## Taking a boat out into open water is serious business,

## one that requires a comparable degree of knowledge and skill.

**Very often novice boaters head out on nice, calm sunny days only to find that conditions suddenly change.**

A person said, “running down wind in up to six foot seas in a 30 foot cruiser we encountering the problem that the boat for no overt reason, would turn violently parallel to the trough and almost tip over." Clearly what they were describing is what is known as "broaching," a condition in which a boat runs down the crest of wave, gathering speed, and as it meets the backside of the next wave ahead, buries its bow in that wave. The resistance of the bow hitting the back side of the wave causes the bow to slew around, and the boat to veer sharply off course. There's nothing unusual about that.

**We saw it coming but did not run**

**Our sturdy Hatteras was built to take it, But I wouldn't want to test this storm out In a Silverton. . . . . Know your own and your boat's limitations. Smashing into steep four footers in 50 kt winds at 26 kts. is no problem for some 39' boats.**

Typically, the pilot loses control of the boat, passengers are thrown around, and this can even result in capsizing. The problem is not always the design of the boat, but is often a matter of operator error. That the writer did not use term "broaching" was also an indication of his lack of understanding. Instead, the term "tip over" was used, indicating the operator's rather appalling lack of experience. The pilot here was completely unaware that he was operating the boat at too high a speed for the conditions.

Yet, it's not merely a matter of speed, but one of the lack of general seamanship skills. He was unaware that running with high seas can be just as dangerous as heading into them. In fact, he seems to be unaware that taking a 30 foot boat out in 6 foot seas is, itself, a dangerous proposition.

Many people come to believe that just because they've been out in rough water a few times, that they're now "experienced." Not true. Understanding the effects of wind, waves and currents is not an easy subject to master. Waves behave differently under a large variety of different conditions, so that unless one is familiar with all, or at least most of these conditions, then one is not experienced. That's why to get an ocean operator's license from the USCG requires that an applicant prove that they have had a large number of hours under such conditions.

Hull design has a lot to do with how different boats will handle under different conditions. The simple fact is that the vast majority of boats sold today are designed for creature comforts, not rough water performance. The number of boats around that have good rough water capabilities are few and far between. One reason

for this is that people are not willing to give up luxury and convenience for good handling characteristics. And so the vast majority of boats are best suited for protected, not open water operation.

Even the best of boats won't overcome the lack of knowledge and seamanship skills. One could easily take a 29' Blackfin sport fish out in the Gulf Stream and sink it as a result of inadequate piloting skills. Boats that are designed for rough water operation will perform better, but they do not negate the demand for skillful operation.

Broaching is a dangerous condition. There are times when wave conditions will affect any vessel to the point where running downhill presents the danger of broaching. The only way to avoid this is to alter course to a new course where broaching is not a threat.

Once waves reach a certain height, it becomes necessary for the operator to match the speed of the vessel with the speed of the waves, whether he wants to or not. That means slowing down a lot. One cannot stuff the bow into the backside of the wave ahead, without risking the possibility of broaching and loosing control. If you permit the boat to go zooming off the front side of the wave, you have to consider the consequences of what happens when you quickly meet the back side of the wave ahead.

Would you drive your car 50 MPH down a road full of foot deep potholes? The analogy is an appropriate one here. You'd end up tearing the wheels off the car, losing control and crashing. When the wind blows, the water becomes full of potholes. And worse.

## Negotiating inlets

This is one circumstance where broaching and loosing control presents an unusually serious threat, for loss of control can mean crashing into a jetty or going aground or ashore. Severe tide rips occur when an outgoing tide meets incoming seas. The result is very steep waves with a short distance between crests. But it can also occur at places where promontories generate strong currents, or even bottom features below the surface cause unanticipated conditions. Dangerous conditions that occur without warning, unless, of course, you have been educated as to how to anticipate these. Sure, having a well designed boat helps, but you've got to bring yourself up to speed with equally good seamanship skills. Either that, or risk becoming yet another story on the evening news.

When approaching an inlet with a nasty tide rip, it is best, whenever possible, to approach it as close-in as the water depths will permit. That means approaching the channel from the side. The last thing you want to do is chug through a mile or two of tide rip as many people are prone to do. To do so safely means that you have to know your water depths outside of the deep channel, and whether or not there are any obstructions. Once you're into the rip with nasty following seas behind you, it's a matter of good seamanship to keep the boat at the right speed and under control.

Finally, be wary of crowded inlets under poor conditions. If there is too much traffic, don't be in a big hurry to join the fray. Wait until traffic lets up some.

One of the things that makes boating so very interesting is that there is so much to be learned. Another is that it can be dangerous, which, for the adventurous just adds some spice to the banquet. The socially oriented recreational boater is unlikely to ever learn much in the way of seamanship; he owns a boat as an avenue for recreation, something to do with family and friends. It's a whole different ball game for the true boater, for whom boating is a hobby or avocation. Him we can call the true yachtsman whether he owns a small outboard or a mega yacht because his real interest lies in challenging the sea, be it an ocean, bay or river.

One major problem that the boat owner has is that most will never have the opportunity to operate enough different boats to be able to discern the difference between a good handling boat and a poor one. The most common complaint is that a boat rolls too much. More often than not, this is the perception of the inexperienced. All boats roll, and in big waves they roll a lot.

If you are on a boat with a flying bridge, keep in mind that the higher up you are, the greater the range of motion will be. It's like sitting on top of a flag pole: that pole does not have to bend many degrees in the wind for the pole sitter to experience a violent range of motion. A person sitting in the cockpit, though he is experiencing the same number of degrees of roll, is moving far less because he is sitting at the base of the radial arm, while the person at the far end of that radial arm is being flung around violently. It's not the boat's fault, it's his fault for wanting to sit up so high.

Seamanship is the ability acquired by a seaman to pilot his vessel skillfully under adverse conditions. It's a skill that involves understanding your boat, wind, waves, tides, currents and geography. Nowadays, operating a boat is regarded as little different than driving a car: just get in and steer the boat around. We see this casual disregard for the need to acquire any kind of boating skills whatsoever on every single weekend at the local marinas where we can observe dozens of boat owners who have yet to learn even how to dock their boats with any degree of skill.

Spending a few hours on Sunday at the local gas dock watching the antics of unskilled boaters can be some of the best free entertainment available. But it's a lot less funny when you happen to be out on the ocean with one of them. Amazingly, I see this all the time with "licensed" captains who have been hired by brokers to operate boats for the day on a survey. These are often young men who have studied the navigation books and have passed a test. But books and tests can't give you hands-on experience, and these young fellows often have little.

## Tide Rips

This is so clearly illustrated when they often head straight out an ocean inlet, directly into a tide rip. A tide rip is a condition in which the tide is rushing through a narrow channel against the direction in which the waves are moving, causing the waves to become taller and steeper, with less distance between crests. You do not head directly into a tide rip unless there is no other way to avoid it. To avoid a tide rip you have to know your water depths around the inlet. Just because the channel is marked doesn't always mean that you have to stay in the channel. This is especially true for inlets along the coast like Fire Inlet of Long Island, Manasquan Inlet of NJ, the waters S & E of Warwick Light in Narr. and Vineyard Sound to name a local few. For example, the Port Everglades inlet at Ft. Lauderdale has adequately deep water to the south outside the channel. Since the prevailing winds are east/southeasterly, this wide deep inlet can produce a very nasty tide rip. However, it is easily avoided by leaving the market channel to the south, but very rare is the captain I see who ever does this. Instead, they subject us to heavy bashing and plumes of spray for nearly a mile beyond the jetties. Why do they do this? Well, because they are not familiar with this famous inlet, though they will surely tell you they are. That, you see, is a fundamental ingredient in this thing called seamanship. It doesn't begin and end with just boats and waves, but also understanding how weather and topography affects the movement of water. Any sailor worth his salt, understands that the contours of the bottom under the water is just as important as knowing shorelines and channels. These are the kind of things that are only taught in master seamanship courses by those who are truly master seamen.


**A deep water inlet with a strong tide rip and moderate seas can produce conditions like this. <u>Do you know how to handle it?</u> What would you do if encountering a situation like this?**

Consider this: It can more comfortable, and safer, cruising in twelve foot waves than six foot waves (under some, but not all, circumstances). How can that be? Well, if you have any understanding of waves at all, you know that it's not the height of the wave that is most important, but the distance between waves. If the distance is very far, as with swells, they can be very large indeed, but not be threatening or causing undue discomfort. Yet a steep four foot chop can be downright dangerous or make your time on the water miserable.

Waves are peculiar things. If you've ever taken the time to actually observe them, you know that the water making up the wave doesn't actually move in a linear direction. No, the water in a wave actually moves in a vertical circle and similar to the way sound waves move through the air or AC current travels through a wire: it undulates. It is caused by friction of the wind on the water surface, obviously. But water is heavy, and does not want to move. Waves rise up because of this resistance of the water which is not pushed around easily.

The point to understand here is that a single wave can weigh dozens of tons, usually much more than your boat, and though water is fluid, it resists the movement of your boat through it. Good seamanship involves choosing the best pathway through the waves, even though that usually doesn't take you in a straight line to your destination. In going from point A to point B, you have to decide whether pounding the boat straight into the waves is preferable to choosing a more comfortable course.

Sailboats cannot sail directly into the wind; instead, they have to tack back and forth at angles in order to travel upwind. A wise motor boat pilot often does the same thing rather than subject his boat and passengers to such abuse. The trick is in figuring out the best angles relative to wave direction, tides and currents.

When waves become large enough, like around four feet for a 30-40 foot boat, all choice in the matter is lost as the waves determine what direction it is even possible to travel in. As waves get yet larger, the distance between crests increases relative to boat length and it may become easier to navigate.

## Sea State

Sea state is the term used to indicate, not only wave height, but is also a description of wave life. As winds are increasing and building up wave height, as at the start of a storm, waves will be shorter and steeper. The shape of waves is determined. in part, by how long the wind is blowing at a particular speed. Waves will remain steep as long as wind speed is constant or increasing, but as soon as the wind slackens, wave height and duration will begin to decrease. These waves will be far more comfortable than the waves while winds are constant.

## Currents

The next most important factor affecting waves is current. If you ever get the chance to fly over the Gulf Stream, just look down and you can clearly see the effect of the northward flow on the pattern of waves. At each point of the compass, the effect of the current on the direction of the waves is different. The real seaman will understand how this affects waves from all directions. Locally the RIPS at the north end of Block Island is a combination of currents and topography.

If the wind is in the same direction as the current, not only will wave height be lower, but distance from crest to crest will increase, making for a more comfortable ride. While winds directly opposite current will make waves short and steep, winds perpendicular to the current will create confused or highly irregular waves that can be equally dangerous. Here, the current works to scatter or break up waves. Wave height will be inconsistent and when winds are very strong, will create what are called "rogue waves."

If you've ever seen two wakes of boats traveling in the same direction come together, then you know exactly what a rogue wave is: it's two waves coming together at oblique angles to form a single, yet larger wave. This is why currents around promontories or sudden changes in bottom topography can create very dangerous conditions. Cape Horn, Cape of Good Hope, Cape Hatteras are all famously dangerous promontories that create very dangerous conditions because they divide two large bodies of water that converge. Thus the waves and currents also converge.

But the conditions caused by the topography of a Cape Horn can be just as easily created on a large bay or lake by a similar topography. Hence boaters can get into big trouble on the likes of Chesapeake Bay as they can those other famous trouble spots. All along our coastlines there are hundreds of spots where wind, current and land mass shapes can cause sudden and unexpected dangerous water conditions. The boater is running along, happy as a clam, in comfortable conditions, and suddenly he is hit by the unexpected.

"We were running along and everything was fine. Then, suddenly we were hit by these huge waves and the boat leaned over so far that my sister on the bridge fell and broke several ribs. The sofa in the salon went from the port side to the starboard side and smashed the cabinets and paneling. Later we learned that the batteries broke loose, which is why we lost power to the radio and couldn't call for help."

Stories such as that were told to me many times in my insurance claims work over the years. When I plotted the location of the mishap on a chart, it usually became very clear why they ran into trouble. Their description of the event was all wrong: they were not *suddenly hit* by big waves. Oh, no. What they did was pilot their boat into an area containing big waves. The potholes in the road did not jump up and hit the car, the car was driven over the potholes, and had the driver been looking where he was going he could have avoided them.

In such cases the boat operators unknowingly piloted their boats into dangerous waters around promontories or confluences of currents which are predictable if you have the knowledge. In most cases one can plot the trouble spots on a chart if you know how to read one.

Down in the Caribbean there are some  spots, such as the Windward and Mona Passages, which are famous for their dangerous waters. These involve very strong tidal flows between major islands. So, too, areas of the lower Chesapeake where all that tidal water flowing out on an ebbing tide around promontories can kick up hellacious seas very unexpectedly to the unknowing, and where hundreds of them get in trouble every year. All because they are unqualified to be operating a boat where they were.

There are times when the trouble spots cannot be avoided, so that good seamanship calls for making preparations for entering areas of dangerous waters, as well as knowing how to pilot the craft through them. Just because you have a fast boat doesn't mean that you can escape from trouble quickly. Once you pilot a boat into troubled waters,  you become trapped by them, and only good seamanship will get you out. Lacking such skills, you days on Earth may come to an end.

## Bottom Topography

Probably one of the least understood and anticipated influences on wave conditions is bottom topography. Water depth has a major effect on waves which will behave very differently between shallow and deep water.

Waves do not merely affect the surface of a body of water. The motion involved actually goes down fairly deep, around four times the height of the waves. So if a wave is four foot, the water is being disturbed down to a depth of about sixteen feet.

Thus, when you have a situation where the bottom suddenly rises up to near the surface, this can cause nasty sea conditions. There are excellent examples of this in the Bahamas where there are actual underwater cliffs that rise close to the surface.. You can imagine what happens when a current meets a sheer under water wall or very steeply rising shelf. It's much the same thing as the wind flowing around tall buildings. Water moving against a submerged plateau is going to "hump up" at that point.

Not only does the underwater obstruction force a change in water flow direction, but will cause increases in velocity and create nasty eddies. These things can create some of the most dangerous water conditions there are. Like rapids on a river, only a very skilled boatman can handle them.

Even worse is the location where many of these factors come together, such as a promontory and steep underwater shelf, along with a forced increase in water flow and possibly the venturi effect of two headlands coming together. Such places can be serenely placid at one moment, and deadly the next as the slack tide or winds suddenly change.

## Recommendations For Novices

If you are a novice, I recommend that you do several things.

1. Never rely on GPS electronic maps for your knowledge of the waters you navigate. I suggest you use Raster charts instead of Vector charts. There is a good reason why, the first screen you see when you turn it on, warns you not to rely on it: it does not contain all the information you need to navigate safely.

2. Buy paper charts of the areas that you intend to navigate, INCLUDING your local area. Learn to read charts and study them. Memorize the geography of the land and the topography of the water.

3. Learn about tidal flows and currents, their direction and velocity. Know the places that are best avoided.

4. When encountering rough water, take the time to be observant of what is happening around you. Use the opportunity to practice and learn boat handling skills.

## Small Craft Warnings

Small craft is a relative term and means ships less than ships. Because small craft entails so many sizes of boats, it's up to you to know what sea states are dangerous to your boat. The authorities are just giving a general warning to let operators know that conditions may be dangerous to some boats. If you have a small outboard, then obviously all small craft warnings apply to you. No official agency could possibly gather all the possible differing factors and put them into something more specific.

The criteria to use is wind speed and sea state. Twenty knot winds make for nasty, if not big, seas. Your obligation is to be sufficiently educated in order to understand when conditions become a threat. No one can tell you that, because they do not know you, your boat, or your skills.

## Big Seas, Little Seas

Previously we discussed why it is difficult to have a general discussion about seamanship, and why experience is so important. Water and waves behave differently under different circumstances. Smaller waves, say in the 4-6 foot range are often more dangerous than larger waves when in open waters. I've been in ocean waves of 8-12 foot seas that were far less threatening and uncomfortable than 4 footers.

Since different boats behave differently under differing circumstances, it is up to the operator to learn how to become a good seaman, learning about his boat's strengths and weaknesses. In maritime law there is an axiom that no boat is seaworthy without a skilled captain.

No one is going to learn much without making the effort to learn. You can try to learn from others, but nothing is going to take the place of actually being out there under the kinds of conditions you want to learn about. That means that you have to challenge yourself and your boat a bit and test the waters.

The sensible way to start out is with moderate conditions and circumstances that are less dangerous. As a young racing sail boat sailor, I learned rough water seamanship simply by taking the opportunity to go out when conditions were bad. I got a big thrill of going out and challenging the ocean. People thought I was nuts, but what they didn't realize was that I didn't start out challenging 12 foot seas. Like every other good seaman, I started at the small end of the scale, but didn't stop once I'd learned the easy stuff. Operating an 8ft dinghy in 3 to 4 ft seas can teach you a lot of good boat handling skills. You will wear out the throttle from constantly changing your speed.

Then, when the big blows came along, I'd round up my crew and out we'd go into conditions that would make most boaters hair stand on end. Granted, there is not much point in doing something like that in a floating motel room, but if you're a cruising boat owner who is going to sooner or later get caught in bad conditions, the best way to learn to deal with them is simply a matter of practice.

Not only will you learn about seamanship, but you'll also learn a lot about boat design, equipment and safety. Who knows, you might even have fun doing it.

## Controlling Speed

In a power boat, you have an advantage that sailors don't have. That is the ability to control your boat speed relative to wave speed, and along with the direction of travel, are the two most important factors. Controlling speed controls the effect a wave will have on a boat. Most people don't want to slow down when conditions get rough, but that is an inescapable necessity.

Following seas are those conditions where the direction of the waves is anywhere aft of a line drawn through the beam. When heading straight downwind, with waves heading exactly in the same direction as your boat, is known as a **following sea**. When that direction is a number of degrees off a line drawn down the center of your boat, these are called **quartering seas.** Seas at an angle off the bow are said to be on the **forward quarter**. Seas parallel to the centerline are called **beam seas**. Seas directly on the boat are **head seas.**

Regardless of direction, it is necessary to control your boat speed and choose the one speed at which the boat becomes most responsive and controllable. Going too fast in a following sea means, that you'll fly off the top of one wave and bury the bow into the back side of the next. That's not good, so we need to find the right speed which yields the most comfortable ride while still keeping good control of the boat.

When following seas start to get really big, we have only two choices: either we slow down to the appropriate speed, or we have to change direction. If we put the seas on the aft quarter we can maintain a higher speed without stuffing the bow into the backside of a wave. On the other hand, we may not end up going in the direction we wish. (And here you may have thought only sailboats engaged in tacking) It then becomes a matter of whether our higher speed makes up for the extra distance we have to travel. Often times it does, making it advantageous to alter course 20-30 degrees.

# Broaching

Controlling a broach is a function of controlling boat speed. It is best to avoid broaches by never running into the backside of a wave at such a high speed that you loose control. Once it happens, the only thing you can do is chop the throttle immediately.

As with a skid in a car, don't try to steer out of it. It is best to hold the wheel where it is and let the slowing speed get you out of it. The danger is in allowing the boat to suddenly go broadside to the waves and possibly capsize. Once the bow is no longer buried in the wave ahead, you can use the rudder and throttle to quickly right your course.

Big head seas bring just about any kind of pleasure boat to a grinding halt. When waves get to around 5-6 feet and we want to head upwind, we're pretty much stuck with idle speeds. Unless, you want to try quartering the head seas and see if that won't get you where you're going at a higher speed without taking blue water over the bow. At a 45 degree angle you can increase speed only slightly. At 60 degrees a bit more, but makes it tough to get where you want to go.

Tacking back and forth in this manner certainly is not a prescription for going anywhere fast, but it can get you there eventually. That's why the experienced pilot will try to use lee shores to advantage. If you can use a course alteration to get in the lee of a shoreline, you may be able to get to your destination in a round about fashion without beating your brains out. What I'm referring to, of course, is finding ways to use irregular shorelines or islands to your advantage.

Many novice boaters get themselves in a pickle by heading out the inlet on a fairly rough day and go charging off in beams seas only to find that they can't get back so fast because to return they now have to take seas on the bow. The moral of this story is don't head out without considering how you're going to get back.

When waves get big, the steepness is normally (tides and currents excepted) a function of whether winds are steady, increasing or decreasing. As all fishermen know, just because waves are big doesn't automatically mean that these are impossible conditions.

Building winds are most dangerous and those likely to get us into trouble, for conditions are likely to worsen. Decreasing or dying winds means that the energy that causes or creates waves is decreasing and so wave steepness will decrease and spacing from crest to crest will increase. Though waves may still be quite large, they will permit the boat to go at higher speeds. The seas left over from storms can be very large, but not necessarily uncomfortable.

A friend learned this lesson back in the 1960's when, docked at Bahia Mar we were waiting for the Stream to calm down before crossing to Bimini. A cold front had been through and the wind had blown for nearly a week. Looking out over the ocean we could see nothing but big lumps on the horizon. There was big surf along the shoreline. Well, he waited and waited, and being on vacation, was seeing it go down the tubes.

Finally, he said to hell with it, let's just go anyway. It was pretty nasty along the shoreline, but much to his amazement, once well out in the Stream he had 12 foot swells rolling down from the north, but they were so big that it was like driving a car over rolling hills. It was a completely comfortable crossing. That was one of his first lessons that taught him, that all waves are not created equal. The question becomes, what kind of waves are they? and from what direction? Arriving on the other side was a different story, where we couldn't enter the harbor for the huge surf breaking on the bar, so we went somewhere else instead.

Several day later in Nassau, for reasons he couldn't fathom, winds freshened out of the northeast again and kicked up a nasty chop in the 12-15 waters of the Bahamas Banks. Now where can we go, he schemed?

We can't head into it toward Abaco, where he wanted to go, but he could head south to the Exumas, or go visit the mosquitos and no-see-ums in Andros. Just one problem: If he got down there, and the wind continued to blow northeast, as it is prone to do in winter, he wouldn't be able to get back.

Or could he? By studying the charts, he could see that it might be possible to plot a course down the less (western side) of the Exumas and stay in the lee of the islands. This was risky because there are nasty rocky shoals jutting miles out from each of the islands in the chain so that one cannot follow the lee shores closely. If you get too far out of the lee, the chop will get real nasty with the tidal currents between islands.

He decided to go for it and hope for the best. This proved to be a mistake. The shoals were worse than they appeared on the charts. He couldn't get anywhere near the lee shores of the Examas (since you can't read depths in real choppy water) and found himself surfing southbound in a thousand feet of water in the tongue of the ocean. He was going to end up trapped by sea conditions and topography and he had no choice but to turn around and head back.  Sometimes you can't win.

## Confused Seas

These are among the worst conditions, and don't necessarily have to involve large waves to be dangerous or make life at sea miserable. Confused sea conditions are best avoided since there is no getting around them and nothing one can do to make things better. Confused sea conditions occur as a result of major shifts in wind direction that occur quickly. This causes waves coming from differing directions, resulting in waves that are irregular and unpredictable.

They are mostly an oceanic phenomenon but do occur on large lakes or very large bays during or after thunderstorms, but will die down quickly on smaller bodies of water. But on oceans, confused seas can last for days after major fronts or hurricanes. Even large thunderstorms can have a significant affect on the ocean. Like throwing a rock in a pond, a storm or front can send out waves in different directions from the winds that caused them previously. The waves come together and make the surface very bumpy.

So called rogue waves are caused by two waves from differing directions coming together at oblique (very wide) angles. Like two boat wakes coming together, the net effect is to create a yet higher wave, up to two or more times the height of the originals. These can be downright dangerous due to their unpredictability. The best way to deal with them is to stay tied to the dock.

When caught out in confused seas, one needs to be particularly alert for those big ones that suddenly pop up out of nowhere. With a bit of experience one can come to anticipate them soon enough in advance to take evasive action.

We often hear reports of skippers describing boats "falling off a wave." They don't mean slamming in the ordinary sense, which is avoidable. A situation occurs that is the opposite of a rogue wave; instead of two waves coming together to make a taller wave. it happens that undulations from confused seas can create exceptionally large troughs like SE of Block Island. The boat hull can be on a hump and suddenly that hump just disappears out from under the boat. What happens is that the undulation moves away, the boat is left with nothing supporting it and it simply drops.  Weird but true.

One can observe this very clearly on those days when there are confused swells as opposed to waves. It's very common in the wake of tropical storms.

## Waves on Top of Waves

This is another dangerous sea condition. It occurs when waves get very large, and at a time when winds and seas are still building. No pleasure craft should be out in these conditions.

If you're into boating long enough, the time will come when you get caught out in a vicious thunder storm. When that time comes, you either know how to handle the situation or you don't.

The big problem is that for the most part, we don't know where that will be when it happens, how long it lasts and how intense the storm is. We all pretty much agree that the weather experts are not very good at predicting these things. That is not their fault, because thunderstorms can develop very quickly. If it happens to develop very close to where you are, then there's not much chance for an advance warning.

# Storm Avoidance

The good news is that very severe storms normally require certain favorable conditions that ARE somewhat more predictable. Such as frontal boundaries which create an unstable atmosphere. Just because the local TV weather bimbo isn't very good at predicting precisely what will happen (after all, she's probably just reading the teleprompter and doesn't know squat about the weather), we shouldn't ignore the weather information that is available to us. That is why sailors (who go around in boats that are very slow and can't escape storms) learn to become weather experts themselves.

If you're not willing to take the time to learn to read weather maps, then the least you should do is to learn to read the sky. Being on the water means that you usually have a far horizon available, so that you should be able to see a storm coming and have opportunity to flee from it.

If you do get caught, here are some tips to help you stay out of trouble.

One cannot always tell how severe a thunderstorm is by looking at it. Sometimes we see ominous squall lines that look like the apocalypse coming. And then almost nothing happens. At other times it may not look so bad and turn out to be the end of the world in disguise. Or so it seems. One of the problems we have with thunderstorms is that they do not conform to any rules of behavior. Though they may appear to be moving in a certain direction, that is only from your perspective. From a larger perspective, they can be moving in more than one direction at once, as they always do along a frontal boundary.

You can observe this phenomenon on weather radar loops. Individual cells moving in one direction, but the whole system in another. Understanding this will give you a better chance of predicting movement.

When storms pop up along frontal boundaries, the overall front is moving in one direction, while the storm is moving in another. The front may be moving east to west, but the storm cells are moving north to south along the front. My point here is that the apparent direction of movement may not be the true direction.

**The Miami skyline on a beautiful morning.**

**Didn't last long though, for within a couple of hours it looked like this. This squall line is moving on shore, but notice that the sky ahead of it is also dark. On this day, the storms were unceasing.**

We especially want to avoid storms associated with weather fronts because both the strength and duration of thunderstorms is likely to be the strongest and of longest duration.

Moral: Don't plan to go out for the day without checking on a reliable weather map or report. That doesn't mean those childish graphics that pass for weather maps in newspapers. The best and easiest available source is the Weather Channel or any one of the official NWS or NOAA web sites.

When you do get caught, your most immediate problems are loss of visibility and high winds. And depending on your location, rapidly building seas. How you react and what you should do depends greatly on the size of your boat and the type of body of water you are on. No one can tell you precisely what the correct response is because every situation is different.

Obviously, if you're in a very small boat you are in big trouble if high seas becomes a threat along with the loss of visibility. The most important thing is to avoid panic and rash reactions. Break out the life jackets and tell passengers to put them on "just to be safe." It is important to keep the inexperienced people calm, lest you end up with more problems.

Next, consider your position. There are several things you want to avoid: Dangerous shorelines, inlets and potential collisions with other boats. How many other boats were around you when you lost visibility? If there were quite a few, and visibility is down to just a few yards, reduce your speed to the minimum needed to control the boat. Begin sounding your horn at regular intervals, say 15 seconds, until visibility clears. Don't go running blindly about at high speed as many boaters do. Collisions are a very real risk, so you should prepare for one. If it looks like the storm may only be of short duration and wind and waves do become threatening, along with threats of collision from loss of visibility but you are close to a shoreline and are in danger of going ashore, head your boat into the wind and maintain a slow headway. This is something that often happens in Florida with its frequent storms. It turns into a kamikaze mission to be running blind, so the thing to do is stop and hold position and hope that all other boats do the same thing.

*Convergence: Soon storms are unpredictably popping up all over. Winds here were estimated at 45-50 knots.*
*Seas from zero to 5 foot in fifteen minutes. Close to a bunch of islands is not a good place for a big boat to be, so we get away.*

*Where it's raining and conditions are the worst is not hard to spot. This doesn't look so bad...BUT…….*

*This is what it ultimately becomes with rainfall rates that blot out all visibility. Those are same islands in background as photo left. Same day on the bay as top photos, different storm cell. In a big, fast Hatteras, we can afford to fool around, but in a twenty footer, you'd be in trouble.*

**Tossing out an anchor probably isn't a good idea unless you are in a very narrow body of water, have completely lost visibility, and going ashore is an immediate threat. If you have plenty of maneuver room, it's best to remain in control of the boat and stand off.**

In most thunderstorms, the wind direction will soon change. Thunderstorm winds are caused by down drafts created by the falling rain. The rain pulls down air with it. The winds generally blow outward from the center of the rainfall area. As the storm approaches, winds are blasting straight at you. As the rain cell passes over you, the winds will slack off, then reverse directions (just like a hurricane) and blow from the opposite direction, usually with less intensity. Understanding this pattern can give you a good idea of how long you'll be exposed to those conditions.

Being able to judge the forward speed and path of a thunderstorm is a definite help toward making right decisions. Generally cold fronts are more severe and move much faster than warm fronts, therefore the time of passage is quicker.  ALL boaters should learn to pay attention to weather and try to learn as  much as one can about its behavior. Serious boaters know all about storm behavior, can accurately predict severity and conditions, and take appropriate actions before it's too late. That doesn't necessarily mean avoidance, but it does mean the ability to place themselves and their boats in less threatening positions before the storm strikes.

A typical example of what I mean is the ability to predict timing so that one knows not to rush toward a dangerous inlet just as a storm hits and visibility is lost. How do you learn things like this? Well, by taking the time to observe storms when they are about. When there is a storm on the horizon, is it going to hit you or not? Does it look serious enough that you should NOT take the chance? Size, direction of movement and speed help answer this question. So does knowing whether there is a front approaching, or whether the atmosphere is unstable.

In the later cases, what appears as one storm can soon become two or three, and rapidly grow in size and engulf you, not by storm movement, but by expanding cell development. The experienced boater keeps one eye on the sky at all times and learns to spot this development before it's too late.

## My Bad Day at Black Cloud

There was one occasion when I got trapped far out in the Gulf Stream. Thunderstorms built in the west over the Everglades as they always do in the summer, and then proceed to move eastward. I was not paying attention to the fact that storms were also starting to build to the south. Soon we had storms moving from the west and south, and of course, they converged in the southwest, making for some of the worst thunderstorms I have ever witnessed, threatening to even a fifty foot sport fisherman.

Except for night-time storms, this was the only time I had ever been frightened by thunderstorms. They were severe and lasted most of the day and into early evening. The results were that we lost a Bimini top, an outrigger and two windows. The interior of the boat was a shambles: the sofa broke loose and smashed part of the salon interior; the reefer door tore off and dumped its contents. A battery box broke loose and shifted into an engine alternator, knocking out the DC system on one side.

Why did all this happen? I'll tell you this: we ignored warnings of unstable weather (a tropical low was developing over us) and we weren't paying attention to what was happening weather-wise around us. We should have seen it coming (developing) and cut our fishing short. As it was, we stayed 15 miles offshore and got our butts kicked but good, learning a valuable lesson in the process: Mother Nature holds all the cards.

Unfortunately, there are situations where you can find yourself smack along the path of a line of storms, in which case you'll be hit by one cell after another. This is the worst possible scenario, and one that usually could have been avoided had you done your job as skipper and checked the weather before you headed out. Storms of this type are in association with fronts and atmospheric instability, and such information is available in advance.  Getting caught in this stuff is a baptism by fire. Multiple storms do not let up, but hit you one after the other, and can go on for hours, even days. This is serious, life-threatening stuff.

When caught in this kind of weather, the best strategy that I know of is to bide your time and wait for a break between storm cells when you can make a mad dash for port, if you are close enough. The one thing you do not want to do is to try to negotiate an inlet on a lee shore with no visibility. (a lee shore is one toward which the wind is blowing because it is on your lee side). If you're far offshore, you may want to try work your way closer to shore (visibility permitting) and then stand off at a safe distance.

## Sheltering

If you have shelter available (but are far from port), such as islands and peninsulas. whether sheltering is a good idea depends much on depth of water and shorelines. In smaller boats, if there are sandy shores, putting up in the lee of one may be a good idea. Just bear in mind that with thunderstorms, wind directions will probably change, so that seeking shelter in the lee of a landmass could mean getting caught on an exposed shore if the wind goes 180 degres. If you perceive the situation as life threatening, it's better to sacrifice the boat and save yourself and family or friends.

Rocky shores are very dangerous to both boats and people. You want to stay clear of them at all costs. Use an anchor if necessary.

## Being Prepared

This brings up the issue of preparedness. You and your boat should be prepared at ALL times. Trouble comes in its own time, not yours. Anchors and rodes should be kept in a state of readiness, along with PFD's and all other safety equipment. At sea, Murphy's law can reign supreme.

## Lightning

Thunderstorms are called that because they come with lightning which generates thunder. Lightning deaths and injuries to boaters are on the rise, mainly because there are more boaters that make good targets. Indeed, out on the water you are a good target.

In larger boats where you have any kind of structure around you, be it a cabin or just a Bimini top, you have a fair degree of safety. Fortunately, injuries to people IN boats are very few as you have a cone of protection around you.

People in open boats are most at risk. The potential for injury increases if you have wet, bare feet. So, wearing rubbery tennis shoes is one help.

We hear on TV not to touch metals. That's good advice in a house, but impractical and not necessarily true in a boat.

If you have hydraulic steering in your boat, and most boats do these days, you needn't fear holding the metal steering wheel. There is an exception however, and that is if your boat has copper hydraulic lines. In that case, holding the wheel puts your body directly in a ground path. Mostly, only larger and older, and especially Oriental built boats will have copper lines, so it's best to check on the material.

Things to avoid holding onto are Bimini top frames, ladders, towers and large railings. Isolated pieces of metal such as small grab rails and the like are not a threat.

Particularly keep your distance from radio antennas which are real lightning rods. Lower them as a storm approaches. Keep passengers off the bridge and into the cabin. By all means, keep your hands off the radio mike; holding it is like strapping a lightning rod to your body.

In an open boat one is very vulnerable and there is not much you can do to avoid being a target except to avoid standing up.

Boat-handling is a art! Some skippers make a passage a comfortable and safe ride, while others make it an unsafe, uncomfortable and downright dangerous passage.

Seamanship is learned not taught! One can be taught things, but you decisions on which waves to steer around, when to “chop the throttles”, what angle of attack should you use for your vessel in a particular sea only comes with practice. Based on your knowledge base, you have to determine how the effect of wind and its fetch on the local currents, along with the bottom topography make up the conditions in the specific area you will be traveling. Change any one of these factors and the local situation changes drastically. You will notice that your boats heading, course over the ground can differ as much as 20 degrees; as well as your speed through the water and your speed over the ground can differ greatly.