Slowing the boat down

When wind and seas threaten to capsize a yacht lying a-hull, running before the storm becomes the only option. Trailing warps will slow the boat to a certain extent, but what about drogues? Richard Clifford conducted exhaustive tests in the Bay of Biscay and offers his findings

All photos: Richard Clifford

Richard Clifford was brought up in Dar es Salaam in East Africa and learnt to sail in the Fifties. He has participated in Fastnet, Round Britain and OSTAR races, and at present owns a Warrior 35. He has cruised extensively, nowadays either alone or with his wife, Jenny. A former officer in the SBS, he was awarded an MBE in 1987

There comes a time as galeforce winds continue to rise and large seas start to break heavily that one must make the decision on how to survive what is to come next. This decision may be precipitated by a wet and noisy knockdown and you are forced to brave the weather on deck, heave to or remove the storm jib and any other sail and lie a-hull.

In storms I have experienced, heaving-to was not an option; the sails would not have survived. Lying a-hull, as I also know to my cost, is not fail-safe. One can be rolled by that 'different wave' that catches the boat at just the wrong moment and you find yourself upside-down.

You can stream warps (more of that shortly), lie to a sea anchor or, to improve the drag of the warps, you can add a drag device such as a drogue. Here I will be addressing the use of drogues and how they can improve the survival capability of a vessel in strong winds.

To avoid confusion, my definition of a sea anchor is a parachute-like device streamed ahead of the boat to hold its head into or nearly into the seas, while a drogue is a small device towed astern to provide additional drag. You will need more sea room for the latter.

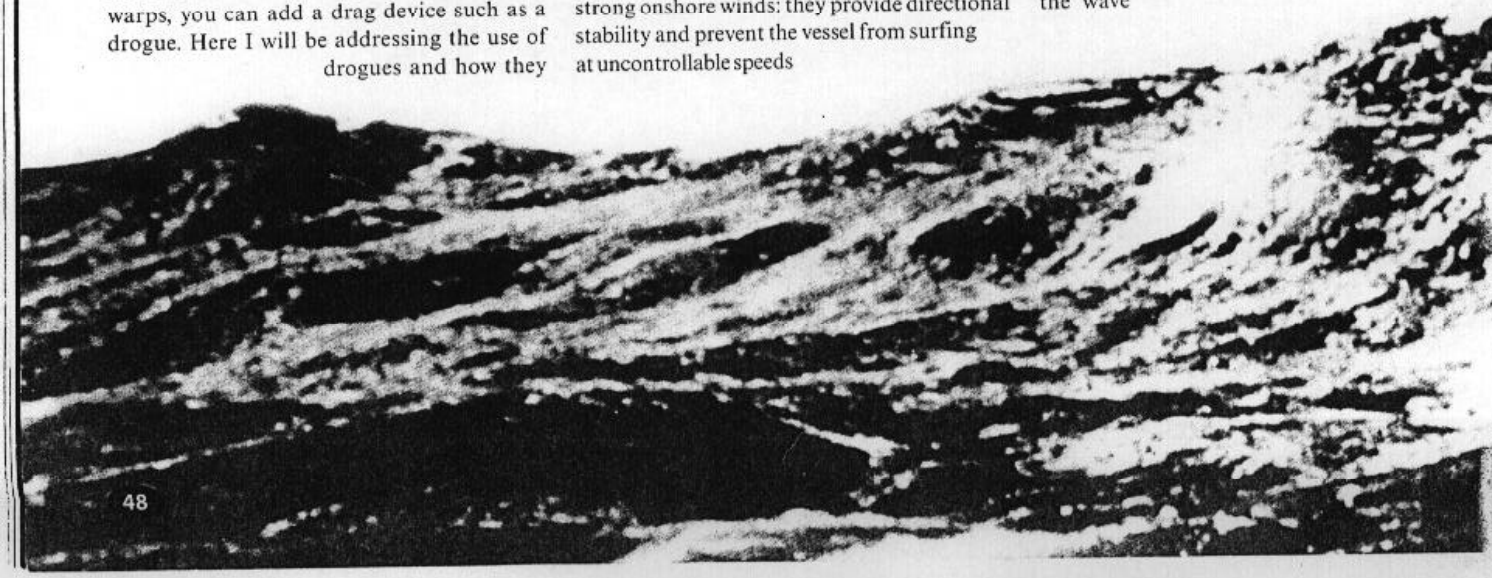
The benefits of both have largely been dismissed by British yachtsmen, due to a misunderstanding of the terms. This is exacerbated by some UK manufacturers who produce a 1m diameter drogue, calling it a 'sea anchor'; if tried on a yacht, it would not have the desired effect.

Drogues have been used for many years by lifeboats when negotiating harbour entrances in strong onshore winds: they provide directional stability and prevent the vessel from surfing at uncontrollable speeds down breaking waves. Additionally, RNLI lifeboats very often give the craft they are towing a small drogue to stream astern, again to give it directional stability.

Both these attributes are an advantage to the yachtsman caught out in a storm.

Once in 1970 in the Channel, then on my return from the USA in 1976 mid-Atlantic (and again when alone 50m off Mizen Head during the Fastnet Storm in 1979), having been knocked down a couple of times when lying a-hull, I ran before the wind.

On each occasion I found that the seas were so big – or my yacht so small – that I was in danger of pitchpoling when the yacht, travelling too fast, reached the wave



Small photos: all Hal Hunt Clifford

My own home-constructed drogue made out of parachute nylon with a diameter of 30in, ten per cent of my waterline length

...ugh and continued downwards. The stern then lifted on the next steep-sided wave.

Something had to be done. Streaming warps (about 120m) gave me some directional stability and slowed me down. After the 1979 experience I made my first drogue out of parachute nylon with a diameter of 30in, just about ten per cent of my waterline length (see photograph above).

The root of the problem is that a breaking ...e is moving at such a speed (20kts+), accelerating the yacht at great speeds in a very short time. The rudder has very little effect and the yacht becomes directionally unstable. She will normally rush down the wave and slew naturally to one side or the other.

A broach like that can lead to a knockdown or capsize. Even worse, if the sea is so large and the vessel has maintained directional stability, the yacht can keep going downwards before the buoyancy of the hull has time to recover, burying the stem well into the trough of the wave. This can lead to a pitchpole.

Despite the experiences of the Fastnet 1979 storm, it was not until the mid-1980s that the RORC asked the Wolfson Unit at Southampton University to conduct a study on sea anchors and drogues.

The report, produced in 1987 as a result of tank testing confirms many of my findings during my own trials at sea and that a drogue increases a yacht's chances of survival.

Drogues tested

Many gales later, my home-made drogue had not been used so in 1998 I decided to do trials at sea with drogues and sea anchors. I conducted a series of trials in the Bay of Biscay and in the English Channel on board my yacht, *Warrior Shamaál*, in winds from Force 5-7.

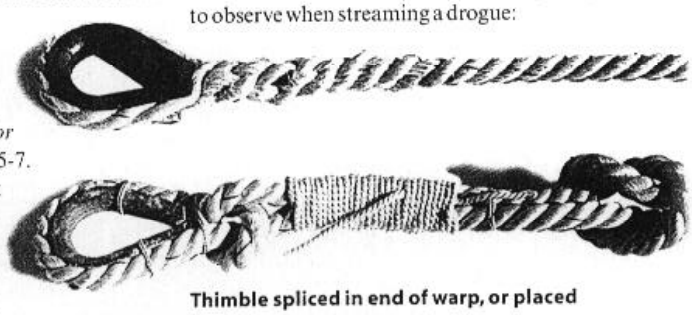
On each trial I went through the process of lying a-hull, then running under bare poles, streaming warps and then using various drogues and a sea anchor. I found that streaming warps had very little effect compared with adding a drag device in the system.

My warp was 100m of 18mm hawser-laid nylon line. It floated and it did not seem to matter whether it was secured with one end on board or as a bight with two ends on board. In my storms I streamed the line as a bight as I believed that it may have provided some sort of slick and prevented the waves breaking quite so badly.

To provide more drag, the line needs to be encouraged to get below the surface by adding a weight to it or by adding a suitable paravane.

From a computer prediction I have noted that a near vertical line provides more drag than a horizontal line at both slow and fast speeds. Even better resistance will be provided by a drogue.

I found that there are a number of principles to observe when streaming a drogue:



Thimble spliced in end of warp, or placed there with half-hitch and seizing

The line

I like the American word, 'rode', for the line used to tow a drogue or stream a sea anchor. The line needs to be of nylon or Terylene/Dacron to provide some stretch and elasticity. It should not be polypropylene as it floats.

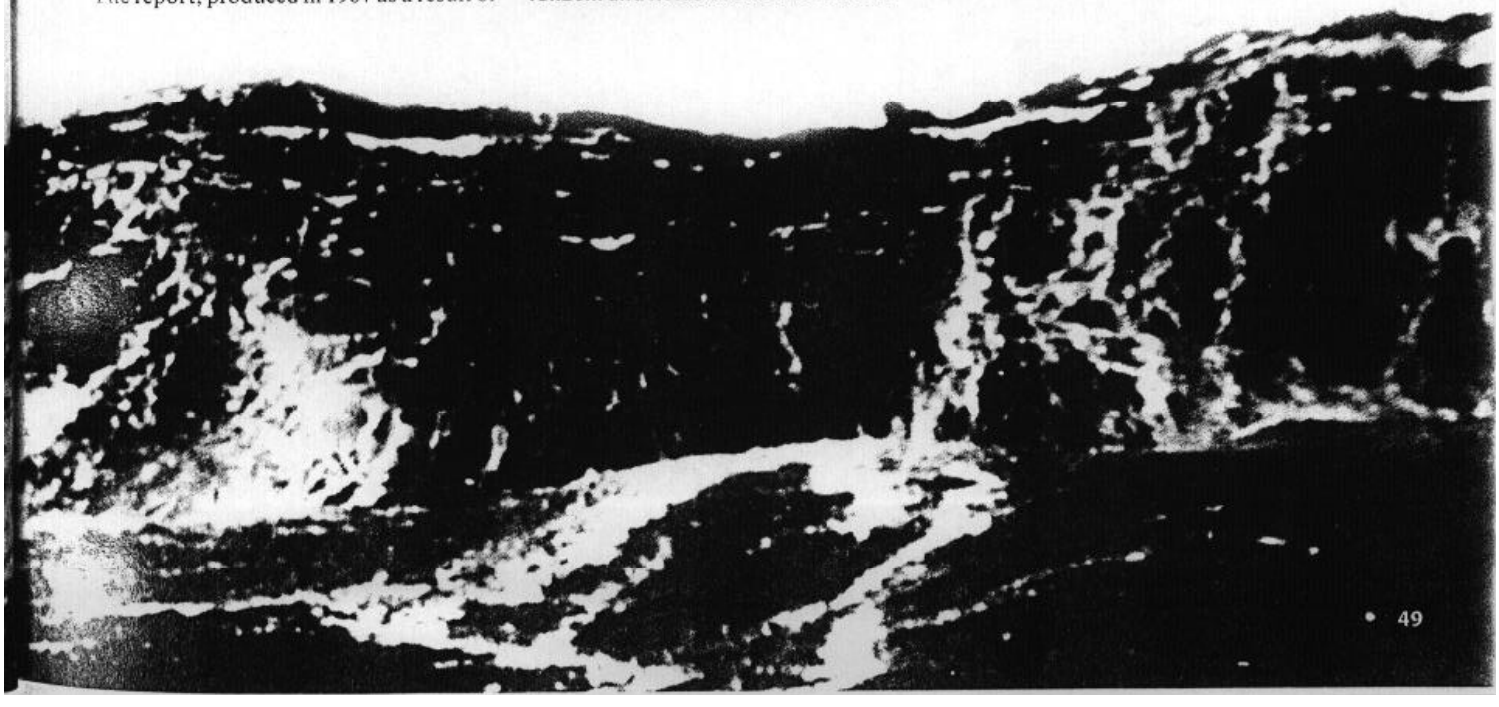
I do not believe it matters whether it is hawser-laid, anchorplait or braided, provided it is the size you would normally use on your boat as an anchor warp or mooring line. There should be a thimble spliced in one end or you can place one there with a half-hitch and seizing.

There is some merit in having a swivel in the rode. Although a hawser-laid line is unlikely to unlay, a swivel will ensure that it does not. Of course if you do not have such a long line on board you can join up all your mooring lines.

Length of rode

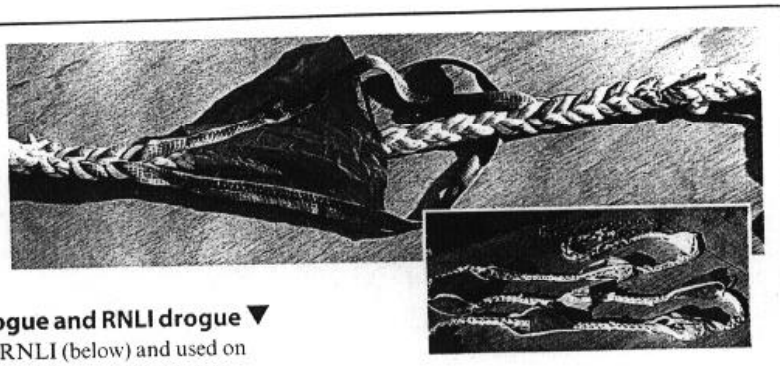
Ideally one needs to position the drogue on the back of the second or more wave astern so that it is in 'solid' water as you are rushing down a wave or two ahead. If you and ▷

Specially designed rode bag – this one is 13x26in and holds 100m of 18mm line



TYPES OF DROGUE

There are a number of speed-limiting devices available. The only type manufactured in the UK is the sleeve or cone drogue. Others are made in either Australia or the USA and some of those are marketed in this country.



◀ Sleeve drogue and RNLI drogue ▼

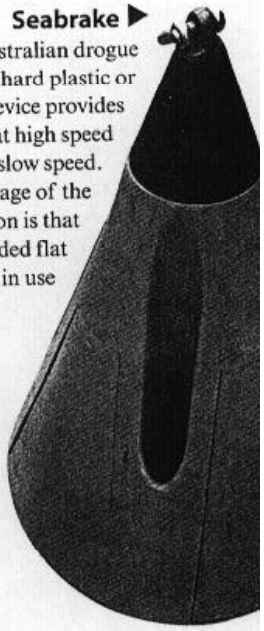
As used by the RNLI (below) and used on many liferafts as a sea anchor. These are conical devices made of a non-porous material with three or preferably four 'rigging' lines made of strong nylon tape which should provide the attachment point for the rode, and at the apex the attachment point of another drogue or weight (left). The diameter of the front of the cone should be 10-15 per cent of the LWL of the yacht

▲ Series drogue

Designed by the American Donald Jordan, this system consists of a long (say, 100m of 18mm) line with numerous 5-10in parachutes stitched onto the rode. The advantage is that it is unlikely to go slack as there will always be some of the parachutes providing drag. Its disadvantage is that it ties up a 100m line for only one job on board

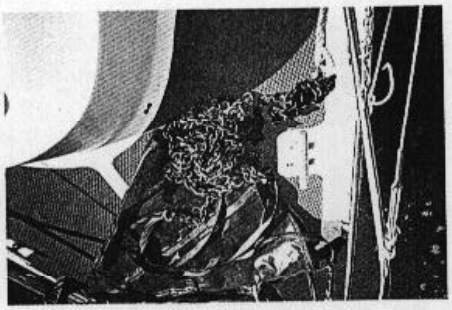
Seabrake ▶

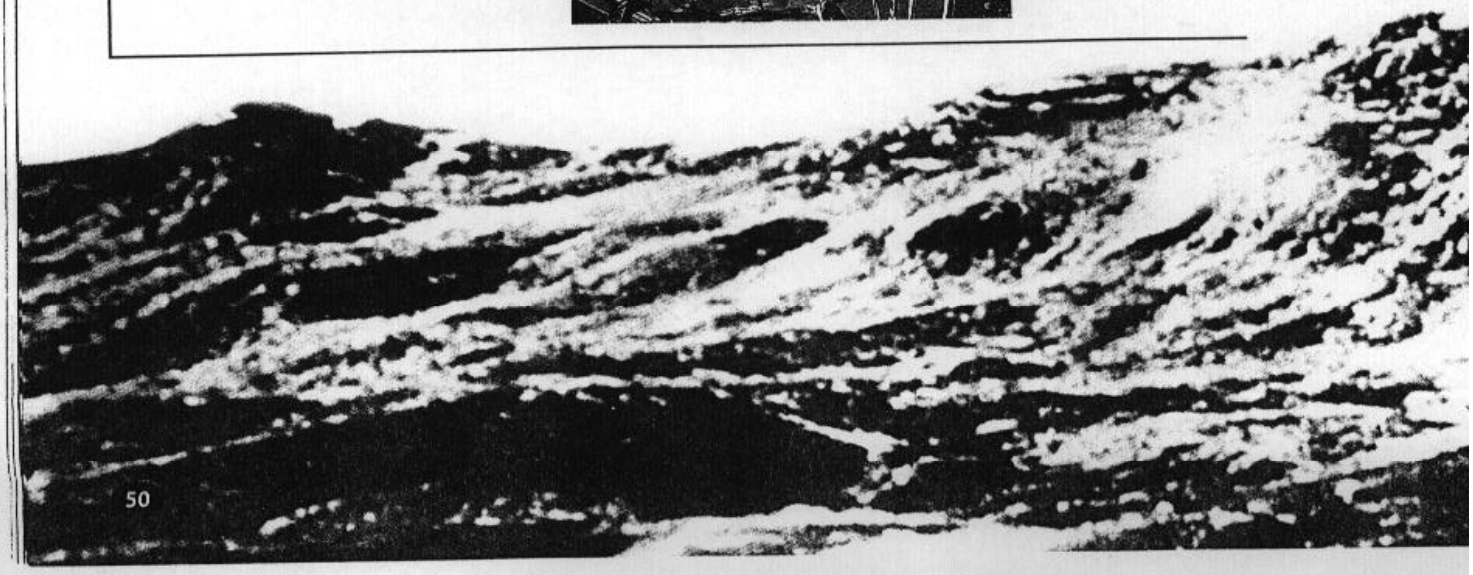
This is an Australian drogue made from either hard plastic or fabric. The device provides most resistance at high speed and less at slow speed. The disadvantage of the hard plastic version is that it cannot be folded flat when not in use



Tandem sleeve drogues ▶

I have found that securing the apex of one drogue to a second drogue with either a 20m mooring line or a 10m length of chain has some benefits – the main one being that there is always at least one drogue providing the necessary drag and the rode is less likely to go slack





▲ Delta drogue
This is a remarkably shaped device which allows water to enter a central hole and forces it out through three side orifices. Although very effective, it is not possible to use two as a tandem drogue

Self-help
If you are not carrying a drogue or have left it in your garage, the following method can be used: a foresail onto which you can secure mooring lines at the peak, tack and clew and join them together at a single point onto which you can attach the rode. Beware of using too big a sail which could act as a sea anchor and stop the boat

CONTACTS
UK manufacturers of drogues:
Jimmy Green Marine (01297) 20744
Seaflex (01983) 290525
UK company that markets sea anchors and drogues:
Cruising Home (01452) 503705

the drogue are both on the front of the wave, it will have little drag in the mobile, aerated water.

Stowing the rode
Carrying 100m line on board and keeping it snag-free when wanted in a rush can be a problem. I use two methods: when I coil the line I seize it in coils of about every 20m with breakable sailmaker's twine and then hang the lot in a locker.

Otherwise I can recommend the rode bag into which one can methodically stuff the rode. Alternatively, one can keep the rode on a drum.

Bridle or not
The rode is led on board and secured to a winch and/or cleat as described below. Alternatively, attach another line using a rolling hitch on the rode just abaft the stern. This way the strain is taken on two fittings on board.

My only reservations are that it then makes major adjustment of the length of the rode more difficult and additional deck work to achieve the arrangement. However, if you need to use the drogue as a steering device, see below.

Size of equipment
All the shackles, chain, etc, should be the size you would normally use when anchoring.

Depth
It is important to keep the drogue out of the turbulent water so it needs to be kept 10-15m under water. There are several ways of achieving this. One of the easiest is using a length of chain in the end of the rode ahead of the drogue.

All yachts should carry a short (say 10m) length of chain as a spare or for anchoring by the stern or for the second anchor. Kept in a canvas bucket or in a locker near the stern, it is always convenient for this use.

One could use the kedge anchor shackled onto the end of the rode ahead of the sea anchor. I am currently researching a depth-keeping device, similar to those used by fishermen, to keep the drogue deep.

Slack
Do not let the rode go slack as speed can build up and the yacht can be pooped or even knocked down. Also sudden taking up of the slack can put great strain on the rode or boat fittings, particularly if the drogue collapses when the rode has gone slack.

To prevent this happening one needs to position the drogue where it is working effectively, using a well designed system under tension.

Speed
Ideally the speed needs to be controlled so that the yacht is not going too fast down the waves and when in the trough she is not stopped dead in the water. Therefore the device must not be too small nor too large. One manufacturer has a system for providing more drag at high speed, but less at slow speed.

Tripping lines
I have found that there is no need for one and the drogue can be pulled in by hand or the winch. The RNLI uses a tripping line when recovering a drogue at high speed.

On-board fittings
The rode needs to pass through a fairlead and be protected by some anti-chafe such as a plastic pipe, and then lead forward to the main winch. The inboard end (the bitter end) of the rode should be well secured to a cleat. You do not want to lose your gear.

Boat structure
With a drogue out astern and the yacht not travelling as fast as the breaking wave, it is very likely that the odd wave will break on board. It is therefore prudent to keep the

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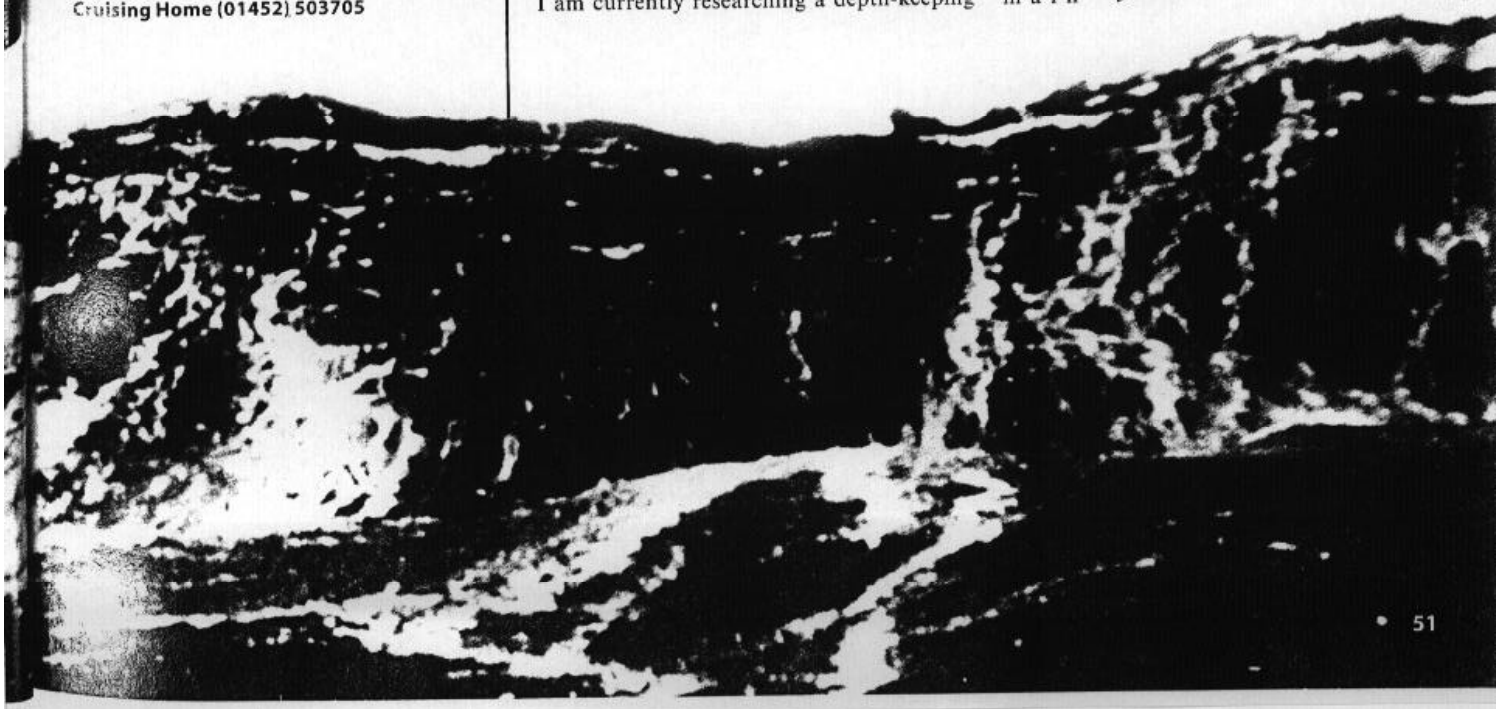
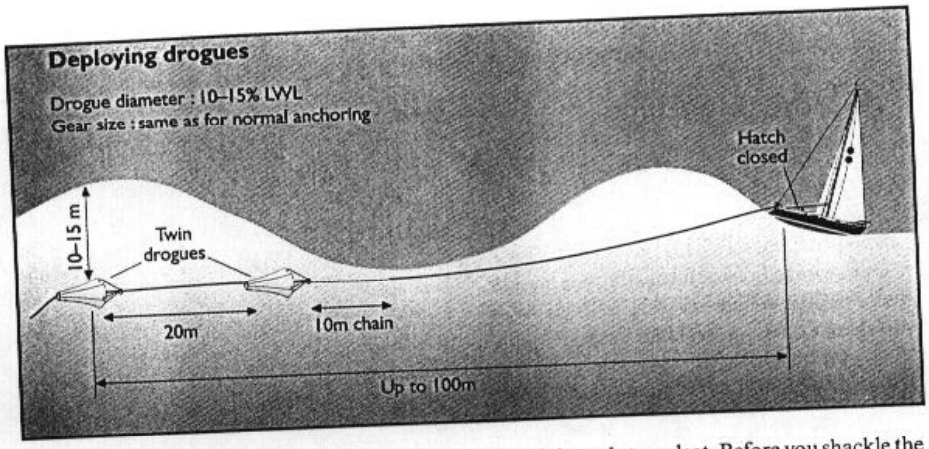




hatch shut and ensure that the boat's structure is robust enough to withstand a wall of water breaking on board. Likewise, make sure that the cockpit drains are clear.

Emergency knife

Have a sharp knife at the ready to cut the gear free in case you are unable to recover it and need to free yourself from the system quickly.

Sea anchor

Do not attempt to use a parachute sea anchor over the stern in rough weather. It will stop the boat nearly dead in the water where it will be hammered by waves from astern which could cause structural damage. Recovery is also extremely difficult.

IRPCS

When streaming a drogue (or lying to a sea anchor) one is in a 'vessel not under command' or a 'vessel restricted in her ability to manoeuvre'. So in theory one should hoist the appropriate light or daymark.

Setting the drogue to work

Having decided that it is time to rig a drogue, it is then a matter of careful preparation. Most can be done within the cockpit. First, locate all the equipment and position it in a safe, sheltered position and attach it all together.

Start with the rode and flake it out so that you know it is not going to tangle; secure the bitter end of the rode to a cleat. Before you shackle the chain to the rode, pass the end of the rode (with the thimble) under the guardrails. Bring it back on board and attach it to the chain, add the swivel and then the drogue. Prevent the drogue from flying about. Take a turn round the winch you are going to use.

With the helmsman steering carefully downwind, dump the drogue over the quarter followed quickly by the chain. Let the drogue(s) fill in sight and then slowly ease out the rode with a turn or two round the winch and the rode passing through a fairlead.

When you are satisfied with its distance astern, take a turn round a cleat and feel the difference. Place some anti-chafe in the fairlead.

Watch how the boat lies and how she copes with the seas. You may find it necessary to adjust the length of the rode.

You will most likely have to keep a hand on the wheel or tiller to correct a bad slew, or I have used my windvane self-steering to direct the boat; she may, of course, look after herself.

I do not recommend lashing the helm amidships as you may want to steer in haste and a lashing could delay you. Providing the drogue(s) are working well, you should now have an easier ride and be less likely to broach.

Recovering the drogue

The next difficult decision is when to recover the drogue and continue sailing. It is a relatively easy task to gather in the rode and drogue. I have usually managed it by hand, but there is no reason why one should not use the winch.

Having got it all on board, pack it away for the next occasion. When next in port, with access to fresh water, it is worth washing and drying the equipment to lengthen its life.

Other uses

I tried using my drogues as steering devices and was amazed by the results with my wheel secured amidships. First, I rigged a bridle by using a 20m mooring line and securing onto the rode with a rolling hitch.

Both ends of the bridle were led to the sheet winches. Then, by putting the strain on one side of the bridle, it brought the bows round.

With this method I was able to steer in an impressive arc from dead downwind until the wind was about 10° abaft the beam on either side. This could be an excellent emergency steering system.

Another use is to deploy a drogue instead of heaving to for a meal or a sleep, providing it is seamanlike to do so.

Seamanship

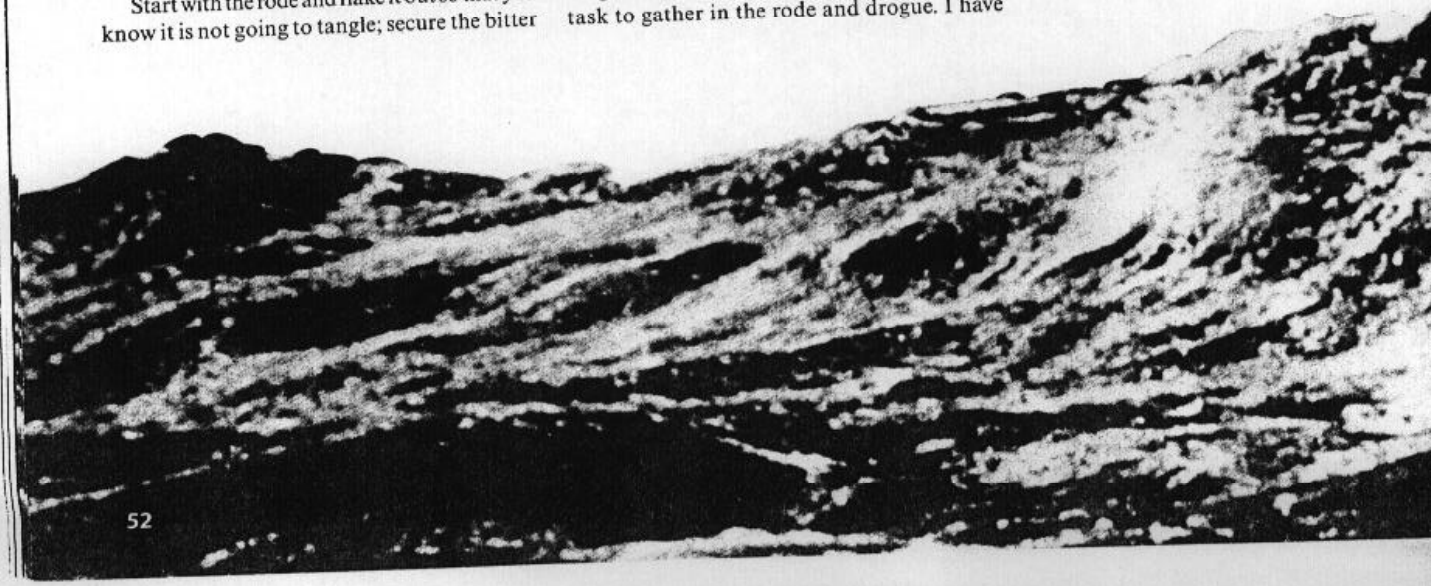
Practice makes perfect. It is highly advisable to rehearse the use of the drogue – not only to ensure that you know how to lay it out, but also to see how your yacht reacts. Pick a fair day in Force 4-5 and plenty of sea room and slowly prepare, stream and recover the drogue. Note any changes you will make if you have to use it for real.

Conclusion

A drogue of nylon-coated vinyl packs into a very small package. There can be little reason for all offshore racing and cruising craft, whether sail or motor, not to have one on board ready to use when the waves get too bad to lie a-hull or heave to.

A packed drogue takes little room and is inexpensive. It is easy to rig and stream, and provides the necessary drag to increase the chances of survival in mountainous seas.

My thanks to Stuart Welford of the RNLI and P Bruce for their guidance and advice



Storm in the Pacific by Andy Bray

In November 1995 I skippered a Bénéteau 391 on a delivery from Neiafu in Tonga to the Bay of Islands, New Zealand, a passage of about 1,400nm with my two Fijian crew.

The early conditions were atypical, with Force 2 maximum where there should have been south-east trades of Force 4-5. Slowly, to preserve precious fuel, we made our way on 230°T to put in as much westing as possible, prior to encountering any south-westerlies near New Zealand.

After traversing the variables at 35°N, our course took us further south toward Cape Reinga. Then things started to change rapidly. Having done other NZ deliveries, I was all too aware of the risks of unpredictable weather within 350nm, dictated largely by rapid movement of depressions into our sailing area from the Tasman Sea.

In touch with the Kerikeri radio station (sadly no longer operating) in New Zealand, we were warned of rapidly approaching frontal systems with winds that night (our seventh) freshening to 20 knots from the east.

For the previous two days conditions had become greyer and more overcast as expected and this forecast was no surprise. In any event, it was ideal for our intended 200°T course. However, by 1200 the wind was up to 30 knots with signs of increasing.

Rain squalls, poor visibility and a quickly rising sea – by now 3-4m. As darkness fell the sea had built into a very steep-sided succession of foaming waves on top of an underlying 2m swell. Constant rain, no visibility beyond the lit nav lights.

At 1900 the wind had reached a steady 40 knots and waves were beginning to break behind us. Under one-third sail the boat speed was up to eight knots. Then the inner forestay broke.

Although we had checked the swages daily, I had forgotten this one. In no time it had unspiralled. After a long fight it was brought under control, using a helpful bulldog clip to clamp it to a mast cleat and the spini uphaul to replace the forestay.

By 0000 the wind had reached a steady 55 knots. In itself not a serious problem, but the sea was fast-running and the incredibly steep sided waves pooped us regularly. We reefed the main, keeping a rag of genoa, but finally got rid of that, too. Even the boom needed preventing to leeward to stop the risk of broaching.

We continued like this for two days: running under bare poles at six knots, max 50m visibility, day and night, vicious rain squalls and being soaked by pooping. As we raised 9-Pin at the entrance to the Bay of Islands, the wind slowly began to abate.

Our delight in the landfall was saddened by hearing that another yacht, *Mellinda Lee*, (see below) had been lost during the same storm.

By 0000 the wind had reached a steady 55 knots. The sea was fast-running and the steep-sided waves pooped us regularly

Lessons learnt

1 My main concern was that we did not have a method of slowing the yacht down. If not a drogue, I would feel it prudent to have substantial warps to hand for trailing.

2 With a roller furling genoa there is a great deal of windage once fully reefed. We were lucky as this helped the yacht head downwind. If I'd needed to heave to, or make sail, I might have needed the storm jib, but it would have been impossible in the conditions to change sails. In future, if faced with similar winds, I would have reefed earlier (or preferably had a cutter rig with a furled staysail!)

3 Roll swages are often missed on inspection and prone to failure with catastrophic consequences when really put to the test. I had noticed slight rusting at the wire/swage join and should have doubled up the inner forestay then and there with the uphaul. We were lucky it wasn't the forestay itself that went, or a cap shroud!

4 Three days of soaking and poor sleep took its toll. Morale was definitely boosted by a regular supply of good hot food.

5 The sad story of the *Mellinda Lee* ended when a woman was found badly injured inside a dinghy in a remote corner of the Bay of Islands. She was the only survivor.

In the storm she, her husband and two boys had hove-to with no watch and had been run down by a freighter. Without wishing to pass judgement on their tragic predicament, the need for a watch when hove-to has been proven.

A sister yacht of ours had hove-to, but had had a much worse and longer time at sea. Perhaps the decision to heave to can be made too early, when running with a fair wind could be safer and more comfortable. It's up to each skipper in the end.

The author is no relation to YW Editor or to Andrew 'Aussie' Bray