

They were carrying just a trysail, and used the engine at low RPMs to keep their speed in the 2- to 3-knot range. The slow speed enabled them to avoid dropping into the troughs on the back side of the seas, yet provided enough steering control to allow them to feather through the crests.

The year after their experience, Pascual was most enthusiastic about this tactic's application in a survival storm. It was Pascual's feeling that as long as he could keep steering the boat, he would be safer working his way through the crests, rather than lying to a sea anchor or hove to.

Years later, sitting in an anchorage in the Sea of Cortez, we had a similar discussion with Doris and Ussi Aspialla. They'd used the same approach in a black southwester off the coast of Africa. Ussi felt that using the engine on their Swan 57 at the time gave them the most flexibility with the waves they found in the Aghulas current and got them into port much faster- and with less risk than would have been the case if they'd just been sailing.

POR VIDA

We want to leave this section on motorsailing in extreme conditions with some comments from Skip Elias, who went through the 1994 Queen's Birthday storm between New Zealand and Tonga. He and his wife Susan were aboard *Por Vida*, a Westsail 43 (13.1m).

They had owned *Por Vida* for six years, and when this event occurred they were on their second season in the South Pacific. Prior to this, they had raced and cruised extensively on both East and West Coasts of the US. However, their offshore experience was limited to time in the South Pacific.

Sea State and Wind Conditions

Skip picks up the story from here, starting with a description of the conditions in the height of the storm:

At the worst of it, windspeed meter hit 90 knots a few times, with the highest sustained winds of around 70 knots. Our instruments are Telcor 1976 vintage so I cannot vouch for their accuracy. We spoke to the Orion aircraft that was looking for *Destiny* and their estimates were similar. I don't know how to objectively describe the sea state. Average wave height of 40 to 50 feet (12.2 to 15.2m) would probably be accurate. We spent most of the time down below, but when I managed to look out, my mind was processing more adjectives than numbers.



With so much data on unpleasant conditions it is worth remembering that most cruising takes place in moderate weather, and at the end of the passage, an anchorage like this one on Moorea awaits.

POR VIDA

Por Vida is a ketch-rigged Westsail 43 with a displacement of around 18 tons (as compared to a design displacement of about 16 tons).

She is powered with a Perkins 4-236 turning a 3-to-1 reduction gear V-drive. The prop is a 22-inch (558mm) Max feathering prop, with 20 inches (508mm) of pitch.

They are over-propped and cannot not use the engine to its full RPM. However, for a Maxi prop this may actually be a good pitch ratio (see *Offshore Cruising Encyclopedia* page 753 for more data on the use of maxi feathering props). They generally power at 1,600-1,800 RPM.

Their autopilot consists of Cetrek controls, a Wagner PV140 pump with a Kobelt 30-cubic-inch hydraulic ram connected directly to the quadrant. The maximum design output was calculated around 1200 foot pounds.

My overall impression is that the seas were more regular than confused. Confused is not the word I would use to describe them. I remember the intense vertical motion. I remember having that feeling in my chest that you get on a roller coaster, with an occasional giant slam. In the eye of the storm the seas were quite confused.

It would probably be accurate to say that most of the time you could be hit from a direction of 45 degrees plus or minus from the general wind direction. Wave dynamics in open ocean and high winds is more a matter of statistical probabilities than an algebraic formula. Therein is the problem of defining fixed tactics to defend yourself.

Early Tactics

As the wind was building (we had no warning of what was to come) we started running with it at plus or minus 45 degrees to the general sea direction under reefed main, then went to the storm trysail. Next we put out a Shewman 54-inch (1.4m) drogue over the stern on roughly 150 feet (46m) of 3/4-inch (19mm) nylon braid.

The drogue had a very impressive effect on the motion of the boat. We slowed down to plus or minus 2 knots and were much more comfortable. We took a few hits over the stern but were doing okay. I think we started the engine to charge the batteries about this time, but not sure.

Unfortunately, we lost the drogue several hours later because of chafe (I think!). During this time, we also lost our second bow anchor. It was a 55-pound (25kg) Delta with 20 feet (6m) or so of chain and 300 feet (92m) of 3/4-inch (19mm) nylon braid. Which would have been no problem except it took the deck pipe with it so we had a 4-inch (102mm) open hole in the forward deck. Later in Fiji we discovered a knot of line around the prop and some damage to the rudder. Either one or both of the lines were caught in the prop and cut by the "spurs" on the shaft. Really happy I had them installed before we left.

After we lost the drogue (after 2 hours of use) we put the boat into the wind, off just enough to keep the centered trysail from luffing, and kept adjusting the course with the autopilot to maintain that attitude. So we went through the majority of the storm under motor. Using the engine was just an instinct to stay longways relative to the waves. In my mind, this was just basic physics.

Using the Engine

Skip ran the Perkins diesel at between 1,600 and 1,800 RPM. The throttle was not adjusted during the storm as they averaged 2 to 3 knots motorsailing into the waves. The autopilot was used the entire time for steering chores as Skip felt it was too dangerous to be on deck with the breaking seas. There was no problem with the oil pressure dropping due to heel angle as Skip indicated they did not heel that much. Fuel tank sediment was also not a problem.

DON'T RELY ON THE ENGINE

We are fairly careful to filter and treat all fuel we take aboard. We also have a vacuum gauge on parallel Racor filters. Even using 2-micron primaries, we have had no problems.

We asked about the motion motorsailing this way, and Skip replied:

My memory is of being more uncomfortable from the vertical motion of going up and down 50 feet (15.2m) in what seemed like every few seconds than the horizontal motion. We have been in short choppy seas that caused more things to fly around the boat than in the storm.

When asked if he would change anything in terms of systems, Skip said:

The engine is getting on in years so we are considering a new one. Perhaps to an extent because of the storm we need the feeling that the engine is 100 percent dependable. The new one will be properly engineered with regard to prop size, reduction ratio, etc.

Final Thoughts

A significant (in strength) drogue off the stern is likely to be better than bow-on under power. In both cases, the smaller profile of the boat is presented but still the hit is going to be significant. A properly set-up drogue is more likely to hold the stern into the hit better than the relatively small horsepower that any motor can provide going bow-on. The boat is also going to be more stable being thrown forward than backward. The drogue, at least to an extent, is like feathers on an arrow. A boat is more stable going forward than backward. Given no proper drogue, I would go bow-on under motor, as we did. All one can do in this situation is improve the odds. The Shewman drogue has a design strength of about 5,000 pounds (2,270kg). A proper drogue would need to have a design strength of upwards of 20,000 pounds (9,080kg). It would also need to be functioning in quiet water. This means it should be maintained well under the surface (1/2 wavelength down would be ideal) or have multiple elements to reduce the chance if operating in an oncoming wave face.

DON'T RELY ON THE ENGINE

Having just spent a lot of pages discussing how to use the engine for beating in storm conditions, we'd like to close with a caution about engines.

This approach will work in many conditions where sailing by itself may not offer as much control. However, to totally rely on the engine for your safety is a mistake.

The engine itself could have a problem, the prop may cavitate excessively, or you may end up with a sheet wrapped around the prop.

At this point, without the engine, you still have your sails to help you work your way through the waves. If you have always relied in the past on the engine, you may not have the necessary sailing skills to make the most efficient use of wind and waves.

By all means, practice with the engine using these techniques. But don't neglect your pure sailing skills. Work on these as well, so that if the time comes where you are forced to sail to weather in breaking seas, you will know what to do.

Skip Elias's comments on rig and tactics:

"I don't think it would have made a difference (if we were a sloop instead of a ketch). The point was, with a centered, very flat sail, we could stay off the wind just enough to keep the boat heeled to one side for comfort.

"With our rig, we cannot reef the mizzen, so that was not an option. Another consideration is that, in such high winds, any sails used should be very heavy, very flat.

"The trysail was only used to stabilize us. We wanted to stay as close to the wind as possible.

"Keep a storm trysail on deck and rigged at all times. A main with two reefs is not of much use above 40 knots.

"We had a parachute anchor, but it was too rough to go on deck to deploy it.

"Any chafe-prone gear (drogue or parachute anchor) should be attached to the boat with chain or multiple (rope) elements.

"We needed bigger cockpit drains and will be better prepared below for the possibility of a roll (in the future)."