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J/80 Review & Best Practices - Part I

Following two separate incidents in the past 12 months where 15+ year old J/80s suffered apparent keel stub failures, J Boats has compiled, with the help of several industry experts, the following "best practices" inspection, maintenance and use guide for J/80 owners. We urge each owner to read carefully the recommendations, to proactively and periodically inspect all critical components of your boat, and to contact anyone in the J/80 network of dealers, builders and class associations if you need any assistance.

Background

There are nearly 1,200 J/80s sailing in 15+ countries. The J/80 design was announced by J/Boats in late 1992 and the first boats were built in spring 1993 by TPI, Inc. (now Pearson Composites) of Warren, Rhode Island. As the builder, TPI designed and engineered the composite and structural elements of the boat, handled materials purchasing, construction, maintenance of quality standards, invoicing, warrantees, and after sales parts. The J/80 was the first J model built with the resin-infusion system called SCRIMP (Seamann Composite Resin Infusion Molding Process), an environmentally-friendly advanced molding technology invented by Bill Seamann and developed in conjunction with the US Defense Department. The first beneficiaries of the process in the sailboat field were, in succession, the TPI-built Sundeer offshore cruising boat line, the Corsair 31 trimaran, the Hoyt Solar Sailor and the J/80. The industry quickly followed suit and top brands like Hinckley Yachts, Sabre Yachts and others signed license agreements to adopt the technology. Now 16 years later, most of the top manufacturers in the world use the same or similar molding process for larger sail and power yachts.

Because SCRIMP was not available to European builders in the 90s, the European J/80 was specified to be conventionally built with "hand laid" materials and open molding technique (same as the J/22 and J/24). This practice continues today and is also being followed by the new licensee in Asia. The J/80 builders provide a 5 year structural and 10 year hull blister warranty.

Laminate & Structure

The J/80 hull and deck are built with balsa/E-glass sandwich construction. Vinylester (VE) resin is used in the outer skin coat to provide protection from osmotic blistering. GP resin is used for the rest of the laminate. The forward, main, and aft bulkheads as well as the v-berth and settee berths are bonded to the hull and deck with fiberglass tabbing and VE resin. Newer J Europe models use ABS approved PLEXUS (2-part elastomer glue) for attaching the fore and aft bulkheads and the hull to deck joint. There are six transverse keel floors of solid fiberglass that are closely spaced and bonded to the hull and sump with fiberglass tabbing. In addition to the base laminate for the hull, there is select reinforcement that runs along the centerline, bow, stern, main bulkhead and keel sump areas. The keel is bolted to the hull sump with five ¾" 316 stainless bolts. The exterior horizontal joint between the lead keel and fiberglass sump (approx. 12" below the hull) is finished with a cosmetic fiberglass wrap approximately 6" wide.

INSPECTION OVERVIEW

Considering the typical high-frequency use seen by many J/80s, at a minimum, we recommend that J/80s be inspected on an annual basis and that a professional survey be done every five years. An inspection should include a detailed review of the high-load areas, such as the rudder and keel attachments, rigging terminals, structural bulkheads, keel floors, mast step, mast partners, steering systems, mast and boom fittings, lifelines, etc. Inspection should also include identifying any possible leaks, including thru-hull fittings, as well as identifying worn rigging and hardware. Additional inspections/surveys should be performed immediately after any instances of grounding, collision, and/or extreme weather sailing.

The American Bureau of Shipping (A.B.S.) calls for a detailed inspection every two years and a professional survey every 6 years (see Appendix A for details) following new construction.

According to Carter Gowrie of the Gowrie Group, most insurance companies mandate a professional survey for boats at 10 years. A survey may indicate a structural or safety issue that an owner needs to address in order to continue insurance coverage. For boats that haven't changed hands (which usually triggers a pre-sale survey), it's otherwise left entirely to the owner to determine when a survey should occur.

J/80 KEEL/ KEEL FLOORS

Overview - One of the most critical areas of a modern, fin-keeled composite boat is the keel and keel floor area. This is an area that absorbs incredible loads and enormous stress.

Use Considerations:

1. **GROUNDINGS**: After any grounding or collision with any underwater object, soft or hard, be sure to carefully inspect the keel, sump area and keel floors for any signs of cracking or weakness. This is best handled by a qualified marine surveyor. Even a seemingly minor grounding can weaken the overall structure, particularly if left un-repaired for any length of time and/or if the boat continues to sail without repairing. There have been cases where a moderate grounding revealed no visible damage (due to the bottom of the boat absorbing the impact and then returning to shape), only later to reveal the presence of fractured glass on the inner hull laminate just aft of the keel. Have repairs done by a professional yard with a follow-up survey.

2. **TRAILERING/ HAULING/ POPPETS**: Boats that are actively trailered can be subject to excessive stress and strain on the keel/hull joint. In fact, years of trailering alone can subject a keel/ hull joint to excessively sharp vertical accelerations that can cause significant wear and tear on any portion of the composite structure; including keel sump and keel floors.

   According to Triad Trailers, one should first load a trailer by placing most of the weight (80-90%) on the keel as it sits in the trailer's keel tray. Then screw each individual hull support up to the hull just until light contact is made. Do this for each of the six individual hull support stands (on the Triad Trailer). After all six stands are touching the hull release the lifting straps so the boat is now mostly on the keel with the hull support stands preventing the boat from tipping side to side. Adjust each hull support stand upwards towards the hull to a point where you are only able to spin the carpeted top on the hull with a good amount of force. After each hull support stand is properly adjusted use a 9/16 inch wrench to tighten the set screw on each of the 6 hull supports. This set screw prevents the wing nut handle from vibrating down during travel.

   Be particularly careful when strapping the boat down to the trailer. It's not uncommon at regatta venues to see boats quickly hauled and lowered onto their trailers, with little time to get the boat aligned and sitting properly on the poppets, then strapped down hard onto the trailer with powerful ratcheting webbing straps and then driven off. In short, the hull is being pulled down hard on top of the keel/sump and in a very short period of time is potentially subjected to excessive stresses and strains on the entire hull/keel/sump structure. If you have a bow-stop on the trailer, use shorter strap runs (running nearly vertical) over the boat rather than long diagonal straps through the bow and stern rails. This reduces the possibility of trailer flex contributing to any excess strain.

3. **KEEL FAIRING**: the J/80 one-design class rules specifically restrict the shape and dimensions of the keel and keel sump and set minimum thickness offsets that all boats must exceed. Because the J/80 has a molded sump, extreme care must be taken that fiberglass material is not removed from the exterior of the sump in an effort to minimize

the keel dimensions or to change in any way the radius of the fairbody (where sump and hull meet) which provides important structural geometry. Fairing the lead is fine, but removing glass will weaken the structure.

4. **STORAGE**: Care should be taken to avoid mooring or docking your boat in locations that can result in the keel being occasionally imbedded in the mud/sand/silt when at low tide or low water. A combination of the keel bulb imbedded with any sort of wave action against the hull can cause undue stress to the boat. The same is true for boats that use special dockside hoisting systems to hoist the hull out of the water, while the keel remains underwater and unsupported.

HOW TO INSPECT YOUR KEEL/KEEL FLOORS (For Owners and Surveyors)

1. With your boat suspended from travel lift straps (OK) or braced in a cradle (best) or trailer (good), grab the keel at the bottom and forcefully rock it back and forth. This **tip deflection test** on a deep keel boat should create a small amount of flex over the keelspan and sump (if solid fiberglass like the J/80), but there should otherwise be minimal movement from side to side. When you release the keel it should immediately return to position (and not continue to cycle). It is also important to have someone belowdecks to check for movement in the keel floor or bilge area, or any evidence that the sump is moving independently of the keel floors.

2. Are there any visible signs of cracking on the hull at the front and back of keel? Check the full length of the leading edge and bottom of keel for any impact marks/dents, scrapes. The two go hand-in-hand with grounding or impact damage. It's most common for grounding damage to first show at the trailing edge up at the hull, then leading edge at the hull, followed by the side along the sump to hull radius. Note that bottom paint can easily disguise visual clues like cracking, so when in doubt sand back the bottom paint in the area in question.

3. Is there any cracking at the sump/keel joint (approx 12” down from the hull)? A crack in the cosmetic wrap could indicate that the keel nuts have loosened and need to be re-torqued, or it could be a result of excess keel fairing in the area. A crack may permit water to penetrate to the keel bolts and cause crevice corrosion over time – particularly if in salt water. Keel nuts should be torqued according to ISO standards, which specify the setting based on bolt material and thickness. For example, a ¾” 316 stainless keel bolt has a torque setting of 125 ft lbs assuming clean threads.

4. Is there any cracking, no matter how small, along the radius of the hull to molded sump interface? This is the transition from the hull fairbody to the keel sump. If yes, then bottom paint/gel coat should be sanded back to identify depth of cracking. One should also inspect the corresponding area on the turn of the sump inside the boat and consider sanding back interior gelcoat to see if any damage to the glass (white crazing). The tip deflection test (#1) can help better identify whether the cracks are a result of flex or a different issue.

5. Remove all floorboards (both fixed and unfixed) and the ladder and thoroughly clean and dry all bilge components. With flashlight and mirror check all keel floor to hull intersections, including all edges of tabbing for any cracking or debonding. The integrity of the molded keel sump relies primarily on the keel floors and their secure attachment. If the keel and sump have excess movement, it is likely that the tabbing of one or more keel floors is compromised in some way (i.e. the floor is floating free from the hull). The picture to the right shows and example of delaminated tabbing. If there is any sign of different color gelcoats or paint, it is likely the keel sump has been previously repaired. When in doubt, sand away any gelcoat, clean area with a solvent, and look for white crazing in the laminate-- this may be a sign of delamination. Have a surveyor immediately inspect this area for structural integrity.

6. Carefully inspect the keel bolt nuts for signs of corrosion. Periodically have your yard back off the keel nuts (one at a time) and inspect for crevice corrosion on the keel bolts. This can also be checked with a magnet. 316 stainless steel is not magnetic but crevice corrosion changes the properties and the steel could become magnetic.

7. A surveyor will use other tools to check the area: 1) the “tap test”- tapping with a phenolic hammer or small rod to sound out both the exterior and interior for voids or delamination as well as to check the integrity of the glass tabbing along the keel floors; 2) a moisture meter for finding areas of elevated moisture; 3) even thermal infrared imaging to check for any inner laminate damage that might not otherwise be visible to the naked eye (see www.inspectboat.com for sample thermography images).

Maintenance Considerations

1. Care should be taken to avoid having standing water in the bilge. Not only does standing water accelerate corrosion of wiring, fasteners and keel bolts over time, it ruins floor boards and interior woodwork. As the gelcoat/ paint ages in the bilge area, bilge water can eventually seep into the fiberglass laminate by way of pin holes in the gelcoat and weaken the fiberglass laminate structure. The *process of hydrolysis* can be initiated

in the fiberglass laminate *anytime* there is ingress through cracks in the paint/gelcoat in the bilge. *The process of hydrolysis is persistent and invisible- it's water that chemically degrades the quality and strength of the laminate over time.* Bilges (all areas under the floorboards, not just the centerline bilge) should be cleaned thoroughly once per year and then every five years recoated with fresh gelcoat or epoxy paint to ensure proper protection. In northern climates, water turns to ice in the winter. If moisture gets into the laminate and freezes, this can rapidly accelerate deterioration in the laminate. The New Hampshire Materials Testing Labs website (www.nhml.com) has an informative article on hydrolysis, see Newsletter of May 1, 2006.

Here's a J/80 bilge that hasn't seen soap in years. Note evidence of high water present over a long period of time.

2. In the J/80's cored hull, take special care to avoid having any fasteners penetrate the inner hull laminate in the bilge or underneath the bunk areas. Water in the bilge area can easily weep through the fastener into the laminate and cause core damage. If you need to secure a fitting or wire tie to the hull, the best fastening method is to glue a piece of epoxy coated marine ply to the hull and then fasten into the ply.

3. The J/80 has two enclosed compartments (under V-berth and aft of aft bulkhead) which can also trap water, the aft compartment being more susceptible. Owners should routinely check these areas (via the inspection ports) for collected water.

4. A growing trend amongst active one-design racers is to use a dehumidifier to keep the inside of the boat dry. This extra step not only keeps the boat a little lighter, but helps everything from wiring, to woodwork, to sails, last longer.

Structural Repair Considerations

1. For J/80s, the owner and a certified SAMS surveyor (www.marinesurvey.org) or composites expert should (1) determine the extent of cracking, distortion, wetness or delamination and (2) if there is any evidence discovered in step #1 that indicates a potential problem, the surveyor should then conduct destructive or non-destructive testing and, depending on the results of the test, recommend a repair procedure that is carried out by a qualified repair facility.

2. The surveyor can determine within a reasonable degree the relative “strength” of the hull/ keel sump/ keel floor structure through a variety of tests that are available to them. Based on the “degree” of damage ranging from “cosmetic” to “structural failure” the repair considerations may range from repairing paint/gelcoat in the area at nominal cost to a reconstruction of the hull/ keel sump/ keel floor structures (e.g. hull laminations, keel sump laminations, keel floor laminations and tabbing, bulkhead laminations and tabbing) at a considerably higher cost.

RUDDER & STEERING

1. The J/80s rudder straps and gudgeons should be checked on at least an annual basis for corrosion or cracking. In salt water environment, these fittings should be replaced every 10 years and rebedded with Sikaflex or Boatlife every 4-5 years. If you need to mount new straps with a different bolt pattern, have the old holes properly repaired so as not to weaken the structure of the rudder and if necessary, replace the backing plate inside the transom wall.

2. The J/80s rudder blade itself should be checked for pin holes or other cracks that might allow water migration. Check also for splits on the bottom, leading edge and trailing edges. Weighing the rudder on an annual basis is a good way to monitor whether it may have absorbed water which could lead to a weakened laminate structure. When a transom hung rudder breaks it’s usually just under the bottom gudgeon. A simple side to side flex test (grasping the rudder bottom and moving side to side with tiller secured amidships) can indicate whether the blade is weakened or showing cracking at the lower gudgeon area.

RIGGING

1. **Standing Rigging** - The general rule of thumb from Hall Spars is that standing rigging (whether wire or rod) should be replaced every 10 years, unless excess strain due to hard ocean sailing shortens this life. Fatigue can be in any form- sailing in extreme wind conditions, unnecessary flogging of loose leeward shrouds, corrosive environment. Any signs of a broken wire strand(s) indicate immediate replacement is necessary. Otherwise keep a close look out for corrosion or cracking in the swage fittings and

turnbuckle threads. In southern coastal areas, with the high salinity and year round warm weather, rigging must sometimes be replaced every 5 years. Fresh water sailed boats will generally have a longer rigging life, but are still subject to fatiguing after years of stress.

2. **Headstay** – The top of the headstay (wire or rod) should be checked to make sure it's not bent. The fasteners and the top of the headstay foil should also be routinely checked.

3. **Clevis pins** – More rigging and spar mishaps are caused by clevis pins backing out, than perhaps any other culprit. If the clevis pins are semi-permanent (only removed a few times per year), then use appropriate sized cotter pin and fully bend them back around the clevis pin. Then cover with clear sealant rather than tape so that they are visible.

4. **Running rigging-** suffers the greatest wear and tear (chafing primarily) and should be checked frequently for wear, particularly high load lines like main and jib halyards and jib sheets.

5. **Lifting Strap** – many owners use commercial grade web lifting straps for hauling and launching their boats on cranes. These straps come in a variety of configurations and have been seen to be used in many ways. **ALWAYS USE A LARGE FORGED SHACKLE TO ATTACH THE WEB STRAP TO THE STAINLESS LIFTING BAR** (between the aft two keel bolts). Webbing will otherwise chafe against the edges of the bar and can prematurely wear. The stitching in the webbing will break down even after one season, particularly in a wet bilge. If your lifting strap is more than two years old or shows any sign of wear along the stitching, replace it immediately. Most straps are less than $100.

SPARS

1. Spar life can vary, but Hall's general rule is the mast should be replaced every 20 years. Frequently check your spar for problems. Spars break more often than not by a failure in the standing rigging, but there are some specific areas to keep an eye out for:

2. **Deck area-** The mast section at the partners (where the mast passes through the deck) is usually subject to the most fatigue over time. This is due to the rig getting set up with pre-bend, then pulling on lots of backstay tension, and the constant flexing of the spar over many years. The best prevention is a good set of mast wedges or the Spartite mast wedge system. Unchecked movement at the deck can significantly shorten the life of the spar. Be especially careful about drilling any holes in the mast near the deck, and periodically inspect any holes in the area to make sure, there are no cracks developing.

Any holes must be round or have rounded corners.

3. **Spreader tips** – these should be untaped and inspected annually. Seizing wire should be redone annually so that the shrouds will never "pop" out of the spreader tip. Use spreader chafe covers that won't collect water.

5. **Rig Tuning** – to provide not only the best performance but also a longer mast life, it's very important to properly "tune the mast." Tuning means adjusting the shroud tension so that the top of the mast is centered over the boat, and such that the mast is in column or straight as you site up the mast groove on the aft side. Proper tuning for all conditions usually means maintaining enough tension on the shrouds so that they do not go completely slack on the leeward side while sailing. The J/80 and other classes have tuning guides provided by sailmakers. Some suggest very loose settings on the shrouds for better light air performance. Care should be taken to avoid sailing in windy conditions with the light air shroud settings. This can significantly shorten the life of the mast and can lead to breakage.

6. Aluminum spars are subject to corrosion and fittings should be routinely inspected and replaced when necessary. Particular problem areas over time can be fasteners around boom vang, boom and mast ends, and gooseneck attachment brackets.

7. Booms often have a shorter life than masts, particularly on race boats that do a lot of windward-leeward buoy racing in breezy conditions. In some class boats it is common practice to pull the boomvang hard going upwind (vang-sheeting) and then release the boomvang several inches going downwind. However if one bears away without first releasing the boomvang (from its vang-sheeted position) then most booms will bend under this load. Repeated occurrences will shorten the life of the boom and could cause breakage.

8. Every sailboat should carry aboard a tool that is capable of cutting through standing rigging quickly. When a mast does break, the portion that is in the water can easily ram a hole and potentially sink a boat. You may not have time to be unwrapping tape and trying to pull clevis pins at all the attachment points. The top of the line cutters are hydraulic, which can be used on wire or rod rigging. For the J/80, a good hacksaw should be carried at a minimum.

OTHER STRUCTURE

1. **Bulkhead tabbing-** the J/80 forward, main and aft bulkheads are tabbed both fore and aft both on the hull and the deck. This tabbing should be inspected annually and, especially, after any groundings or excessive exposure to "hard trailering". If there is

any evidence of gelcoat cracking or actual tabbing visibly loose, ensure that a marine surveyor inspects the boat and recommends adequate remedies to correct potential damage.

2. **Hull-to-deck joint**- the J/80 is a "glued" PLEXUS (2-part elastomer glue) hull to deck joint. It is an ISO/ ABS approved method for hull-to-deck bonding. This joint should be inspected at least annually and, in particular, if any leaking is noticed inside the hull. Sometimes the best check is to use a "non-permanent dye" in water to squeeze into the hull/deck joint and look for "runs" inside the hull. If any leaking is observed, have the hull to deck joint surveyed and have the surveyor make recommendations for adequate remedies to correct potential damage.

3. **Chainplate fittings-** the J/80 bulkhead is a composite structure of marine-grade plywood, laminated fiberglass and gelcoat. Both port and starboard chainplates should be checked at least annually, with new sealant applied under the deck cover plate whenever the rig is restepped and tensioned or at least once per year, which ever is sooner. Look for leaks around the chainplates where they intersect the deck. See Appendix B photo #1. If any long-term leaking is noticed, consider completing unbolting the chainplates, removing all the bedding compound and inspecting the deck and bulkhead laminate for any water ingress. Most J/80s have high density foam core in this area, but there is still a chance there may be core damage. If any of the core is damaged, remove the damaged area by reefing out the core and replace the area with a WEST epoxy repair kit using the filler to create a paste and then file the hole into shape. Another technique that can help prevent "wicking" of moisture along the stainless plate is apply a strip of metal primer to ensure a bond with the sealant. If any of the chainplate bolts are corroded, they should be replaced.

4. **Bow Sprit system**- the J/80 sprit system is a combination of a carbon tube, pulley system and an integral bulkhead/ bow support. The system can easily be damaged, particularly when struck laterally or vertically at the end of the pole with any force (e.g. when rounding marks hitting sterns, hitting metal buoys, or burying the bow in steep seas under full force of the asymmetric spinnaker too many times). Regularly inspect the sprit for excessive wear where the sprit intersects the outer bearing at full extension.

DECK HARDWARE

1. **Lifelines and lifeline fittings** should be replaced at least every 10 years or at the first sign of corrosion or damage to the wire strands, swages or turnbuckles. Many older

boats have white vinyl coated lifelines, which are no longer allowed by ORC Offshore regulations, as the vinyl can disguise ongoing corrosion or damage to the wire. These should be replaced immediately.

2. Sealants used for deck hardware can last anywhere from 5-10 years depending on the stress exerted on the hardware. If most of your hardware is still original, you should consider backing off the fasteners and rebedding with Sikaflex. Jib and genoa tracks are usually the first areas to start to leak over time. Caulking the deck chainplates should be considered an annual maintenance item. Every six months, or each time your rig is re-stepped (whichever occurs sooner), you should back off the cover plate of the shroud chainplates, scrape out the old sealant, and apply new. Stanchion set screws should be re-inspected and replaced when necessary.

ADDITIONAL REMARKS

There are few industry guidelines regarding pro-active maintenance, inspection and periodic replacement of key components on aging composite boats. Many owners rely on reminders from their boatyards for upgrades or required maintenance. For trailerable one-designs, it's mostly up to the owner unless a surveyor gets involved with a pre-sale survey, and even then, not all surveyors are versed in composites. There are critical areas on every boat that need to be vigilantly looked after and routinely inspected, and we strongly encourage all owners to start by inspecting their boats now to best ensure a long, productive life.

FOOTNOTE: The contents of this article are thought to be accurate, but do not necessarily include all of the possible preventative maintenance suggestions that owners could follow to ensure long-term, safe operation of their boats. Boats incur wear and tear in unique ways. When in doubt please consult a professional for advice/instruction on maintaining, inspecting, repairing and/or operating your boat.

APPENDIX A

American Bureau of Shipping (ABS) 1994 Guidelines for Offshore Racing Yachts
Section 11- Surveys After Construction

Summary:
ABS specifically recommends that a boat should be inspected every two years (the "Biennial Classification Survey"- Section 11.2) and every six years after date of construction (the "Special Periodical Survey"- Section 11.3).

The 2 year surveys defined in Section 11.2 recommend the following survey to be completed:
11.2(a)- boat hauled, cleaned, dried in satisfactory condition for examination.
11.2(b)- general examination externally and internally and placed in satisfactory condition.
11.2(c)- all thru-hull openings and valves to be examined internally and externally.
11.2(d)- basic list of items to be examined and placed in satisfactory condition; including superstructures, hatches, companionways, ventilator and airpipe coamings, skylights, flush deck scuttles, all openings in yacht sides including freeing ports.
11.2(e)- general examination of the steering gear, operationally tested and placed in satisfactory condition.
11.2(f)- general examination of anchoring equipment and placed in satisfactory condition.
11.2(g)- general examination of mast, spars, standing rigging, running rigging and sails and placed in satisfactory condition.

The 6 years surveys defined in Section 11.3 recommend a far more complete survey. In addition to all elements as described in 11.2- Biennial survey, the following components need examination:
11.3(c)- examination of the rudder, bearings and stuffing boxes and placed in satisfactory condition.
11.3(e)- complete examination of the interior, including removal of lining, ceiling, portable tanks and ballast as may be required by Surveyor to satisfy the condition of all parts of the structure.
11.3(f)- all integral tanks tested to full capacity
11.3(g)- examine anchor windlass, hawse pipes, anchors and cables and placed in satisfactory condition.
11.3(i)- examine hull/keel fastenings and "hammer tested" to ascertain soundness by Surveyor.
11.3(k)- all sails, masts, spars, standing and running rigging to be unstepped, laid down on ground and fully examined by Surveyor and placed in satisfactory condition.
11.3(m)1- examine all framing, holds, hull laminate on the interior, tanks, bilges, drains and machinery.
11.3(m)2- if there's evidence of cracking, distortion, wetness or delamination, destructive or non-destructive testing and removal and repair of the defect carried out to the satisfaction of the Surveyor.
11.3(m)3- examine engine foundations and attachment to hull
11.3(m)4- examine the hull, fastenings and backing reinforcements regards hull fittings and attachments.