HURRICANE AVOIDANCE TACTICS

Fortunately, most hurricanes have areas of severe winds that are *relatively* small in diameter.

Most (but by no means all) hurricanes have relatively small areas of strong winds. Avoiding this region is best accomplished by taking early action.

If you are offshore, with plenty of sea room, it is not usually that difficult to stay away from the dangerous parts of the storm.

The logic and tactics to be employed are, in fact, the same as when dealing with a low pressure system in higher latitudes.

The fact that the high wind centers of these storm systems are so tight makes them easier to deal with, in most cases, than large, well organized depressions in the higher latitudes.

Having said that, a mistake with hurricane strength winds is going to be a lot more painful than with one with a high-latitude gale.

BOAT AND CREW FACTORS

As in so many other areas, the right tactics to use depend on the capability of vessel and crew.

Remember that in port your vessel may be in danger but you have the option of getting ashore and finding a secure place in which to ride out the storm.

All of the factors discussed so far now begin to rely on the preparation of your vessel and crew.

If you have a sound rig, are confident in your structure, have a variety of storm canvas at your disposal and know how to deploy it, you have the greatest array of options.

A key factor is how well you know your boat and its handling characteristics in heavy weather.

Crew experience is another major issue.

SEA ROOM

The first decision that needs to be made is whether or not to close with shore and seek shelter. While this may seem, at first thought, to be the safest approach in many cases, given adequate sea room, just the opposite may be true.

It is critical, however, to have the sea room necessary to maneuver away from the storm center, being able to run off so that the navigable, lowest wind quadrant of the storm passes over you—if you cannot avoid the storm entirely.

The worst possible scenario is to be caught without adequate sea room, and forced to close reach or beat due to local obstructions, while headwinds try and draw you into the storm's eye.

SHELTERED CONDITIONS

If you are at sea, looking to the land for shelter is subject to all of the vagaries of closing with land under inclement conditions. What will the weather be like when you arrive? Will visibility be good enough to allow you a safe entry?

Another factor when dealing with severe storms is the type of bottom for your anchor to dig into. Even more important are the neighbors you are likely to have and how well *they* are secured.

It is often ill-prepared, unattended commercial and pleasure vessels that drag, causing all sorts of problems to vessels that were doing just fine on their own.

Issues to consider in finding shelter:

- ❑ Protection from wind and seas for a variety of wind directions.
- ❑ Room to swing on the hook.
- ❑ Bottom condition—is the holding good?
- ❑ How close are your anchored neighbors and what are the risks from them?
- ❑ If you are blown ashore, what will the grounding be like? Some areas will do little damage. Others will puncture your hull.

FINDING THE STORM CENTER

Whether you are anchored or at sea, knowing where the storm center is relative to your position, and how the storm is tracking, will be of vital importance. At anchor, this data allows you to prepare for a possible wind shift.

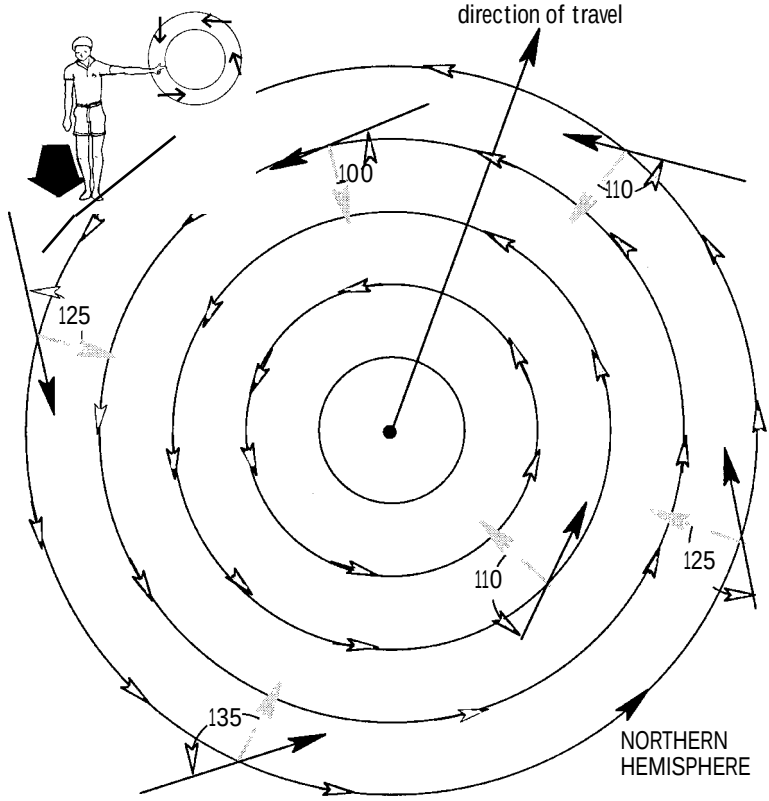
Offshore, the primary objective will be to avoid the storm-force winds entirely. And if this is not possible, then to minimize the wind and sea state to which you are exposed.

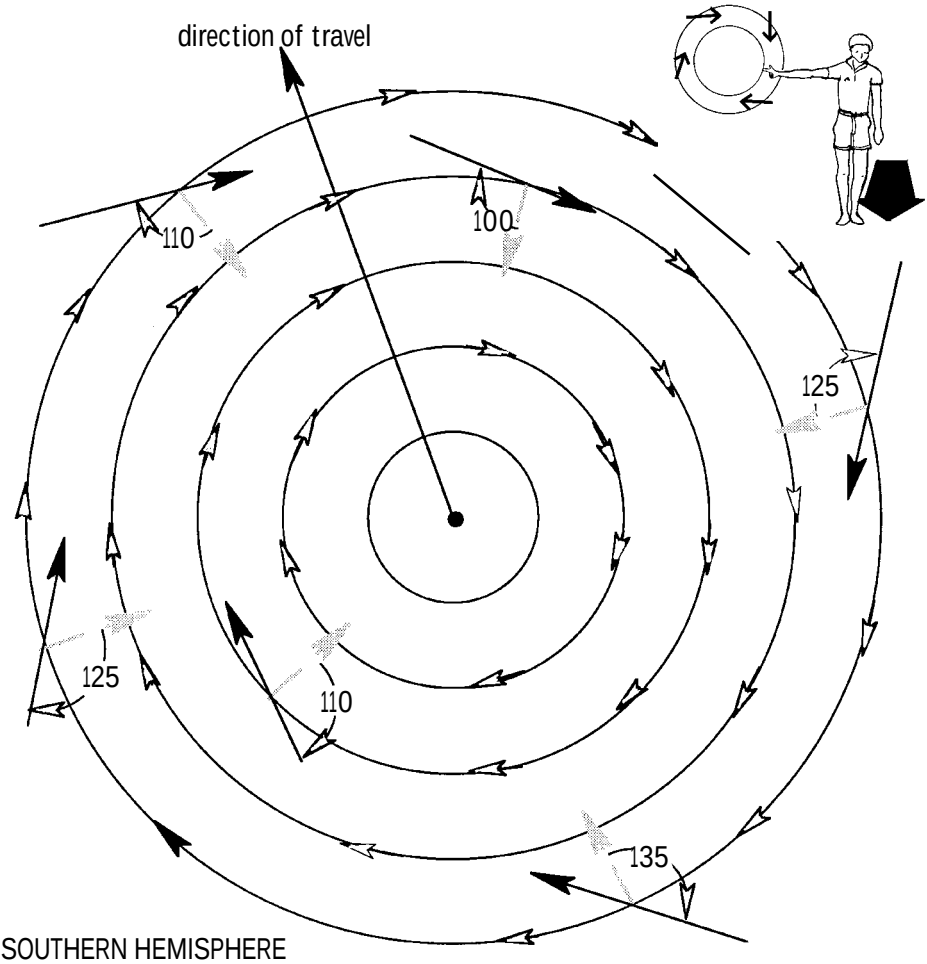
Fortunately, there is a relatively simple method of finding the center of any depression. This is the same system we discussed in the section on Low Pressure Tactics (See page 193).

If you stand with your back to the wind (in other words at right angles to it) the storm center will be on your left in the Northern Hemisphere and on your right in the Southern Hemisphere.

Take a look at the drawing below, and imagine yourself with the appropriate arm pointed at right angles (or more accurately 100 to 110 degrees) to the wind. That shows you the bearing to the low center.

We need to finesse this a little bit. Nowadays most yachts have wind speed and direction indicators aboard. Some of these are pretty accurate. So, rather than standing on deck and getting wet, we can sit in the cockpit, look at the instruments, and work out the same data with a bit more accuracy than standing with your back to the wind.





SOUTHERN HEMISPHERE

Use the drawing above in the Southern Hemisphere to find the storm center. First, determine the true wind angle. Next, depending on where you think you are relative to the storm center, the angles shown will indicate the difference between true wind direction and the center of the storm. It is easier, although not as accurate, to point across with the wind at your back. The drawing on the opposite page is for the Northern Hemisphere.

Along the outer edges of the storm, the wind is veered towards the center, rather than pointing directly along the isobars. The amount of the veering depends on where you are relative to the center.

You have the smallest amount of veering ahead of the storm, and the greatest amount behind the center. This angle ranges from 20 degrees or so of veering towards the center from ahead to as much as 30 to 40 degrees from behind the low center.

As the storm center approaches the winds blow more nearly along the isobar lines.

ESTABLISHING THE STORM TRACK

Early on in the approach of the storm system, you can use the swell direction and the point of convergence of the cirrus clouds to indicate where the center is located.

Finding the storm track:

- Cirrus clouds converge at a point on the horizon, indicating storm center.
- Long-period swells radiate out from storm center—back bearing indicates storm center.
- If barometer drops and wind direction remains the same, storm center is headed directly for your position.
- When rain bar is visible, if it maintains same bearing as it moves towards you, you are in the path of the eye.

If the swell and/or cirrus convergence maintains a constant heading, then the storm track is directly toward you. If the storm is to pass to one side or the other, the bearing to the point of convergence and the swell angle shifts in the direction of storm movement.

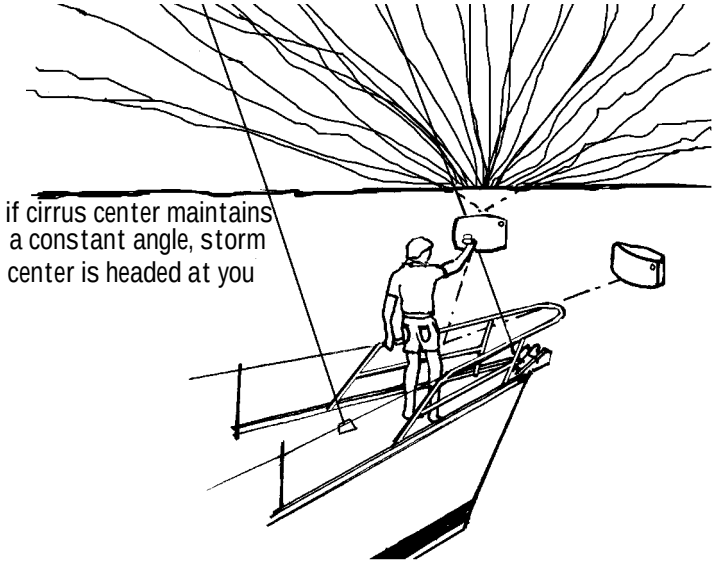
As the wind begins to increase, using the system just discussed you can track the storm's progress. Once again, if the wind direction remains the same, and the barometer is falling steadily, then you are directly in the path of the storm.

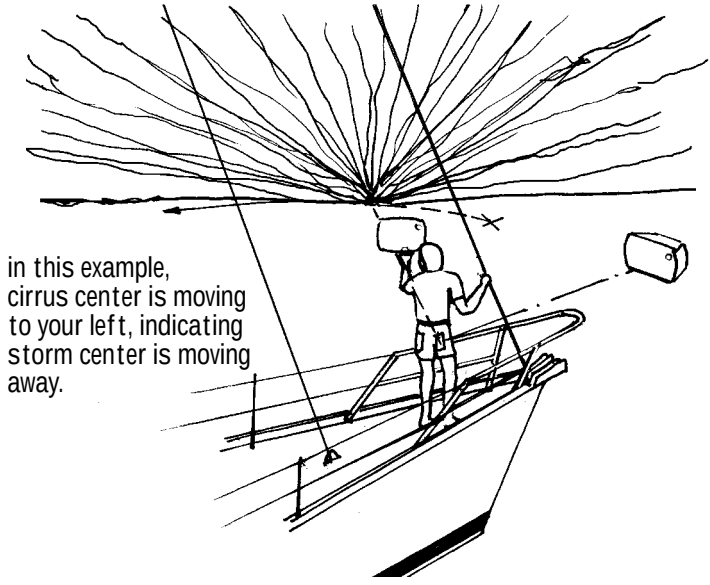
When the rain bar of the storm becomes visible, the darkest portion of the bar indicates where the center of the storm is located.

When you begin to be encompassed by dense clouds their movement should be noted carefully. Because they are not subjected to surface friction, their track is usually directly in line with the isobars surrounding the storm center.

If you draw an arrow on your chart representing cloud direction, and then take a bearing at right angles (to the right in the Northern Hemisphere and to the left in the Southern Hemisphere) this will be pointing right at the storm center.

If it appears stationary, then the center is probably heading toward you. If the bar drifts slowly to one side, then that is the direction in which the storm center is moving, hopefully away from you.





During the early part of the storm's approach, the cirrus clouds will come to a point on the horizon. This indicates the direction of the storm center.

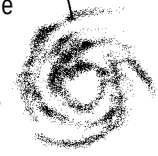
NORTHERN HEMISPHERE

The clouds you see aloft as the storm approaches are traveling in line with the isobars rather than at a toed-in angle as you see with the surface wind.

track of storm

By noting the direction of travel of the clouds, you can then draw a 90-degree bearing on a chart to the cloud movement. This will point to the center of the depression.

In this example the bearing to the storm center is moving aft, so the storm center is going to cross behind the boat.

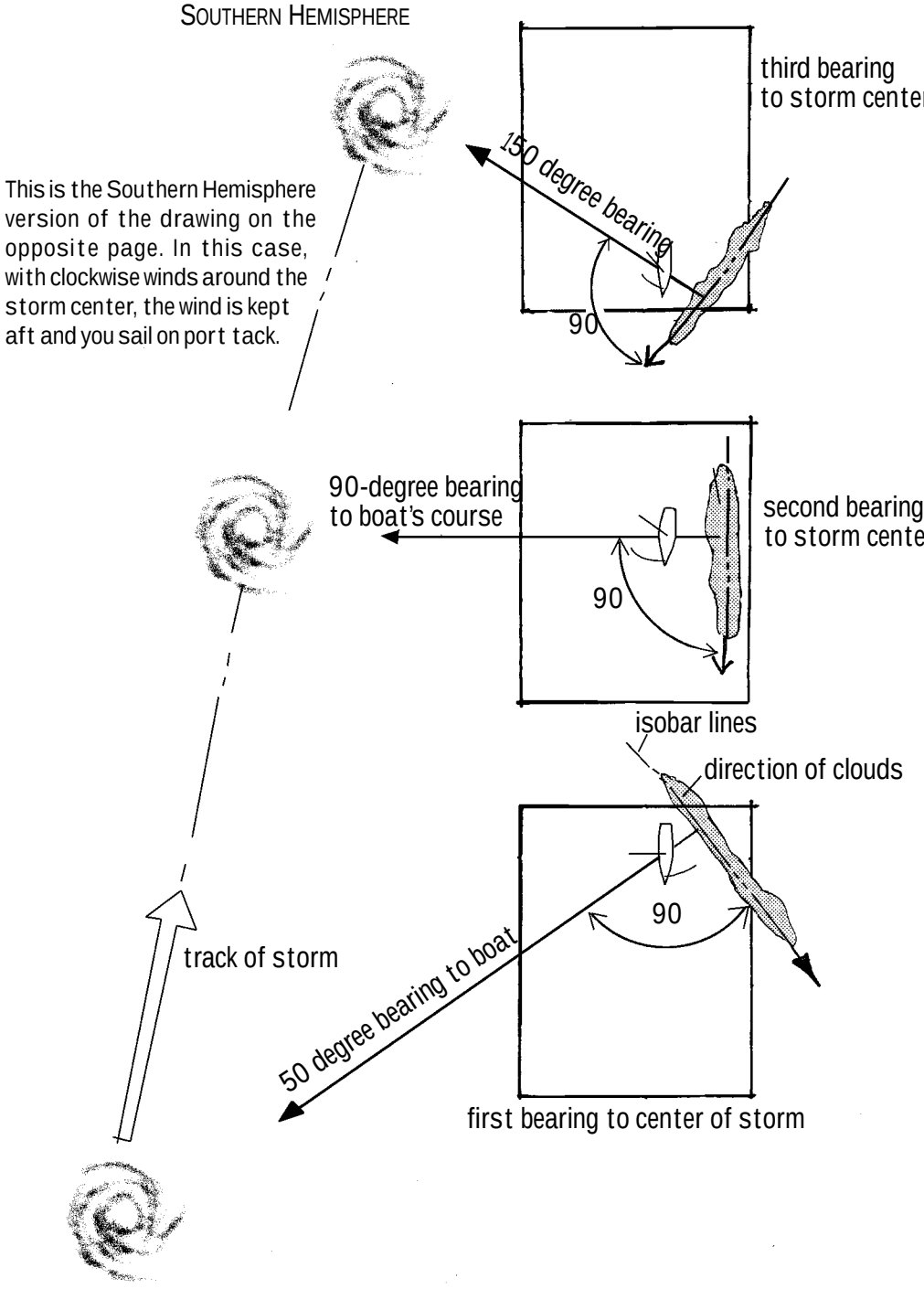


These hurricanes are shown for Northern Hemisphere circulation (i.e., counterclockwise wind circulation around the center). This means the boat is heading towards the navigable side of the storm.

With the first bearing in this drawing, the boat is running. As soon as the location of the storm center is determined, the wind should be brought more on the bow. In this way, a course at right angles to the storm track can be maintained to keep as much distance as possible between yourself and the storm center.

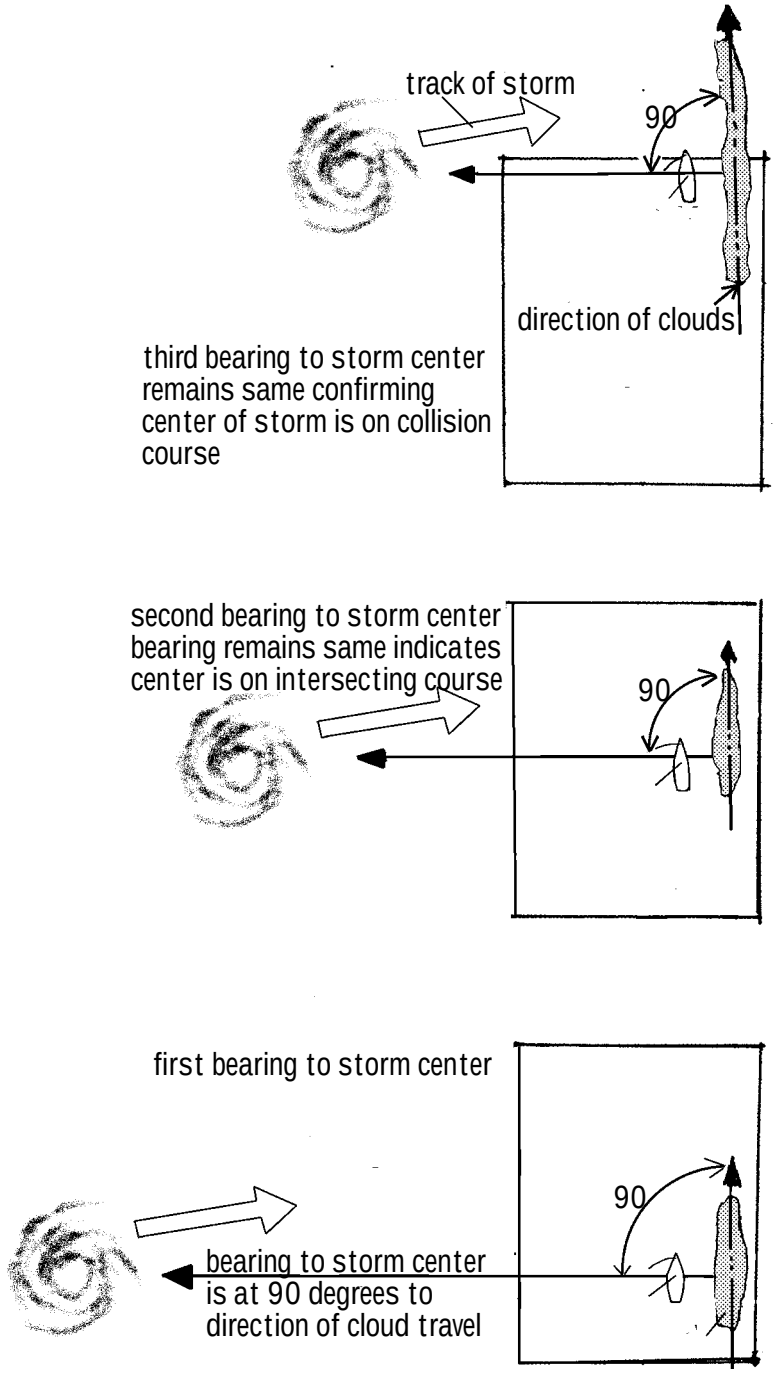
Help

SOUTHERN HEMISPHERE



This is the Southern Hemisphere version of the drawing on the opposite page. In this case, with clockwise winds around the storm center, the wind is kept aft and you sail on port tack.

NORTHERN HEMISPHERE

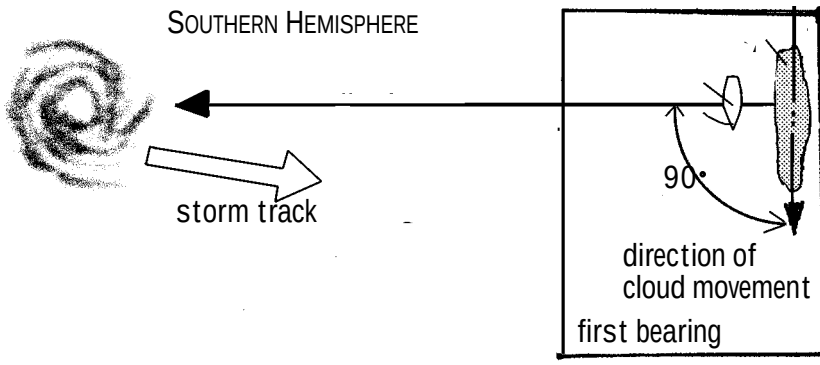


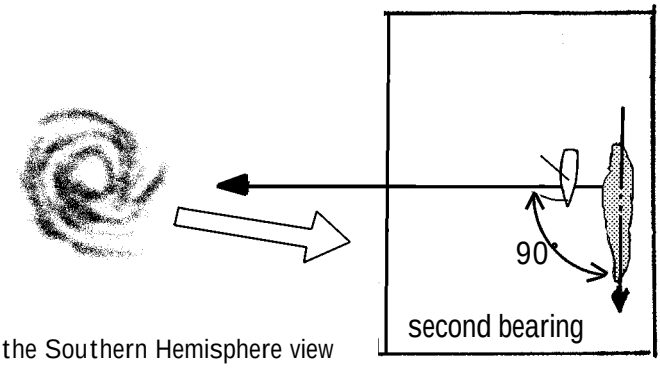
If the bearing with the clouds remains the same, as in this series of sketches, then you know that the storm center is closing with you and some form of avoiding action needs to be taken. Note that the wind direction will also remain constant if the storm center is heading right at you.

As this drawing is of a Northern Hemisphere hurricane, if there is sufficient time and boat speed available, the objective should be to try to cross to the navigable side of the storm (as drawn here, continue towards the North).

However, if you can stay out of the storm or hurricane force winds by reversing your course and avoiding the storm track rather than crossing, this would be the better tactic.

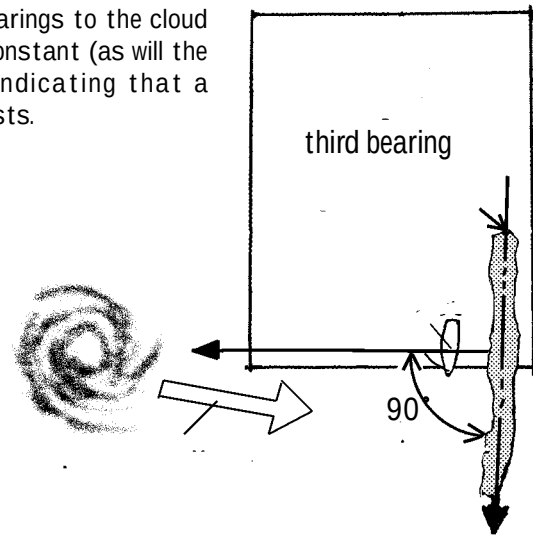
The decision in this case is a tough one—based on what you or the forecasters think the storm may do as it approaches, and the speed of your vessel.





This is the Southern Hemisphere view of the drawing on the opposite page, with the winds circulating around the storm center in a clockwise direction.

Once again the bearings to the cloud direction remain constant (as will the wind direction) indicating that a collision course exists.

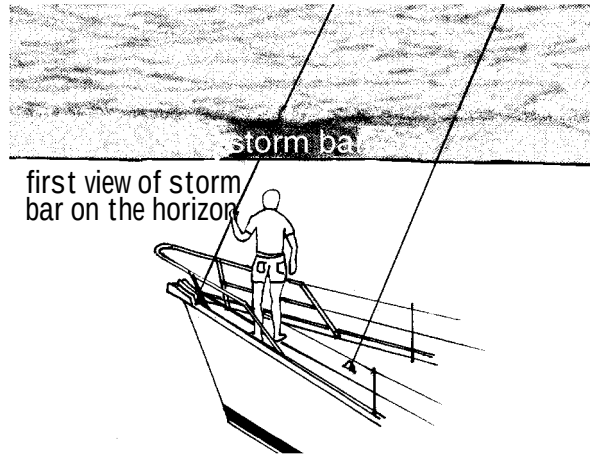


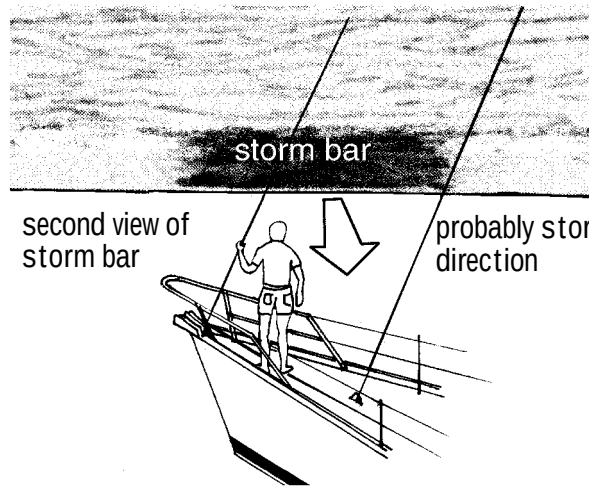
Once you can see the storm bar—a mass of dense, black clouds, heavy with rain—you know that the region of hurricane strength winds is approaching.

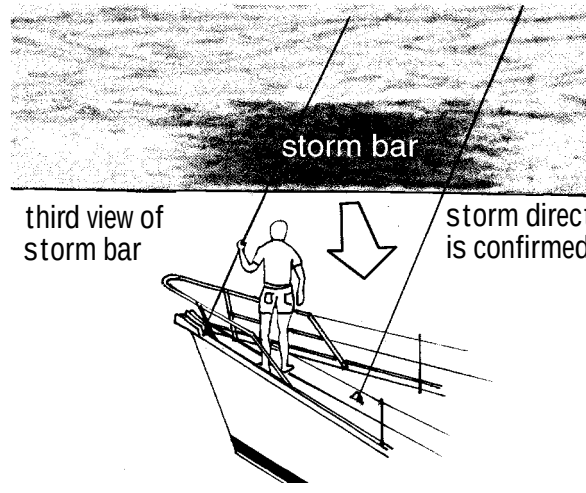
Early in the approach, while you still have visibility, if you take periodic bearings on the bar and write them down, you will be able to tell if the storm center is heading directly for you, or to one side or the other.

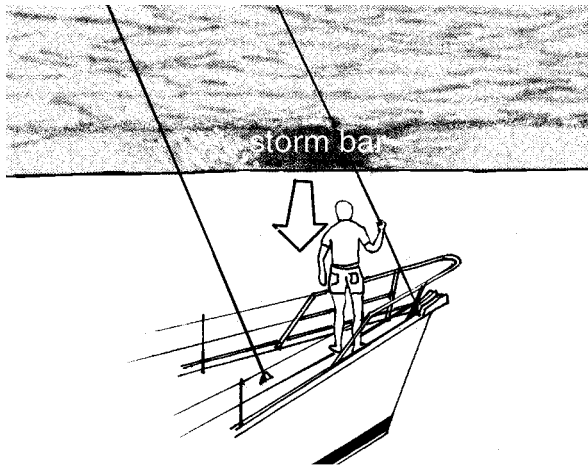
In this example the bar is coming straight at the yacht in the foreground. as the bearing on the bar remains the same as it draws closer.

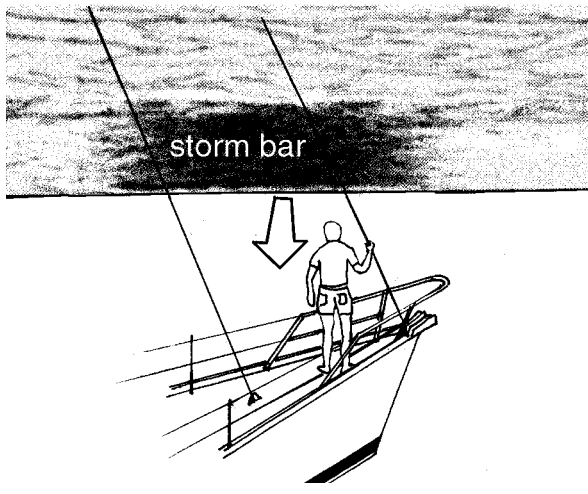
If this were taking place in the Northern Hemisphere, with counterclockwise winds, this vessel would be headed into the dangerous (left when facing the storm center) quadrant. In the Southern Hemisphere, the boat would be headed correctly to the navigable quadrant.



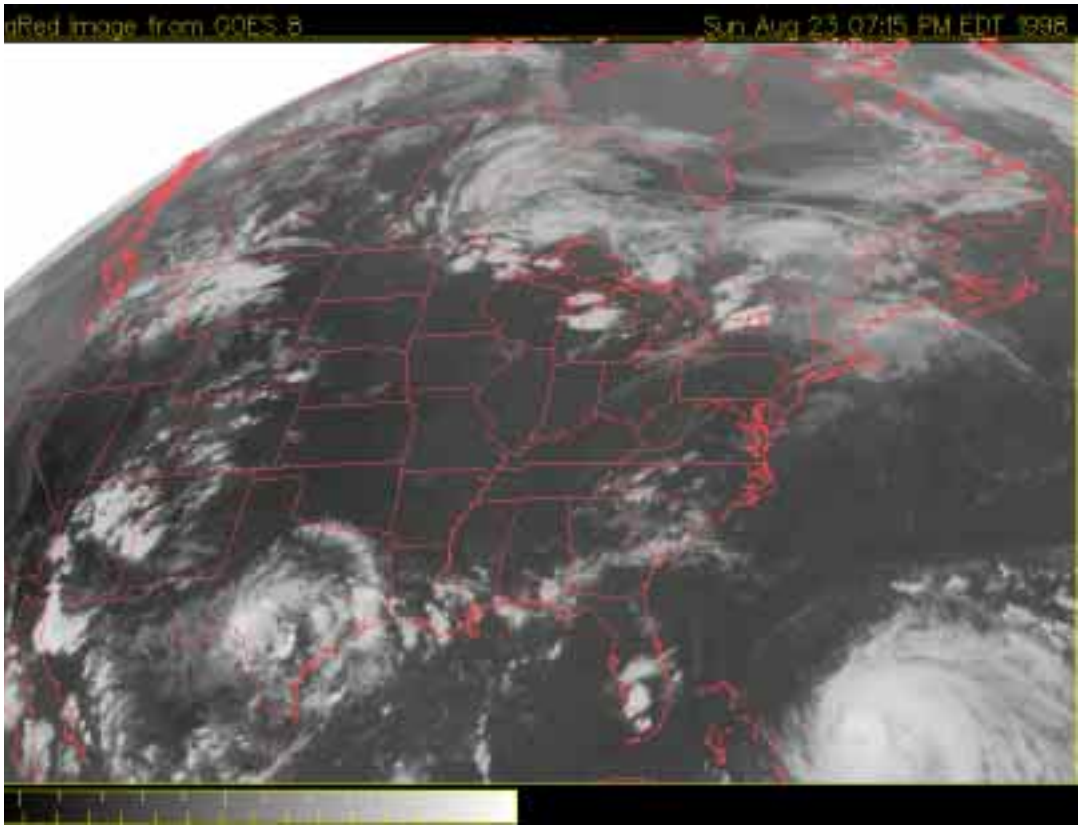








This would be the correct course of action in the Northern Hemisphere if you were at sea and saw the storm center bearing down on you. In this case, the vessel is headed to the right of the storm center (when facing into it) towards the sector of the storm with less winds, and where the direction of wind makes it easier to escape the storm center.



It is never certain what a tropical storm is going to do. However, if you have access to the Internet, or can contact someone with access to the net there is a huge amount of data available.

Here is a satellite image of Hurricane Bonnie together with a wind speed vs. time probability chart. If you are sitting in an anchorage, wondering if it is worth the risk of moving, this type of data from the Tropical Prediction center can be very helpful.

WIND SPEED FORECAST FOR BONNIE
EXPRESSED AS PROBABILITY
FROM NHC ADVISORY 024
8:00 AM EDT AUG 25 1998

TIME	WIND SPEED INTERVAL IN MPH							
HOURS	DISSIPATED	TROPICAL DEPRESSION (39	TROPICAL STORM 39-73	HURRICANE 1:74	HURRICANE CAT.1 74-95	CAT.2 96-110	CAT.3 111-130	CAT.4-5 131
12	<2%	<2%	<2%	>98%	15%	25%	50%	10%
24	<2%	<2%	5%	96%	15%	30%	35%	15%
36	<2%	<2%	<2%	>98%	30%	25%	30%	15%
48	<2%	<2%	3%	95%	35%	20%	20%	20%
72	<2%	3%	25%	75%	35%	15%	15%	10%

Help

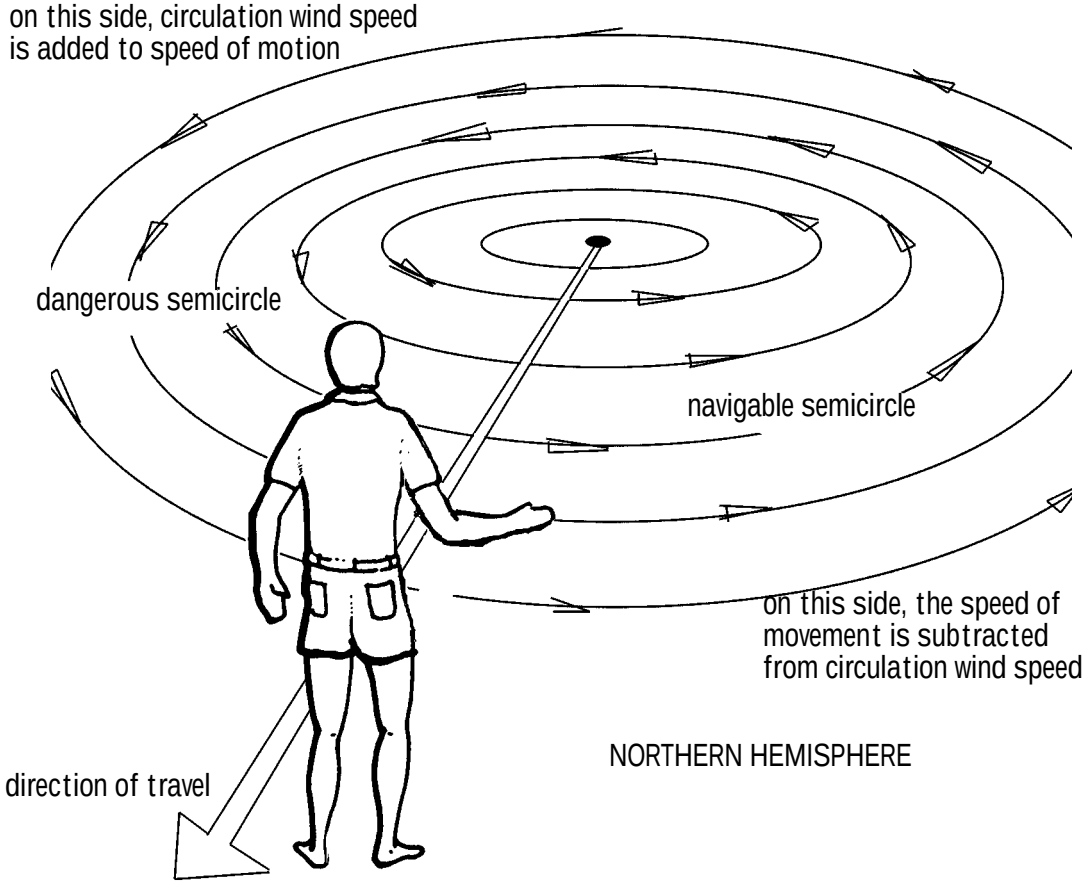
NAVIGABLE SEMICIRCLE

If you are facing *into* the direction of the storm track, the safest part of the storm is to the right in the Northern Hemisphere and to the left of the track south of the equator.

These are the sides of the storms where their forward velocity is *subtracted* from wind speed. On the other hand, the opposite, dangerous sides of the storms is where their relative motion is *added* to the wind speed.

If you do not know the storm track, or in which part of the storm you are located, a written record of the wind direction can be of some assistance.

In the Northern Hemisphere, a wind which is shifting to the *right* (clockwise) indicates you are in



N, Hemisphere wind-shift summary:

- ❑ If the wind is shifting clockwise you are in the dangerous semi-circle of the storm.
- ❑ If the wind is shifting counterclockwise you are in the navigable quadrant.

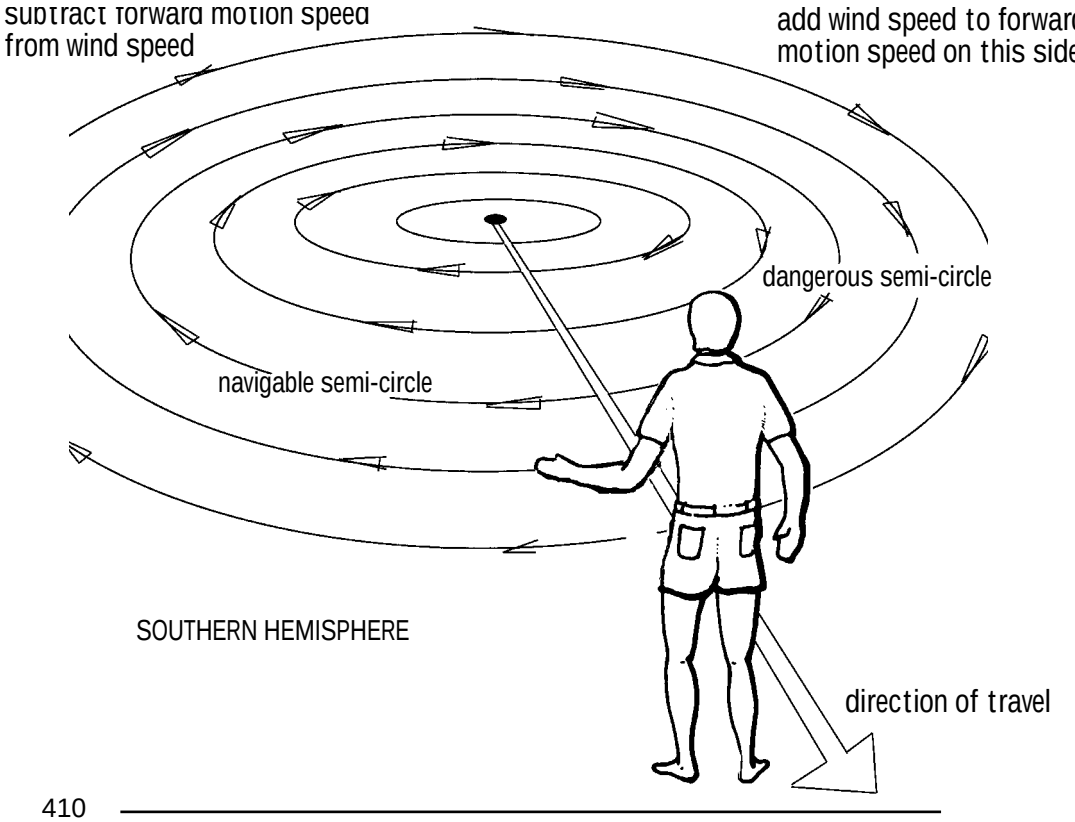
S. Hemisphere wind-shift summary:

- ❑ If the wind is shifting counterclockwise you are in the dangerous.
- ❑ If the wind shifts clockwise you are in the navigable quadrant.

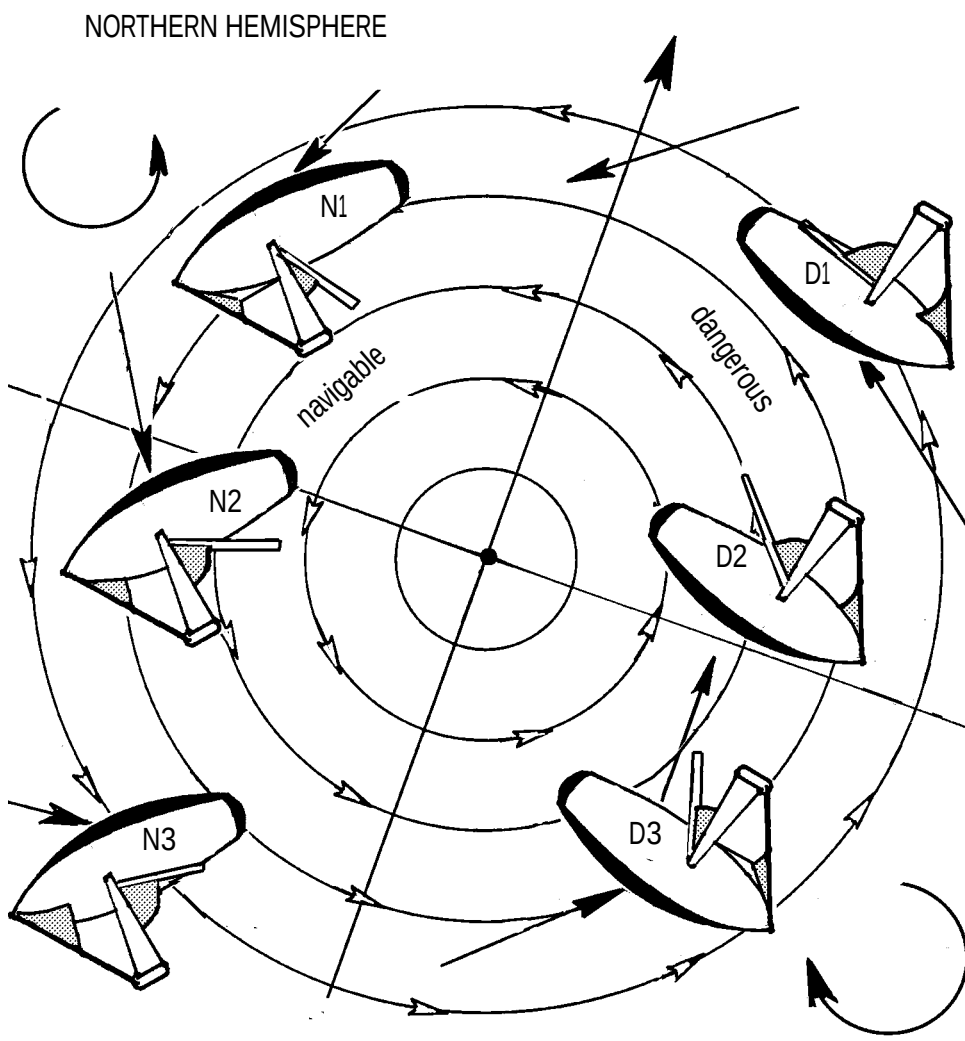
the dangerous semi-circle of the storm. In the Southern Hemisphere a wind which is shifting to the left (counterclockwise) gives the same prognosis.

Left hand (counterclockwise) shifts north of the equator indicate you are in the safer side of the storm (right hand shifts—clockwise— indicate the safer side of the storm south of the equator).

Lets recap some of the external signs you can use for establishing the bearing to the storm center. The first is the point on the horizon where the cirrus clouds converge. Another is tracking cloud movement and drawing a right angle bearing (keep in mind that at some point cloud movement may be obscured by night, rain, or a thick deck of low clouds. Keeping track of the direction of the long period swells is another, means, and finally, watching the direction that the wind shifts as detailed in the beginning of this section.



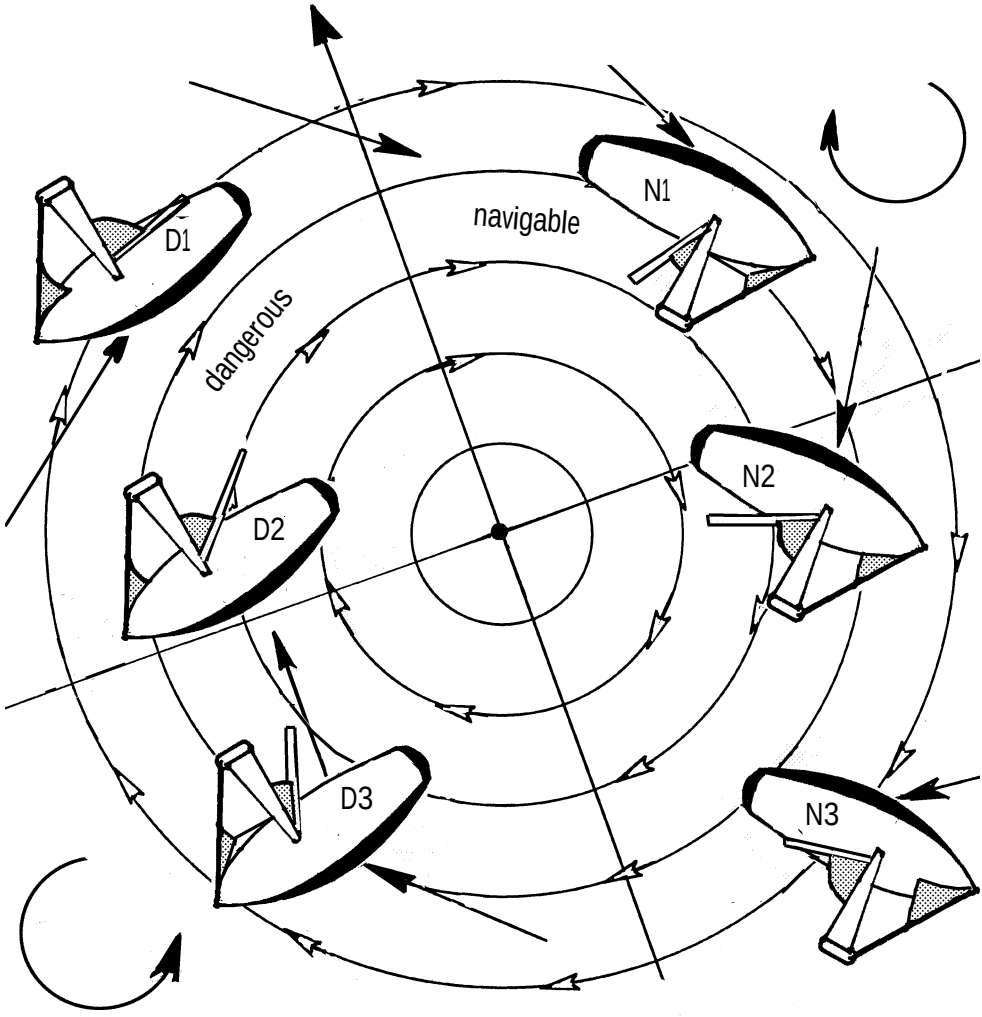
Help



By watching the manner in which the wind shifts, you can tell if you are in the navigable or dangerous part of the storm. In the Northern Hemisphere the wind will back; that is, shift counterclockwise if you are in the navigable quadrant. N1 is on a starboard tack broad reach to a run. N2 is on a reach as the wind backs, and N3 is on a close reach to a beat.

On the dangerous side of the storm, the wind veers; that is, it shifts in a clockwise fashion. D1 is on a starboard tack beat, D2 on a reach, and D3 on a broad reach as the center moves past.

SOUTHERN HEMISPHERE



In the Southern Hemisphere the wind veers—changes direction clockwise—when you are in the navigable quadrant of the storm. N1 has the wind on the port quarter. N2 is reaching, and N3 is beating.

In the dangerous quadrant the wind backs—goes counterclockwise—as the storm advances. D1 is beating on port, D2 is reaching, and D3 is broad-reaching.

COURSES OF ACTION

The earlier you take avoiding action, the easier the job will be. Usually just 50 or 100 miles make the difference between a modest gale and a full-fledged hurricane.

Even if the action takes you away from your intended destination, by far the safest thing to do is to take avoiding action sooner rather than later. Once you begin to be influenced by the wind and sea of the stronger parts of the storm, your options becomes much more limited.

Within the context of being able to make progress, here are some general rules for the *Northern Hemisphere*:

If the storm is tracking directly towards you, bring the wind on the starboard quarter (about 150 to 160 degrees) and move as fast as possible. This will take you at right angles to the course of the storm.

If you are behind a storm center, slow down and watch carefully for anything that would indicate the storm was reversing.

If you are in the lefthand side of the storm, in the navigable semicircle, keep the wind just aft of the beam (starboard tack) and move as fast as possible away from the storm center.

If you are caught in the dangerous, right hand side of the storm, bring the wind as close on the bow as possible and do everything possible to gain distance, even motorsailing if that helps you make progress to windward.

In the *Southern Hemisphere* the actions are just the opposite:

On the dangerous lefthand side of the storm, stay on port tack and make as much progress to weather as possible.

If you are in the safer side of the storm, to the right- hand side of the track, keep the wind just aft of the beam on port tack.

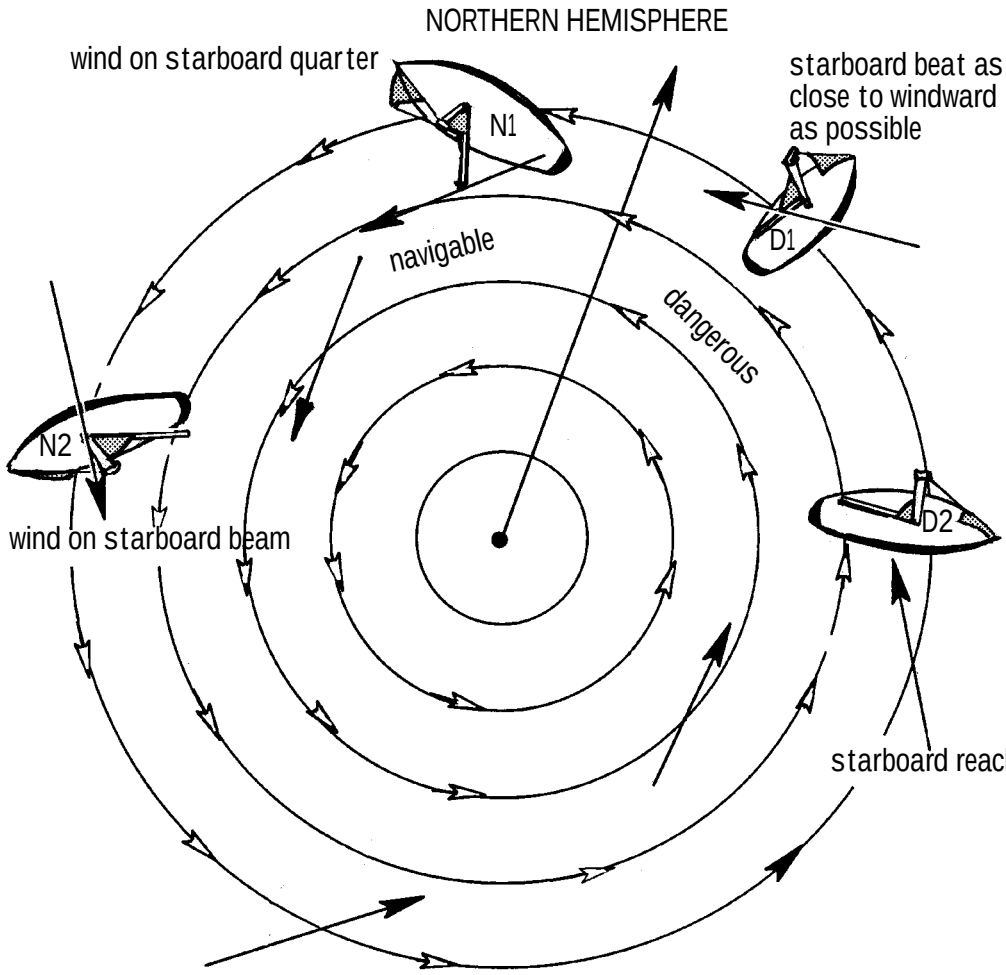
If the storm is heading towards you, and you are on its track, keep the wind on the port quarter, at a broad-reaching angle (150 to 160 degrees true) and move as fast as possible.

N. Hemisphere tactics:

- ❏ If storm is heading for you, bring wind on starboard quarter.
- ❏ Behind the system, slow down and/or head away from center on tack that is closest to equator.
- ❏ In navigable quadrant, keep wind on starboard quarter or beam.
- ❏ In dangerous quadrant sail as close to wind on starboard as possible.

S. Hemisphere tactics:

- ❏ If storm is headed for you, bring wind on port quarter.
- ❏ If behind center slow down and/or take action that brings you closest to equator.
- ❏ In navigable quadrant keep wind on port quarter or beam.
- ❏ In dangerous quarters, beat on port tack.



In the Northern Hemisphere, on the navigable side of the storm, bring the wind on the starboard quarter as the storm approaches (N1). As the center of the storm draws abeam the, wind should be on the starboard beam (N2).

In the dangerous side of the storm, start out on starboard tack (D1) sailing or motorsailing as close to the wind as possible. As the storm center draws abeam (D2), the wind will be on a forward starboard quarter.

To the extent possible, keep moving away from the storm center as quickly as is feasible. Sometimes a matter of 50 miles will make a huge difference in sea and wind conditions.