ΠΑΝΕΛΛΗΝΙΟΣ ΟΜΙΛΟΣ ΙΣΤΙΟΠΛΟΪΑΣ ΑΝΟΙΚΤΗΣ ΘΑΛΑΣΣΗΣ
HELLENIC OFFSHORE RACING CLUB

AEGEAN 600

HEAVY WEATHER

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This article is based on the books "Guide to Offshore Personal Safety for Racing and Cruising" published by ISAF, now World Sailing, "Heavy Weather Sailing" by Adlard Coles, the requirements of Offshore Special Regulations by World Sailing and with the addition of opinions based on personal experience.

In summary:

- Sailing is one of the safest sports and recreational activities but because it takes place at sea, one has to be prepared for every eventuality.
- Safety is not a matter of equipment only but also the ability and mentality of the skipper and crew.
- Training is required
- For survival, persistence and a sense of the temporary nature of the adversities faced, is required.

1912 Titanic – arrogant skipper

1979 Fastnet, Solent – Fastnet – Plymouth.
303 boats – 15 fatalities – 85 finished – 5 sunk – the rest abandoned

1998 Sidney – Hobart
115 boats – 6 fatalities – 44 finished – 6 capsized – 2 sunk – the rest abandoned

2007 Fastnet
300 boats, 79 knots winds with gusts at 92 knots, 4 knots opposing current, 12-14 m high waves.
211 abandoned – no fatalities

From the above table, it is understood that by changing our mindset, ie showing more respect for the sea and with continuous education, we can enjoy sailing with safety, avoiding taking risks that can put us in danger.

Only general principles can be stated regarding survival procedures aboard a boat faced with severe weather with wind speeds exceeding Force 9 in the Beaufort scale. In conditions up to Force 9, a trained crew can determine the course to be sailed while superior wind speeds compel the crew to adopt the course dictated by the conditions.

Psychology

The most important principle in the mind of the crew dealing with severe weather is that **the conditions they are facing now will recede in time, therefore they should be dealt with composure, mental endurance and faith that all will end well.**

The application of the general principles for dealing with heavy weather is in direct relation to the experience of the crew, its mental and physical endurance and the strength of the boat and the rig.

Especially with regard to personnel, none can predict the reaction of the crew in such extreme conditions of cold, constant spray, fatigue and stress from possible equipment failure. A crew that has experienced similar conditions in the past has a better chance to cope a second time.

Avoidance

Obviously, the safest method of avoiding exposure to danger is to keep away from extreme conditions.

Unfortunately, either because meteorological forecasts are not always accurate or because situations may develop in mid passage, avoidance is not always possible and thus there remain only two options: The crew must decide whether to sail to a nearby port or to confront the storm at sea.

Sailing to a safe haven in not always possible. A port may lay in great distance from the boat or the approach to the port may not be safe in the prevailing conditions. There is nothing more dangerous than a difficult approach to a port, where manoeuvring space may be limited or there may be shallow water by the entrance that amplifies the waves that are also reflected by the shore. Many accidents have happened in similar conditions. In such case, the only remaining solution is to weather the storm at sea. There is a saying of old sailors “The sea is half a port.”

Technology

Technology has not improved much the way we deal with heavy weather.

Boat and rig strength remains at a similar level to that of two to three decades ago, not to mention the reduced safety factors as shipbuilders strive to make lighter, therefore faster, boats that are sold at competitive prices.

On the other hand, developments of reefing systems for sail (genoa and mainsail) have lead to easier but not safer sail handling. There is still the possibility of jamming while operating in heavy weather.

In addition, development in communication systems (DSC, EPIRB, SART, SatCom) or in life saving equipment (life rafts etc.) is useful, but only in the last stage when a boat is about or has already been abandoned.

Meteorological Forecast

It goes without saying, that during the planning of the passage we must gather detailed information from recent meteorological bulletins and plan our course, as much as possible avoiding foul weather, except for unpredictable meteorological phenomena.

In any case, the crew must be informed of the expected weather conditions, their duration and the tactics to be followed.

Preparation

If heavy weather is expected, we must take advantage of the available time to prepare. During heavy weather, simple tasks, like a sail change, may become extremely difficult.

It is necessary to close all vanes that don’t need to be open, like heads and sinks, so that water cannot enter the boat through them in case of excessive heeling. In case of the

boat capsizing, closed vanes will prevent air escaping from inside the boat, thus preventing from filling with water.
If it is not possible to secure the anchor and chain, it is better to remove it and stow them securely below deck.
At the same time, personal safety equipment, like foul weather gear, life jackets, harnesses, personal locator beacons (PLB) must be worn. Storm sails must be set in place in advance and the deck cleared from all unnecessary equipment. Below deck, all movable objects, drawers, hatches and air vents must be secured.
It is advisable to utilise the more experienced crew members during the first stages of the storm, in order to give time to the rest of the crew to get accustomed to the weather conditions, stay warm and rested inside the boat and thus be ready to take over at a later time.
The absolutely necessary number of people must remain on deck, in order to reduce the risk of an accident and to have available the maximum possible reserve.
Food and water must be consumed in advance. Extra sandwiches and hot beverages stored in thermal containers must also be prepared so that are available for the duration of the storm.

Choice of tactics
The desired objective in choosing an appropriate tactic for dealing with heavy weather is to avoid a knock down, a roll over or pitch-polling.

No matter how high a wave might be, it cannot capsize a conventional sailing boat with good stability, unless it is a breaking wave.

On the contrary, breaking waves **may cause pitch-polling if the height of the wave grows to more than 60% of the length of the boat and may cause knock down if a wave of a height of at least beam length hits the boat on the beam.**

Therefore, our main concern is to maintain the position of the boat either towards the waves (close reach) or with the waves (broad reach), while trying to avoid waves on the beam.

In the wave creation process, increase in wave height precedes augmentation in length. **Pitch-polling probability increases substantially while running, if the wave length reaches twice the length of the boat.**

Use of sails
Many prefer to use traditional sail systems (hanks on foresails or slab reefs on the mainsail). Even if the foresail is equipped with a reefing system, it is advisable to carry a separate storm sail with lines or hanks for use in case the reefing system malfunctions.
In heavy weather, it is preferable to set a smaller jib as the mainsail is easier to reef than a change of headsails.

It is better to set the sail area carried by the boat to correspond to gusts than the average wind speed. We are not focusing on maximising boat speed, but on sailing safely and minimising risk of damage.

Steering the boat
As far as steering the boat is concerned, we must avoid slamming onto waves.
Waves carry an enormous amount of energy and can cause irreparable damage to a boat.

Taking a wave head on or on the beam can cause damage or a rollover.
On the other hand, running before the waves can have the following consequences: the cockpit can be filled with dangerous quantities of water from crashing waves or the boat may gather speed temporarily and start overtake the wave in front of her. If it slams on the back of the wave, the instant deceleration will lead to pitch-polling and possible damage to the rig from the stress.
The best solution is to steer at a broad angle from the bow or stern of the boat with respect to wave direction.
Whenever the wind speed increases further, we must reduce sail.
When the course is to windward, the crew, in order to continue racing, may decide to steer on course under storm jib or trysail, despite the heavy pitching.
The helmsman must sail close reach along the valley of the wave and then climb the wave by luffing and at the crest abruptly bear away so as to avoid slamming on the back of the wave.
Using the above technique, the crew may continue on course instead of heaving-to or sailing under bare poles as long as they can avoid breaking waves.
As a storm tactic, these actions are useful only if the crew, the boat and the storm sails can cope.
If conditions become extreme and even the smallest sail overpowers the boat, the helmsman will be forced to luff repeatedly in order to lessen the heeling force and the flapping of the sail will strain the rig.
If the helmsman tries to steer on a reach in order to accelerate, the boat will heel excessively in the water and a following wave may hit on the beam and knock down the boat.
This way of sailing tires the crew, causes damage to the boat and is unsuitable for night time and must be applied only when there is no other option e.g. when in the dangerous quarter of a hurricane.

<u>Heave-to</u>
When sailing to windward and the boat, for whatever reason, cannot continue on course can heave-to, instead of bearing away.
Heave-to is performed by tacking without releasing the foresail sheet and the mainsail reefed according to weather conditions. The helm is set so that the bow points to windward.
It is critical to practice this maneuverer beforehand in order to understand how heave-to works.
The sound of the waves is reduced along with the motion of the boat and if the helm is lashed in place there is no need of a helmsman.
This method gives time to the crew to rest and plan the next move.
While hove-to, the boat continues to sail at a slow speed but at the same time drifts to leeward.
Unfortunately, not all fin keeled boats behave satisfactorily while hove-to.
A boat should not try to heave-to with a large foresail because it will tear at the spreaders of the rig. Furthermore, many boats cannot maintain the hove-to position with a large foresail.
A heave-to can be performed with a storm jib or a try sail alone but in this case the helmsman’s presence is necessary.
In such cases it is preferable to use the try sail.
Heave to is a tactic that should be used in Beaufort scale Force 7 – 8 strong winds. It is also one of the recommended methods for recovery of man overboard situation.

If the wind speed increases above the aforementioned strength, any sail set will flap violently and may be damaged, and the boat will heel excessively in the water, in danger of a knock down. In these conditions, the heave to should be abandoned as it is neither safe nor comfortable any more. Other methods of coping with the situation must be applied.

a) Running at speed

With this tactic, the boat has the following advantages:
First, the apparent wind decreases. Second, the rudder is more responsive, and the boat can avoid breaking waves by keeping the stern at such an angle to the waves that can prevent broaching or capsizing that is a danger posed under bare poles (no sail hoisted). Third, the speed induced inertia along with the high propulsion force dampens to a significant degree the pitching and rolling motion of the boat.
Of course, this tactic is not easy. It demands skilful helming because it is very physically and mentally tiring with high degrees of concentration and vigilance. It is especially difficult at night.
Boats with a tiller or a direct transmission between the steering wheel and the rudder, are at an advantage.
The speed of the boat must be adequate so to respond immediately to rudder movement but at the same time to avoid piercing the back of the wave ahead resulting in pitch-poling or broaching.
It is reported that wind vanes can cope successfully with this tactic up to wind speed of 50 knots, maybe more.
The tactic of running in front of the waves is especially employed in sailing races, where crew prefer going faster and keep as much sail area as possible.
The tactic used with the bigger waves is to luff along the trough of the wave in order to maintain speed and then bear away almost at right angle to the oncoming wave and surf on it.

b) Bare poles.

When heave-to and running at speed are not possible due to the severity of the weather, then the solution is to run under bare poles, by removing all sails, lashing the helm slightly to leeward, button down all hatches and wait for the storm to pass.
Every boat behaves differently to this situation.
Older designs that are narrower and comparatively heavier displacement behave better than wider, lighter displacement modern boats.
When under bare poles, the pressure of the wind on the mast alone moves the boat, with the force applied slightly forward of the beam.
In conclusion, when other methods cause survival problems, running under bare poles is safer as long as the boat is far away from shore.
It goes without saying that the boat should not be too prone to roll-over, as this increases significantly the probability of damage to the rig.
As a precaution, when inside the cabin, the crew should secure all hatches, then lie down on the cabin floor or under a table and secure themselves with pillows and mattresses around them for the prevention of injuries.
A boat may capsize even after the worst of the storm has passed as high waves remain in the area and become confused as they are affected by the constant change of wind direction.
In conclusion, many experienced sailors find the bare pole tactic effective in dealing with hurricanes even in light displacement boats.

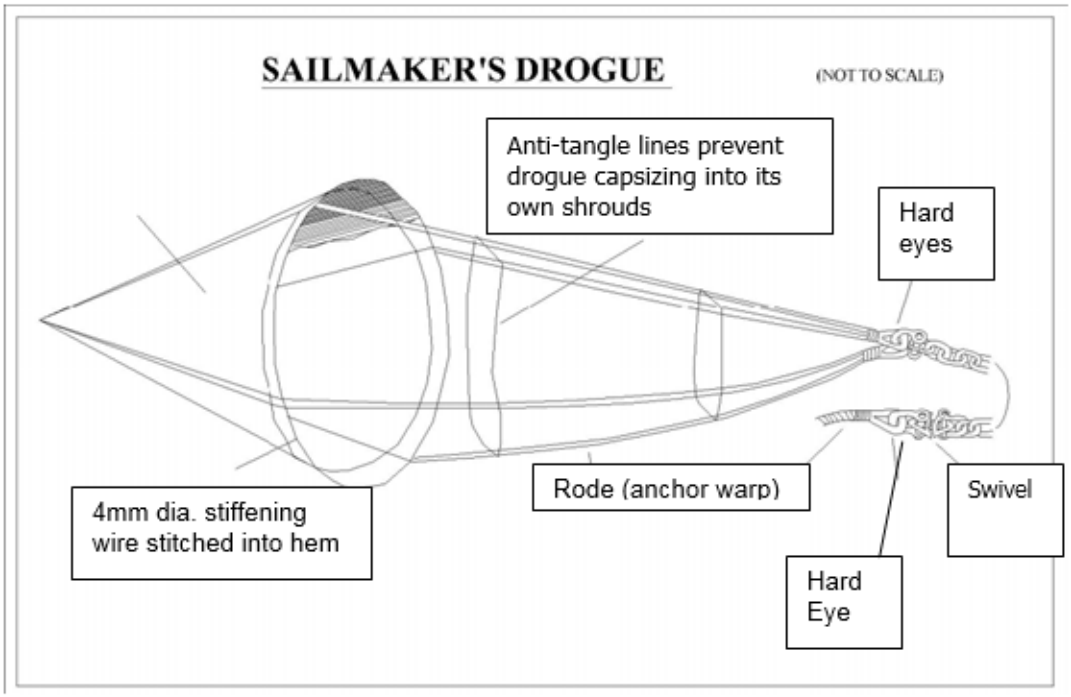
c) Running with drogues (towing devices or objects)

As already mentioned, when running in big waves it is necessary to control the speed of the boat so that the rudder remains responsive in order to maintain the stern at the correct angle to the waves and at the same time not slam in the wave ahead.
This can be achieved by increasing the drag force at the stern deploying towing devices like drogues or other objects, such as ropes.
Such devices have been the subject of several research studies, including one conducted by the Southampton University Wolfon Unit on behalf of RORC.
These experiments proved the beneficial use of such devices. Especially interesting is such a device designed by Donald Jordan as a bunch of drogues. It eliminates the risk of a single drogue being lifted out of the water in a breaking wave and thus losing the resistance it provides. At the same time it is more usable due to the smaller size of each individual device of the bunch.
Towing long ropes, in addition to slowing down the boat, helps with breaking the waves as they move with the boat, The length of the rope can be adjusted so to match the wavelength, increasing their performance. A loop is the most easily adjustable application. One end is tied to a cleat while the other is adjusted.
This is why ropes are preferred to other devices like drogues.
For typical ocean waves, a rope of 120-150m length and a diameter of 1.0-1.5 cm is recommended.
This tactic can be used under sail or with bare poles.
Lone seafarers use this tactic during storms with the storm jib held on the centreline by the tight sheets and the helm tied amidships.
Of course, in order to use this tactic, one must be familiar with it and understand its limitations, especially in relation to the length and height of waves.
Marchaj in his book "Seaworthiness" gives an explanation. He believes that in rapidly growing seas, wave height increases faster than wavelength. As the wave grows in size, at some point its wavelength will become twice the length of the boat. At that point, the bow will be at the trough of the wave when the stern will be at the crest. In this position the boat will tend to either pitch-poll or broach while the steering efficiency is reduced by the forward motion of the water molecules at the wave crest. In fact, if the rudder is located at the very end of the stern, the situation may deteriorate further as the rudder may loose contact with the water.
This situation is a direct function of boat speed. In order to avoid unpleasant consequences, sometimes we need to reduce speed by increasing the drag force and at other times we need to increase speed by raising sail.
The general conclusion is that there can be no safe suggestion because everything depends on the prevailing conditions and the behaviour of the boat. Taking into account those general principles we should try to adapt then to the conditions of the moment.

d) Sea Anchors

According to the terminology of Offshore Special Regulations, Appendix K of World Sailing, the term sea anchor implies a device that is deployed from the bow of a boat and keeps her practically halted in the water.
In the old days, the best known method of keeping a boat bows-to the wind, was to let an anchor and enough chain in the water along with a small sail or the mizzen sail reefed close to the stern, so that the boat would stay luffed to the wind while drifting slowly astern.
Several more effective ways have been developed today.
One such device is the parachute type sea anchor. In order to be effective, it requires a significant length of elastic rope in order to absorb shocks. Nevertheless, the results from its use are not always encouraging.

Offshore Special Regulations propose the following sea anchor:



Typical Dimension

LWL	Mouth dia (Min)	Slope Length (Min)	Shroud Lines (Min)
10m (33ft)	1m (3ft 4ins)	1.3m (4ft 3ins)	1.3m (4ft 3ins)
13 m (43ft)	1.3m (4ft 3ins)	1.7m (4ft 11ins)	1.7m (4ft 11ins)

e) Navigation in limited visibility

Motor Boats: one long sound every 2 minutes

Sail boats: one long sound followed by two short sounds every 2 minutes.

CLOTHING - DIET

Clothing must include:

For cold weather: Isothermal clothes, isothermal shocks, gloves and woollen (fleece) hat, preferably covering the neck, a breathable oilskin, woollen pants and boots.

The heat emitted by the head amounts to about 1/3 of the total body heat emissions. Therefore, adequate head covering plays an important role in maintaining a good body temperature and is better than heavy clothing that makes movement difficult and creates sweating.

For warm sunny weather: light clothing, preferably of light colour covering almost all of the body, sunglasses and hat with lanyards, light boat shoes and sunscreen for the face or unprotected parts of the body,

In order to avoid stomach disorders (vomiting, etc) and nausea, especially for novices should not include fats, sugars and alcohol. Relatively salty food should be preferred. Especially in hot weather, water should be consumed frequently in order to prevent dehydration.

It is noted that regular crew work (e.g. sail trimming or helming) may help to prevent nausea.