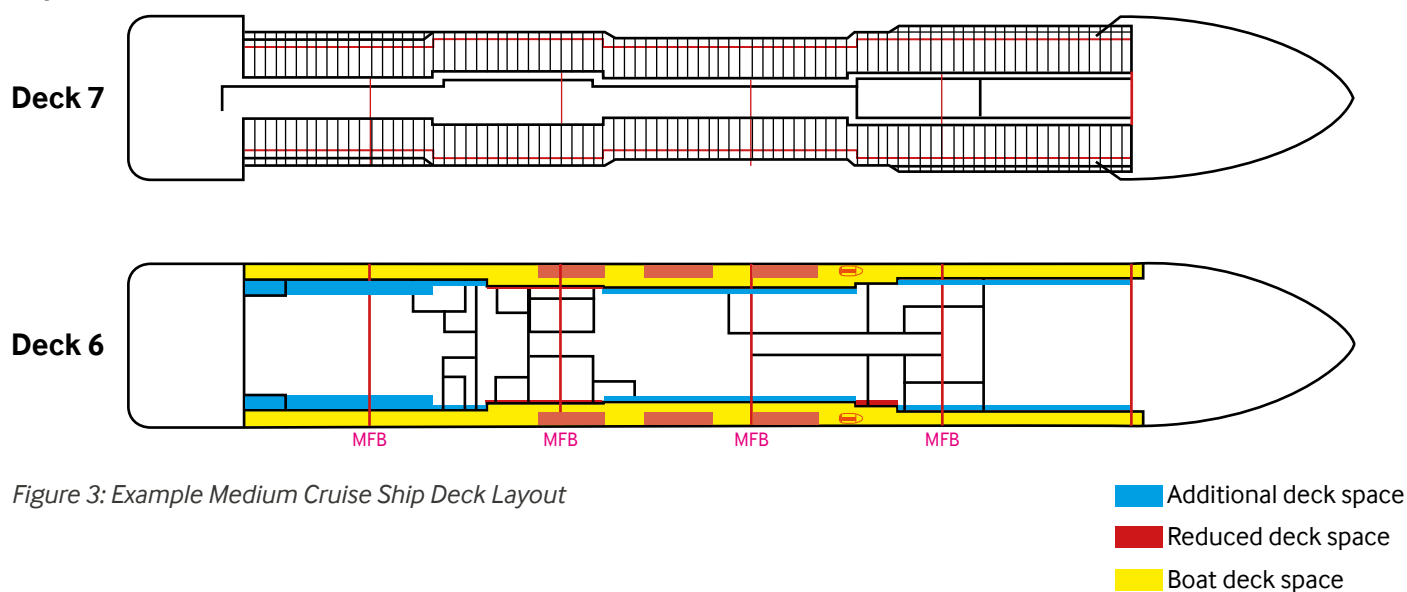
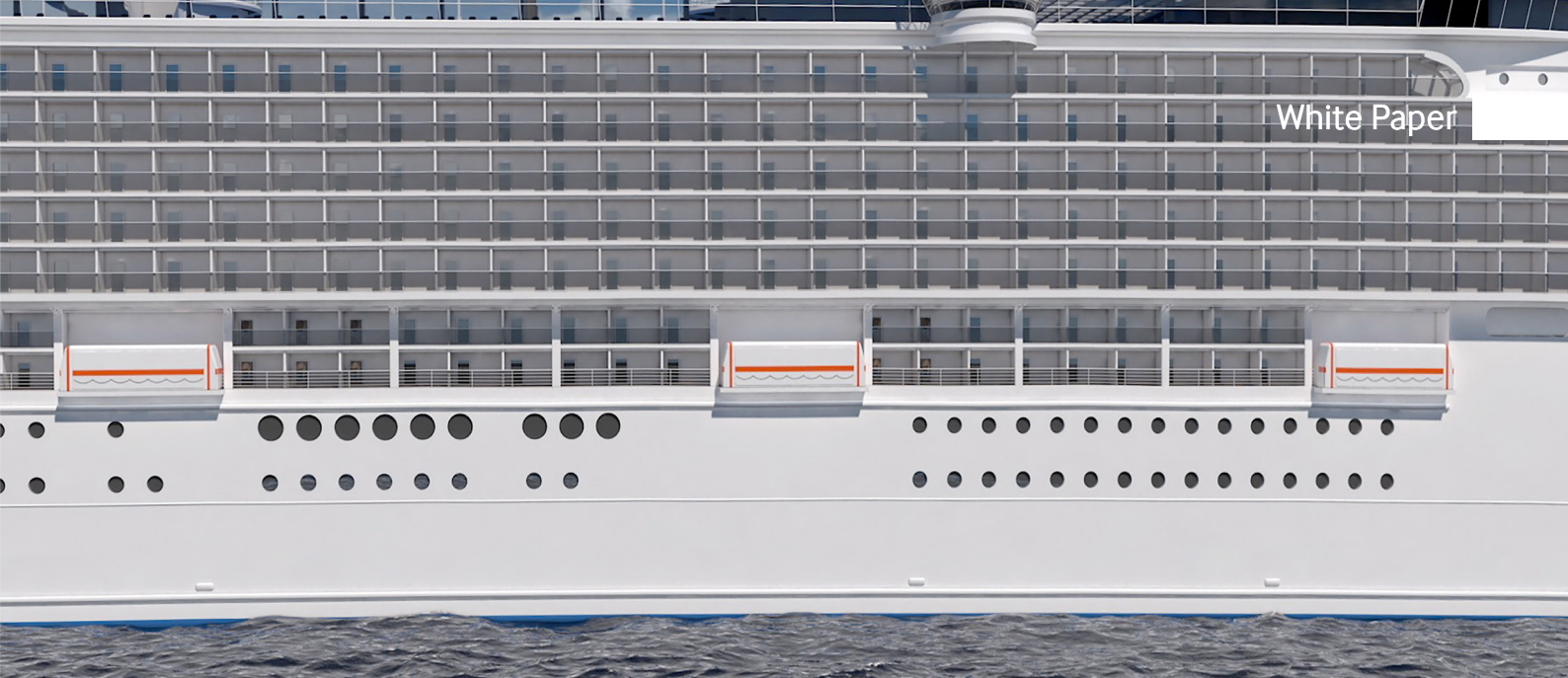


Figure 4: Example Large Cruise Ship Deck Layout

Integrated layouts align the Seahaven system with staircases. This approach enhances passenger access and convenience but requires careful planning to maintain separate and clear evacuation routes. Dedicated boat decks remain necessary to ensure safe and orderly evacuation, which limits the advantages of integrated layouts over traditional ones.



Quantification of benefits

The benefits of integrating Seahaven into cruise ship designs are substantial, particularly in terms of space usage and cost efficiency. There are also weight advantages too. The Seahaven system can be effectively integrated into both new ship designs and retrofitted onto existing vessels, providing benefits across both construction scenarios.

It is important to understand these benefits in relation to the design parameters of a given new build or retrofit project and understand where they differ.

When commissioning a new build design, an operator will set design parameters which suit the intended commercial profile for the vessel, ensuring that the design will be cost effective and competitive. These parameters are relational, meaning that any change must be compensated with a proportional adjustment to the corresponding parameter.

For example, if Seahaven results in an increase in public space, increasing the vessel's Gross Tonnage (GT), this will alter the Space Ratio (Gross Tonnage / Number of Lower Berths) specified in the design parameters. This must then be considered by either reducing public space elsewhere or proportionally increasing the back of house infrastructure if the space is used for additional amenities.

Table 2: Design parameters

Design parameter	Description
Gross tonnage	A nonlinear measure of a ship's overall internal volume
Lower berth	Standard bed in a cabin. Typically, 2 per cabin. Upper-berth would be pullman beds or sofa beds
Space ratio	Gross tonnage/lower berth
Service ratio	Number of crew/lower berth
Occupancy	Number of passengers onboard that is often expressed as a percentage: Passengers/lower berths. Occupancy rate can be higher than 100% as more than 2 passengers can stay in cabin (on pullman beds or sofa beds)
Passenger cabins	The design parameters around passengers that affect the design are: • Size of cabins • Type of cabins: Internal cabin, Seaview, Balcony cabin, demi-suite, suite etc. • Cabin type distribution

The considerations for retrofit solutions are different. Because the design parameters are fixed, Seahaven will be selected for its ability to alter an existing design parameter. For example, retrofitting Seahaven could reduce weight to allow for additional cabins, increase LSA capacity to increase occupancy, or create cabins on the deck above the embarkation deck, and / or public deck area on the embarkation deck itself.

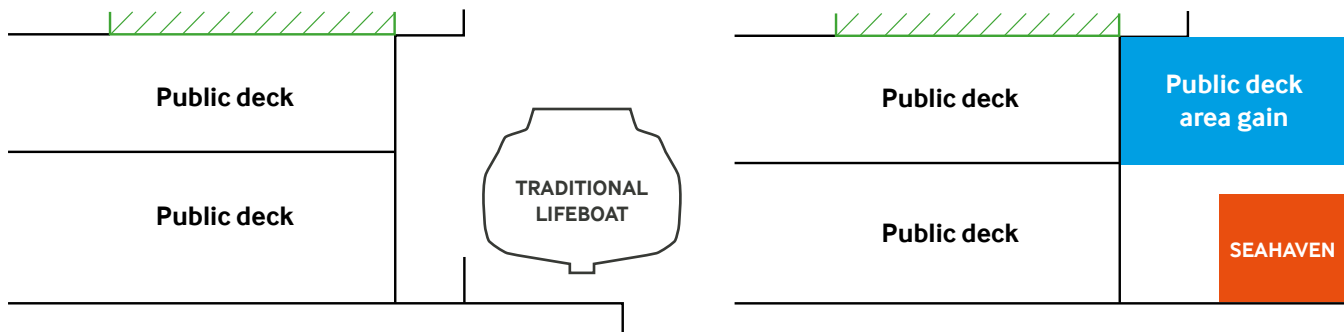


Figure 6: Public deck area gain on the deck above embarkation deck for a medium sized cruise ship

A further summary of each of the key benefits as they apply to both new build and retrofit designs are presented hereafter.

Space utilisation

Compared to traditional lifeboat systems, Seahaven can increase deck space, which can be repurposed for additional passenger cabins, public areas, or amenities. For mid-sized ships, this often means converting interior cabins to more desirable balcony cabins or expanding public spaces, enhancing passenger experience and potentially boosting revenue. On larger vessels, the freed-up space allows for more extensive leisure and entertainment facilities, contributing to a more luxurious onboard environment.

As a retrofit option, these space savings vary depending on the existing layout and boat deck configuration. However, for new build projects that are designed with Seahaven in mind, the savings could be maximised and put to the best alternative use for the owner or operator. Because Seahaven occupies less vertical and longitudinal space than a traditional lifeboat system, visibility is likely to be improved over the boat deck from the bridge. The reduced overhang is also helpful for vessels intending on transiting the Panama Canal and may contribute to improving the exterior aesthetics of the vessel.

Weight advantages

The Seahaven system offers weight advantages when compared to traditional lifeboat systems. For new build and retrofit designs, this weight saving can allow for additional cabins on upper decks or be used to add revenue potential in other ways such as larger or more diverse entertainment areas. In new build designs, a reduction in GT by lowering the deck height could also lower build costs. In retrofit, these weight savings could improve stability or be used to improve revenue potential.

Cost efficiency

Additional space allows for higher revenue generation through increased passenger capacity and enhanced onboard amenities. The Seahaven system's flexibility could simplify design and potentially reduce build time and costs during construction, offering independence from integrated structural and hydraulic systems. Seahaven also offers the potential to simplify and homogenise the LSA on board, reducing maintenance and crew training costs for operators.

Other ancillary advantages include:

- **Lower Deck Height:** The system's efficient design can lead to a reduction in deck height when compared to traditional lifeboat systems. This can contribute to lowering the ship's gross tonnage (GT) and reducing construction costs.
- **Enhanced Views:** By freeing up space and allowing for better layout options, the Seahaven system can improve sea views from the lifeboat embarkation deck and deck above, enhancing the passenger experience.
- **Operational Efficiency:** Simplifying the LSAs used on board (e.g., by reducing the number of different systems) can streamline maintenance and crew training, leading to operational efficiencies.

Conclusion

This review outlines Seahaven's innovative step forward in inflatable lifeboat design, offering enhanced passenger safety, flexibility, cost upsides, and improvements to both onboard operations and passenger experience in suitable applications.

The Seahaven lifeboat system offers distinct advantages for medium-sized vessels, particularly those with sea-view cabins positioned above the embarkation deck. Its lighter construction and reduced need for vertical and horizontal space can free up space and weight for additional cabins and improve overall vessel layout. This reduction in deck height is especially beneficial for medium-sized ships with partially overhanging lifeboats, as it creates extra deck space, enhancing views and the overall passenger experience while minimising the impact on gross tonnage. For large cruise ships, Seahaven also holds significant potential to expand deck areas, enhancing views and passenger experience. For any vessel, the Seahaven deployment time will be a critical advantage in future real-life scenarios, with studies finding safer evacuations and evacuation time improved by up to 33%.

Foreship's analysis provides a thorough and balanced view of its advantages, providing independent reference material for shipbuilders, owners, and operators exploring innovative lifeboat solutions.





SCAN ME
to view our Seahaven
deployment video



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