Pre-purchase Survey of Yacht 'Kxxxxx ' – 2000 Nauticat 331

Report number 021402
1/03/2014

Compass Marine Yacht Surveys

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General Notes

Survey carried out on **25th/26th February 2014, afloat and ashore** at Chichester Marina for: **Mr XXX** (the **Client**) by the surveyor: **Andrew Edmond, Compass Marine Yacht Surveys (www.compassmarinesurveys.com) .**

Recommendations and suggestions defined:

Recommendation (Level A) - Items that should be addressed before vessel is used (or within a given period) and, or, which may affect insurability. They relate to defects with a high risk of failure and moderate to serious consequences for the safety of the crew and the vessel.

Recommendation (Level B) – These require attention in the near future or a given time span. They pose less imminent risk but are likely to cause problems in future, with moderate to serious consequences for the safety of the crew and, or, vessel.

Suggestions may also be made regarding items that may lead to impaired safety or value in the future. Some suggestions may only have consequences for appearance or comfort of crew. These can affect value.

Quotations should be obtained where recommendations or suggestions have been made, and any significant work checked by a competent person once carried out. Whether or not a recommendation is made or at what level, there is no guarantee that an aspect or component will not fail unexpectedly.

Conditions of Survey

The vessel was lifted during the survey and was examined afloat and ashore. Moisture readings were taken both within two hours of lift out and approximately 24 hours later. The Sovereign Moisture Meter's calibration was checked and found adequate before taking moisture readings. The conditions when readings were taken were adequate. Details were as follows:

	Day 1 (2 hrs after lift out)	**Day 2 (24 hrs after lift-out)**
Air Temperature:	13.1°C	13.9°C
Surface temperature:	9.3°C	11.9°C
Relative Humidity:	61.9%	46.2%
°C above Dew Point:	4.4	9.4
Precipitation:	Heavy at start then none	No precipitation

Please see Section J for more on moisture readings. Please see Section K on scope and limitations.

The masts wese stepped so could only be inspected from deck level. Any defects found above that level were seen using a high definition x20 optical zoom camera. This does not allow full examination aloft.

The vessel had an epoxy coating and was seen washed down.

The survey included a visual inspection of the engine and installation both when stationary and when running under modest load while tied alongside.

The survey and this report also take into account **certain comments made by the Client** prior to the start of the work in particular that extensive cruising (six months at a time) are planned including round Britain and "to warmer climes". It is assumed that this will entail some offshore passages. The owner also said the vessel had not been lifted for three years. Although a pre-purchase survey, the client did not require a valuation.

Before the inspection ashore began the hull around the shoring and keels was examined for evidence of distortion.

No special conditions affected the survey other than as mentioned in the text.

Summary and recommendations

The vessel had been under the same ownership since she was first commissioned in 2000. She had been maintained though much was original, as manufactured. The hull and deck were considered sound and no signs of damage or repairs were seen. A small number of blisters were seen close to the P bracket but this is considered minor. The through-hull fittings below or near the static waterline were all serviceable though bungs should be carried.

The lead ballast keel was firm to the hull though keel studs could not be tested. Damage to the leading edge of the ballast keel is not considered serious.

The steering needs some attention to identify the oil leaks at the rudder and wheelhouse helm pump, fit a by-pass valve for the emergency tiller and ensure the packing gland at the rudder tube is in good order. The bow thruster installation was sound.

The hull deck joint was sound where seen. The teak laid deck and coachroof were worn but all fastening caps were in place and caulking was largely intact. Repairs were needed where this is not the case. Deck moulding moisture readings on side decks by way of wheelhouse from below were low but no other access was gained. Access should be gained below coachroof and decks to better assess the extent of any cored sections and whether water has entered. Hatches and portlights were all in fair condition. The guard rail, pushpit and pulpit were sound though two stanchion bases were slightly loose on the toe rail. No jackstays were seen.

Evidence of leaks at chain plates and other deck fittings was seen and it would be prudent to re-seal shroud deck plates along with pad eyes and genoa travellers to maintain the deck's condition. Access should be created to inspect all chain plates and knees.

The standing rigging was original and needs replacing. Cracked terminals were also seen. A split pin in a clevis pin on the bob stay was at risk of coming out. Spars were generally in good condition though no spinnaker pole was seen. Stack packs were in need of a clean but otherwise were serviceable. Winches and other deck fittings were considered in good condition.

The engine was in need of minor attention including a new drive belt and attention to the stainless steel water trap. A professional service should be considered. Packing in stuffing box will need replacing if dripping while engine is stationary cannot be stopped by tightening the packing nut. It is suggested that at the same time, the boot and clips are replaced and stern tube inspected. Fuel filler units have been letting in dirt and water and need replacing. The tanks will need cleaning (a system for this is fitted).

The main anchor chain is only 4m long and should be at least 20m for the type of use intended. Other minor work is needed to the anchor cable. The anchor light was not working, new fire-fighting equipment and some new life saving equipment is needed. Navigation equipment was seen working though some additional items will be needed for off-shore passages.

The gas system including the cooker was in fair condition except for the regulator and the flexible hoses which need replacing. The copper pipe will also need replacing if found corroded under a fitting in the gas bottle locker. Service batteries will need replacing soon. The shore power system operated when tested. The water system was in fair condition and water was not tainted.

Minor work is needed to the WC and holding tank. The diesel cabin heating system was in working order and installation sound but, due to lack of access, it could not be confirmed that an air intake on the wheelhouse coaming, close to the heater's exhaust outlet, was the engine air intake and not the heater blown air intake (there was a second intake fitting in a safer location for the heater). This should be confirmed.

The cosmetic appearance was generally good both externally and below decks and security was fair.

Recommendations

Hull

Wooden bungs (Level A) *–Wooden bungs should be located and secured with a line close to each through hull fitting, including transducers.*

Blisters by P bracket (Level B) – Monitor blisters around the P bracket annually and consult a GRP expert about a local repair if new blisters continue to appear.

Ballast Keel

No recommendations

Rudder and steering

Steering hydraulic by-pass valve (Level A) *– Fit a by-pass valve to free the emergency tiller in a visible and accessible location close to the cylinder.*

Stuffing box on rudder tube and oil leak at hydraulic cylinder (Level B) – Tighten rudder tube stuffing box nut and monitor any leaks. Replace packing if necessary. Identify source of fluid leaks at the cylinder (or connections to copper pipes) and at the wheelhouse helm pump and gain access to check for oil leaks at the aft steering position.

Deck, Cockpit Hatches, Portlights Guardrails and Jackstays

Stanchion base and pelican hook (Level A) *–Tighten stanchion base fastenings where loose. Fit jackstays. Reseal deck safety rings (pad eyes) to prevent water ingress. Replace split pin at stern boarding gate pelican hook.*

Recommendation (Level B) – Repair caulking on teak deck where it has failed. Gain access below side decks to c heck moisture under any cored areas not already checked.

Rig

Bobstay split pin (Level A) *– Open split pin on bobstay turnbuckle.*

Standing rigging (Level A) *– Replace standing rigging, bottle screws and toggles ensuring good articulation, alignment and spreader angle.*

Shroud chain plates (Level B) – Expose all chain plates, test bolts and inspect for water damage to knees. Reseal chain plates below deck plates on all shrouds.

Main halyard (Level B) – Repair or re-splice main halyard.

Main sheet cotter rings (Level B) - Replace cotter rings between main sheet block attachment and traveller and to boom with split pin. Reseal genoa travellers on deck.

Engine fuel system, stern gear and cathodic protection

Drive belt and hose clips (Level A) *– Replace drive belt. Add clips to the raw water hose join and ideally replace hose with a single length.*

Diesel filler units (Level A) – *Replace diesel filler units with better quality fittings. Clean tanks before a sea passage using system fitted.*

Stuffing box (Level A) *– Tighten stuffing box nut and replace packing in stern gland if this does not stop the dripping while engine stationary.*

Coolant engine oil and exhaust water trap (Level B) – Renew coolant and replace engine oil and filter. If tightening the drain on the water trap does not stop the leak, remove and inspect/repair.

Safety and other Equipment

Anchor chain and warp (Level A) *– Replace chain with at least 20m of 8mm galvanised chain. Splice warp to chain correctly so the warp will pass through the hawse pipe. Tie off bitter end of warp in anchor locker with a lanyard that could be easily cut in an emergency. Fit a, chain and warp of appropriate sizes to the kedge anchor. Mouse shackle securing anchor to chain.*

Anchor light (Level A) *– Replace anchor light bulb or effect other repair.*

Fire extinguishers (Level A) *- Before the vessel is used, the fire extinguishers should be serviced or replaced and at least two more added, all to at least 13A/89B rating. Fire extinguishers should be serviced annually or replaced every five years. Secure a fire blanket in accessible position in galley. Consideration should be given to fitting a smoke alarm in the galley and engine compartment and an automatic fire extinguisher in the engine compartment.*

Life-saving equipment (Level A) *– Fit radar reflector, carry full set of flares for offshore passages, lifebuoys should have lights and one should have a line. Lifejackets should each have crotch straps and a spray hood. Carry safety harnesses. A danbuoy is also recommended by the RYA along with MOB recovery system, 406 MHz EPRIB/PLB and liferaft with grab bag. Carry other appropriate lifesaving equipment (consult RYA).*

Radar scanner bracket and compass (Level B) - Inspect Radar scanner bracket aloft. Adjust compass. Carry emergency VHF aerial.

Accommodation and on-board systems

Gas regulator, hose and pipe (Level A) *– Replace regulator and flexible hose in gas locker. Remove fitting securing pipe to hull in bottle locker. Clean and inspect pipe. Replace pipe if necessary. Renew clip. Replace armoured hose to cooker.*

Diesel heater intake and exhaust (Level A) *– Confirm that intake cowl on aft deck locker is for the heater blown air intake to ensure heater air intake is clear of any exhaust fumes.*

Gas alarm and leak detector (Level B) – Fit leak detector and gas alarm.

Battery ventilation (Level B) – Improve battery's hydrogen ventilation.

Holding tank and WC (Level B) – Tighten clip or otherwise prevent leak from hose on top of holding tank. Investigate and prevent other leak seen forward of heads compartment. Replace joker valve on heads. Add a second clip to seawater inlet to WC pump.

The full report should be read to obtain an accurate account of the vessel's condition.

Details of "Kxxxxx"

Type of vessel: Nauticat 331
Designer: W. Aarnipalo
Builder: Nauticat Yachts Oy, (formerly Siltala Yachts OY) Finland.
Year: Built October 1999 for sale in 2000

Serial no/ HIN: "FI – SL T 331 95 J 9 00 ". Seen on starboard side of counter stern.
Registration: UK Part 1: None;
Small Ships: SSR 90818
RCD Category: B – Defined by the EU as "Offshore: Designed for offshore voyages where conditions up to, and including, wind force 8 and significant wave heights up to, and including, 4m may be experienced". (8 persons plus 25 kg personal gear each).

Construction: GRP hull, deck and superstructure with cast lead ballast keel and semi-balanced skeg hung rudder.
Rig: Masthead Bermudan ketch
Engine and transmission: Yanmar 88 HP (continuous rating 80HP), indirect cooled with Kanzaki KM4A gearbox.
Propulsion: Three bladed left handed 21" x 14" bronze propeller on 40mm shaft

The following measurements were obtained from the manufacturer's handbook for the vessel and have not been checked by me and so no guarantee of accuracy can be given.

Length Overall	34'1"	10.40m (11.4 with bow spit)
Length Water Line	28'6''	8.60m
Beam:	11'2''	3.40m
Draft:	5'3''	1.65m
Displacement:	18,200 lbs	8,300kg
Ballast	5,300 lbs	2,350kg
Water capacity	88 gallons	450 ltrs
Fuel capacity	110 gallons	550 ltrs

A. Hull skin, structure and through hull fittings

The vessel was seen afloat, in the slings and ashore in a cradle. The area of the hull around the keel and the shoring was checked for deflection before the vessel was boarded ashore. None was seen.

A.1. Hull below Waterline

The monocoque hull is constructed of GRP utilising unidirectional and mulit-axial fibres. Internally the hull skin below the waterline was visible in several places though it was coated in paint.

a) Coatings - The vessel had a build-up of soft antifouling coatings which had begun flaking and cracking in places. Below the antifouling was an epoxy coating and below that was the white gel coat (seen on the keel).

Suggestion - It is suggested that the antifouling is scraped off by hand, primed and re-coated.

b) Damage – No damage was seen to the hull below waterline.

c) Moisture readings - Readings were taken on Scale A (0-100) of a Sovereign Quantum moisture meter, shallow and deep mode, and Scale 1 (0-100) of a Tramex Skipper moisture meter. Both scales are relative and do **not** express moisture content as a percentage of dry weight. See section J for more information on interpreting moisture readings.

Readings were taken from 33 areas of the hull, plus 6 on the rudder and 4 on the skeg approximately 100 x 75 mm where the antifouling was scraped off. Additional readings were taken through the antifouling but these were considerably higher and disregarded as the coating had retained moisture since the recent lift out.

Readings were taken within two hours of lift-out and 24 hours later when readings were effectively the same. Note that GRP on parts of the vessel not below the water line will also show a moisture reading and that readings are affected by conditions. Compare readings below the waterline to the topsides (normally considered dry) in A.2. (c) where 10 shallow 9 deep (10/9) were the driest readings and can be considered 'dry' for this vessel and the conditions.

Table 1: Moisture readings on the hull

Mode	Range below waterline (Sovereign meter)	Readings below waterline (Tramex meter)
Shallow	21-32	
Deep	16-25	5-33

Moisture readings (see Table 1) varied steadily across the hull and were generally at the level where moisture related defects can be expected. However the epoxy coating would have retained moisture and would normally be expected to drop by one category after 2-4 weeks ashore (see Section J). This would bring the reading down to a level at which the risk of moisture related defects developing is moderate to low.

The highest readings were on the starboard bilge and along the centreline, especially immediately forward of the keel (32 shallow/25 deep) which is below the water tank and main chain plates which were seen to be leaking. This pattern was confirmed by the Tramex meter which reads deeper.

Readings were lower on the rudder and skeg (17-21 shallow and 15-19 deep with 22/19 being the highest) with no significant difference on the two sides. These readings give little cause for concern.

Readings were all less in deep mode than in shallow indicating that any significant moisture penetration is not yet very deep and there is no significant hydrolysis within the laminate.

Internally, readings on the hull were low where access was possible.

If the hull was given a period ashore to dry out and if all readings fall below 20, a new preventative epoxy coating could be considered.

d) Blistering - No evidence of 'osmotic' blistering was found on the hull itself, the rudder or the skeg. Six small blisters (<10mm diameter) were seen around the P bracket bonding to the hull externally. These were sampled and found to contain a substance under considerable pressure and approximately pH 8-9 (slightly alkaline). The blisters were directly under the gel coat and the laminate below was hard.

The above findings suggest a very local occurrence of osmosis, considered to have been caused by uncured epoxy or filler at the join between the P bracket and the hull. This is considered to be of minor concern but because of its position it will require checking in future to see if more blisters appear.

Always storing the vessel ashore out of season to allow some natural drying out to occur and will contribute significantly to maintaining the current condition.

Recommendation (Level B) – Monitor blisters around the P bracket annually and consult a GRP expert about a local repair if new blisters continue to appear.

e) Wicking and gel-coat aeration – Epoxy coating was not scraped off.

f) Voids and delamination - Hammer sounding revealed no indications of delamination or voids.

g) Stress cracking – No stress cracking was found externally below the waterline.

A.2. Topsides

The hull above the waterline was of GRP with no core material. This was visible internally at the anchor locker, engine compartment and either side of the wheelhouse. The inner side of the hull skin above waterline was also visible under the heads and galley sink units. There was a teak rubbing strake fastened immediately below the toe rail. There was a double boot strap and a cavita line in blue gel coat. Slight distortion of the hull by way of the chain plates where the knees were bonded to the hull was not considered to be of concern.

a) Gel coat condition - The appearance was generally very good although there were scratches in places on the boot straps. These have been painted. Otherwise no signs of repairs or damage were seen on the topsides.

b) Delamination and voids – Light hammer sounding did not reveal any signs of delamination or voids on the topsides.

c) Moisture readings – Moisture readings were taken as described in Section A.1.c. above. Readings were below twenty and typically 13/10 deep on the topsides (see Table 1). The lowest reading was 10/9. For this vessel, this can be considered dry.

d) Rubbing strake – A teak rubbing strake was in good condition.

A.3. Bulkheads and Structural Stiffening including internal mouldings

A number of components contribute to the overall structure:

- The shell moulding
- Internal stringers running longitudinally one each side of the centreline (providing longitudinal stiffening) seen in the aft cabin, either side of the engine compartment, under saloon cabin sole and forward to the forecabin seen on the starboard side only
- Internal stringers running longitudinally along the topsides (seen either side of the wheelhouse)
- Substantial 'floors' running transversely distributing the keel loads: one forward; one aft and two under the engine and one below the mast compression post
- Partial bulkheads running laterally in the aft cabin forward of the rudder post, above the floors (described above), in the fore cabin below the bunk and aft of the anchor locker. These are bonded to the hull.
- The mast compression loads are transferred to the hull above the keel through a steel compression post and onto the substantial lateral floor below the mast

a) Stringers and floors– Hammer sounding detected no delamination. Moisture meter readings where taken were below 15/10. No damage was seen fore and aft of the keel though access was limited in saloon and aft cabin.

b) Bulkheads – Bulkheads and bonding were firm to the spike and the hammer where tested. Here moisture readings on the plywood were not high. Protecting bulkheads from water ingress should be considered for the vessel's longevity. Though moisture ingress especially from main shroud chain plates was seen, this was not considered to have affected the bulkheads as the chain plates were fastened to wooden knees bonded to the hull (not to bulkheads) and the water had run into the bilges where bulkheads do not extend.

c) Mast compression post – No sign was seen of the post being compressed into the floor below but access was very restricted.

A.4. Skin Fittings and through hull apertures

Note: Ball valves and gate valves are usually separate from both skin fitting and tailpipe. No skin fittings, tailpipes or valves were dismantled as part of this survey.

The location, function and condition of all through hull fittings, ball valves and tailpipes and other through-hull apertures is as follows (working forward from the stern). Except for the depth transducer, all through hull fittings

below the waterline were seen internally while afloat and none seen leaking. Antifouling was scraped off part of each skin fitting for external inspection.

1. **Exhaust** –Stainless steel through-hull exhaust fitting on the starboard side of the counter stern. Secure externally. Not seen internally due to restricted access.
2. **Engine raw water inlet** – In engine compartment aft of engine on starboard side and below static waterline, the raw water inlet skin fitting and ball valve were in serviceable condition with some corrosion visible, secure to the hull when vigorously tested, opened and closed fully and freely and in serviceable condition with some corrosion visible. The ball valve was fastened via a short stainless steel pipe (external visible condition fair and resisted vigorous testing) to a strainer with a polycarbonate sight plate, double clips to the hose were secure and serviceable and the hose was in fair condition.
3. **Log transducer** – Immediately forward of the engine inlet on the starboard side was the nylon log transducer. This was seen removed with the plug in place. The fitting was secure to the hull when lightly hammer tested externally.
4. **Depth transducer** – Forward and outboard of the log transducer was the nylon depth transducer. Not seen internally due to restricted access but secure externally when lightly hammer tested.
5. **Gas locker drain** – Directly through hull topsides above static waterline. Gas locker was sealed from rest of vessel. The skin fitting was nylon, firm to the hull.
6. **Engine exhaust siphon loop vent** – On the port topsides approximately level with the aft of the wheelhouse was a small skin fitting for the exhaust siphon loop vent. This was firm to the hull but not seen internally due to restricted access.
7. **Heater exhaust** - Forward of the exhaust loop vent was the stainless steel Eberspacher heater exhaust outlet**.** This was firm to the hull but not seen internally due to restricted access.
8. **Deck drains** - On the topsides above the static waterline, just aft of the wheel house doors were the deck drains. These have brass or bronze skin fittings and tail pipes and no valve. On the starboard side this was immediately next to the two bilge pump outlets. Both were firm to the hull and clips secure. The starboard hose was slightly too short and is therefore not fair to the tailpipe.
9. **Bilge pump outlets -** The outlets for the manual and electric bilge pumps were also on the starboard topsides above the static waterline, just aft of the wheel house door and accessible from inside the wheel house. The skin fittings were firm to the hull. Hoses secured to tailpipes by serviceable clips and hoses in serviceable condition.
10. **Galley sink outlet –** Below the galley sink on the starboard side, below the static waterline. The skin fitting (seen externally where antifouling scraped off), ball valve and tailpipe were in fair condition, secure to the hull when vigorously tested, opened and closed fully and freely. Hose clips secure.
11. **Heads outlet and holding tank pump overboard** - Below the sole board adjacent to the heads compartment door and below the static waterline were the heads outlet and the holding tank overboard outlet. The skin fittings, ball valves and tailpipes were in serviceable condition, secure to the hull when hammer tested, opened and closed fully and freely. Hose clips secure.
12. **Heads inlet –** Forward of the heads and holding tank outlets and below the static waterline on the port side was the heads inlet. The skin fitting, ball valve and tailpipe were in serviceable condition with some corrosion visible, secure to the hull when vigorously tested, opened and closed fully and freely. Hose clips secure.
13. **Heads sink outlet**– Below the heads sink unit and below the static waterline on the port side was the sink outlet. The skin fitting, ball valve and tailpipe were in serviceable condition with some corrosion visible, secure to the hull when vigorously tested, opened and closed fully and freely. Hose clips secure.
14. **Holding tank vent** – On the port bow above the static waterline was the holding tank vent. This was secure to the hull externally and not seen internally due to restricted access.
15. **Anchor locker drains** – On either side of the stem, above the static waterline were the anchor locker drains, directly through the hull with no skin fitting. The anchor locker was sealed from the rest of the vessel.

The skin fittings, ball valves and tailpipes for the deck drains, bilge pump outlets, engine inlet, heads inlet and outlet, holding tank outlet and sink outlets were all either brass or bronze but are not thought to be the quality brass most prone to dezincification and failure in marine applications (CW617N).

No wooden bungs were seen by skin fittings. Wooden bungs should be located and secured with a line close to each through-hull fitting, including exhaust and transducers.

Recommendation (Level A) –Wooden bungs should be located and secured with a line close to each through-hull fitting, including transducers.

Suggestion – replace starboard deck drain hose with a longer length of hose.

Sealant (or light GRP laminate) around the internal flange or nut of the log and depth transducer fittings will help to prevent flooding in the possible event of the fitting parting due to over-tightening or other cause.

B. Ballast keel, keel fixings and keel matrix

The vessel has a lead ballast keel attached to a stub keel by stainless steel studs and nuts.

a) Keel Condition - The keel had a blue soft antifouling paint coating. There was evidence of impact at the bottom of the leading edge, but no cracking was seen aft or forward of the keel on the hull and no damage was seen internally, though access was restricted.

b) Keel fixings – Only two keel studs and nuts were seen partially covered in dirty bilge water and below the bilge pump strum boxes and hoses. Access was very restricted and no hammer or other stress test could be done but nothing of concern was seen. The remaining keel bolts were either under GRP below the engine or below the water tank under the saloon sole and could not be seen or inspected.

The keel was flexed with the vessel in the slings but no movement was seen in the join. No seepage of water was seen from the stub keel and ballast keel join while the vessel was ashore.

Stub keel, keel root and 'floors' – To distribute the keel loads, the hull in the vicinity of the keel is supported by three substantial 'floors' (aft and forward of the engine and forward of the saloon) with additional reinforcement below the engine (no access was gained below the water tank above the forward half of the keel). The floors extend laterally to meet (approximately) the saloon and aft cabin soles. The floors are of GRP probably with core material. Hammer sounding revealed no delamination or debonding, though access very was restricted in the aft cabin and saloon. Moisture readings were low.

C. Rudder and steering

a) Rudder blade - The semi-balanced rudder blade is two halves of moulded GRP bonded over the stainless steel rudder stock with four tangs welded to the rudder stock. This was confirmed using a metal detecting tool. No cracks, damage or other defects were seen on the blade. Hammer sounding revealed no voids or delamination. The blade was stress tested and found secure. Moisture levels were mostly below 20 on the Sovereign meter with only one shallow reading above 20 (22). The full range was 18-22 shallow and 14-19 deep. These are low readings for underwater areas especially rudder and skeg.

b) Skeg –The rudder skeg provides support near the base of the rudder. Hammer sounding revealed no voids or delamination. The skeg was stress tested using body weight and no defect found. Moisture readings were 17-20 shallow and 15-17 deep.

The rudder stock was secured to a bush housed in a GRP fitting at the foot of the skeg. This was bonded to the skeg and the join was seen in fair condition. No play was detected in this bush. These are low readings for underwater areas especially rudder and skeg.

c) Rudder stock and rudder tube - The magnetic rudder stock (considered Duplex grade stainless steel) was 40mm diameter and passes through the hull via the bronze rudder tube which terminates some inches above the waterline with a bush and packing gland (with grease nipple fitted). The packing gland was fastened over a stainless steel plate which was bolted to a horizontal plywood member bonded to the hull. These were all found sound. Where the rudder tube was bonded to the hull below the packing gland there was a build-up of harmless verdigris, this is

thought to be of no concern but the gland should be monitored for any signs of dripping and the packing nut tightened (or packing replaced) if seen. No slack was detected in the top bush.

d) Wheel steering – The hydraulic steering was a Capilano system. A stainless steel tiller, was fastened to the top of the rudder stock. Bolt fastenings were secure. There was a key and pin between the stock and the tiller. The tiller was fastened to the steering cylinder (hydraulic ram model BA 150 7TM) which was fastened to a horizontal plywood member bonded between the hull and the bulkhead. All were found secure and in fair condition.

Flexible hydraulic hoses run from the cylinder to the connection block from which copper pipe runs forward to the two steering positions.

Oil was lying on the hull immediately aft of the P bracket fitting internally. This had either come from one of the pipe or hose connections or from the cylinder. Oil was also seen dripping from the wheelhouse helm pump. There was no access to the aft steering position pump. The exact source of these oil leaks should be identified and rectified.

The number of turns from lock to lock at the wheelhouse helm pump is adjustable from just over 3 turns to just over 5. At the aft steering position (wheel 800mm dia) this was not adjustable and was set at 5. Neither wheel caused the other to turn indicating valves are working correctly. Both allowed a small degree of creep when turned hard over. This is normal. Neither wheel bounced back when turned hard over (indicating the system is free of air).

e) Autopilot – The Raytheon ST6000+ autopilot was seen switched on and functioning but not fully tested. The control units were mounted at the wheelhouse and aft steering positions and the main CPU was mounted under the deck to starboard of the wheelhouse steering position. The 1250v pump was located below this steering position in the engine compartment. There were valves to isolate the autopilot pump. The fluxgate compass was located in the hanging locker to starboard of the heads compartment. Both control units had rudder position indicators.

f) **Emergency tiller –** An emergency tiller was seen and could be readily fitted to the rudder stock. No by-pass valve or other means of allowing the rudder to turn freely of the hydraulic system was found (and the owner was not aware of any such valve) and the emergency tiller could therefore not be turned. A visible and readily accessible by pass valve (rated at 1000psi working pressure) should be fitted close to the cylinder (to reduce oil drag).

a) Bow thruster – The tunnel was firm to the hull and no cracks were seen to the bond (which was partly scraped of antifouling. There was no build-up of the hull at the tunnel's leading edge to prevent turbulence entering the tunnel. The hull at the aft edge of the tunnel was recessed to present a fair line when under way. The impeller was turning clear of the tunnel and there was acceptable play when turned. The impeller anode needed replacing and was replaced during the survey. The anode for the internal unit was 40% depleted. The thruster was tested briefly while afloat and found to work effectively.

The control for the bow thruster was at the aft steering position only. An isolator was seen in the engine compartment.

Recommendation (Level A) – Fit a by-pass valve or other means of freeing the emergency tiller close to the cylinder and both visible and accessible.

Recommendation (Level B) – Tighten rudder tube stuffing box nut and monitor any leaks. Replace packing if necessary. Identify source of fluid leaks at the cylinder (or connections to copper pipes) and at the wheelhouse helm pump and gain access to check for oil leaks at the aft steering position.

D. Deck

D.1. Hull-Deck Join

The hull moulding had a horizontal flange turned inboard and the deck is fastened on top of this with sealant and machine screws with nuts that also fasten the teak toe rail. This was seen under the side decks either side of the wheelhouse. Where the join was seen, there was evidence of sealant and fastenings did not show signs of corrosion.

These were flow-coated and so were not sampled. There were no signs of water ingress or corrosion at the hull deck join where seen.

The toe rail was in fair visual condition.

D.2. Deck, coachroof and wheelhouse

The deck, coachroof aft deck and wheelhouse sides are constructed of a single GRP moulding. The wheelhouse roof was a separate moulding with moulded non-slip surface. Cored areas were seen to the side decks from either side of the wheel house and fore deck from anchor locker. Under load bearing fittings backing pads were seen, though these were over-laminated. The decks and coachroof are teak laid. There were two stainless steel handrails each side of the wheelhouse roof.

a) Cosmetic condition, crazing, cracking and damage - The appearance of GRP was generally good and teak was fair. No damage was seen.

b) Teak – The teak laid coachroof was in fair condition though some caulking had parted from the planking. Here the teak had been treated and not cleaned. The teak laid decks had been worn down by approximately 1-1.5 mm. Caulking was largely still intact though a few places were seen on the decks and more on the coachroof where the it was no longer bonded to both adjacent teak planks and is likely to be letting water down to the laminate. None of the caps covering the fastening screws were missing. It is not known if screws penetrate the laminate on the deck and coach roof (though some were seen to have penetrated the laminate at the anchor locker lid where there is no core). This would allow any water penetrating the paying or teak to pass into any cored areas. Moisture readings below the cored side decks by way of the wheelhouse were low (below 15/10 where access was possible indicating that the laminate was not 'wet' and that the side decks were sound. It is suggested that further access be obtained to coachroof and decks to assess the extent of any water ingress to any cored sections. Caulking should be is repaired where it has failed. If water is getting into the core the teak will need to be replaced.

It is also suggested that cleaning is done by the gentlest means to avoid further loss of the material.

c) Moisture Readings - Moisture readings were taken as described above and in Section J but only on the exposed GRP (coachroof coaming, by hatches, foot of the mast and wheelhouse sides and roof). These were all below 17 shallow and 19 deep.

d) Delamination – The deck was sound underfoot and to the hammer.

e) Hand rails – There were no hand rails on the coachroof. Stainless steel hand rails on the wheelhouse roof were secure.

f) Distortion and compression – Using a straight edge, no compression of the deck was seen adjacent to the mast.

g) Seating and lockers at aft steering position- The bench seating at the aft steering position provides two lockers under. The seats were covered in teak planking. The locker lids were not cored. Hinges were sound. The lockers have no seals but have drain holes and are sealed from the rest of the vessel.

h) Upholstery – Upholstery for the aft steering position seating was seen faded but in serviceable condition.

Recommendation (Level B) – Repair caulking on teak deck where it has failed. Gain access below side decks to check moisture under any cored areas not already checked.

D.3. Main companionway and other accesses to accommodation

These are sliding doors each side of the wheelhouse, forehatch and aft cabin hatch. Other hatches include two saloon hatches and two wheelhouse hatches.

a) Sliding doors – These were of GRP with toughened glass windows secure in aluminium frames. The doors were secure in their slides top and bottom, opened and closed readily and latches held them shut. The teak fairing forward

of the doors was secure. The companionway steps were removable and were secure when in position. The bottom of the doorway openings were 7inches above deck level.

b) Hatches – All hatches were Nauticat's own, fair to the deck, lockable from the inside and openable from the deck when unlocked. Acrylic was in good condition. None of the hatches were seen to be leaking despite rain at the start of the survey. There was an indication of previous water ingress on the teak trim below the forward hatch. All seals were dirty and required cleaning.

Forehatch hatch– The forehatch was of adequate size for a person to exit (19" x 19" opening), opening with hinges forward.

Aft cabin hatch – Opening 19" x 16" large enough for a small adult to exit through. Hinges inboard.

Wheel house hatches – Hinges inboard, approximately 19" x 16" too small for an adult to exit through.

Saloon hatches – Hinges forward, opening approximately 17" x 12", too small for an adult to exit through.

Suggestion – Clean hatch seals.

D.4. Ports and windows

a) Fixed Ports – Three fixed portlights on either side of the coachroof and three fixed portlights to each side of the wheelhouse, plus three on the forward side of the wheelhouse were all of toughened glass set in aluminium frames, fair and secure. No signs of leaks were seen despite rain. Wiper motor gearing on portside forward of the wheelhouse sounded worn with limited remaining service life compared to the other two but seen working.

b) Opening ports – On each quarter there were two opening lights and at the aft of the wheelhouse there were two opening ports all of toughened glass in aluminium frames. These were all in fair order with good seals, hinges and locking mechanisms, secure and fair to the hull and not seen to have leaked despite rain.

D.5. Pulpit, stanchions, pushpit guardrails and jackstays

These consist of:

- **Pulpit** – stainless steel tubing welded to the stainless steel catwalk/bowspit. In good condition and firm.
- **Pushpit** – in two halves either side of the stern boarding gate, bolted to the guard rail and secure to the deck.
- **Stanchions and guard rail -** Teak guard rail screw fastened to stainless steel stanchions, which were screw fastened to the toe rail. The guard rail was bolted to the pullpit and ran aft to the pushpit either side of the boarding gate above the boarding ladder. There was a guard wire between guard rail and toe rail, PVC coated and using terminals. Rail and wire were found secure. Stanchions were in fair order, mostly firm on the toe rail when aggressively swigged. Stanchions one and two forward from the portside gate were slightly loose on the toe rail and screw fastenings needs to be tightened.
- **Boarding gates** either side of the wheelhouse used pelican hooks for the wire and the guard rail hinges up and closed with secure latches. At the stern, the boarding gate used wire and pelican hooks, all in fair order, except a split pin is missing from one of the pelican hooks.
- **Jackstays** – not seen aboard.
- **Cockpit safety line rings** x 2 seen, securely bolted with large washers behind each aft deck locker side.
- **Deck safety line rings / jackstay attachments** – 6 seen (3 on each side) on side deck by wheelhouse, forward of mast and by anchor locker all secure. Those by anchor locker were seen to have large washers. The one to portside of wheelhouse was seen to be leaking, allowing water below decks.

Recommendation (Level A) –Tighten stanchion base fastenings where loose. Fit jackstays. Reseal deck safety rings (pad eyes) to prevent water ingress. Replace split pin at stern boarding gate pelican hook.

E. RIG

E.1. Rigging attachment points

a) Forestay – The forestay was attached to a welded plate at the forward end of the bow spit/catwalk structure. A bob stay from below transfers the vertical load to the stem via a turnbuckle and pad eye on the stem. Transverse loads are taken by the stainless steel structure fastened to the topsides either side of the stem and on the stem with three pairs of hex headed machine screws. The arrangement was secure. The eye bolt on the stem and the fastenings on the topsides were not seen internally due to restricted access. A split pin on the bobstay turnbuckle was seen closed and able to fall out.

Recommendation (Level A) – Open split pin on bobstay turnbuckle.

b) Main mast cap and lower shrouds – Cap or main shrouds and lower shrouds (fore and aft) each had their own stainless steel chain plate which protruded through the deck with a rectangular deck plate over the seal. Chain plates were bolted to wooden knees (solid, not plywood) bonded to the hull and deck moulding. There was limited access behind teak panels screw fastened. Two panels were removed and water could be seen running down one of the chain plates and there was evidence of crevice corrosion. There was also evidence of this water ingress in lockers below. On the other exposed chain plate, signs of previous water ingress and crevice corrosion were seen. Those bolts sampled were sound. Access prevented inspection of the knees and bonding but where knees were visible no wet areas were seen and they were firm to the spike. Deck plates need removing, sealant gauged out and replace with a good quality adhesive sealant (eg 3M 5200).

Recommendation (Level B) –Expose all chain plates, test bolts and inspect for water damage to knees. Reseal chain plates below deck plates on all shrouds.

Suggestion - Cut inspection panels in lockers either side of chain plates to allow more complete inspection of plates, knees and bonding. Expose all chain plates, test bolts and inspect for water damage to knees.

c) Main mast Back stays – These were attached either side of the wheelhouse roof via stainless steel pad eyes. They were not lifting but no access to fastenings below was possible. It was noted that the pad eyes were just inboard of the wheel house sides though it was not possible to see if they are bolted through both roof *and* side mouldings.

d) Mizzen lower shrouds - These were also attached to either side of the wheelhouse roof via stainless steel pad eyes. They were not lifting but no access to fastenings below was possible. As with backstays, it was not possible to see if the pad eyes were bolted through both roof *and* side mouldings.

e) Mizzen lower shrouds - These were attached to the deck either side of the aft steering position via stainless steel pad eyes. They were not lifting but no access to fastenings below was possible.

E.2 Spars

These include single spreader main mast, boom and single spreader mizzen mast and boom. The masts were deck-stepped. No spinnaker pole was seen.

a) Mast and booms– As far as could be seen with the mast stepped, the silver anodised aluminium Selden main and mizzen masts and booms were in fair condition with minimal corrosion around fittings and rivets. The masts were rigged straight. When swigged fore and aft the spreader roots were firm to the mast. Spreaders were of extruded aluminium secured to the cast aluminium roots by two clevis pins on each side of the mast with a split pin through each. Cast aluminium spreader tips were also fastened to the spreaders (no fastenings seen or inspected).

The kicker rod was in fair condition and securely attached.

All fittings accessible from deck level were secure and serviceable (see also winches below).

The spreader angle on the main was satisfactory. On the mizzen they were set too low especially on the starboard side and should be rectified when the standing rigging is replaced.

b) Spinnaker poles – No spinnaker pole was seen.

E.3. Standing Rigging and Reefing

a) Wire and terminals – Standing rigging was original as the owner had bought the vessel new and said he had not re-placed any standing rigging. Rigging was tight. The main shrouds were 6mm, the main backstays and mizzen shrouds were 5mm. All were 1 x 19 wire.

Cracks were seen on four swaged terminals. No broken wires were seen projecting from terminals although it was not possible to view those aloft properly and no wire was flexed next to a terminal (as the mast was stepped).

The forestay was not visible at bottom or the top of foil and it was not possible to inspect the forestay inside the furling system nor the forestay or backstays where they attach to the mast nor the shroud terminals or their fittings on the masts.

It is common practice to replace standing rigging every 10 years or sooner. It is now approximately 13 years old and should be replaced. The cracked terminals confirm this necessity.

b) Clevis pins split pins and bottle screw - Split pins were seen in all mainmast clevis pins. Bottle screws on the shrouds were chrome plated bronze with threads in fair condition.

c) Alignment and articulation– There was good alignment on all deck level rigging attachments. There was two-way articulation on deck level attachments and at the top of the forestay and backstays.

Alignment and articulation are necessary to reduce lateral forces induced by sails and constant flexing of the wires or terminals as the wire continually tightens and slackens.

Recommendation (Level A) –Replace standing rigging, bottle screws and toggles ensuring good articulation, alignment and spreader angle.

E.4. Running Rigging

a) Roller reefing – There was a Furlex 200S furling system on the forestay with a single groove foil. This system is rated for vessels up to 7.5 tons dispalcement. The system operated but was without the genoa which had been removed.

b) Main and mizzen reefing – The slab reefing was not tested.

c) Halyards – Halyards ran free. The main halyard was of wire and rope and the splice was in poor condition.

d) Lazyjacks - Lazyjacks were fitted and in order.

e) Other running rigging - The running rigging seen was generally in serviceable condition.

Recommendation (Level B) –Repair or re-splice main halyard.

E.5. Sails and covers

These were:

- Fully battened main sail not inspected as client had conducted a sea trial and was satisfied with his inspection
- Mizzen - not inspected as above
- Genoa – Not seen as it had been removed
- No 2 genoa – furling. Seen in bag. Good condition
- Stack pack for main and mizzen – in need of a clean and serviceable

E.6. Winches, clutches and other deck gear

a) Winches – Two Harken 32, two speed self tailing genoa sheet winches in fair condition and secure to the aft of port and starboard seating at aft steering position (backing plates over-laminated).

On the mast, there were two Anderson 10 single speed winches. Both were firm on the mast and in fair condition.

b) Genoa cars and genoa car travellers, turning blocks – all were considered secure and in working order. No Tufnol type fittings were seen. Genoa traveller fastenings firm to deck. Water ingress was seen on the portside of the saloon under the genoa traveller.

c) Sheeting attachments and travellers – Main sheet attachment and Harken traveller all sound and secure on aft of the wheelhouse roof. However cotter rings (split rings) were used between the main sheet block and the traveller and at the attachment to the boom. These can foul and come out. Mizzen attachment to a pad eye aft of the aft hatch. Removable with a pelican hook to allow access from the boarding ladder.

Recommendation (Level B) - Replace cotter rings between main sheet block attachment and traveller and to boom with split pins. Reseal genoa travellers on deck.

F. Engine, fuel system, stern gear and cathodic protection

F.1 Engine and installation

A Yanmar 4JH2 DTE four cylinder 88HP (continuous rating 80HP) diesel engine with turbo charger and intercooler is mounted on GRP bearers (probably over laminated hardwood). It is indirect cooled and driving a Kanzaki KM4A reduction gearbox. Engine hours 682. The engine number was 36887 (located on a horizontal plate on the top of the engine). The engine was seen running under slight load. The overall external condition of the engine was fair with a few areas of surface corrosion, notably below the thermostat housing at the top of the fore end of the engine. It is suggested that this area is rubbed down primed and re-coated to prevent further corrosion.

a) Engine bearers and mounts - Engine bearers were substantial. Hammer sounding revealed no delamination or voids on either engine bearers. Moisture readings on starboard engine bearer all but one shallow reading was below 20 (range 12-25 shallow) and the deep readings range was 9-18. On the port bearer the shallow range was 13-18 though two deep readings were above 20 (range 13-22). No stress cracking was seen.

Engine mountings were in fair condition and none lifted excessively under the crow bar test.

b) Air supply/intake – There were two air intakes on the portside the aft locker, one on the outboard side and one on the inboard side. It was not confirmed which served the engine and which the diesel heater (see heating), nor if they had baffles. There was a swan neck to the exhaust hose.

c) Engine Oil – No significant oil leak was seen. The sump was in fair condition. There was no evidence of water in the oil or in the rocker cover, cap or on the dip stick. The oil was not black. No date was seen on the filter. The level was full. The maintenance chart seen showed the most recent oil and filter change was in 2011, this cannot be confirmed as accurate. An oil and filter change may now be timely. There is a pump to facilitate removal of oil from sump when changing oil.

d) Gear box– Transmission oil was clear and full. The casing was in fair condition. With the engine running (afloat) forward and astern were engaged smoothly and quietly.

e) **Cooling Water system –** No water leaks were visible. Raw water hoses were reinforced and serviceable. There was only a single clip to the hose where it was attached to the raw water pump and also where there was a joint forward of the inlet. Double clips should be used where tailpipes allow. There was no siphon loop on the raw water inlet. The raw water pump was located at the front of the engine below the alternator. The impeller was not inspected, however the manufacturer recommends changing only every 600 hours. The owner's maintenance record shows it was changed by him at approx. 612 hours and an invoice for a new impeller corresponds in date though I cannot say this was correct. The coolant pump was not seen or inspected. The manufacturer also recommends changing the coolant annually.

The belt condition was poor and it should be replaced. The coolant pump will not operate if the belt fails. It is suggested spare belts are carried and the belt is regularly renewed.

The cylinder block was examined as far as possible with very restricted access especially on the port side and no cracks were seen.

The temperature gauge in the cockpit was seen working however the engine had not fully warmed up despite motoring for 30 minutes prior to the start of the survey.

No emulsified oil was seen on the lid of the heat exchanger or in the coolant.

f) Exhaust – The exhaust elbow was hammer sounded and found sound. These do corrode from the inside and need to be replaced periodically. Failure not only results in loss of cooling but also fills the engine compartment/cabin with exhaust gases. The owner's maintenance chart says this was changed in 2002 and an invoice for the work was seen corresponding to this.

The exhaust hose was in fair condition where inspected aft of the engine and under the wheelhouse seating. There was an anti-siphon loop (under the wheelhouse seating) to approximately deck level. A stainless steel water trap (to prevent water entering in a following sea) was mounted on the bulkhead aft of the engine. It was in fair order with minimal external signs of corrosion. There was a slight leak from the drain on the water trap. From a photograph taken from underneath, a possible defect can be seen in the weld. If tightening the drain does not stop the leak, remove and inspect/repair.

Double or triple clips were in use at all exhaust hose connections. Those tested were sound to the hammer.

g) Engine Controls including stop – These operated freely at the both steering positions and were securely connected to the diesel pump and gear box. The stop solenoid operated. **Note** that some insurance underwriters will not cover claims resulting from failed engine controls when these have not been serviced and maintained.

h) Electrical – The alternator (80A) was seen to charge the batteries with the engine running (see section H.3). It was in fair visual condition.

Recommendation (Level A) – Replace drive belt. Add clips to the raw water hose join and ideally replace hose with a single length.

Recommendation (Level B) – Renew coolant and replace engine oil and filter. If tightening the drain on the water trap does not stop the leak, remove and inspect/repair.

Suggestion – Have the engine professionally serviced.

F.2. Fuel System

a) Tank material and bearers – The two mild steel tanks (with a paint coating) are located either side of the engine under the side decks. They are mounted on GRP bearers. No attachment points were seen or tested as access was very restricted. However, there was no indication of any movement. While the coating was largely in fair condition there were some signs of corrosion and it is suggested that these are rubbed down and re-coated to maintain the otherwise good condition. A shut off valve was seen on the outlet on the top of the tank.

There were two fuel gauges in the wheelhouse seen operating but calibration was not checked.

Both tanks were fitted with a system to remove sediment and water from the bottom of the tank. This uses a single hand pump and a two way valve both situated on the bulkhead to starboard and aft of the engine. .

b) Filler/vent unit and hose – Both filler units on the side decks were connected by chain to the polyethylene caps. The seals in the caps are in poor condition. These are flush fittings and had allowed dirt (and possibly water) from the decks into the tanks. These fittings are frequently seen with poor seals and threads and damaged caps. The caps should be replaced and ideally the units should be replaced with ones that are a better quality (eg stainless steel

caps) and not a trip hazard but are less likely to allow dirt to enter. The tanks should also be cleaned using the drain pump.

The filler hoses were in fair condition and secure to the filler units though only a single clip was used on the filler end of the hoses (tank ends not seen). The filler units were electrically bonded to the tanks to prevent the build-up of static charges.

Vents for each fuel tank were on the outboard sides of the port and starboard aft deck lockers/bench seats. Hoses in fair condition and secure with loop of approximately 100mm to reduce the risk of flooding.

Recommendation (Level A) – Replace diesel filler units with better quality units. Clean tanks before a sea passage using system fitted.

c) Fuel Pipe and hose – Copper pipe was fitted between the tanks and the three way valve (allowing switching from one tank to the other or both off) and from the valve to the primary filter. The pipe was in good condition where seen.

CODAN antistatic oil hose (20 bar working pressure and 80 bar bursting pressure) was seen in use for diesel feed and return hoses. This is not considered ISO 7840 A1 compliant. The hose, where seen, was in fair condition. It is suggested that the fuel hoses are replaced with ISO 7840 A1 compliant fuel hose as this is rated for use in engine compartments in case of fire.

Filters and bowls - The primary filter (Separ 2000/5) has an inspection bowl and a shut off valve and is mounted on the bulkhead to the aft of the engine. The mounting was very close to the fuel feed pipe where it passes through the bulkhead and if it came loose could damage the pipe. The primary filter was upstream of the lift pump, as required.

The secondary filter was on forward side at the top of the engine to starboard. No dates were seen on the fuel filters.

Suggestion - Replace fuel filters and O ring seals and mark the date on the filter with permanent felt pen. Consider moving fuel filter mounting to reduce the risk of damage to fuel pipe.

F.3. Stern Gear

a) Shaft Coupling – The flexible coupling fastenings between the gearbox and propeller shaft were sound when hammer tested.

b) Propeller Shaft - This was magnetic and is therefore considered Duplex stainless steel with low susceptibility to corrosion. Shaft rotated freely. It measured 40mm.

Suggestion - When the shaft is next removed, check for pitting or crevice corrosion and wear especially where it passes through the stern gland.

c) Stern tube and stern gland – The stainless steel stern tube was bonded to the hull but access prevented full inspection. The bronze stern gland is traditional packing gland and was seen dripping while afloat and engine stationary despite copious grease from the gland. The boot was fitted to the stern tube aft with double clips, firm to hammer but showing signs of crevice corrosion. The boot was in serviceable condition though it and the flax packing is now considered to be 13 years old. If the dripping cannot be stopped by tightening the stuffing box nut then the packing should be replaced. It is suggested that the rubber boot and clips be replaced at the same time as a precaution and the opportunity taken to inspect the stern tube and shaft.

d) P Bracket – The P bracket (thought to be bronze) was secure to the hull with over-laminated fastenings all in fair condition seen below the aft cabin bunk. The bracket was electrically bonded to the main anode and connectivity was good.

e) Cutlass bearing – The P bracket houses the neoprene cutlass bearing and this had very little play.

f) Rope cutter – No rope cutter was fitted.

g) Propeller – This was 21" x 14" three bladed left handed and of bronze. It was secure on the shaft with a locking nut and grub screw. The propeller was in fair condition with no signs of dezincification or cavitation damage. Light hammer sounding found it sound. Shaft and propeller rotated true.

Recommendation (Level A) – Tighten stuffing box nut. Replace packing in stern gland if this does not stop the dripping while engine stationary.

F.4. Cathodic protection

For galvanic protection a single main zinc anode was fitted to port and slightly aft of the stern tube. Engine (and gearbox), propeller shaft, propeller, P bracket and rudder stock all had good electrical connectivity to the main anode.

The main anode was about 80% depleted and was replaced during the survey. The two studs were secure.

G. Safety and other Equipment

G.1. Ground tackle and mooring arrangements

a) **Main anchor –** This was a 35lb CQR plough anchor attached to the chain via a galvanised shackle with an un-moused pin all in fair condition. There was no swivel mechanism. All moving parts were free and the anchor was not excessively worn or slack at the pivot between neck and shank. The anchor's weight and type are considered adequate for the vessel. There was provision to secure the anchor to the deck. There was a single roller on the catwalk frame in fair condition.

b) Main anchor chain and warp – There were 4m of 8mm chain and 38m of nylon warp (20mm dia).

The chain was in fair condition and adequate size but its length will limit anchoring conditions especially as this is a heavy displacement vessel (with considerable windage for her size) and the type of use planned. The chain should be replaced by a length of at least 20 meters.

The warp was in fair condition and is considered of adequate size and length. The warp and chain were connected poorly with a bowline knot and a shackle to the chain. The knot would not pass out of the hawse pipe preventing use of the warp unless untied and re-secured to the chain. A proper warp-chain a splice is required.

The bitter end was tied fast at the base of the anchor locker and would be awkward to cut with a knife in an emergency.

c) Kedge Anchor – A kedge anchor was seen on the port quarter. No warp or chain was attached.

d) Anchor windlass – There was a Lofrans manual windlass secure on the fore deck, this operated but was not tested under load. There was a handle lashed with wire to the underside of the anchor locker. Consider fitting an electric windlass.

e) Mooring cleats and fair leads – There were six anodised aluminium mooring cleats, two in the bow, two amidships and one in each quarter. In the anchor locker, backing plates were seen over-laminated. All were secure to the deck. There were two stainless steel fairleads in the bow, two amid ships and one in each quarter. All were serviceable.

f) Fenders - Eight fenders seen in fair condition and serviceable.

Recommendation (Level A) – Replace chain with at least 20m of 8mm galvanised chain. Splice warp to chain correctly so the warp will pass through the hawse pipe. Tie off bitter end of warp in anchor locker with a lanyard that could be easily cut in an emergency. Fit a, chain and warp of appropriate sizes to the kedge anchor. Mouse shackle securing anchor to chain.

G.2. Bilge pumping arrangements

a) Manual pump - There was a manual bilge pump (not seen due to restricted access) fitted forward of the aft steering position with a handle stowed beside it. This had a strainer on the end of its hose in the bilge aft of the engine but no strum box. The hose end was not secure to the hull though it was lodged under a mesh box and this was considered adequate. The pump was tested and worked. Its capacity is not known. Where seen the hose was in fair condition. A non-return valve was seen on the hose in the bilge.

b) Electric pump - There was a Rule 2000 electric pump rated at 7.5 litres per minute. It operated on automatic and manual. The float switch and the strum box were secure and the pump was secure to the strum box. There was a second float switch immediately forward of the Rule switch. The manual states this operates the electric pump even when it is not switched to 'Auto'. This was not tested.

c) Hoses - Hoses were in serviceable condition. The outlets for both pumps were on the starboard topsides by way of the wheelhouse. The hoses were looped up to deck level therefore syphoning is not likely.

G.3. Davits and Boarding Ladders

There were no davits. A stainless steel boarding ladder with teak steps bolted to horizontal stainless steel tubing was permanently fixed to the counter stern, secure and in working order. No fastenings were seen internally as there was no access. The ladder extended into the water less than the 600mm considered necessary to assist an MOB recovery. Consider extending the boarding ladder.

G.4. Navigation Lights

The navigation lights and their performance were as follows:

- 25W white stern light fitting on pushpit – approved fitting – working. Bulb wattage not checked.
- 25W red and green bi-colour light fitting on catwalk/bowsprit - approved fitting – working. Bulb wattage not checked.
- Steaming on main mast–working. Bulb wattage not checked
- Deck lights on both masts – working.
- Anchor light at masthead – **NOT** working – wattage not checked.

When the anchor light is repaired, it is thought that the vessel's navigation lights will conform to the Collision Avoidance Regulations though bulb wattage was not checked.

Recommendation (Level A) – Replace anchor light bulb or effect other repair.

G.5. Firefighting equipment

a) Fire extinguishers - These included the following:

- 1 x 2 kg ABC dry powder – secure below steps to saloon. Service record shows new in 2000, service due 2001. The extinguisher had exceeded its manufacturer's time limit for use. Gauge showed adequate pressure.
- 1 x 6 kg ABC dry powder (rated 24A/233B) – secure in hanging locker to starboard of wheelhouse. Service record shows new in 2000, service due 2001. The extinguisher had exceeded its manufacturer's time limit for use. Gauge showed adequate pressure.

The single fire extinguishers were in need of service or replacement. For a vessel of this size, the RYA recommends fitting at least one fire extinguisher with a minimum fire rating of 13A/89B **at each** exit to the open deck from each accommodation space. In this case, two in the wheelhouse, one in the forecabin, and one in the aft cabin. Consider fitting an extinguisher at the galley and an automatic extinguisher in the engine compartment.

b) Engine compartment – The compartment can be sealed from the rest of the vessel. Sound proofing beside the engine is **not** fire resistant (a small sample was tested away from the vessel). Consider fitting fire resistant sound proofing.

c) Smoke alarms –No smoke alarm was seen in the galley or engine compartment. Consideration should be given to fitting these.

d) Fire Blanket – No fire blanket was seen aboard. This should be fitted (to BSEN 1869 standard).

Recommendation (Level A) - Before the vessel is used, the fire extinguishers should be serviced or replaced and at least two more added, all to at least 13A/89B rating. Fire extinguishers should be serviced annually or replaced every five years. Secure a fire blanket in accessible position in galley. Consideration should be given to fitting a smoke alarm in the galley and engine compartment and an automatic fire extinguisher in the engine compartment.

http://www.rya.org.uk/infoadvice/safteytips/Equipment/Pages/fire.aspx

G.6. Lifesaving equipment

The following lifesaving equipment seen aboard:

- Two lifebuoys with no line and no light. Mountings seen for lifebuoys on each quarter. A line, a light, on each is recommended for offshore passages
- No safety harnesses seen
- No dan buoy was seen aboard. This is recommended for offshore passages
- Two hand held orange smoke flares were seen aboard replacement date Dec 1997. No other flares seen
- No MOB recovery system was seen
- No thermal protective aids (TPAs) seen aboard (eg 'space' blanket)
- No EPIRB was seen
- No radar reflector on mast
- Lifejackets seen but with no whistle no crotch straps but no safety harness was seen aboard

Life-saving equipment (Level A) –Fit radar reflector, carry full set of flares for offshore passages, lifebuoys should have lights and one should have a line. Lifejackets should each have crotch straps and a spray hood. Carry safety harnesses. A danbuoy is also recommended by the RYA along with MOB recovery system, 406 MHz EPRIB/PLB and liferaft with grab bag.

More information can be obtained from the RYA.

The RNLI operate free inspection and advice service concerning levels of safety equipment (SEA Check) and can be contacted on 08003280600 or via https://rnli.org/Pages/All%20forms/142-enquiry-sea-check.aspx

G.7. Navigation equipment

The following were seen aboard

- Helmsman's compass at wheelhouse steering position – checked with two hand bearing compasses and found to be reading approximately 5 degrees less than hand bearing compasses. When deflected the card returned to the same place.
- Raytheon ST60 log/speed (wheel house and aft steering position) –both seen switched on and functioning but not fully tested.
- Raytheon ST60 wind speed/direction (wheel house and aft steering position) – both seen switched on and functioning but wheelhouse unit needs calibrating.
- Raytheon ST60 Depth (wheel house and aft steering position) – both seen switched on and functioning but not fully tested

- Raytheon Pathfinder RL70C chart plotter/radar mounted at the wheel-house steering position - most modes seen working but not fully tested. GPS Aerial on wheelhouse roof and radar scanner on mizzen. Some of the rivet heads on the radar scanner bracket to the mast (seen on a photograph) are corroded and need to be inspected aloft.
- Raytheon ST60 multi (wheel house and aft steering position – used to display GPS data) –both seen switched on and functioning but not fully tested
- Shipmate RS8400 VHF seen switched on and functioning (receive and transmit – using a hand held VHF) but not fully tested. This was not a DSC radio. An aerial was seen at the top of the main mast.
- Three clocks, and barometer– not tested
- Fog horn on main mast – heard working

Day shapes were seen aboard (steaming triangle and anchor ball).

Aft deck VHF speaker not tested.

No emergency VHF aerial or Navtex receiver was seen. Consider fitting a Navtex system.

Recommendation (Level B) - Inspect Radar scanner bracket aloft. Adjust compass. Carry emergency VHF aerial.

G.8. Other inventory items

a) Mooring lines - Various mooring lines seen in serviceable condition.
b) Ensign and pole –serviceable.
c) CD player/radio. Not tested .
d) Two TVs with Glomex aerial on mizzen. Not tested.

H. Accommodation and on-board systems

H.1. Accommodation General

Overall the accommodation was in good condition. Upholstery, headlinings, curtains, varnished teak-clad plywood and teak trim were all in tidy condition. The teak and holy cabin sole boards were in fair condition under carpets also in fair condition. Blinds under hatches were less tidy.

In the forecabin were 2 single berths to starboard. The heads compartment was to port with a WC, washbasin, shower, hot and cold pressurised water. A large hanging locker was opposite the heads compartment. The saloon has a U shaped settee to port which converts to a double bunk. The table was fitted centrally to the settee. The galley was to starboard, opposite with refrigerated cool box, butane stove (with cover) and twin stainless steel sinks.

Steps up to the wheelhouse where there was a chart table to port, instrument panel above and steering position to starboard. There was a bench seat to port with a table.

Steps down to the aft cabin with a fore-aft double berth to port and large hanging locker to starboard.

Ventilation was good with hatches in all cabins, opening lights in the aft cabin and dorade ventilators over the heads compartment passage.

Cosmetic condition of the heads compartment was considered good.

H.2 Gas Installation

This vessel was built to be RCD/CE compliant and the manual states gas system has been installed to SFS 3682 standard. This standard was replaced after 1999 when this vessel was built. The vessel is not being coded for commercial use and the surveyor is not 'Gas Safe' registered. Some insurance companies require a declaration from the assured that the gas system conforms to ***current*** standards and if that is the case here upgrading may be required as a condition of the insurance policy.

The vessel had the following gas installation:

- One butane bottle in a gas locker on the starboard side deck adjacent to the wheelhouse. This drained overboard directly through the topsides.
- A regulator with shut off valve mounted directly to the gas bottle.
- A flexible hose on the low pressure side from regulator is clipped to a 'male' fitting at the locker side.
- A copper pipe from here to the galley with a shut off valve in locker below the sink and a flexible reinforced hose to a gimballed cooker with two burners and an oven.

a) Bottle storage: Bottle was secure. The vent overboard was approximately 19mm which is considered adequate. There was no seal around the locker lid, no hinges and no catch (as manufactured).

b) Regulator condition: This was not a marine grade regulator. Gas was difficult to turn on because the valve handle was loose to the valve. The regulator should be replaced.

c) Flexible hose: No date was seen and it is considered original. This hose is expected to have a five year service life. There were double clips on the male fitting to copper pipe but only a single clip on the regulator end of the hose. The hose should be replaced.

d) Copper gas pipe on low pressure side to cooker: Fair condition where seen but the majority of the pipe's length was inaccessible. In the gas bottle locker, there was a fitting securing the pipe to the hull. This had corroded and left debris on the pipe preventing inspection. This should be removed and the pipe cleaned and replaced if found corroded.

e) Connections and armoured flexible hose to cooker: Condition was fair. The hose was fouling on the cooker as it swings. Hose date not seen but from its visual condition, the hose was not recently fitted and is considered original.

f) Cooker and other appliances: Cooker condition was fair. It was gimballed and had a shut off valve under the galley sinks which was clearly visible and accessible when the locker door was open. The valve was thought not to be a needle type though this was not confirmed. The flame failure devices on the oven and both top burners were heard to work. There was an opening hatch above the galley. There were no other appliances and none requiring flues.

g) Leak detectors: No gas alarm nor leak bubble tester was seen. These should be fitted.

Recommendation (Level A) – Replace regulator and flexible hose using double clips. Remove fitting securing copper pipe to hull in bottle locker. Clean and inspect pipe under the fitting. Replace pipe if necessary. Renew clip. Replace armoured hose to cooker.

Recommendation (Level B) – Fit leak detector and gas alarm

H.3. Electrical installation

a) **Batteries and charging**– There was one 12v , 110Ah, DC lead acid battery (engine start) to starboard of the engine and two service batteries in parallel (amp hrs not seen) to port of the engine. There was a volt meter and amp meter on the instrument panel. All batteries were secure.. The plywood battery compartments were in fair condition and had lids. Though they were as manufactured, it is doubtful that they would retain the batteries in a knock-down. The installation was clean and tidy and well maintained and cabling was flexible. Electrolyte levels were not seen.

There was an isolating switch in the locker aft of the galley, below the wheelhouse steering position.

There was a hydrogen ventilation hose from each battery box. On the starboard side this falls immediately it leaves the box. On the port side the hose rises up and then falls. The hose should rise upward steadily. When batteries are charging they produce hydrogen gas, which is lighter than air but very explosive. The upper ends of the hoses were not seen.

With engine stationary, shore power disconnected and only instruments switched on, battery one showed 12.62v and battery (bank) two showed 12.10v (battery tester and wheelhouse meter). Battery 2 dropped below 12v after an hour. Battery one performed well on the drop charge test. Both batteries in bank two were at the stronger end of the 'weak' band on the drop charge test. This indicates the batteries in bank two are close to the end of their service life and are likely to lose charge quickly when loaded or left un-charged. They will need replacing in the near future.

Charging from the engine was by a single alternator (rated at 80amp) and a 240v charger. With engine running, battery 1 was seen charging at 13.46 volts and battery bank two was seen charging at 13.49.

A 240v 'Mastervolt' battery charger was seen to starboard of the wheelhouse steering position, seen working.

b) Circuit protection – 12v DC circuits had switches mounted on a panel behind the wheelhouse steering position. All switches operated well. A main fuse was seen in the engine compartment below the wheelhouse steering position.

c) Cabin lighting –All cabin lights were seen working. In the wheelhouse the central unit was red. Courtesy lights by all cabin steps from wheelhouse and starboard steps to deck were seen working.

d) **240 volt shore power** – 240v AC shore power was fitted with main isolator switches for the calorifier, battery charger and ring main. The ring main had sockets in the forecabin, heads, saloon, galley, wheelhouse, engine compartment and aft cabin. A Hager RCD (0.03A 230 volts) was seen in the locker below the switch panel in the wheelhouse. 29 x 240v MCBs were seen in the locker aft of the galley (not tested). The RCD trip operated when tested. There was no galvanic isolator (though no indication of corrosion from stray current was seen as main anode was corroding slowly) and the system was earthed to the main anode. A 240v low output heater unit was fitted to starboard of the engine.

The socket in the cockpit for the shore cable was rated at 30Amps and 220 Volts. The pins in the fitting were flat and there was an adaptor for use in the UK.

Recommendation (Level B) – Improve battery's hydrogen ventilation.

H.4. Fresh water tanks and delivery

The polyethylene tank was below the saloon sole. There was an inspection hatch. Access was very limited. The water filler unit, cap and seal on the port fore deck were secure and seal serviceable though of the same design as the diesel fillers. The tank vent fitting was not identified on deck (though there was a fitting beside the mizzen on the wheelhouse roof). The filler hose was serviceable where seen (under forepeak bunk). No access was gained below the fitting to check the hose's security. There was a water tank level gauge in the wheel house (not checked).

The engine water heating produced warm water. The calorifier was in good visual condition and operated when connected. Freshwater hoses where seen were in fair condition.

The Jabsco ignition protected pump (located to starboard of the engine) delivered water to galley and heads sinks and heads shower. The water did not taste tainted.

H.5. Heads

The Jabsco WC was manual sea water flush securely mounted with direct overboard discharge and discharge to a holding tank below the forecabin bunk. The WC unit was in good visual condition. Hoses and clips were sound to the hammer and secure. Only one clip was in use on the inlet to the pump. The joker valve on the heads unit had failed (or was being held open) and needs cleaning or replacing as emptying the bowl is very slow.

All shower, toilet discharge hoses and toilet inlet hoses were in fair condition. Access prevented seeing any anti-siphon loops.

The holding tank was mild steel with a paint coating in fair condition where seen on upper surface only. The deck pump-out unit was of the same design as the water filler unit (though with a green cap) and firm to the deck with seal in fair condition. No access was gained to the unit internally. There was a manual pump fitted below the fore cabin bunk. There was a leak from one of the hoses where it is secured to the top of the holding tank. This should be investigated and remedied (and may simply require tightening the clip). Signs of another leak were seen forward of the heads unit to port of the forepeak bunk, but the source was behind panelling with no access. This should also be investigated and remedied.

There was a holding tank vent fitting secure on the port bow, also behind panelling internally preventing inspection. The

shower sump drained into the bilge aft of the engine.

Recommendation (Level B) –Tighten clip or otherwise prevent leak from hose on top of holding tank. Investigate and prevent other leak seen forward of heads compartment. Replace jocker valve on heads. Add a second clip to seawater inlet to WC pump.

H.6. Heating and refrigeration

a) Fridge – There was a 12v fridge compressor below the galley sink with box to aft of galley. The cooling plate became cold when switched on.

b) Heating – The vessel was fitted with an Eberspacher Airtronic diesel fired hot air heating system. Ducting was to all cabins. The unit was seen operating and the vents produced warm air. The heater the blown air intake was either a fitting on the starboard side of the port aft deck locker or from the portside of the same locker but access prevented confirmation of this. The latter was close to the heater's exhaust outlet. With some wind directions there is a possibility that exhaust gases would be drawn into the heater's inlet with potentially serious consequences. Therefore it needs to be confirmed which fitting is in use by the heater unit.

The heating fuel feed was taken from the portside tank. The heater's external fuel pump was in fair visual condition. Ducting was not completely checked though where seen it was in fair condition.

Recommendation (Level A) – Confirm that intake cowl on aft deck locker is for the heater blown air intake to ensure heater air intake is clear of any exhaust fumes.

I. Security

Insurers may not honour claims arising from theft if insufficient measures have been taken. For details, policy wording, insurers and the Financial Ombudsman Service should be consulted. **Main cabin access –** Secure and lockable with a barrel lock on both wheelhouse doors. **Deck hatches –** As manufactured. Lockable and adequate. **Aft deck lockers –**Lockable with a padlock.

J. Moisture Readings

High moisture content is not generally a structural defect, and is to be expected in older GRP/FRP vessels. However where some moisture has been absorbed the likelihood of moisture-related problems occurring is higher, and the actual state of the laminate cannot be completely guaranteed without destructive testing and chemical analysis. The opinion given in this survey is based on all the evidence available at the time without destructive testing.

The readings should be considered in conjunction with the period the vessel has been ashore and the weather conditions when obtained. Differences between readings above the water-line (normally dry) and below should be noted.

The interpretation of the readings in shallow mode range for a monolithic hull is as follows:

- 0 – 15 For all practical purposes may be considered dry; 16 - 20: Some moisture present at low levels but of no great concern;
- 21 – 30 Considered medium, but those at the top of the range i.e. 30 are at the point where the risk of moisture related defects developing is significant;
- 31- 45 Considered high and at a level where the risk of moisture related defects being present but not yet physically detectable is significant;
- 46 – 60 Very High and will usually be accompanied by physically detectable signs. Likely to be accompanied by a significant increase when switched to deep mode;
- 61 – 100 extremely high and indicative of possible laminate damage in addition to osmotic blistering. Likely to be accompanied by a significant increase when switched to deep mode.

K. Scope, Limitations and Declaration

This pre-purchase survey was carried out in accordance with my standard Terms of Business. Its purpose is to establish the structural and material condition of the vessel and systems.

- Where equipment was tested this is detailed in the text.
- References to condition are in relation to the vessel's age (i.e. good condition does not necessarily mean new).
- Mechanical condition of the engine is not covered under the terms of the survey, only the installation and visual condition were inspected.
- The survey is not a parts and labour guarantee and it should be noted that defects may exist in the vessel that the survey could not detect due to the limitations of time, vessel presentation and the range of tests (excluding destructive testing or dismantling) acceptable to the owner.
- Some components may appear serviceable but are found defective when under load.
- Parts of the vessel that were covered, unexposed or inaccessible due to fixed panels, mouldings etc were not examined, so I cannot say these areas are free from defects other than where specified.
- No fittings or fastenings were removed for examination other than where specified.
- The survey carries with it no guarantee against faulty design or latent defects or suitability of the vessel for any particular purpose, nor any guarantee of compliance with any particular national or international rule, requirement, regulation, law, standard or code unless specifically stated in this report.

The survey is for the client with no liability to anyone else. The surveyor retains this report's international copyright.

Declaration - This report is as true and accurate a description of the vessel as could be ascertained at the time of the survey, but no guarantee is given or implied.

Andrew Edmond (1st March 2014)