This Island Packet 29 suffered a wobbly stern tube

Stern tube concern

Mike Pickles on a routine boatyard job that became a serious reconstruction

The owner of this Island Packet 29 had noticed a rumble from the stern of his boat when under power – a common complaint when a boat's cutless bearing is on its way out.

So we lifted the boat out of the water and sure enough the shaft was wobbling about. A new cutless bearing was ordered and an apprentice was instructed to take the prop off, undo the lock screws and pull the bearing out of the tube.

After just a few minutes I was called back to the boat to help out when one of the locking grub screws wouldn't come out and the apprentice asked: "Should the stern tube be wobbling about?"

To my surprise, the tube was indeed wobbling about because it was held in place with just two bolts that were both threaded all the way and only secured with nyloc nuts and small washers. The GRP through which it was bolted was 12mm thick, however, where the nuts had been tightened they'd compressed the GRP to such an extent that the lower hole had compressed to nothing.

GRP around the stern tube's lower bolt hole was compressed to such an extent that it failed

Furthermore there was no other internal support for the tube, even at the stern gland. Keep in mind that the 1in diameter shaft runs around 5ft between the skeg and the engine coupling. Having no internal support for the prop shaft tube or shaft is asking for trouble.

Stern tube withdrawn from the keel. A failed bolt hole in the keel GRP had allowed it to wobble

Fixing the problem

We agreed the following plan with the worried/relieved owner: clean out the keel, replace the shaft tube with a GRP one, build in a couple of supports between the engine and the aft end of the keel and reconstruct the exterior of the keel.

ABOUT THE AUTHOR

Mike Pickles is a foreman at Harbour Marine Services in Southwold. With a long career of yacht deliveries and racing he's now the proud owner of a MGRS34 three-quarter tonner.

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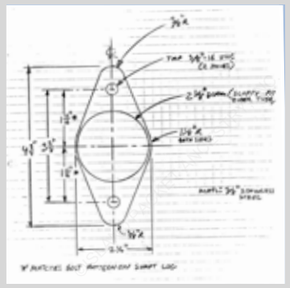
Worth checking



PBO approached Bill Bolin at Island Packet for comment on this particular boat. He told us: 'I have not seen this failure before and, in reviewing some warranty records, I don't see this anywhere.

'I do have a drawing of a backing plate for the shaft log (pictured above) and, although it is labeled for an IP380 model, I think this was pretty universal on all models.

'It is possible on the smaller models (under 30ft) that just washers and lock nuts were used, but I would hope this particular IP29 is a rarity!'

Mike Pickles adds: "I have personally seen four examples of Island Packets with stern tube problems. It's now one of the first things I check on these boats."

Preparation

1 There were three hatches designed into the aft double berth: the forward, big inspection hatch is for the rear of the engine and gearbox coupling; the middle hatch allows access to the stern gland and greaser, while the aft hatch allows access to the aft of the keel and the exit of the propshaft tube.

2 You can't remove the propshaft from the boat aft as the rudder is in the way. There is also no room to take it forward as you can't get it past the engine. So we manoeuvred one end down into the bilge and the other end poking out of the aft hatch into the cabin. The red rope is there to hold the propshaft in place while we effect the repairs. The keel is about a metre deep and no more than 3in wide at the bottom. You can see there is no support or even any localised strengthening around the propshaft exit hole. One of the first jobs was to clean out all the crud and mud that had accumulated within the bottom of the keel.

Creating new structures

3 I decided to make a dam (a vertical GRP panel) at the back of the keel up to 10mm below the exit hole and around 200mm forward. I then put a second panel in place as a horizontal shelf to take the load of the front of the new shaft tube and stern gland. If dangling upside down in a small hole, with just enough room for one arm and my head was not hard enough, we had to relocate the propshaft into its usual orientation.

4 But what material to use as the core for the dam and shelf? Obviously whatever we put in the bilge would need to be impervious to rot, so plywood was ruled out. Even ply sheathed in GRP will rot given the slightest hole in the sheathing. So I used my favourite core material: Nidaplast, a plastic honeycomb with a bonded scrim on each side. It comes in various thicknesses from 5mm to 90mm. I mainly use 10mm or 15mm as this tends to be the same thickness used for the balsa core in decks. A couple of layers of 250g woven cloth glassed on each side results in a rot-proof panel as stiff as plywood at a quarter of the weight.

5 The void aft of the vertical panel was filled with Pro-Set expanding closed cell foam. This foam is much, much stronger and stiffer than the usual builder's merchant expanding foam and it also has very good bonding performance. Closed cell is again important as it won't absorb any water.

Once the foam had set hard it was trimmed flat and I applied five layers of 450g woven cloth on top and round and down the front of the panel.

Note I'd taped the propshaft to make it easier to remove any epoxy afterwards.

Supporting the new tube

6 Next we made some tube supports out of softwood with the plan that these would sit on the new shelf and support the new GRP propshaft tube.

7 Note the wooden wedges inserted into the tube to keep the propshaft central to the tube while the tube was bonded securely into place.

8 At this point it's essential to ensure we have perfect alignment. So the propshaft was re-attached to the gearbox coupling and we chocked the propshaft externally so that it exited the keel exactly central to the exit hole.
Once this had been achieved and chocked into position I taped up around the sterntube on the outside to stop any glass and resin from the layup on inside leaking out.

9 Back in my hole again I injected some thickened epoxy under the tube with a large syringe and then glassed the tube into place, using a mixture of 250g bi-axial and some 450g heavy weave cloth.

10 After checking the shaft alignment was still OK, I glassed in the front tube supports and sterntube into place. Again mainly using 250g bi-axial but around the wooden tube supports I applied a couple of layers of 300g powder bound chopped strand mat.

TOP TIP:

Note that you must only use powder bound chopped strand mat (CSM) with epoxy resin. Normal CSM is emulsion bound and the styrene in polyester resin dissolves the emulsion. Epoxy will not dissolve the emulsion in standard CSM, so if you use it you can end up with a very sticky mess.

Finishing off

11 Once the glass had cured we could fit the new stern gland and greaser and thankfully I could exit the hole.

12 Outside, I'd already ground back the keel and so after a dust off applied five layers of 250g bi-axial cloth. Once this had cured it was keyed and a couple of coats of epoxy two pack primer was applied followed by a tie coat and then antifouling paint.

ABOUT THE BOAT

A total of 64 Island Packet 29s were built from 1991-1997, of which five or six were shipped to the UK and another three or four to the Netherlands.

Hull type	long keel
Rig	cutter
LOA	9.75m (32ft)
Hull length	8.84m (29ft)
LWL	7.80m (25ft 6in)
Beam	3.30m (10ft 10in)
Draught	1.30m (4ft 3in)
Displacement	4,944kg (10,900lb)

The surveyor's view

Ben Sutcliffe-Davies describes the most common stern tube issues and explains how to repair them

Mike's report on the stern tube issue aboard this Island Packet 29 is very interesting and the method of repair sounds a sensible approach, although I haven't physically seen it myself.

Readers may remember an article I wrote about the WEST System expanding epoxy foam (PBO January 2020) – that product would have been an ideal application for this job too.

Mike raises the important point about prop shaft support, which is critical to prevent any 'whipping' of the shaft within a stern-tube arrangement when under load. The Island Packet has a 1in diameter shaft. My father and uncle used to say a ratio of 40:1 (length:diameter) was a good starting benchmark, which would make the Island Packet's 5ft unsupported stretch less than ideal.

But, in the original builder's defence, several other factors need to be considered: the physical loading (weight of craft); size of engine (horsepower and rpm output) and gearbox ratio.

It's also important to know what the shaft is actually made from and to take into account the size of the propeller and pitch. Folding propellers can put extra strain on sterngear fittings compared to fixed props.

A couple of years ago I dealt with a problem where an owner had changed his propeller and uprated it by another inch diameter and a further 2in on the pitch. The yacht developed a horrendous knocking noise under load when the engine went over 2,200rpm.

I was able to prove quite quickly that what he had done had gone beyond the physically capabilities of the shaft diameter and length. The good news is there are plenty of calculators online and many very reputable companies who will work this out for you.

If you own one of the older versions of these craft, it would be worth investigating the stern tube closely.

The description of using Nyloc nuts underwater is also really not recommended as it's a great location for crevice corrosion to develop!

From a survey point of view it was good to see the majority of the stern tube was accessible. This is quite rare. With many GRP production craft physical access to the stern tube can be quite limited down in the bilge, especially if encapsulated in a polyurethane foam or actually laminated over completely.

Here's a very worn cutless bearing: as you can see the shaft was clearly not aligned as wear to top is greater than anywhere else

Shaft condition Owners can check their own prop shafts for wear at the point the shaft exits through the stern tube arrangement, or for any wear to a mid-way support and the condition of a shaft or P-bracket bearing.

Shaft bearing Look for excessive wear – anything more than 1.5mm-2mm of play is enough to start vibration and potentially cause damage to the shaft as well.

Rope cutters Some rope cutters are fitted so close to the end of the bearing face that it prevents any free flow of water through the bearing.

Shaft alignment If the engine can be run afloat looking for any vibration is always a good start when running ahead and astern. Careful inspection sometimes reveals more wear to one side of the bearing than the other.

Stuffing gland Grease it and pull it down when needed. Any kind of 'lip seal' arrangement should be changed around 5-7 years depending on manufacture. They should also be 'burped' on launch unless you have a vent provided. If you have a vent pipe keep a watch on its general condition too: if it fails raw water will enter the boat unchecked.

This very worn GRP stern tube is a combination of a serious misalignment and a poorly fitted shaft bearing that eventually allowed the bearing to spin!

Engine-shaft alignment Aligning when the craft is ashore is never ideal – yachts change shape in the water.

Engine mounts The most common reason for shaft wear is failing engine mounts. Many owners forget that all the load required to push or pull a craft through the water is held by four engine mounts. Rubber mounts can degrade over time so should be replaced in most installations at least every ten years.

ABOUT THE AUTHOR

Ben Sutcliffe-Davies is an Accredited Member of the Yacht Designers and Surveyors Association (YDSA) and has been surveying yachts and powerboats for over 20 years.
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