fieldhouse yacht surveys

JUNO

Pre-Purchase Survey

Completed for
John Smith,
5, South Road,
London,
E22 1QQ
On 29/10/2011

Inside front cover

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LAW AND JURISDICTION

This document is to be construed under English Law and English Law shall be used in interpreting the document and for resolving all claims or disputes arising out of or connected with the document.

LIMITATIONS

Where access was restricted by fixed panels, linings etc, it was not possible to examine the vessel behind these and it cannot be stated that these areas are free from defects.

1 INTRODUCTION

1.1 The primary aim of this document is to report on the factual condition of JUNO at the time of the survey. Where the equipment has been inspected or tested and found to be in an unsatisfactory condition, recommendations for rectification, repair or replacement will be detailed in this report. These recommendations will be assigned one of the five categories detailed in Appendix 1 on page 45. For clarity, all recommendations will be printed in upper case and red font thus: RECOMMENDED.

1.2 Where reference is made to the condition, this must be considered in relation to the age of the vessel.

1.3 This survey was carried out in accordance with instructions received from John Smith of 5, South Road, London.

1.4 The vessel was inspected whilst ashore on the hard-standing at Western Marina on 29th October 2011.

1.5 The survey was conducted by Nic Fieldhouse, Principal Surveyor of Fieldhouse Yacht Surveys.

1.6 The survey was carried out in accordance with agreed terms and conditions, and with relevant codes of practice published by the International Institute of Marine Surveying.

1.7 Those present during the survey were:

Eur Ing Nic Fieldhouse BEng (Hons) CEng MIMechE GradIIMS.	Marine Surveyor, Fieldhouse Yacht Surveys.
John Smith	Client

2 SUMMARY

2.1 JUNO was seen to be a 1988 Beneteau 435E sailing sloop.

2.2 The rig, engine, domestic services and interior finish were generally all in serviceable condition.

2.3 The hull showed evidence of some structural damage. The hull internal moulding was found to have several areas where the GRP tabbing to the hull had become de-bonded. There was a crack of approximately 50mm length in one of the transverse floors that supports the mast compression post. There was a horizontal fracture approximately 300mm in length along the forepeak internal moulding. These are discussed in paragraphs 2.6.2 to 2.6.5 below and also more fully in the main body of the report.

2.4 The teak laid decks of JUNO were worn and in need of some attention to prevent their long-term deterioration.

2.4.1.1 There were two areas of the cockpit moulding where significant gel-coat cracking had occurred. These were located on the port and starboard sides of the cockpit coaming, where the horizontal section of the coaming meets the vertical face of the coachroof aft bulkhead. This is discussed further in section 5.3.3.1.

2.5 There were 12 type A1 recommendations that MUST be repaired BEFORE the vessel is relaunched. Please refer to Appendix 1 for a full description of the categories of recommendations used in this report.

2.5.1 One of the two hose clips that secure the exhaust hose to the transom was found to be partially corroded. Testing with light hammer blows resulted in the corroded clip breaking. It is RECOMMENDED (type A1) that a new clip made from marine grade stainless steel is installed. Similar clips on the exhaust hose should also be removed, inspected and replaced if found to be corroded. See paragraph 5.1.9.4 for full details.

2.5.2 The quarter turn valve for the sink outlet in the aft heads compartment (item 8 in Table 3) was found to be badly corroded. It is RECOMMENDED (type A1) that the gate valve is replaced with a marine grade stainless steel or bronze fitting. See paragraph 5.1.9.5 for full details.

2.5.3 The short length of black hose that joins the quarter turn valve to a 'Y' connection of the sink outlet in the aft heads compartment (item 8 in Table 3) was found to be made from non-reinforced hose. It is RECOMMENDED (type A1) that the short length of hose is replaced with reinforced tubing. See paragraph 5.1.9.6 for full details.

2.5.4 The forward heads toilet outlet pipe (item 12 in Table 3) was found to be made from non-reinforced hose. It is RECOMMENDED (type A1) that the entire length of hose is replaced with reinforced tubing. See paragraph 5.1.9.7 for full details.

2.5.5 The quarter turn valve for the sink outlet in the forward heads compartment (item 14 in Table 3) was found to be badly corroded. It is RECOMMENDED (type A1) that the gate valve is replaced with a marine grade stainless steel or bronze fitting. See paragraph 5.1.9.8 for full details.

2.5.6 The quarter turn valve and 90º pipe bend that supply sea water to the galley (item 19 in Table 3) were found to be badly corroded. It is RECOMMENDED (type A1) that the gate valve and 90º pipe bend are replaced with a marine grade stainless steel or bronze fittings. See paragraph 5.1.9.9 for full details.

2.5.7 The quarter turn valve and 90º pipe bend that supply sea water to the engine cooling system (item 20 in Table 3) were found to be badly corroded. It is RECOMMENDED (type A1) that the gate valve and 90º pipe bend are replaced with marine grade stainless steel or bronze fittings. The pipe bend should also be orientated so that the

severe kink in the hose is removed. See paragraph 5.1.9.11for further comments on the hose. See paragraph 5.1.9.10 for full details.

2.5.8 The hose that supplies sea water to the engine cooling system (item 20 in Table 3) was found to be severely kinked where it was attached to the valve. Closer inspection revealed that the hose had been damaged by the heavy strain imposed by the kink. Figure 6 shows where the hose has been weakened. It is RECOMMENDED (type A1) that the hose is replaced and routed so that there are no such kinks in the new installation. See paragraph 5.1.9.11 for full details.

2.5.9 Where the backstay was connected to the backstay tension adjuster, the split pin was found to be missing, as shown in Figure 15. It is RECOMMENDED (type A1 recommendation) that a new split pin is inserted. See paragraph 5.4.7.2 for full details.

2.5.10 Where accessible, the armoured flexible exhaust hose was inspected. Damage to the hose was found where the rudder end-stop control wire was chafing against the hose. It is RECOMMENDED (type A1 recommendation) that the exhaust hose is shortened by a small amount so that chafing does not occur. Further protection should be given by wrapping a piece of neoprene rubber around the affected area and securing with plastic cable ties. See paragraph 5.5.2.6 for full details.

2.5.11 The engine raw water filter was mounted against the sound insulation on the port side of the engine compartment. The fastening screws were of inadequate length to efficiently attach to the side panel and the filter became detached during the inspection. It is RECOMMENDED (type A1 recommendation) that the water filter is properly secured in a location that is at least 300mm above the vessel's loaded waterline. See paragraph 5.5.2.7 for full details.

2.5.12 Three spare gas cylinders were stowed loose at the bottom of the cockpit locker. It is RECOMMENDED (type A1 recommendation) that these cylinders are not stowed on the vessel under any circumstances as there is no provision for their safe storage. See paragraph 5.6.6.3 for full details.

2.6 There were 11 type A2 recommendations that must be addressed after the vessel is relaunched but MUST be repaired before the vessel is taken to sea.

2.6.1 It is RECOMMENDED (type A2 recommendation) that all seacocks and through-hull fittings are checked for leakage once the vessel is afloat. See paragraph 5.1.9.15 for full details.

2.6.2 It is RECOMMENDED (type A2) that for ALL de-bonded areas of the Internal Moulding, the de-bonded tabbing is cut back entirely until the bonded interface is found. Surfaces of the Internal Moulding that are to receive over-laminating shall be cut back to remove the gel-coat surface. This is to ensure that the new laminate is bonded to existing laminate rather than gel-coat, which is a very poor substrate for bonding. All prepared areas shall then be thoroughly cleaned and dried. Multiple layers of fibreglass cloth and epoxy resin should then be applied, with the edges of the cloth layered so as to give a gradual tapering to the existing structure. The thickness of the layup should be in excess of the laminate removed during the repair. This will ensure that strength of the repair is similar or greater than the original layup. See paragraph 5.2.2.6 for full details.

2.6.3 There is a large (greater than 50mm) crack in the GRP transverse floor (see Figure 10) that is directly in front of the mast compression post. The forward end of the stainless steel fabrication that provides a base for the mast compression post is connected to this floor. It is RECOMMENDED (type A2) that the area around the crack shown in Figure 10 should be stiffened. The tip of the crack should be located and a 6mm diameter hole drilled through the stiffener at this point. This will help to reduce the rate of propagation of the crack. Following this, all surfaces of the damaged area that are to receive over-laminating (at least 200mm either side of the 'arch' of the limber hole) shall be cut back to remove the gel-coat surface. This is to ensure that the new laminate is bonded to existing laminate rather than gel-coat, which is a very poor

substrate for bonding. All prepared areas shall then be thoroughly cleaned and dried. Multiple layers of fibreglass cloth and epoxy resin should then be applied, with the edges of the cloth layered so as to give a gradual tapering to the existing structure. The thickness of the layup should be significantly in excess of the laminate thickness of the transverse floor. This will ensure that strength of the repair is similar or greater than the original layup. Note that this over-laminating should cover both port and starboard sides of the 'arch'. The accessible surfaces inside the 'arch' should also be strengthened in a similar manner. See paragraph 5.2.2.8 for full details.

2.6.4 A stainless steel cylindrical column supports the coachroof and transfers the mast compression load to the hull and keel of JUNO. The base of the compression post was supported by a welded stainless steel box-section fabrication that spans two of the transverse floors in the saloon. Inspection revealed that at the forward end of the fabrication, the self-tapping screws that are fastened into the transverse floor were partially pulled out of the fibreglass. Figure 11 shows these fasteners and the resulting gap between the stainless steel and the floor. This image also shows that the screws are not correctly located, having been forced down by a vertical load from the compression post. This situation has been exacerbated by the gap between the stainless steel and the vertical face of the transverse floor.

It is RECOMMENDED (type A2) that this misalignment is rectified and the following repair carried out at both ends of the stainless steel fabrication. In order to perform this task, it will be necessary to remove the tension in the mast rigging (or lift the entire mast off the coachroof) so that the fabrication can be raised into its correct position. Once the fabrication has been lifted up and realigned, a hard setting epoxy / filler mix should then be used to fill the gap between the steel end plates and the transverse floors. Once this has set, the steel plates should be re-attached to the floors. See paragraph 5.2.3.2 for full details.

2.6.5 The Internal Moulding under the forepeak sole was also inspected and found to have a fracture approximately 300mm in length along the vertical face of the moulding that adjoins the forward heads door bulkhead, as shown in Figure 12. It is RECOMMENDED (type A2) that this damage is cut out and repaired. The damaged laminate should be cut back to sound material. Surfaces of the Internal Moulding that are to receive over-laminating shall be cut back to remove the gel-coat surface. Multiple layers of fibreglass cloth and epoxy resin should then be applied, with the edges of the cloth layered so as to give a gradual tapering to the existing structure. The thickness of the layup should be in excess of the laminate removed during the repair. This will ensure that strength of the repair is similar or greater than the original layup. See paragraph 5.2.3.4 for full details.

2.6.6 There were two areas of the cockpit moulding where significant gel-coat cracking had occurred. These were located on the port and starboard sides of the cockpit coaming, where the horizontal section of the coaming meets the vertical face of the coachroof aft bulkhead. Figure 14 shows that the surface of the gel-coat has been distorted and roughened by this cracking. The gel-coat has been permanently distorted, which suggests that the damage extends into the laminate, although this cannot be guaranteed without destructive testing of the gel-coat and laminate. It is RECOMMENDED (type A2) that the damaged gel-coat is cut back to sound laminate and repaired. Additional laminate should be applied to the internal surface of the cockpit and bulkhead in these areas in order to stiffen the coaming to bulkhead join and to decrease the likelihood of this problem recurring. See paragraph 5.3.3.1 for full details.

2.6.7 JUNO had an engine starting battery and three batteries for services. The batteries were not adequately tied down or secured in order to prevent movement when the vessel is at high angles of heel. It is RECOMMENDED (type A2 recommendation) that all of the batteries are restrained by straps of adequate strength and these should be well attached to the hull structure. See paragraph 5.6.9.1 for full details.

2.6.8 It is RECOMMENDED (type A2 recommendation) that two buckets are stowed on board. These should be between 9 and 14 litres in capacity. See paragraph 6.2.1 for full details.

2.6.9 There was no radar reflector found on the vessel. It is RECOMMENDED (type A2 recommendation) that one is installed on the vessel. See paragraph 6.3.1 for full details.

2.6.10 There was no fog horn found on the vessel. It is RECOMMENDED (type A2 recommendation) that one is installed on the vessel. See paragraph 6.3.2 for full details.

2.6.11 One fire extinguisher (date expired) was found on board, located on the cockpit access steps. It is RECOMMENDED (type A2 recommendation) that at least two 1kg dry powder fire extinguishers are installed. See paragraph 6.4.1 for full details.

2.6.12 One RORC distress flare pack (Pains Wessex) was found on board and found to have expired. It is RECOMMENDED (type A2 recommendation) that a new pack is procured and stowed ready for use. See paragraph 6.8.1 for full details.

2.7 In addition to the 12 type A1 and 12 type A2 recommendations, there were 9 type C and 3 type D recommendations.

2.8 It is possible that the cockpit cracking and hull damage was caused by a combination of hard sailing in heavy weather and an over-tensioned rig. The damage found in the hull & cockpit points to this having occurred. The improper use of the adjustable backstay may have contributed to this. It is important that the vessel's skipper and crew are made familiar with the use of this piece of equipment.

2.9 Once the type A1 and A2 recommendations have been satisfactorily performed, JUNO should have her mast head rig set up and tuned by a professional rigger. A piece of pvc tape should be placed on the ram of the adjustable backstay to mark the maximum permissible tension that the backstay may be adjusted to.

3 SCOPE

3.1 The vessel was inspected while she lay ashore. There was good, all-round access to the exterior of the hull. The only minor obstructions were the shoring supports. Access to the bottom of the keel was limited to the part not resting on chocks.

3.2 Internal inspection was limited to the areas that are normally accessible either directly or through lockers, inspection hatches, removable panels, etc. No part of the vessel was dismantled; no bolts were removed for inspection and no linings removed. Consequently, any part of the vessel, her equipment or fittings, which were unexposed or inaccessible, cannot be confirmed to be free from defect.

3.3 We have not inspected woodwork or other parts of the structure which are covered, unexposed or inaccessible and we are, therefore, unable to report that any such part of the structure is free from defect.

3.4 We have not inspected fibreglass laminate, woodwork or other parts of the structure which are covered, unexposed or inaccessible and we are, therefore, unable to report that any such part of the structure is free from defects, rot or deterioration.

3.5 There are limitations to the examination of a vessel ashore. The mast could not be ascended with safety, so the rig was examined as far as possible from the deck. The engine could not be started. Seacocks could not be tested for leaks, and services such as the sea toilet could not be fully tested. Nor was it possible to test the navigational and sailing instruments. It is therefore advisable to take the vessel out on sea trials if a complete evaluation is required.

3.6 The vessel and her equipment were not assessed for design or suitability for any particular purpose, or compliance with any rules, regulation, standard or code.

3.7 Note that the terms “serviceable” or “serviceable condition”, as used in the report, means that the item remained usable, despite possible wear or deterioration. The item may nevertheless require maintenance or replacement in due course.

4 THE VESSEL

4.1 DETAILS

Name	JUNO
Official number (serial number)	xxxx
Approbation number	xxxx
Built by	Beneteau France
Model	435 E
Type	Sloop rigged sailing yacht
Build date	1988
Engine manufacturer & model	Perkins Prima 50
Engine type	4 stroke, 4 cylinder indirect injection diesel

Table 1: Vessel Details

4.2 JUNO was seen to be a Beneteau 435E sailing vessel, a sloop rigged sailing yacht with an iron fin keel. She was built by Beneteau France in 1988.

4.2.1 The hull of JUNO was moulded in hand laid GRP. She had a sloping stem, round bilge, retrousse stern and bolted cast iron fin keel. A dark blue spray painted coating formed the outer surface above the waterline, with two gold coloured bands running along the hull, just above the waterline. There was evidence that the hull below the waterline had been treated with a secondary epoxy coating. White antifouling was applied below the waterline. The hull was seen to be stiffened internally by a separately moulded glass fibre structure consisting of longitudinal stringers and transverse floors. This moulding was bonded to the internal surface of the hull using adhesive and GRP tabbing.

4.2.2 The cockpit, deck and superstructure were of moulded GRP with a core material between the two layers of laminate. They were finished with a white pigmented gel-coat. Hull to deck join was of the in-turned flange type. The deck moulding was finished with teak planking and a moulded non-slip texture on the coachroof.

4.2.3 Accommodation consisted of a double berth forward. The saloon had one settee berth on the starboard side and a curved seating & dining area on the starboard side. The folding dining table was located along the centreline of the saloon. The galley space was on the port side, adjacent to the companionway hatch. A navigation station lay to the starboard of the companionway. There was a heads compartment on the port side of the aft cabin and on the port side of the forepeak accommodation.

4.2.4 A Perkins four cylinder Prima diesel engine drove a three-bladed auto-feathering propeller via a single shaft. One stainless steel fuel tank was located under the aft cabin bunk.

4.3 DIMENSIONS

Dimension	Metres	Feet / inches
Length maximum	13.54	44’ 5”
Length hull	13.22	43’ 5”
Length on Waterline	11.25	36’ 11”
Beam maximum	3.99	13’ 1”
Depth maximum	3.46	11’ 4”
Draught	2.46	8’ 1”
Freeboard	1.00	3’ 3”

Table 2: Vessel Dimensions

5 THE SURVEY

5.1 HULL EXTERIOR

5.1.1 Material & Details of Construction

5.1.1.1 The hull was moulded in one piece with hand laid GRP. The cast iron fin keel was through-bolted to the hull with steel fastenings.

5.1.2 General Appearance

5.1.2.1 The hull was sighted from a distance fore and aft and visually inspected all round. Her lines were symmetrical, fair and true, with no signs of distortion, hard spots or flat areas.

5.1.3 Topsides

5.1.3.1 The topsides were inspected visually. The original gel-coat had been spray painted with a dark blue paint coating to a high standard. Further inspection revealed that two areas of the topsides had received a later application of blue paint. These had been applied by brush and to a lower standard than the previous spray paint application. The two areas that were brush painted spanned a distance of approximately one metre, located amidships on the port and starboard beam.

5.1.3.2 It was noted that areas of the topsides had also become matted, due to abrasion from mooring fenders.

5.1.3.3 The topsides had no signs of major trauma. There was some evidence of gel-coat cracking due to hinging about internal hull structure. These cracks usually occur when the vessel is moored along-side a pontoon or other vessel and when the mooring fenders are pushed heavily against the hull. The laminate is forced to flex, with resulting stress cracks occurring in the relatively brittle gel-coat where the flexible laminate is joined to the stiffer internal structure.

5.1.4 Hull Below the Waterline

5.1.4.1 The hull antifouling below the waterline was in poor condition and required a new application.

5.1.4.2 The hull was inspected, except where surfaces were hidden behind the shores. It was found that the hull below the waterline had received a secondary gel-coat application, applied on top of the original gel-coat.

5.1.4.3 Generally there was no evidence of scratching or chipping to the hull, although three specific defects were found. These are discussed below.

5.1.4.4 A crack in the gel-coat was found on the forward quarter, starboard side, and just forward of the main supporting shore, as shown in Figure 1. There is no evidence to suggest that this was caused by impact damage. It is likely that this crack has developed due to flexing of the hull in this area whilst the vessel has been under sail. Moisture readings were taken in this area and were found to be similar to adjacent laminate. It is RECOMMENDED (type C recommendation with an implementation time of one year) that the hull around these cracks is cut back to sound material. Any removed laminate shall be replaced and the repair finished with epoxy gel-coat. Additional laminate should be applied to the hull in this area (internal face) in order to stiffen the hull and to decrease the likelihood of this problem recurring.

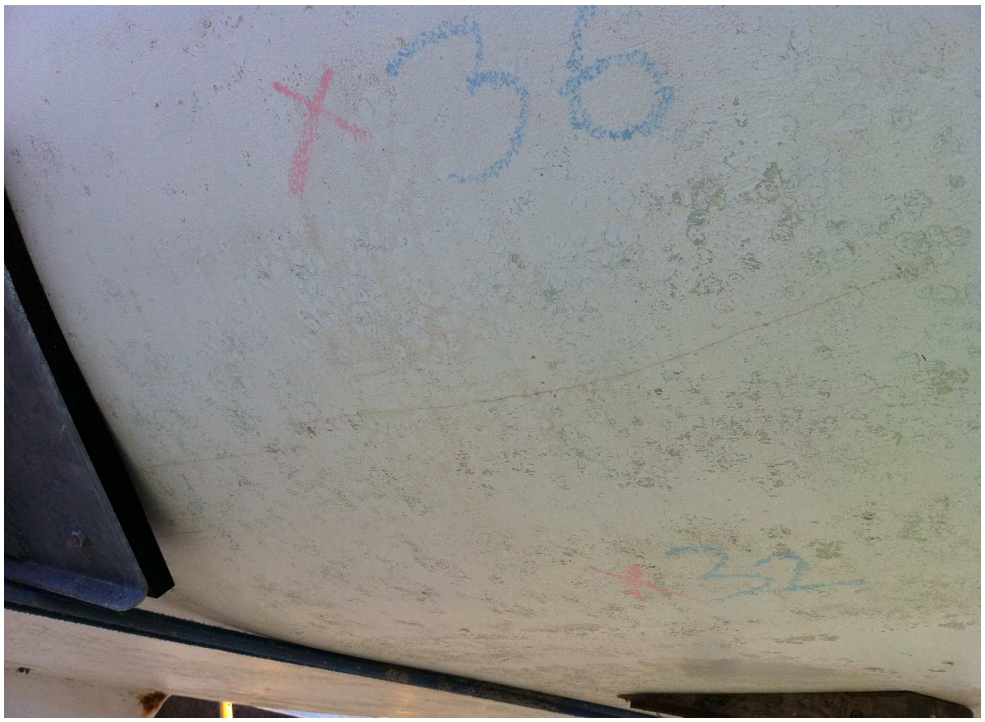

Figure 1: Cracks to gel-coat, starboard side, forward quarter

5.1.4.5 Multiple horizontal and parallel cracks were found in the gel-coat on the forward quarter, port side, and just forward of the forward heads sink outlet, as shown in Figure 2. These are similar to the crack described in 5.1.4.4 and there is no evidence to suggest that these were caused by impact damage. It is likely that these cracks have developed due to flexing of the hull in this area whilst the vessel has been under sail. Moisture readings were taken in this area and were found to be very high, indicating that moisture has been absorbed to a higher degree than surrounding, un-damaged gel-coat. It is RECOMMENDED (type C recommendation with an implementation time of one year) that the hull around these cracks is cut back to sound material. The laminate should then be thoroughly cleaned and dried. Any removed laminate shall be replaced and the repair finished with epoxy gel-coat. Additional laminate should be applied to the hull in this area (internal face) in order to stiffen the hull and to decrease the likelihood of this problem recurring.

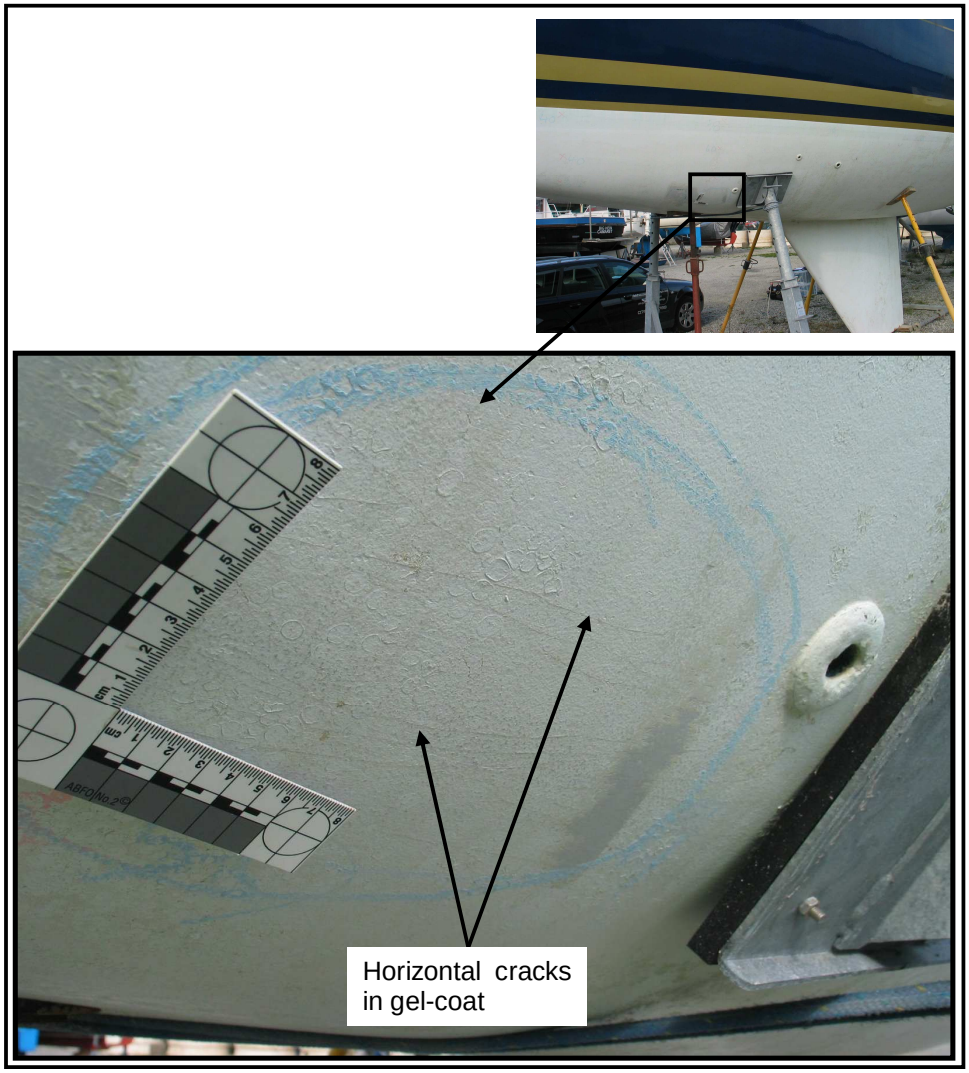

Figure 2: Cracks to gel-coat, port side, forward quarter, just forward of heads sink outlet

5.1.4.6 Figure 3 shows an area of laminate damage where the propeller shaft enters the hull. This damage is not detrimental to the strength of the hull but repair should be carried out in order to prevent water ingress into the adjacent laminate. It is RECOMMENDED (type C recommendation with an implementation time of one year) that the broken material is cut out. The gel-coat around the damage should be cut back to allow new laminate to be applied in this area. The repair should then be finished with epoxy gel-coat.

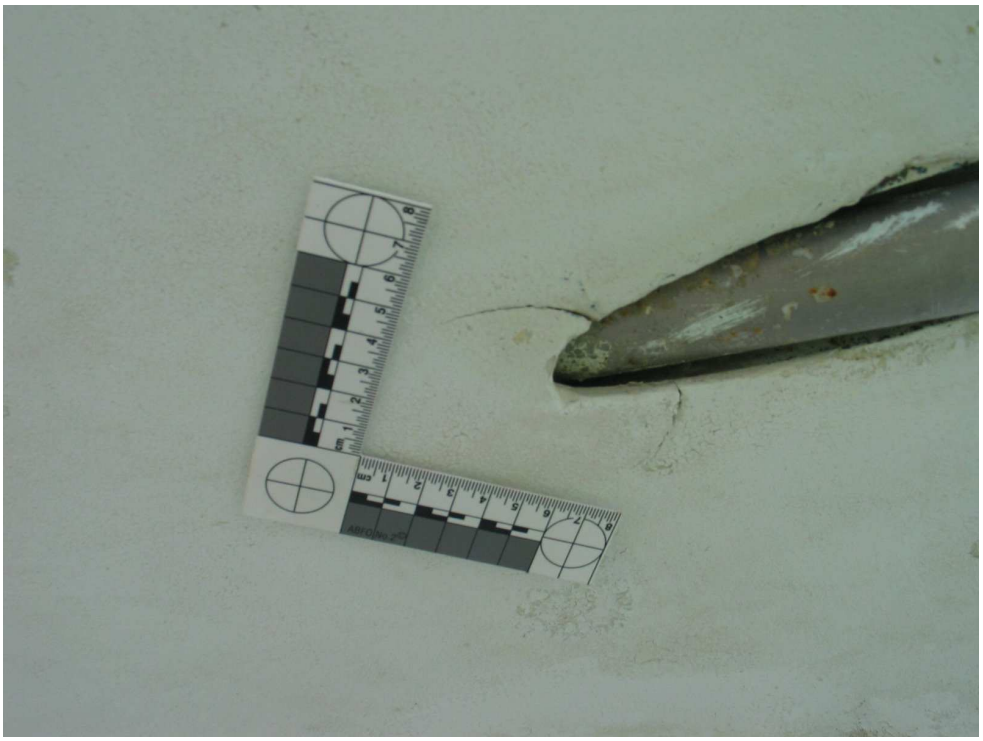

Figure 3: Fracture of gel-coat and laminate, adjacent to prop-shaft hull entry point

5.1.4.7 A close inspection of the laminate and surface coatings on the hull was made. This revealed no evidence of blistering or other damage attributable to water penetration.

5.1.5 Hammer Testing of Hull Below the Waterline

5.1.5.1 The exterior surfaces of the hull, keel and bilge keels were then tested by light blows from a small (180g) plastic-headed hammer. The test gave sound returns with no indications of softening or delamination of the GRP.

5.1.6 Moisture Readings

5.1.6.1 At the time of the hull inspection, we were informed that JUNO had been out of the water for between six months and one year.

5.1.6.2 Moisture readings were taken at intervals across the hull using a Tramex Skipper Plus moisture meter. Readings measured were less than 5 (low) on the comparative scale (0 to 100) for surface moisture and between 30 and 70 (medium to high) when set to range 2, which measures deeper into the layup.

5.1.6.3 Note that these readings are relative and do not indicate a moisture content as a percentage of dry weight. High moisture content is not generally a structural defect and is to be expected in older boats. Where some moisture has been absorbed, the likelihood of moisture related problems occurring are higher. When this occurs, the actual state of the laminate cannot be completely guaranteed without destructive testing and chemical analysis. The opinion given in this survey report is based on all the evidence available at the time but without destructive testing.

5.1.7 Keel

5.1.7.1 The fin keel of JUNO was made from cast iron. The keel was inspected, except where the bottom of the keel was hidden by supporting chocks and no evidence of hard

grounding or impact were found.

5.1.7.2 Hammer testing and magnet testing over the exposed surfaces of the keel revealed that there were a number of areas where the surface of the keel had been faired with plastic filler. These repairs were mostly likely performed in order to fill areas of the iron that had become pitted due to corrosion. This method of repair is accepted practise and ensures that the surface of the keel remains smooth.

5.1.8 Rudder & Steering

5.1.8.1 JUNO had a balanced spade rudder constructed from a stainless steel stock encapsulated in a hollow GRP moulding. It was inspected visually and found to be in serviceable condition. There was a small crack along the lower corner of the leading edge of the rudder moulding, as shown in Figure 4. This crack shows evidence that the internal steel framework has corroded, although the degree to which it has corroded cannot be ascertained without splitting the rudder moulding. Moisture readings taken on the rudder were high, although these readings can be attributed to residual moisture in the air space inside the moulding. It is RECOMMENDED (type C recommendation with an implementation time of one year) that this crack is inspected on an annual basis or whenever the vessel is hauled. If the crack extends in length, or additional cracks appear around the rudder edges, the rudder moulding should be split along its join and the internal steel framework repaired or replaced.

Figure 4: Weeping from crack in leading edge of rudder

5.1.8.2 Lateral and fore-aft loads were applied to the rudder blade which revealed a small but acceptable degree of wear in the rudder bearings.

5.1.8.3 The tabernacle mounted helm wheel was connected to the rudder stock via a tensioned cable and yoke steering system. Access to the steering mechanism was from the stern locker, aft of the helm wheel. The mechanism was closely inspected and

found to be free from any wear that might indicate poor alignment of the yoke and pulleys. Fastenings were inspected and, where accessible, were found to be adequately secured and locked using nyloc nuts to prevent loosening under vibration.

5.1.8.4 The tabernacle mounted helm was inspected and found to be adequately secured to the cockpit structure.

5.1.9 Through-Hull Fittings, Valves and Seacocks

5.1.9.1 The through-hull skin fittings were all in serviceable condition. All fittings on or below the waterline were bronze (apart from the plastic speed impellor and depth transducer) and showed no signs of dezincification.

5.1.9.2 Figure 5 and Table 3 below show the location and function of the through-hull penetrations.

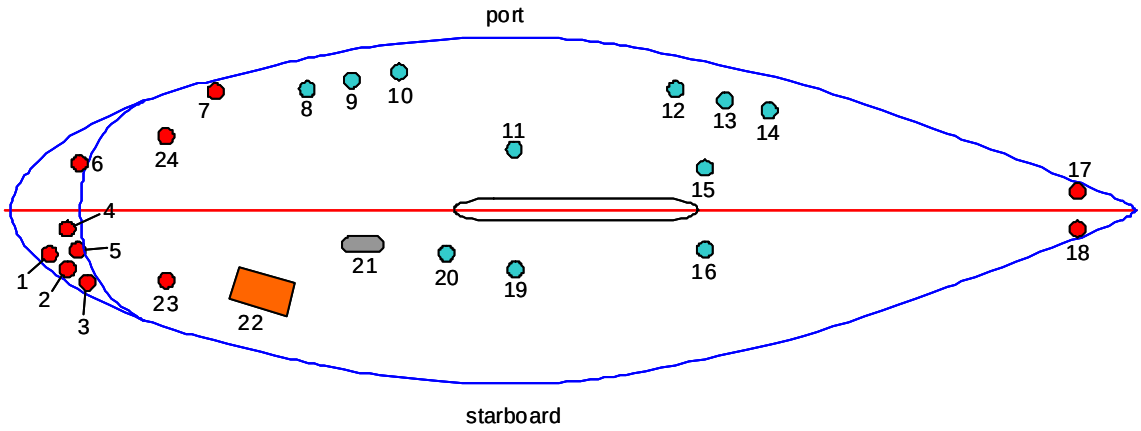

Figure 5: Location of through-hull fittings

No.	Above/below waterline	Function	Fitting material
1	Above	Engine exhaust & cooling water	Stainless steel
2	Above	Bilge pump (manual) outlet	Plastic
3	Above	Bilge pump (electric) outlet	Plastic
4	Above	Space heater exhaust outlet	Stainless steel
5	Above	Engine bay air extractor outlet (redundant)	Aluminium
6	Above	Engine bay air extractor outlet	Aluminium
7	Above	Gas locker vent	Plastic
8	Below	Outlet, heads sink	Bronze
9	Below	Outlet, heads toilet	Bronze
10	Below	Inlet, heads toilet	Bronze
11	Below	Outlet, galley sink	Bronze
12	Below	Outlet, heads toilet	Bronze
13	Below	Inlet, heads toilet	Bronze
14	Below	Outlet, heads sink	Bronze
15	Below	Depth transducer	Plastic
16	Below	Impeller, speed instrument	Plastic
17	Above	Drain, anchor locker	Stainless steel
18	Above	Drain, anchor locker	Stainless steel
19	Below	Inlet, sea water for galley, port sink	Bronze
20	Below	Inlet, engine cooling	Bronze
21	Below	Anode	Zinc
22	Below	Seaground plate	Brass or Bronze
23	Above	Drain, cockpit, starboard	GRP
24	Above	Drain, cockpit, port	GRP

Table 3: Function and material of through-hull penetrations

5.1.9.3 No skin fittings, seacocks or valves were dismantled as part of the survey but the following tests were performed:

- Examination from outside and inside the vessel
- All valves opened and closed to their full extent
- The through-hull fittings, valves and seacock bodies were hammer tested
- The fittings were aggressively tested to assess their security of attachment to the hull
- Hose clips were inspected and hoses were aggressively tested

5.1.9.4 One of the two hose clips that secure the exhaust hose to the transom was found to be partially corroded. Testing with light hammer blows resulted in the corroded clip breaking. It is RECOMMENDED (type A1) that a new clip made from marine grade stainless steel is installed. Similar clips on the exhaust hose should also be removed, inspected and replaced if found to be corroded.

5.1.9.5 The quarter turn valve for the sink outlet in the aft heads compartment (item 8 in Table 3) was found to be badly corroded. It is RECOMMENDED (type A1) that the gate valve is replaced with a marine grade stainless steel or bronze fitting.

5.1.9.6 The short length of black hose that joins the quarter turn valve to a 'Y' connection of the sink outlet in the aft heads compartment (item 8 in Table 3) was found to be made from non-reinforced hose. It is RECOMMENDED (type A1) that the short length of hose is replaced with reinforced tubing.

5.1.9.7 The forward heads toilet outlet pipe (item 12 in Table 3) was found to be made from non-reinforced hose. It is RECOMMENDED (type A1) that the entire length of hose is replaced with reinforced tubing.

5.1.9.8 The quarter turn valve for the sink outlet in the forward heads compartment (item 14 in Table 3) was found to be badly corroded. It is RECOMMENDED (type A1) that the gate valve is replaced with a marine grade stainless steel or bronze fitting.

5.1.9.9 The quarter turn valve and 90º pipe bend that supply sea water to the galley (item 19 in Table 3) were found to be badly corroded. It is RECOMMENDED (type A1) that the gate valve and 90º pipe bend are replaced with a marine grade stainless steel or bronze fittings.

5.1.9.10 The quarter turn valve and 90º pipe bend that supply sea water to the engine cooling system (item 20 in Table 3) were found to be badly corroded. It is RECOMMENDED (type A1) that the gate valve and 90º pipe bend are replaced with marine grade stainless steel or bronze fittings. The pipe bend should also be orientated so that the severe kink in the hose is removed. See paragraph 5.1.9.11 for further comments on the hose.

5.1.9.11 The hose that supplies sea water to the engine cooling system (item 20 in Table 3) was found to be severely kinked where it was attached to the valve. Closer inspection revealed that the hose had been damaged by the heavy strain imposed by the kink. Figure 6 shows where the hose has been weakened. It is RECOMMENDED (type A1) that the hose is replaced and routed so that there are no such kinks in the new installation.

Figure 6: Damage to engine cooling supply hose

5.1.9.12 There was clear access inside the vessel to all valves and seacocks. The engine cooling inlet valve should be adjusted (rotated) to remove the sharp kink in the hose.

5.1.9.13 The remaining five quarter turn valves appear to be in satisfactory condition. In view of the condition of the neighbouring valves that have a recommendation requiring their immediate replacement, it is RECOMMENDED (type C recommendation with an implementation time of one year) that the following valves are also replaced:

- Outlet, heads toilet
- Inlet, heads toilet
- Outlet, galley sink
- Outlet, heads toilet
- Inlet, heads toilet

5.1.9.14 After future applications of antifouling, the slots of the skin fitting that provide the engine cooling water should be inspected and cleared of any antifouling that might obstruct the flow of water into the engine cooling system.

5.1.9.15 It is RECOMMENDED (type A2 recommendation) that all seacocks and through-hull fittings are checked for leakage once the vessel is afloat.

5.1.10 Anodes

5.1.10.1 A bulb anode was through-bolted to the hull on the starboard quarter. The anode was approximately 50% intact.

5.1.10.2 A cone anode was found to be properly secured to the propeller assembly. This anode was found to be intact.

5.2 HULL INTERNAL STRUCTURE

5.2.1 General Appearance

5.2.1.1 Beneath the sole boards the internal hull surfaces were painted with a light grey bilge

paint. The internal moulding structure was finished in a light grey gel-coat.

5.2.1.2 All storage spaces in the aft cabin, saloon, heads and forepeak were finished in a white vinyl covering, which was bonded to the hull or deck head. The sides of the hull in the forepeak were finished with varnished wood strip. It was not possible to remove these trim items, therefore the condition of the hull and stiffening behind this trim cannot be guaranteed.

5.2.2 Hull Internal Moulding Structure

5.2.2.1 Within the aft cabin, saloon and forepeak, there were a number of removable sole boards. These were all lifted in order to inspect the internal hull and stiffening structure.

5.2.2.2 The hull was seen to be stiffened internally by a separately moulded glass fibre structure (Internal Moulding) consisting of longitudinal stringers and transverse floors. This Internal Moulding was bonded to the internal surface of the hull. The exposed surfaces of the Internal Moulding were finished in light grey gel-coat. Additional strength was provided by GRP tabbing between the hull and the lower flanges of the Internal Moulding sections.

5.2.2.3 Two of the transverse floors in the saloon (beneath the saloon table) were bridged by a stainless steel fabrication that provides a base for the mast compression post. This fabrication ran longitudinally along the centreline of the vessel. See section 5.2.3 for a discussion of this structure.

5.2.2.4 Close examination of the join between the tabbing and a number of sections of the Internal Moulding revealed that the bond had failed. Figure 7 and Figure 8 show two typical areas where this has occurred in the saloon area.

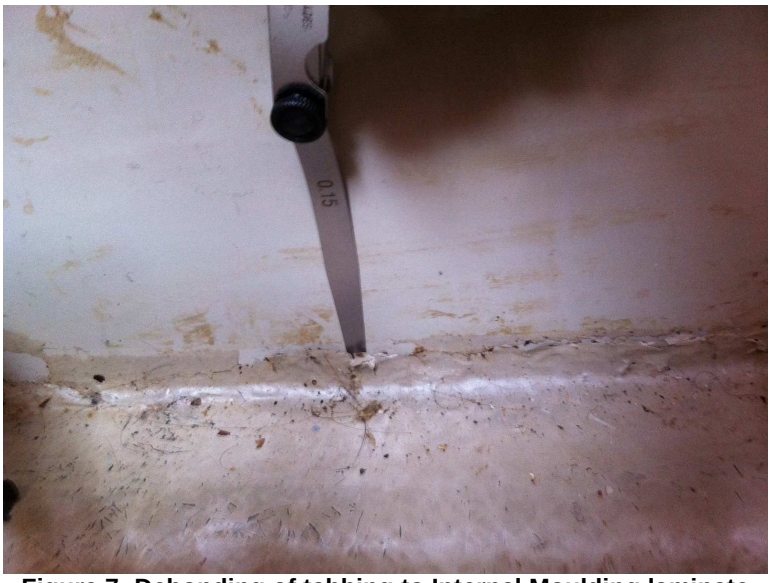

Figure 7: Debonding of tabbing to Internal Moulding laminate

Figure 8: Debonding of tabbing to Internal Moulding laminate

5.2.2.5 Figure 9 shows a schematic cross section of the top hat section and the method of bonding to the hull laminate. It was confirmed by inspection that the red-coloured bond lines had failed. Without destructive testing it was not possible to confirm that the green-coloured bond lines were intact. It is likely that the observed bond failure has occurred as a result of high stresses in the hull and Internal Moulding, combined with the fact that the tabbing was bonded to the gel-coat surface of the Internal Moulding. For this reason it is likely that the green-coloured bond lines have also failed.

5.2.2.6 It is RECOMMENDED (type A2) that for ALL de-bonded areas of the Internal Moulding, the de-bonded tabbing is cut back entirely until the bonded interface is found. Surfaces of the Internal Moulding that are to receive over-laminating shall be cut back to remove the gel-coat surface. This is to ensure that the new laminate is bonded to existing laminate rather than gel-coat, which is a very poor substrate for bonding. All prepared areas shall then be thoroughly cleaned and dried. Multiple layers of fibreglass cloth and epoxy resin should then be applied, with the edges of the cloth layered so as to give a gradual tapering to the existing structure. The thickness of the layup should be in excess of the laminate removed during the repair. This will ensure that strength of the repair is similar or greater than the original layup.

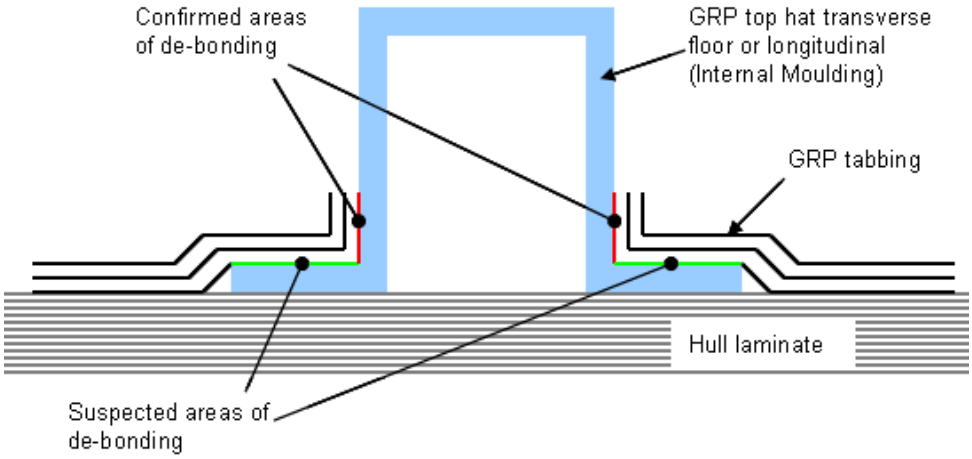

Figure 9: Schematic cross-section of typical transverse floor

5.2.2.7 Figure 10 shows a large crack (greater than 50mm) crack in the GRP transverse floor that is directly in front of the mast compression post. The forward end of the stainless steel fabrication that provides a base for the mast compression post is connected to this floor (section 5.2.3). The location of this crack strongly indicates that the crack has been caused by high loading in this area, combined with the reduced section of the transverse floor: The size and location of the limber hole where the cabling and tubing pass through has significantly reduced the section and hence the strength and stiffness of the transverse floor.

5.2.2.8 It is RECOMMENDED (type A2) that, in addition to the recommendation made in paragraph 5.2.2.6 being applied to this transverse floor, the area around the crack should be stiffened. The tip of the crack should be located and a 6mm diameter hole drilled through the stiffener at this point. This will help to reduce the rate of propagation of the crack. Following this, all surfaces of the damaged area that are to receive over-laminating (at least 200mm either side of the 'arch' of the limber hole) shall be cut back to remove the gel-coat surface. This is to ensure that the new laminate is bonded to existing laminate rather than gel-coat, which is a very poor substrate for bonding. All prepared areas shall then be thoroughly cleaned and dried. Multiple layers of fibreglass cloth and epoxy resin should then be applied, with the edges of the cloth layered so as to give a gradual tapering to the existing structure. The thickness of the layup should be significantly in excess of the laminate thickness of the transverse floor. This will ensure that strength of the repair is similar or greater than the original layup. Note that this over-laminating should cover both port and starboard sides of the 'arch'. The accessible surfaces inside the 'arch' should also be strengthened in a similar manner.

Figure 10: Crack in transverse floor

5.2.3 Mast Compression Post

5.2.3.1 A stainless steel cylindrical column supports the coachroof and transfers the mast compression load to the hull and keel of JUNO. The base of the compression post was supported by a welded stainless steel box-section fabrication that spans two of the transverse floors in the saloon. This fabrication ran longitudinally along the centreline of the vessel and located underneath the saloon folding table. This fabrication was attached to the vertical faces of the two adjacent transverse floors by a number of stainless steel self-tapping screws. Inspection revealed that at the forward end of the fabrication, the self-tapping screws that are fastened into the transverse floor were partially pulled out of the fibreglass. Figure 11 shows these fasteners and the resulting gap between the stainless steel and the floor. This image also shows that the screws are not correctly located, having been forced down by a vertical load from the compression post. The use of self-tapping screws into GRP laminate is not good practise, especially where high loads are to be expected. This situation has been exacerbated by the gap between the stainless steel and the vertical face of the transverse floor.

5.2.3.2 It is RECOMMENDED (type A2) that this misalignment is rectified and the following repair carried out at both ends of the stainless steel fabrication. In order to perform this task, it will be necessary to remove the tension in the mast rigging (or lift the entire mast off the coachroof) so that the fabrication can be raised into its correct position. Once the fabrication has been lifted up and realigned, a hard setting epoxy / filler mix should then be used to fill the gap between the steel end plates and the transverse floors. Once this has set, the steel plates should be re-attached to the floors. Instead of self-tapping screws, suitably sized stainless steel bolts, washers and nuts should be used. Access to the inside of the top hat sections of the floors can be gained by cutting a single hole in the mid-height of the opposite face of each of the transverse floors. The size of each hole should be the minimum necessary to allow the insertion of a bolt & penny washer. Once all of the bolts are inserted, the penny washers should not overlap adjacent washers. After satisfactory assembly of the bolted joints, the gel-coat around the repair areas should be cut back and cleaned thoroughly. The access holes should then be over-laminated to a thickness equal to or greater than the transverse floor thickness.

5.2.3.3 The stainless steel fabrication is also designed to transfer some load to the hull inner surface by means of a contact surface that is half-way along the underside of the fabrication. Once the repair discussed in paragraph 5.2.3.2 has been completed, it is likely that there will be a gap between the fabrication and the hull inner surface. This must be completely filled by a hard setting epoxy / filler mix.

Figure 11: Downward deflection of support for mast compression post

5.2.3.4 The Internal Moulding under the forepeak sole was also inspected and found to have a fracture approximately 300mm in length along the vertical face of the moulding that adjoins the forward heads door bulkhead, as shown in Figure 12. The cause of this damage cannot be verified but it may possibly be due to flexing of the portion of hull & deck that is forward of the mast. It is RECOMMENDED (type A2) that this damage is cut out and repaired. The damaged laminate should be cut back to sound material. Surfaces of the Internal Moulding that are to receive over-laminating shall be cut back to remove the gel-coat surface. This is to ensure that the new laminate is bonded to existing laminate rather than gel-coat, which is a very poor substrate for bonding. All prepared areas shall then be thoroughly cleaned and dried. Multiple layers of fibreglass cloth and epoxy resin should then be applied, with the edges of the cloth layered so as to give a gradual tapering to the existing structure. The thickness of the layup should be in excess of the laminate removed during the repair. This will ensure that strength of the repair is similar or greater than the original layup.

Figure 12: Fracture of Internal Moulding in forepeak

5.2.4 Bulkheads

5.2.4.1 The plywood bulkheads, including the aft cabin bulkhead, were inspected and found to be in satisfactory condition with no evidence of moisture ingress, wood rot or delamination.

5.2.4.2 Where accessible, the attachment of the hull & deck to the bulkheads was inspected. The bulkheads were secured to the hull & deck by fibreglass tabbing. The integrity of the tabbing was inspected and found to be free of de-bonding, cracks or movement. The surfaces of the plywood beneath the tabbing had been cut back to remove the teak faces of the ply. This is correct practise as the resin does not bond well to the natural oils found within the teak.

5.2.5 Engine Beds

5.2.5.1 The engine beds were examined and found to be sturdily built and were free of signs of cracks or deformation.

5.2.6 Keel Bolts

5.2.6.1 Where accessible, the steel fastenings that attached the keel to the hull were inspected. The external surfaces of all accessible bolts were found to have evidence of corrosion. When hammer tested, all were found to be securely fastened. It is RECOMMENDED (type C recommendation with an implementation time of one year) that at least one bolt is withdrawn in order to assess its condition. If the unexposed parts are found to be corroded, all fastenings should then be replaced.

5.3 DECK AND EXTERNAL FITTINGS

5.3.1 Hull / Deck Join

5.3.1.1 The deck was joined to the hull by an in-turned flange hull-to-deck joint.

5.3.1.2 The join was finished by a grey anodised, extruded Aluminium toe-rail, with stainless steel bolted fastenings attaching the toe-rail to the deck and hull. Where accessible, the bolted fastenings were inspected and found to be supported by adequately sized stainless steel washers.

5.3.1.3 As far as could be ascertained, the hull to deck joint appeared to be sound. In areas that could be accessed for inspection, there was no evidence of water ingress to the vessel interior through this join.

5.3.2 Deck Moulding

5.3.2.1 The deck moulding was a cored GRP composite, finished with white pigmented gel-coat. It incorporated the decks, coachroof and cockpit.

5.3.2.2 The integrity of the deck structure was checked by applying the Surveyor's weight to the deck surface. No excessive deformation was noted.

5.3.2.3 On JUNO, moisture levels in the deck structure could not be measured as access to the internal surfaces of the deck was prevented by the internal linings. Moisture levels could not be measured from the outside as any readings would be affected by moisture in the teak deck. High moisture levels in the deck structure are an indication that moisture has penetrated into the deck core material.

5.3.2.4 The gel-coat was found to be in sound condition with only minor scuff and scratch marks. The gel-coat finish was generally matted by UV degradation.

5.3.3 Cockpit

5.3.3.1 There were two areas of the cockpit moulding where significant gel-coat cracking had occurred. These were located on the port and starboard sides of the cockpit coaming, where the horizontal section of the coaming meets the vertical face of the coachroof aft bulkhead, as shown in Figure 13.

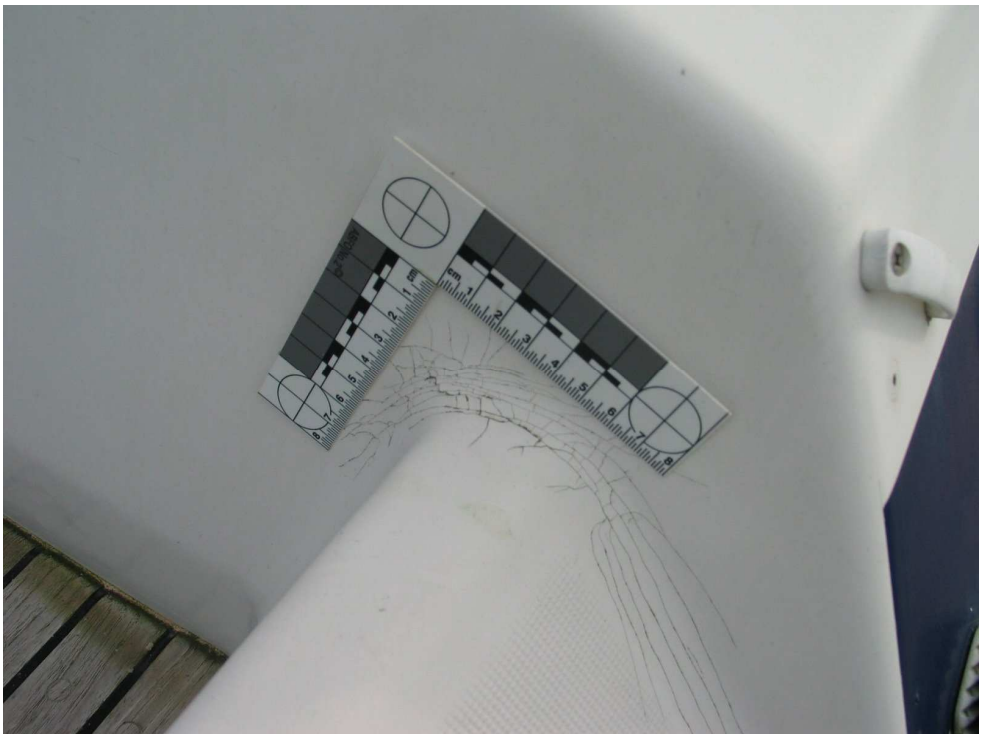

Figure 13: Cracks in gel-coat of cockpit coaming

5.3.3.2 Figure 14 shows that the surface of the gel-coat has been distorted and roughened by this cracking. The gel-coat has been permanently distorted, which suggests that the damage extends into the laminate, although this cannot be guaranteed without destructive testing of the gel-coat and laminate.

Figure 14 Detail of cracks showing uneven surface

5.3.3.3 It is RECOMMENDED (type A2) that the damaged gel-coat is cut back to sound laminate. The laminate should then be thoroughly cleaned and dried. Any removed laminate shall be replaced and the repairs finished with epoxy gel-coat. Additional laminate should be applied to the internal surface of the cockpit and bulkhead in these areas in order to stiffen the coaming to bulkhead join and to decrease the likelihood of this problem recurring.

5.3.3.4 The port side of the cockpit coaming was found to be heavily worn by the abrasive action of sheets being pulled around the aft winch and rubbing over the coaming. It is RECOMMENDED (type D recommendation) that these abrasions are filled with epoxy filler and finished with white gel-coat.

5.3.3.5 The cockpit floor and seats were all in sound condition, with no evidence of cracking or crazing.

5.3.3.6 In the cockpit area there were three storage lockers. The aft locker, located behind the helm position, was used for the storage of fenders, spare engine oil, boat hooks and the emergency tiller.

5.3.3.7 The locker located under the port side cockpit seating was for general storage and also contained the LPG gas cylinder storage box. See section 5.6.4.1 for details of the inspection of the gas locker. Additional items in this locker included spare gas cylinders, storm jib, hot water calorifier, battery charger, shore power connection plug and 240 volt master switches

5.3.3.8 The locker located under the starboard side cockpit seating was for storage of warps and spare halyards & sheets.

5.3.3.9 The hinges and latches of the cockpit lockers were inspected and found to be well secured and to function correctly.

5.3.3.10 Access to the aft cabin was through a sliding polycarbonate hatchway on the centreline of the coachroof.

5.3.4 Chain Locker & Bulkhead

5.3.4.1 The anchor chain was stowed in the forward chain locker. Chain from the deck was fed from the deck to the locker through a cut-out at the forward end of the hinging chain locker lid. The hinges and latch of the chain locker lid were inspected and found to be well secured and to function correctly.

5.3.4.2 The locker and aft bulkhead were inspected and found to be adequately attached to the hull & deck and were generally free of damage.

5.3.4.3 The chain locker drain holes were clear and functioned correctly.

5.3.5 Deck Covering

5.3.5.1 The non-slip surface on the decks and cockpit was provided by teak planking, attached to the deck, cockpit and anchor locker cover by stainless steel fastenings. The planking was heavily worn in some areas. As a result, the black caulking was standing proud of the teak surface. In some areas the fixing screws had become exposed. These screws should be re-set so that they are recessed further into the wood. Teak plugs should then be bonded in to hide these screws and to prevent moisture ingress.

5.3.5.2 Some areas of the caulking were found to be loose and falling out. It is RECOMMENDED (type C recommendation with an implementation time of six months) that all loose or cracked caulking is removed and new caulking applied.

5.3.5.3 Non-slip surface on the coachroof was provided a texture moulded into the gel-coat surface. This non-slip surface was inspected and found to be in good condition with no major evidence of wear or impact damage.

5.3.6 Hatches

5.3.6.1 One aft hinging Lewmar hatch (900 x 900mm opening) was installed in the roof of the forepeak. It was found to be securely attached and showed no signs of water ingress. The polycarbonate material was generally free from any scratches or crazing.

5.3.6.2 One aft hinging Lewmar hatch (500 x 900mm opening) was installed in the roof of the saloon. It was found to be securely attached and showed no signs of water ingress. The polycarbonate material was generally free from any scratches or crazing.

5.3.6.3 The size of each hatch was in excess of the minimum recommended dimension of 380mm for an escape hatch. There was no similar sized hatch located in the aft cabin.

5.3.7 Ports, Windows and Ventilation

5.3.7.1 The inward hinging windows in the sides of the saloon and aft cabin were polycarbonate in Aluminium alloy frames. They were in serviceable condition. Three of the hatches in the aft cabin showed signs of water ingress or mildew due to condensation forming around the Aluminium frames.

5.3.7.2 There were two UFO type fixed ventilators, located in the saloon roof above the seating area. These were in good condition.

5.3.7.3 There were two dorade type vents located in the aft cabin roof, both in serviceable

condition.

5.3.8 Deck Fittings and Equipment

5.3.8.1 The vessel's name was positioned on the transom, on either side of the bow and on both sides of the mainsail cover.

5.3.8.2 There were six Aluminium fairleads fitted to the Aluminium toe rail. Two were located at the bow, one at each of the stern quarters and two amidships. All were inspected and found to be adequately secured to the toerail.

5.3.8.3 There were four Aluminium mooring cleats: Two on the foredeck and two just forward of the rear quarters. All were inspected and found to be adequately secured to the deck. It was however noted that there was some movement in the two aft cleats. It is suggested that the backing pads used to secure the cleats to the underside of the deck are replaced with larger ones.

5.3.9 Grab Rails

5.3.9.1 Two 25mm diameter tubular welded stainless steel grab rails were fitted to the saloon roof. They were in good condition and were tested with the Surveyor's weight and found well secured.

5.3.9.2 Additional hand holds were provided either side of the cockpit by two 25mm diameter tubular welded stainless steel dorade vent guards. They were in good condition and were tested with the Surveyor's weight and found well secured.

5.3.10 Guard Rails

5.3.10.1 The vessel was fitted with a pulpit, side stanchions, and pushpit.

5.3.10.2 The pushpit and pulpit were constructed from 25mm diameter stainless steel tubing and was found adequately secured to the Aluminium toerail and in good order.

5.3.10.3 The side stanchions were found to be made from tapered (25mm to 15 mm diameter) stainless steel tube and fitted with twin safety wires of 1 x 19 construction. The upper wire was 5 mm diameter and the lower was 4 mm diameter. The stanchion tubes were connected to the toe-rail via Aluminium bases. The stanchions, bases, lock nuts and safety wires were found secure and in good order.

5.3.10.4 The vessel was fitted with wire rope jackstays. These were found secure and in good order.

5.3.11 Boarding Ladder

5.3.11.1 A tubular welded stainless steel boarding ladder was attached to the transom of the vessel. It was found to be adequately secured to the transom. There was evidence that the ladder had been impacted from the rear as the right hand lower corner was slightly buckled.

5.3.11.2 Note that the ladder does not extend downwards for man overboard recovery. It is RECOMMENDED (type D) that the ladder is modified or replaced with a ladder that extends downward to a point well below the waterline.

5.4 RIGGING AND SAILS

5.4.1 Mast

5.4.1.1 The mast could not be ascended with safety, so the rig was examined as far as possible from the deck.

5.4.1.2 The lower part of the mast and tabernacle were in sound condition, with no sign of serious corrosion or physical damage.

5.4.1.3 It is advisable to take the mast down for a full inspection every few years, as part of the routine maintenance programme. In the short term, closer examination of the mast, spreaders and masthead gear would be possible once the boat is afloat.

5.4.2 Boom

5.4.2.1 The boom and gooseneck was found to be in serviceable condition.

5.4.3 Spinnaker Pole, Boom Vang

5.4.3.1 An anodised aluminium spinnaker pole was found on the starboard fore-deck. It was in good condition. The outboard end connector was found to be stiff. The barrel should be cleaned and lightly greased.

5.4.3.2 The compression type boom vang was inspected and found to be secure, in good order and functioned correctly.

5.4.4 Shroud Chain Plates

5.4.4.1 The stainless steel chain plates were fabricated from welded stainless steel plate. They were closely examined and found to be free of cracks and generally free of corrosion

5.4.4.2 The chain plates were found to be adequately secured through the deck, with sufficiently sized bonding into the hull and no evidence of undue strain on the mountings.

5.4.5 Forestay & Backstay Chain Plates

5.4.5.1 The stainless steel forestay and backstay chain plates were examined and found to be free of corrosion, adequately secured to the hull and with no evidence of undue strain on the mountings.

5.4.6 Jib Furling Mechanism

5.4.6.1 The Harken MkIII roller furling equipment was tested as far as practical and found generally in good working order with the reefing line square to the drum and of suitable length. The drum was examined and no defects were seen in either the bearings or in the rigging screw attachment. The aluminium alloy tube appeared to be straight and with no kinks.

5.4.7 Standing Rigging

5.4.7.1 The standing rigging comprised single lower shrouds, intermediate shrouds and cap shrouds passing over triple spreaders. There was a single backstay terminating at a plate on the transom. The forestay was formed by the headsail reefing foil.

5.4.7.2 Where the backstay was connected to the backstay tension adjuster, the split pin was

found to be missing, as shown in Figure 15. It is RECOMMENDED (type A1 recommendation) that a new split pin is inserted.

Figure 15: Missing split pin in backstay

5.4.7.3 Running backstays were fitted to the mast at a position approximately half way up the mast.

5.4.7.4 The standing rigging was formed from 10mm 1x19 stainless steel wire, with swaged terminals secured to the chain plates by toggles and bottle screws.

5.4.7.5 As far as could be ascertained, the bottle screws and toggles appeared to be in sound condition, with no signs of bending, splitting, cracking or other failure. They should, as a matter of routine, be stripped, inspected and greased before reinstallation.

5.4.7.6 The bobstay (babystay) was made from 7mm 1x19 stainless steel wire. The wire and end fittings were in good working order.

5.4.7.7 A removable inner forestay was also fitted to the rig. The end fitting of this stay was fitted with a 'pelican' hook which allows the wire rope to be tensioned at the bow fitting without using special tools.

5.4.7.8 We were informed that the standing rigging had been replaced in 2005, although this cannot be verified. To be safe, stainless steel standing rigging should be replaced every five years if the yacht is raced and every ten years if she is just cruised.

5.4.7.9 As far as could be ascertained, those parts of the shrouds and stays that could be inspected from the deck appeared to be serviceable. The owner should appoint a rigger if a second opinion or a full survey of the rig is required.

5.4.8 Running Rigging

5.4.8.1 The running rigging that was stored on the vessel was inspected and showed only minor signs of wear. These all remain serviceable.

5.4.9 Winches, Clutches, Travelers, Cars

5.4.9.1 Headsail sheet leads were mounted on travelling cars on the side decks. The tracks were securely mounted and in serviceable condition.

5.4.9.2 There were a total of eleven winches on the deck of JUNO. At the aft end of the side decks there were two self-tailing two speed winches (Lewmar 43) for spinnaker sheet control. Forward of these were two primary self-tailing two speed winches (Lewmar 55) for jib sheet control. There were two self-tailing two speed winches mounted on the coachroof, either side of the companionway. The starboard winch only operated in low gear. Forward of the companionway there were two two-speed winches mounted on the coachroof. There were two further two-speed winches mounted just aft of the mast and a single winch mounted on the mast.

5.4.9.3 The winches listed above all functioned correctly, apart from the starboard winch mounted next to the companionway which only worked in low gear. It is RECOMMENDED (type D) that all winches are dis-assembled and cleaned. Any worn pawls or broken springs should be replaced. The assemblies should then be greased and re-assembled.

5.4.9.4 The were two sets of four jammer type clutches mounted on the coachroof for the purpose of holding the tensioned halyards and reefing lines. They were inspected and found to be securely mounted and functioning correctly.

5.4.10 Sails

5.4.10.1 The mainsail was stowed on the boom during the survey. The sail cover was partially removed and the sail examined without hoisting. The sail was found to be generally clean and well maintained, but with some evidence of mildew.

5.4.10.2 A light blue ‘Hood’ cruising chute was stowed in its snuffer bag. This was inspected and found to be in good condition.

5.4.10.3 The furling genoa was stowed in the main saloon at the time of survey. The genoa was partially opened up whilst inside the boat. This was inspected and found to be in good condition but with some dirt at the head and tack and a small amount of wear to the stitching on the leach. The white ultraviolet sacrificial strip on the genoa was decayed and weakened by UV degradation and should be replaced.

5.4.10.4 The storm jib was stowed in the port cockpit locker. It was inspected and appeared to be unused, although storage in a damp environment has left some staining on the canvas form the corroding hanks. The hanks were inspected and found to be intact but were very stiff. These should be cleaned and the barrels lubricated with a light grease.

5.4.11 Canvas

5.4.11.1 A beige canvas spray hood was found stowed inside the vessel. This was in good new condition with clear plastic windows. Some of the tie-down straps were found to be partially rotten and should be replaced.

5.4.11.2 A beige mainsail cover was fitted over the mainsail. The vessel’s name was attached to both sides of the cover. The cover and fastenings were in acceptable condition.

5.4.11.3 A white canvas awning was stowed in the same bag as the storm jib.

5.5 PROPULSION

5.5.1 Engine & Transmission

5.5.2 JUNO was fitted with a Perkins Prima four cylinder 50hp diesel engine, with fresh water cooling, driving through a reduction gearbox. Engine control was via a single lever, giving forward and reverse gears and throttle control, mounted next to the helm.

5.5.2.1 The engine had been winterised and therefore could not be started, therefore it was not possible to fully evaluate its condition.

5.5.2.2 The engine bearers were securely mounted, and the flexible rubber engine mounts were in sound condition. The mounting bolts were tight. Some paint was flaking from the engine sump and gearbox casting. Externally, the engine was clean and in fair condition, with no evidence of oil leaks. The alternator belt appeared to be correctly tensioned. There was no evidence of leakage from the cooling system.

5.5.2.3 Maintenance access to the water pump, oil level indicator, alternator, coolant filler cap, oil filter and fuel filters was good.

5.5.2.4 Engine exhaust and cooling water were discharged through a muffler box and an armoured flexible hose, to a hull fitting on the stern.

5.5.2.5 One of the two hose clips that secure the exhaust pipe to the transom was found to be partially corroded. Testing with light hammer blows resulted in the corroded clip breaking. See paragraph 5.1.9.4 for the recommendation relating to this defect.

5.5.2.6 Where accessible, the armoured flexible exhaust hose was inspected. Damage to the hose was found where the rudder end-stop control wire was chafing against the hose. It is RECOMMENDED (type A1 recommendation) that the exhaust hose is shortened by a small amount so that chafing does not occur. Further protection should be given by wrapping a piece of neoprene rubber around the affected area and securing with plastic cable ties.

5.5.2.7 The raw water filter was mounted against the sound insulation on the port side of the engine compartment. The fastening screws were of inadequate length to efficiently attach to the side panel and the filter became detached during the inspection. It is RECOMMENDED (type A1 recommendation) that the water filter is properly secured in a location that is at least 300mm above the vessel's loaded waterline.

5.5.2.8 The sound insulation within the engine compartment was found to be well attached to the compartment panels. The insulation material should be manufactured from fire resistant material, but this cannot be checked as part of a normal pre-purchase survey.

5.5.3 Fuel System

5.5.3.1 There was a single stainless steel fuel tank mounted under the aft bunk. Access to the fuel tanks was limited. The visible parts of the fuel tanks were clean and free of damage and corrosion.

5.5.3.2 The fuel line clips that secure the fuel pipe to the fuel tank were secure and free of corrosion.

5.5.3.3 The fuel filter, fuel lines and clips were in sound condition.

5.5.3.4 The fuel shut-off valve was located immediately next to the fuel tank.

5.5.4 Stern Gear

5.5.4.1 The exposed section of the 35mm diameter stainless steel propeller shaft was in good

condition. The shaft was rotated and it was found that there was 1 to 2mm of bend at the mid-span of the shaft between the stern bearing and the cutlass bearing. If it is found that the cutlass bearing wears quickly, the propeller shaft should be removed and straightened.

5.5.4.2 There was a small amount of wear (0.5mm) between the propeller shaft and stern bearing. The three-bladed self-feathering manganese bronze Maxprop propeller was in good condition and securely attached to the propeller shaft.

5.5.4.3 The stainless steel P-bracket was inspected and found to be free of corrosion and adequately secured to the hull.

5.5.4.4 A 'Stripper' rope cutter was mounted between the P-bracket and propeller. This was inspected and found to be free from damage.

5.5.4.5 The mechanical seal on the stern tube appeared to be in good condition, as was the shaft coupling. The seal will nevertheless need to be checked for leakage when the vessel is afloat, and with the engine running in gear.

5.6 SYSTEMS AND SERVICES

5.6.1 Anchor and Chain

5.6.1.1 The vessel's anchor and chain is discussed in Section 6, Safety Equipment on page 43.

5.6.2 Anchor Windlass

5.6.2.1 A Lewmar 12 volt electric windlass was installed on the foredeck. This was inspected and found to be adequately secured to the chain locker shelf.

5.6.3 Fresh Water System

5.6.3.1 There were two polyethylene fresh water tanks. The tanks were located on the port and starboard sides of the saloon, under the seats. These were found to be adequately secured to the adjacent structure.

5.6.3.2 There was one GRP moulded fresh water tank located beneath the forepeak bunk. This was found to be adequately secured to the adjacent structure.

5.6.3.3 Water from each tank fed into a pressurised water system, pressurised by one 25psi Jabsco automatic water system pump and accumulator, located at the forward end of the saloon, under the seats. The taps in the galley and heads were tested and were found to function, although the pressure was low. It is suggested that the accumulator is serviced or replaced.

5.6.3.4 This water system supplied cold water to taps in the galley and in the heads. A calorifier located in the port side cockpit locker also provided hot water to these taps. The calorifier was heated by either hot water from the engine cooling system or by 240 volt ac electric heating.

5.6.3.5 It is suggested that the tanks are thoroughly flushed out and disinfected before use.

5.6.4 Heads (Forepeak)

5.6.4.1 The sea toilet was clean and the pump appeared to be serviceable. The toilet was a Jabsco manual pump type. The installation could not be fully tested while the vessel was ashore but the water pump-out mechanism was tested and worked correctly. The steel hinge screws on the toilet lid were badly corroded and should be replaced.

5.6.4.2 The sink unit and taps / shower nozzle were in satisfactory condition. The cupboards below the sink and behind the toilet were in good condition although the vinyl lining in some areas was slightly dirty and detached in places.

5.6.4.3 The vanity mirror mounted above the heads sink was badly tarnished.

5.6.5 Heads (Aft cabin)

5.6.5.1 The sea toilet was clean and the pump appeared to be serviceable. The toilet was a Jabsco manual pump type. The installation could not be fully tested while the vessel was ashore but the water pump-out mechanism was tested and worked correctly.

5.6.5.2 The sink unit and taps were in satisfactory condition. The cupboards below the sink and behind the toilet were in good condition although the vinyl lining in some areas was slightly dirty and detached in places.

5.6.5.3 A separate shower hose and head with hot & cold taps were located behind the toilet seat. This was tested and found to function correctly.

5.6.5.4 The vanity mirror mounted above the heads sink was tarnished.

5.6.5.5 A small fold-down table was located to the right of the heads that folds down over the toilet.

5.6.6 LPG Installation

5.6.6.1 The GRP gas cylinder storage locker was located within the port side cockpit locker. Two gas bottles, one of which was stored as a spare and not connected, were stowed in this locker. The locker was inspected and found to be well secured and gas tight to a level above the top of the cylinder / pressure regulator. A loose fitting GRP lid was fitted to the locker.

5.6.6.2 A locker drain hose was installed at the bottom of the gas cylinder locker in order to drain any leaked gas to the outside of the hull. The hose and attachments were in good condition. The outlet fitting on the hull was located at a height that was greater than 75mm above the loaded waterline.

5.6.6.3 A further three gas cylinders were stowed loose at the bottom of the cockpit locker. It is RECOMMENDED (type A1 recommendation) that these cylinders are not stowed on the vessel under any circumstances as there is no provision for their safe storage.

5.6.6.4 Flexible rubber hose connected the gas bottle & regulator to the copper tube at the side of the gas cylinder locker. There was no shut-off valve in this location. Copper tubing then led the supply through the port cockpit locker, cabin bulkhead and aft cabin lockers to the galley area and to an isolating cock in the galley cupboard to the left of the gas cooker. A further length of copper pipe led to the cooker where a flexible pipe conveyed the gas supply to the cooker. There was an additional isolating valve located in one of the lockers of the aft cabin, attached to the galley bulkhead.

5.6.6.5 Connected to the outboard gas cylinder was a pressure regulator. This was found to be clean and free from corrosion. The date stamp indicated that it was approximately six years old.

5.6.6.6 The rubber hose connecting the gas cylinders to the copper gas pipe had no date stamp or evidence of compliance to any standard. There was no evidence of damage or cracking on the hose. It is RECOMMENDED (type C recommendation with an implementation time of six months) that this hose is replaced by a maximum length of one metre of appropriately labelled gas hose. The hose should be marked to BS 3212 type 2 or BS 3212:1991 or BS EN 1763 class 2/3/4. This work should be performed by a qualified gas technician, such as those listed on the gas safety register. See http://www.gassaferegister.co.uk for further details.

5.6.6.7 The copper pipe passing through the cockpit locker, aft cabin and galley cupboard was adequately supported at regular intervals and was protected from chafing by short lengths of plastic hose.

5.6.6.8 The flexible armoured rubber gas tubing that runs between the gas pipe and cooker was partially corroded and of an unknown age. It is RECOMMENDED (type C recommendation with an implementation time of six months) that this hose is replaced. This work should be performed by a qualified gas technician, such as those listed on the gas safety register.

5.6.6.9 The installation was not further inspected or pressure tested for leaks.

5.6.6.10 Note that this survey is not any kind of gas safety certificate. This is only obtainable after comprehensive pressure testing and assessment by a qualified person listed on the gas safety register. See http://www.gassaferegister.co.uk for further details.

5.6.7 LPG Appliances

5.6.7.1 The Plastimo Neptune 2000 twin hob and oven installation (serial number 912256, 6.28kW output) was secured by a gimbal mechanism to the galley structure. An attempt was made to turn the cooker burners on but this was not successful due to an unknown fault with the gas system. The installation should be checked by a qualified gas technician in order that the fault can be diagnosed and rectified.

5.6.8 Galley

5.6.8.1 There was an Isotherm front opening 12 volt refrigerator installed in the galley area, to the left of the cooker.

5.6.8.2 There was an Isotherm top opening 12 volt refrigerator installed in the galley area, to the right of the cooker and under the galley work surface

5.6.8.3 There were two round stainless steel sinks in the area of the galley that runs from port to starboard. Both sinks are supplied with hot and cold fresh water from a monobloc chrome mixer tap. The left sink was also supplied with seawater via a manually operated foot pump. Both sinks were fitted with wooden covers that also serve as cutting boards.

5.6.8.4 There were a range of lockers and drawer units. The white melamine work surfaces and shelves were all fitted with fiddles to prevent items from sliding off when at sea. The galley units were all in satisfactory condition.

5.6.9 Electrical System

5.6.9.1 JUNO had a 12 volt dc electrical system, with an engine starting battery and three batteries for services. The batteries were located under the aft cabin bunk in an adequately ventilated area. The batteries were not adequately tied down or secured in order to prevent movement when the vessel is at high angles of heel. It is RECOMMENDED (type A2 recommendation) that all of the batteries are restrained by straps of adequate strength and these should be well attached to the hull structure.

5.6.9.2 Three of the batteries were found to have a very low charge, indicated by the red colour of the batteries' inspection windows.

5.6.9.3 Battery charging from the engine alternator was from a Lucas alternator.

5.6.9.4 Battery charging from mains supply power was through a SBC 300FR charger. This unit was located in the port cockpit locker.

5.6.9.5 In the same locker and adjacent to the SBC unit, a 240 volt ac master switch unit was

installed. This unit houses the breakers to isolate the shore power and to supply power to the water heater, 13A sockets and the SBC battery charger

5.6.9.6 Four individual quarter turn breaker switches controlled the output from the batteries. Service power was then distributed via a switch panel. Table 4 shows the functions of the switch panel. The panel also incorporated a LCD display to monitor the battery voltage. The facia of the panel was in poor condition with approximately four of the switch surfaces worn and damaged.

No.	Function	No.	Function	No.	Function
1	Navigation lights	8	Forward cabin	15	VHF / stereo
2	Anchor light	9	Aft cabin	16	Speed / log
3	Steaming light	10	Fresh water pump	17	Depth sounder
4	Deck light	11	Bilge pump	18	Nav. No.1
5	Compass / instrument lights	12	Shower drain	19	Nav. No.2
6	Navigation lights No. 1	13	Fridge 1	20	Autopilot
7	Saloon and spot lights	14	Fridge 2 / freezer	Bat	Battery voltage level

Table 4: 12 volt DC switch panel functions

5.6.9.7 The wiring that could be seen appeared to be serviceable. All the interior lights were in working order.

5.6.9.8 The engine start panel was provided with suitable instruments and alarms for effective engine condition monitoring. This was located on the starboard side of the cockpit, next to the helm.

5.6.10 Navigation Lights

5.6.10.1 A transom mounted stern light was adequately attached to the pushpit.

5.6.10.2 A port & starboard bicolour light was adequately attached to the pulpit.

5.6.10.3 The deck level navigation lights were tested and found to function correctly. It was not possible to determine whether the masthead lights were functioning due to the excessive level of ambient light.

5.6.10.4 A deck spot light was mounted on the mast. This was tested and found to function correctly.

5.6.11 Navigation Equipment

5.6.11.1 JUNO was equipped with a Plastimo Olympic 135 tabernacle mounted compass, positioned on the helm tabernacle. The compass light worked correctly.

5.6.11.2 A Raymarine C80 GPS Chartplotter was installed above the navigation table. This was powered up and was found to function.

5.6.11.3 A Navico RT6500 VHF radio was installed at the chart table. When powered up, it was found that the radio's squelch adjuster could not be correctly tuned.

5.6.11.4 An Autohelm wind speed & direction indicator was installed at the top of the mast, with one display mounted above the chart table and another at the helm.

5.6.11.5 A Raymarine speed log display was mounted at the helm.

5.6.11.6 An Autohelm depth sounder display was mounted above the chart table with another at the helm.

5.6.11.7 A Cetrek C18 Autopilot display unit was mounted at the helm. This controlled a Seastar hydraulic unit mounted at the rudder steering yoke.

5.6.11.8 A Weatherman radiotelex unit was mounted above the chart table.

5.6.12 Space Heating System

5.6.12.1 JUNO was fitted with an Eberspächer Airtronic heating system. The system heats a closed loop water circuit, which is piped to the two cabins and saloon where heat exchangers and fan blowers transfer the heat to the air space.

5.7 ACCOMMODATION AND DÉCOR

5.7.1 Aft Cabin

5.7.1.1 Access to the aft cabin was from either side of the companionway hatch. The port side access leads through the heads compartment and into the cabin. The teak faced plywood doors were was found to be in serviceable condition and closed correctly.

5.7.1.2 The interior of the aft cabin was finished with solid varnished teak and varnished teak panelling and furniture. The woodwork was found to be in good condition and generally free of splits or damage. The ceiling area was lined with a light brown faux suede material, which was in acceptable condition.

5.7.1.3 The teak faced plywood sole boards were in fair condition.

5.7.1.4 The bunk cushions were found to be in good condition and free of damage or stains.

5.7.2 Main Saloon

5.7.2.1 Access to the main cabin was from the companionway and down a number of teak wood steps

5.7.2.2 The teak faced plywood sole boards were in fair condition. The colour of the sole boards around the chart table and galley area was lighter and had suffered more wear than the sole boards of the saloon.

5.7.2.3 The teak faced plywood table functioned correctly and was able to fold and stow correctly.

5.7.2.4 The interior of the saloon was finished with solid varnished teak and varnished teak faced plywood panelling. The woodwork was found to be in good condition and free of splits or damage.

5.7.2.5 The saloon cushions were found to be in satisfactory condition with some mildew staining.

5.7.2.6 Beige vinyl panels were fitted to the top and sides of the coachroof. These were found to be in good cosmetic condition and free of damage. Some of the panels on the starboard side were not fully fastened and should be re-secured.

5.7.2.7 The interior of the lockers were lined with a soft vinyl material. The lining was becoming detached in places where the foam backing material had become degraded.

5.7.3 Forepeak

5.7.3.1 The teak faced plywood door that gave access to the heads and forepeak was found to be in serviceable condition and closed correctly.

5.7.3.2 The interior of the forepeak was finished with solid varnished teak and varnished teak faced plywood panelling. The woodwork was found to be in good condition and free of splits or damage.

5.7.3.3 The teak faced plywood sole boards were in fair condition.

5.7.3.4 The bunk cushions were found to be in good condition and free of damage or stains.

6 SAFETY EQUIPMENT

6.1 ANCHOR AND CHAIN

6.1.1 The 45 lb (20kg) galvanised CQR anchor was inspected and found to be free of wear but with some surface corrosion.

6.1.2 The anchor chain was shackled and seized to the CQR anchor. The shackle was in satisfactory condition. The chain was generally free of wear and corrosion and all were in good working order. The anchor chain was made from short plain linked galvanised steel. Dimensions of the chain were 10mm x 35mm x 50mm.

6.1.3 The anchor chain was attached to a length of anchor warp. The bitter end of the warp was correctly tethered to a hull fitting by a short length of small diameter line.

6.1.4 A 26kg Danforth type kedge anchor was stowed in the cockpit starboard locker.

6.2 BAILING / BILGE PUMPING

6.2.1 It is RECOMMENDED (type A2 recommendation) that two buckets are stowed on board. These should be between 9 and 14 litres in capacity

6.2.1.1 A manual diaphragm bilge pump was located on the starboard aft deck and was operated from the cockpit. This was tested and found to function correctly. The handle should be tethered to aid its location and to prevent its loss in the event of a capsize. This pump collected water from the sump under the main saloon sole. The end of the tube was fitted with a strum box.

6.2.1.2 An electric bilge pump was also installed on JUNO. This pump had an automatic pump mode selected by a switch located next to the battery switches in the aft cabin. This pump was tested and found to operate correctly. The float switch and pump inlet were located in the same sump as the manual bilge pump.

6.3 DETECTION EQUIPMENT

6.3.1 There was no radar reflector found on the vessel. It is RECOMMENDED (type A2 recommendation) that one is installed on the vessel.

6.3.2 There was no fog horn found on the vessel. It is RECOMMENDED (type A2 recommendation) that one is installed on the vessel.

6.4 FIRE FIGHTING EQUIPMENT

6.4.1 One fire extinguisher (date expired) was found on board, located on the cockpit access steps. It is RECOMMENDED (type A2 recommendation) that at least two 1kg dry powder fire extinguishers are installed.

6.4.2 It is suggested that an automatic or semi-automatic fire extinguisher is installed in the engine compartment.

6.4.3 A fire blanket was located in the galley area, within easy reach of the cooker.

6.5 FIRST AID KIT

6.5.1 None were found on the vessel.

6.6 LIFEJACKETS

6.6.1 None were found on the vessel.

6.7 MAN OVERBOARD RECOVERY EQUIPMENT

6.7.1 Two white plastic life buoys were found in the aft cabin. They were not fitted with a floating lifeline. One buoy was fitted with a broken light.

6.7.2 One life buoy should be fitted with a water light, drogue and buoyant line.

6.7.3 All lifebuoys should have the vessel's name applied to both sides of the buoy in large black lettering.

6.8 PYROTECHNICS

6.8.1 One RORC distress flare pack (Pains Wessex) was found on board and found to have expired. It is RECOMMENDED (type A2 recommendation) that a new pack is procured and stowed ready for use.

Appendix 1. Types of Recommendations Used in This Report

The recommendations detailed within the body of this report are presented in five categories and are classified as follows:

Type A1 Structural, mechanical or other defects requiring IMMEDIATE attention i.e. those affecting structural strength, seaworthiness or safety which MUST be repaired BEFORE the vessel is relaunched at this time.

Type A2 Structural, mechanical or other defects affecting strength, seaworthiness or safety which may be repaired after the vessel is relaunched but MUST be repaired before the vessel is taken to sea.

Type B Defects not affecting strength, seaworthiness or safety but which, by their nature, should be dealt with before putting the vessel afloat.

Type C Structural, mechanical or other defects NOT requiring immediate attention but are to be dealt with within a specified time period.

Type D Non-essential or cosmetic defects whose repair may be left to the Owner's convenience. All suggestions are, unless noted otherwise, of this type.

These recommendations are intended to be only a guide to necessary rectification work. Both type A and type B recommendations cover urgent remedial work to be carried out as soon as practical. Type C recommendations cover significant remedial works to be carried out within the specified time period. It should also be noted that, in some instances, defects are noted within this report without a covering recommendation. In such cases either no action is necessary or the remedy is self-evident.