



## Riding the storm: Managing heavy weather risks

As storm seasons intensify and climate change drives more extreme maritime weather, it is increasingly important to manage heavy weather risks. This article – the first in a series – explores the operational factors relevant to keeping ships and those on board out of harm's way.

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Storm seasons have been active in both the West and East recently, and the Northern Hemisphere winter season is upon us. At a recent [WMO-IMO Symposium on Extreme Maritime Weather](#), participants noted that climate change is contributing to more frequent and intense extreme weather events, such as rapidly intensifying cyclones, which pose a major hazard to seafarers. Whilst not all heavy weather is extreme, failing to manage these risks can have serious consequences for those on board, ships and the environment. All ship types can be affected, although in different ways.

For these reasons we run a series of Insights articles on heavy weather risks, with emphasis on strong winds and high waves, focusing on the following operational scenarios:

- in port and leaving port
- on passage
- at anchor, before entering port

In this first Insight we introduce the topic and some relevant considerations.

## **Frequency and severity**

In Gard's experience heavy weather can be a factor in several claims and can feature more prominently in high severity claims. The recent IMO symposium heard that extreme weather was reported as a factor in at least one third of total losses in 2023. For 2024 the share was around a quarter. Fortunately, it is still relatively rare that ships are lost or that people are harmed by heavy weather affecting ships. However, Mother Nature can be cruel and fatalities or serious injuries do sometimes occur or at the very least endanger those onboard.

Significant harm can also be caused to the environment, especially when bunkers or cargo are lost due to grounding or cargo stowage failure. Worst case, groundings can also result in wreck removal. From a pure property perspective, heavy weather can cause damage to the ship and again, although rare, the loss of a ship from structural failure or water ingress. On a more day-to-day basis, heavy weather can cause contact damage during port manoeuvres or anchor dragging, and cargo damage due to shifting or seawater contact.

## **Ship factors**

It is important to understand how heavy weather can affect a particular ship. Vessels with high superstructures (cruise ships and car carriers), deck structures (offshore/heavy lift) or cargo areas (containerships) have large sail areas making them particularly vulnerable to strong winds. More conventional ships riding high in ballast (or without cargo undergoing repair) will also have enlarged sail areas. In addition, reduced propeller or rudder immersion may affect the vessel's power and manoeuvrability.

Ships having lower freeboards, with deck passages, openings and windows closer to sea level are more vulnerable to the effects of rough seas. Some vessels are more unique in design, and some will have built-in redundancies, such as back-up power when main propulsion is lost. Larger passenger ships must comply with SOLAS Safe Return to Port requirements, reflecting the potential consequences of an evacuation. The stability of the vessel, its geometry and speed are also important factors influencing behavior in a seaway and in combination with certain wave features can lead to more dangerous situations. Finally, the operational status of a vessel, including any defective equipment, can impair the ability to manage heavy weather risks. The structure, machinery and equipment of older vessels may be more vulnerable to the extra strains.

The issue of an ageing world fleet combined with more extreme weather events is a combination that deserves consideration. As for new ships, there is [debate](#) about how weather risks – and ships' ability to avoid severe conditions, especially in the context of climate change – should influence future ship design.

## Weather services to ships

The WMO-IMO Symposium recognised that seafarers depend on detailed and timely weather forecasts. Importantly for safety that means continued free access to baseline metocean warnings and forecasts through GMDSS. Such services are rapidly being augmented by readily available online products on better connected ships. Bespoke private sector weather services play an increasingly important role for routing costs, schedules, fuel efficiency, and emissions. Wind-assisted propulsion adds a further layer of complexity. We will consider weather routing and potential tensions between what is optimal and safe in a later Insight article.

Whilst challenges remain in forecasting the timing, localisation and intensity of adverse conditions, machine learning is enhancing accuracy. There is also a growing availability of graphical products and impact-based forecasts with electronic chart integration being made available. Marine weather and wave condition warnings are part of next generation universal data standards for [digital navigation](#), which should enhance decision making.

## Weather competence on ships

Improved weather services have, however, not prevented accidents from occurring, suggesting that decision-making remains an important factor. A seafarer's understanding of weather information and threats is key to decision making on board. A survey of seafarers and others across the maritime industry, conducted by the Nautical Institute (NI), in partnership with WMO and IMO, indicated that 40 per cent had not received weather-specific training from an "accredited" or "authoritative" weather programme.

The International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW) is under review, but weather competence is competing with other needs and a gap analysis of the current STCW resulted in over 500 proposals. Appreciating the importance of weather, some companies, particularly in the passenger sector, are not waiting for regulation. One cruise line attending the symposium employs their own meteorologists and others are known to provide around-the-clock critical weather guidance and support to their ships. The importance of formal "lessons learned" from weather events has also been recognised in setting operational limits or better informing future decisions.

## **WMO Voluntary Observing Ships (VOS) Scheme**

Weather forecasting accuracy benefits significantly from real-time observations from vessels at sea. Such observations would also likely help increase weather competence on board. Surprisingly, therefore, only an estimated 3 per cent of commercial vessels actively participate in the [WMO Voluntary Observing Ship \(VOS\) programme](#). These observational "portholes" into weather conditions actually being experienced are particularly key to adjusting forecast models in more remote parts of our oceans. There are calls for more mandated reporting or automated collection of real-time data.

## **Not as forecast**

Better weather services and competence go a long way but there will always be the possibility that actual conditions differ from forecasts. In the above-mentioned NI survey, 20 per cent of respondents had some degree of mistrust in marine weather warnings and forecasts. The symposium heard of experience that forecasts at sea often underestimate actual wind and sea conditions. More VOS reporting may help to support that one way or the other, particularly where forecasts cover large areas. Differences in the path, timing and intensity of more extreme weather events are not unusual. History serves as a stark reminder of events which can very quickly turn deadly. These include [Cyclone Tauktae](#) – the deadliest cyclone in the Arabian Sea for a decade. More lives were lost in the Gulf of Mexico when a small but intense low-pressure system, known to meteorologists as a [wake low](#) , created much more intense conditions than forecast. Forecast winds of 50 knots were far exceeded when a [cruise ship](#) found itself in winds of 146 knots off the US East Coast. The master estimated waves at 15 metres which disabled and damaged the ship and led to passenger injuries. These events are extreme and fortunately rare, but similar weather will re-occur in the future. There are many more occurring which may be less extreme but worse than forecast with the potential to cause harm.



*Seas breaking on a cruise ship*

## **Shore support and prudent overreaction**

As this article series will explore, ships and crew need more support to manage heavy weather risks. There will be limits to competence on board and seafarers have many tasks to juggle. Support from authorities in proximity to the ship should not be relied upon. Shipping companies are increasingly providing support through more specialist weather services. How those services are used will however benefit from a watchful eye from the comfort of the company office. With improved connectivity there is greater opportunity for better conversations between the ship and office. The support also needs to be clear in the form of guidance to and authority of the master. This should be reflected in the Safety Management System (SMS) beyond checklists. With an increased intensity of heavy weather events, prudent overreaction will sometimes be called for, and masters need backing when justifiably trying to prevent harmful consequences. It can also be the case that a master is over-confident by not taking appropriate measures, perhaps based on past experiences which may be misleading. Operational limits prescribed in the SMS may help to manage commercial dilemmas, especially where weather services are provided by charterers. Consideration should be given for what weather limits should be based on, such as forecast wind gusts versus sustained winds. Audits should consider whether any gaps exist in equipping the ship and the crew with what is needed to manage heavy weather risks.

## Key takeaways

- Weather has an increasingly important impact on shipping and, with climate change, heavy weather is having greater potential for harm to ships and those on board.
- Companies are investing in services and there are good reasons to also invest in competence. Different ships are affected in different ways and in every heavy weather situation there should be an assessment of the risks and control measures, including the potential consequences of measures not being taken and in good time. It should not be left to the ship and a single point of failure when making that assessment.
- The company ashore is an important line of defence and plays an important role in protecting lives, the environment and business, including reputation. Lessons from actual events, whether affecting own or other vessels, will also help to manage risks that all crew will face at some point.

In our next Insight we will look at heavy weather risks for ships in port and leaving port.

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