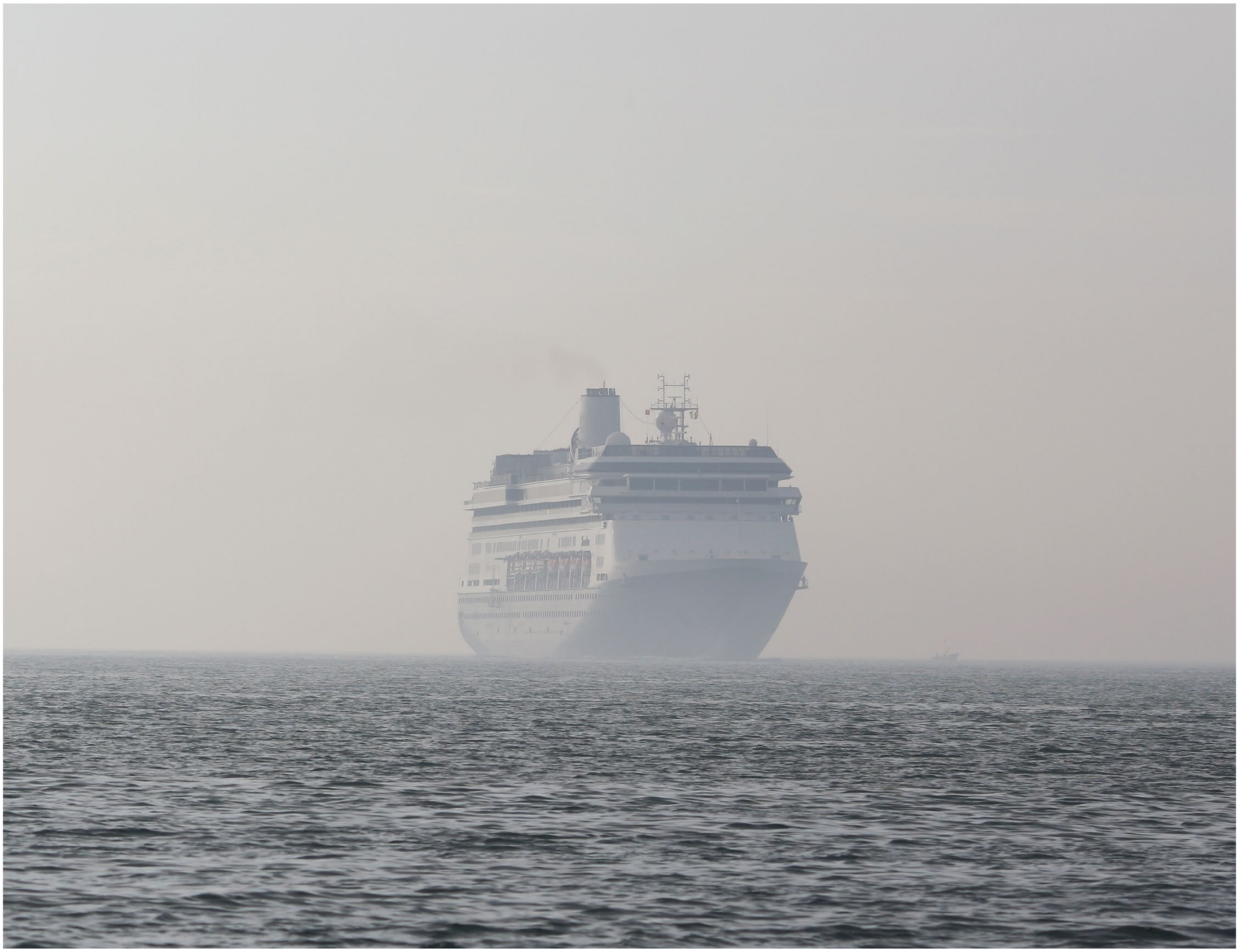


The American Club

SAFETY ALERT

MOORING PRECAUTIONS FOR VESSELS WITH LARGE SAIL AREAS WHEN EXPECTING HIGH WINDS

THE AMERICAN CLUB 1917

Introduction and background

The unpredictable force of the wind, often underestimated, significantly impacts large sail area (profile) vessels such as passenger ships, container vessels, ferries, and roll-on/roll off (ro/ro) vessels and car carriers, especially when moored. Their large sail areas expose them to potential beam wind hazards, leading to risks like a vessel breakaway that can result in a grounding, allision, collision, or damage to third party property.

This alert presents crucial insights on wind forces, mooring strategies, and common high-wind challenges.

Expected Forces Considerations

Wind pressure on a vessel's 'windage area' can create significant forces, especially on large ships. Estimating this force is vital for preparing for high wind scenarios to prevent overloading the mooring arrangement.

The windage area is calculated by multiplying the vessel's length by its height above the waterline. The expected wind force is then determined using the formula:

$$F = \tfrac{1}{2} * (\text{Density of air}) * V^2 * (\text{Windage area})$$

F is the wind force in Newtons

Density of air can be estimated at 1.2 kg/cubic meter

V is the wind speed in meters/second (m/s)

Windage area is the ship's area exposed to wind (in square meters)

OR

$$F = \tfrac{1}{2} * (\text{Density of air}) * V^2 * (\text{windage area}) / (32.2\ \text{ft-lbs/s}^2/\text{lbf})$$

F is the wind force in pounds-force (lbf)

Density of air can be estimated at .0752 pounds-mass/cubic foot

V is the wind speed in feet per second (ft/s)

Windage area is the ship's area exposed to wind (in square feet)

Example calculations are attached at Annex.

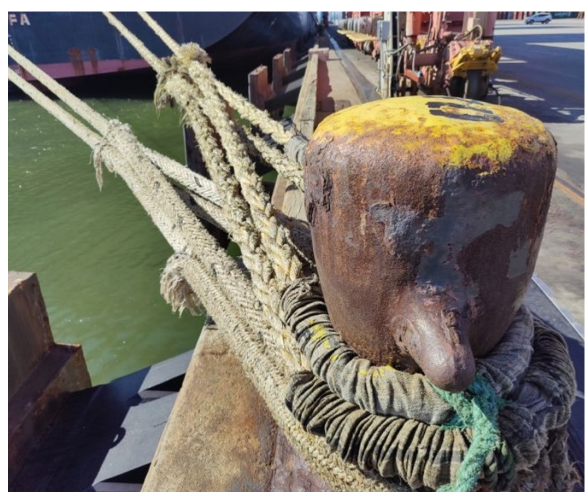
General considerations

Mooring a vessel in high wind conditions necessitates a thorough understanding of several factors that include:

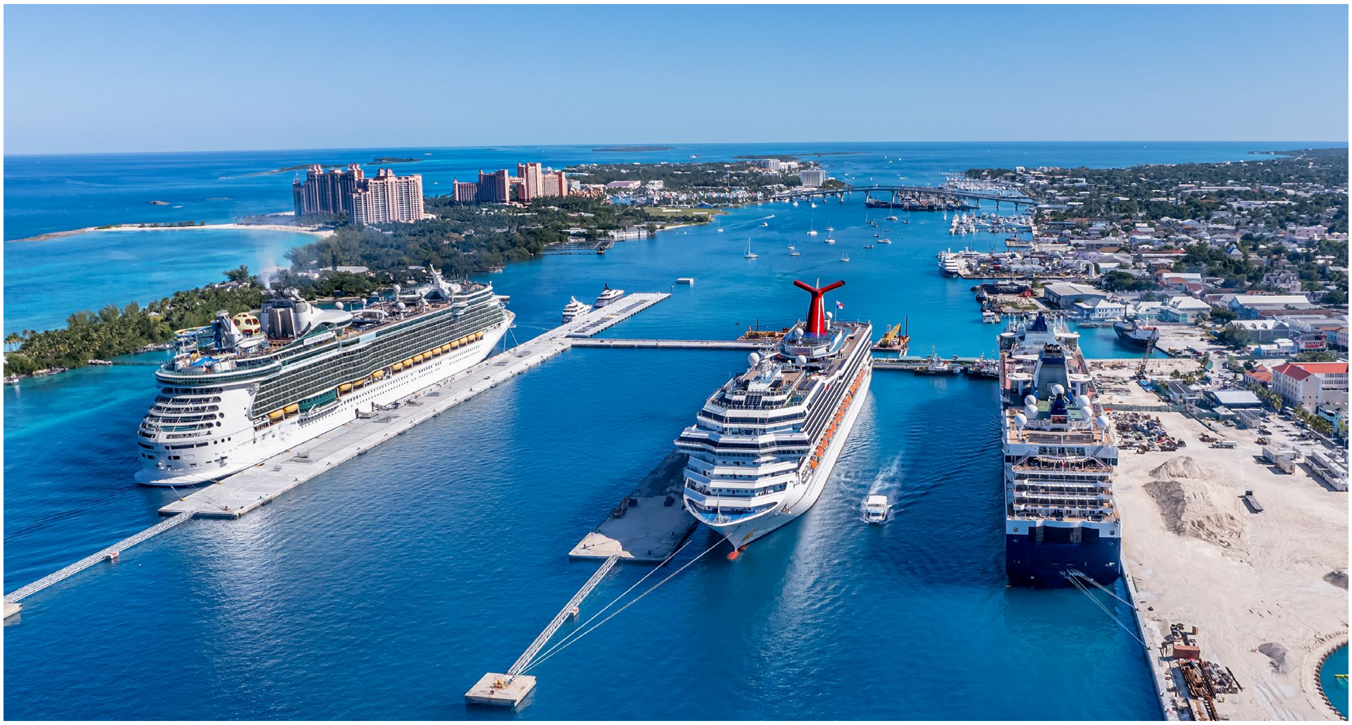
- characteristics and history of the berth, especially during strong wind events;
- possible outcomes of a mooring failure or breakaway;
- the berth's exposure and potential hazards in case of a breakaway;
- availability of more sheltered berths;
- possibility of leaving for the open sea or a sheltered anchorage area;
- readiness and availability of critical equipment such as main engines, thrusters, anchors, and tugs; and
- manning level and crew availability.

Moorings considerations

If the vessel captain decides to stay moored after considering the expected wind speed, estimated wind load, and other general considerations, the vessel should deploy extra mooring lines taking into account the following factors:



- conditions and age of the mooring ropes;
- brake render settings of the mooring winches;
- availability and safe working load of shore/terminal mooring points;
- conditions of shore/terminal mooring points;
- maximum number of moorings allowed to each mooring point;
- mooring pattern/arrangement and lead of the mooring lines;
- terminal recommendations for mooring arrangements;
- availability of tug assistance and linesmen that may be required to assist on short notice;



- potential wake effects of passing vessels on moored vessels;
- any forthcoming high tides or currents at the location that can put additional strain on the mooring lines;
- availability of clear and constant communication between the ship's crew, the terminal staff, and tug operators; and
- familiarity with port and terminal procedures, rules and guidelines that are relevant to mooring in high wind conditions, as may be applicable.

Be aware

There are several mooring operations related complications that may arise during periods of high winds that should be considered:

- overloading bollards due to the load from one or multiple mooring lines;
- using older and weaker mooring lines;
- incorrect settings on constant tension winches or winch render settings; and
- lack of situational awareness and monitoring of weather conditions.

- inability to deploy additional mooring lines due to unavailability of line handlers.

Lessons learned

- Plan for the expected weather, especially if wind gust velocites are anticipated to be high.
- Plan the mooring arrangement in advance of arrival as ashore mooring points can vary significantly.
- Know the capacities of the available mooring points ashore.
- Increasing the number of mooring lines before the weather deteriorates is much easier.
- Anticipate that thunderstorms can often include high winds.
- Training and drilling for high wind events can include line handling drills, emergency departure and engine start drills, and ensuring crew readiness in an actual situation.
- Establish and prepare an emergency action plan to mitigate the consequences of a mooring failure or vessel breakaway. For large sail (profile) vessels, such considerations should be part of the safety management system's emergency preparedness procedures.
- Perform a risk assessment before the vessel is berthed to help identify any possible issues and to enable planning for mitigation actions.
- Identify and liaise with local port authorities and meteorological departments. Cooperation with these authorities can be beneficial for gaining an understanding of local weather patterns and berth characteristics.

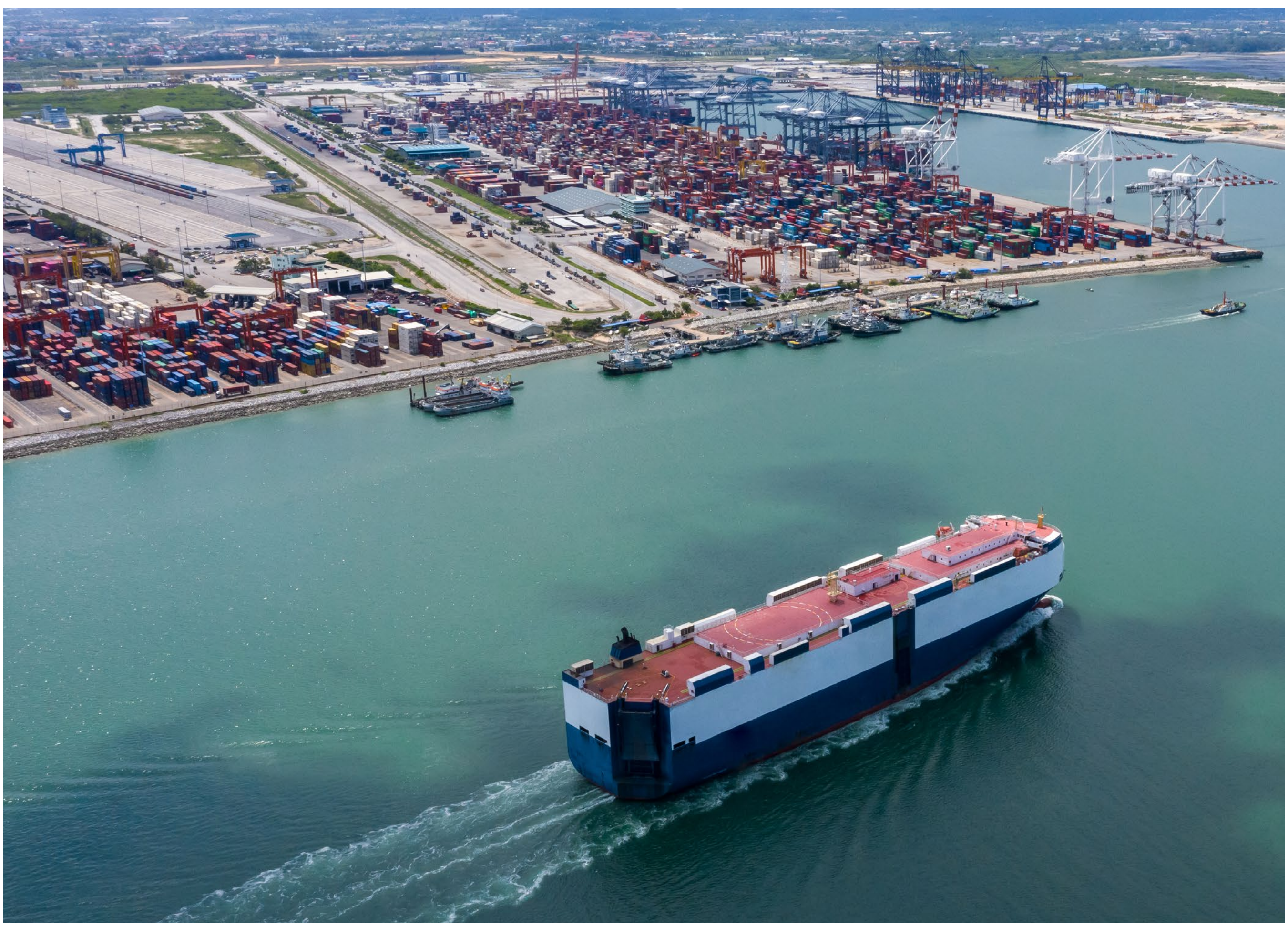
Advanced strategies to consider

- **Weather Monitoring Systems**. Real-time weather updates, including wind speed and direction, and site-specific forecasts can allow for swift decision-making in adverse weather conditions.
- **Mooring Analysis Software**. Modern ships and technical offices can utilize mooring analysis software considering the vessel and a berth's mooring arrangements and various environmental conditions, including wind, current, and wave actions. The use of such software can enhance decision-making regarding the mooring arrangement.

In conclusion

A combination of rigorous preparation, proper equipment maintenance, regular training, usage of modern technology, and cooperation with local authorities can go a long way towards ensuring the safety of large vessels when moored during high wind conditions.

The American Club would like to specially thank Independent Maritime Consulting, LLC for their contribution to this document.



Examples of wind force calculations

$\textbf{Force}_{\textbf{WIND}}$ = Mass ∗ Accelerations = ½ ∗ Air Density ∗ (Wind Velocity)^2 ∗ (Affected Area)

Where the Air Density can be approximated as 1.2 kg/m^3 or 0.0752 lbf/ft^3.

If an Affected Area is 1,000 m^2, Wind Velocity is 35 m/s and Air Density is 1.2 kg/m^3, then:

$\textbf{Force}_{\textbf{WIND}}$ = ½ ∗ 1.2 kg/m^3 ∗ (35 m/s)^2 ∗ 1,000 m^2
= 735,000 Newtons
= 75,000 tonnes-force in SI units

Alternatively, if an Affected Area is 10,760 ft^2, Wind Velocity is 114 ft/s and Air Density is 0.0752 lbf/ft^3, then:

$\textbf{Force}_{\textbf{WIND}}$ = ½ ∗ 0.0752 lbm/ft^3 ∗ (114.8 ft/s)^2 ∗ 10,764 ft^2 /32.2 ft-lbm/s^2/lbf
= 165,650 lbf
= 82.8 short tons force in non-SI (English) units of measure

AMERICAN STEAMSHIP OWNERS MUTUAL PROTECTION & INDEMNITY ASSOCIATION, INC.

SHIPOWNERS CLAIMS BUREAU, INC., MANAGER

One Battery Park Plaza, 31st Floor
New York, NY 10004 United States of America

TEL +1 212 847 4500
FAX +1 212 847 4599
WEB www.american-club.com
EMAIL info@american-club.com

2100 West Loop South, Suite 1525
Houston, TX 77027 United States of America

TEL +1 346 223 9900
EMAIL claims@american-club.com

SHIPOWNERS CLAIMS BUREAU (UK) LTD.

78-79 Leadenhall Street
London EC3A 3DH United Kingdom

TEL +44 20 7709 1390
EMAIL claims@scb-uk.com

SHIPOWNERS CLAIMS BUREAU (HELLAS), INC.

Filellinon 1-3, 3rd Floor
Piraeus 185 36 Greece

TEL +30 210 429 4990 1 2 3
FAX +30 210 429 4187 8
EMAIL claims@scb-hellas.com

SCB MANAGEMENT CONSULTING SERVICES, LTD.

The Workstation, 28th Floor
43 Lyndhurst Terrace, Central
Hong Kong SAR People's Republic of China

TEL +852 3905 2150
EMAIL hkinfo@scbmcs.com

SCB MANAGEMENT CONSULTING (CHINA) CO., LTD.

Room 905, Cross Tower
No. 318 Fuzhou Road
Shanghai 200001 People's Republic of China

TEL +86 21 3366 5000
FAX +86 21 3366 6100
EMAIL claims@scbmcs.com

SHIPOWNERS CLAIMS BUREAU (CYPRUS), LTD.

4, Kallitheas Street
Imperial House
2nd floor, Office 202
3086 Limassol, Cyprus

TEL +357 25 584545
FAX +357 25 584641
EMAIL info@asomic.eu