

**FLOODING:**  
**PLANNING FOR AND DEALING WITH A SINKING SHIP**

By Dick Stevenson, s/v Alchemy, January 2014

This article outlines a strategy for managing a flooding situation on board your vessel. By flooding I mean any ingress of water which is unable to be stemmed by pumps: i.e. **you are sinking**. A planned and practiced strategy is crucial as flooding calls for specific directed actions, quickly executed.

I am primarily addressing **the typical cruising boat, a husband/wife team** on any size boat, although much of the planning can easily be considered for fully crewed vessels. Even if you often have guests, they are unlikely to be helpful in a situation where quick, practised action is necessary.

**The Synopsis of this Strategy**

The bottom line in a flooding situation is the need to find **the flooding and find it fast**. As water rises it covers the leak making what was, at first, an easy visual inspection, turn quickly into one done by Braille: by feeling around. Clearly, visual inspection is far quicker and surer. Most of what I suggest is to allow the leak to be found fast.

As a general rule, most of us get less competent in emergencies. Obvious alternatives are not thought of in the anxiety of the moment. Planning ahead, making diagrams and, most important, practicing will mitigate this tendency.

1. ***Set up your boat*** to allow you to quickly find and respond to leaks.
  - a. **Anticipate vulnerabilities:** First, know your boat and try to anticipate all possible areas of vulnerability to flooding. Make a diagram with salient points highlighted.
    - i. Make sure all seacocks are accessible and able to be worked by your least strong crew. If there is a seacock which is largely inaccessible, say only by taking apart woodwork or by emptying a locker, consider access cutouts or re-thinking your storage. Relocating that seacock is not an unreasonable choice.  
Labelling seacock locations on cabinet/hatch/floorboards can help, especially those vessels with many thru hulls.
    - ii. Include rudder, drive shaft, and transducers as areas for flooding potential as well.

- iii. Track all your hoses, especially those from seacocks. You will find chafe points you can protect, and you can anticipate vulnerable areas such as distribution manifolds.
  - iv. You cannot do much about your vessel's sump, but one should keep in mind that the less sump you have, the less warning you will receive and the more quickly water will cover and obscure wide areas.
  - v. The same goes for structural "pans" which obscure hull inspection and direct water in difficult to predict pathways.
- b. **Early notice:** high water alarms\* are absolutely essential as they can give immediate warning of any unusual water accumulation. They must be able to be heard in the cockpit of a closed up boat with the engine running. Many a crew has first found flooding by discovering their floorboards afloat. If we have heard the story told, the crew was very lucky. I suspect many who found their floorboards afloat never found it possible to tell anyone their story.
- i. One option is an alarm which sounds every time the electric bilge pump operates from its float switch. We have a dry boat so pump activation is always motivation for bilge inspection.
  - ii. Another option (and there is no reason not to do both) is a dedicated high water alarm ready to go off when water gets just a scooch higher than the level where your bilge pump activates.
  - iii. If you have two (or more) bilges it helps when the alarm sounds are distinct for each bilge so as to have an early indication for a search area.
- c. **Floorboards:** the crucial floorboards for inspection must be able to be removed quickly by the weakest member of the crew.
- i. After a period of high humidity, make sure your floorboards are not too swollen to remove. Shave them if necessary.
  - ii. Review all floorboards that need to be lifted for a complete flooding inspection. If screwed down, refit to a floorboard lock that is quickly released (a distant second best, store a charged electric screwdriver ready at hand).
- d. **Speed:** the quicker that the leak can be isolated, the narrower the search area.
- i. Some boats have the engine area bilges separated from the living area bilges. A quick look determines which area is flooding and narrows the search area.
    - 1. Make separate diagrams as to which seacocks, transducers etc. drain into which bilge area. This is not always obvious, especially with structural pans. One way to clarify is to pour a glass of water near a seacock and track where the water goes.
  - ii. If you have a "one bilge" boat, consider a dam at a strategic point. It does not have to be high or strong: just a water stopper. Water can and should

spill over, but make it high enough to allow alarming it to narrow the search area. \*\*

- e. **Pumps:** the more water that can be removed from the boat automatically, the more time to find the leak when it is most easily found.
  - i. This means electric bilge pumps for most of us.
    - 1. Pumps benefit from clean bilges, flushed regularly.
    - 2. They also benefit from good voltage and unrestricted amperage. Review, check and/or upgrade your wiring.
  - ii. It also means that manual bilge pumps have no place in this strategy:\*\*\*
    - 1. They are a dangerous distraction from the main goal of finding the leak and finding it fast.
    - 2. Most cockpit mounted pumps (with their short 12 inch handle) move only a moderate amount of water and are hard to sustain energetically.
    - 3. A big pump like an Edson with a 3 foot handle is a wonderful piece of kit, but is still not a wise use of manpower. You do not want 50% of your search capacity (2 person crew) pumping when that pumping is quite unlikely to keep up with sustained flooding and the goal is to find the flooding fast. Two people should be searching for the leak.

## **2. Refine the strategy for your boat:**

- a. The alarm indicates flooding. This is one alarm that should get immediate action and the action should be previously thought through and practiced: this is not a time to be spontaneous. One or two floorboard lifts should indicate whether there is a worry and where to initially concentrate your search.
- b. From here each vessel's detailed flooding procedure plan will start to be unique to its own particular design. I am including *Alchemy's* flooding plan (shown below) as a way to address the details, the compromises, and some ancillary considerations for this serious event. The following will show how we have taken the above strategy and made an operating procedure for our vessel. Each vessel will differ in the details, but generally the principles will pertain.

## **3. Practice!!**

**There is no way to emphasis this enough.** You cannot just write a plan. **You must practice** using it to make sure your plan works and you can work the plan.

\*Easily obtained high water alarms can be had very inexpensively by any vendor who sells household products. These self contained units are often powered by 9v batteries so they are independent of ship's power grid. They should be tested at regular intervals.

\*\*Often, a natural area for a small dam is where the engine room bilge meets the living area bilge. As said, the dam does not have to be high, but an added benefit is that small inevitable spills of oil, diesel, coolant, etc. stay contained and are easier to clean and less likely to be pumped overboard. They also give quick notice of engine drips/leaks.

\*\*\*Often articles in magazines reflexively mention manual bilge pumps. I have worried that many boat owners believe going to their manual bilge pumps is a first response to flooding. A casual survey of boat owners seems to confirm this.

### **Flooding plan for *Alchemy*:**

#### **A. Procedures to be thought through and practiced in advance.**

##### **IS THE BOAT ACTUALLY FLOODING?**

1. Flooding should be first brought to attention by a high water alarm or bilge pump alarm.
  - a. Which high water alarm is sounding should differentiate whether the forward or aft section of the bilge is flooding [*the bilges are separated and water must reach the floorboards to fall/flow to the other bilge*]. If unsure, raise floorboards where engine bilge meets forward bilge (next to galley sink) and see which side is full and/or which way the flow is going. This determines search area.
2. Test water for salinity; if fresh water, breathe easier (unless sailing in fresh water). Make sure it is not diesel.

**IF IT IS FLOODING**, then Ginger and Dick work previously determined areas of inspection.

##### **1. IN GENERAL:**

- a. Locating the leak takes precedence over most everything because as the water level rises finding the leak becomes more difficult.
- b. If extra crew, set them up in cockpit with manual pump-handle in bottom step.
- c. THINK! Ask ourselves what has just been done/happened (heard a bump, tacked, started genset, filled water tanks etc.)
- d. Watch footing for holes left exposed by floorboard removal. Not a time for injury.
- e. At some point, earlier rather than later, consider donning life jackets/vests or ensuring they are ready at hand.
- f. At some point, again earlier rather than later, reach out to make contact. This could include:
  - i. Calling out a Pan Pan Pan and making a report of location and nature of distress.

- ii. Hitting the VHF distress call button (DSC button) and hold for 5 seconds--we can always cancel later.
  - g. Consider same with EPIRB.
  - e. Consider heading the boat toward a grounding place, a beach preferably, and put on speed. (It is likely we will be on autopilot and this will entail only a quick turn of a dial.)
  - f. Consider starting the engine as electric bilge pumps will pump more water with increased voltage.
2. Consider setting up high capacity electric bilge pump (one automatic medium capacity pump is always available). Attach hose (stored in forepeak starboard side under) with quick attachment and put out portlight or cockpit. Tie in place. *[Note: a plan is in the works for this to be made automatic as this interferes with the primary task of finding the leak.]*

#### **IF FLOODING IS IN AFT BILGE AREA:**

1. Check aft of engine (if clear, then rudder assembly, genset and thru-hulls aft are ok; go to #3), if water is flowing, then:
  - a. Turn genset off if it is on, then turn off water for GS at manifold.
  - b. If flow stopped, the genset was the problem, if still flowing, then:
2. Check rudder shaft area.
  - a. Remove starboard lazarette.
  - b. Rudder shaft, 4 cockpit drains, genset exhaust & propane locker drain should be visible. *[On ALCHEMY, there are a number of thru-hulls at or just above the waterline that have no valves (such as the cockpit drains). I consider this a design compromise I am not happy with, but have decided to live with.]*
3. Two areas to check midships aft (that go into aft bilge area).
  - a. Three seacocks are under head sink. Turn all off after inspection.
    - a. In wet locker and head are 3 thru-hulls just above waterline (electric bilge, scupper, shower sump).
    - b. Port side locker has scupper discharge and a no longer used, now plugged, refrigeration outlet
  - b. Check engine area for leaks, especially shaft area.
    - a. Check engine exhaust and manual bilge pump discharge thru-hulls outboard in engine room.

#### **IF FLOODING IS IN FORWARD BILGE AREA**

Check bilge at most forward floorboard for water flow

- a. If Yes, then:
  - i. Check and turn off deck wash seacock.
  - ii. Check depth and speed transducers.
  - iii. Next is hull integrity.

- b. If No:
  - i. Check main seacocks (two, near mast step).
  - ii. Check distribution manifold (close genset seacock if not in use).
  - iii. If all ok consider starting engine for mobility and for good voltage for pumps.
  - iv. Check likely hose lengths for breaks.
- c. Check galley seacock and turn off.
- d. Hanging lockers either side may drain either side of bilge barrier.
  - i. Port side also has old refrigeration thru-hull, plugged.

**IF NO SUCCESS, CONSIDER:**

1. Checking keel bolts (just one in aft bilge area).
2. Checking for siphon action: bilge pumps, engines, toilet, galley sink, PSS Shaft Seal bleeding hose, etc.
3. Checking hull integrity around best guess for ingress.
  - a. Tack over to get opposite side out of water.
4. Checking to see if water level is decreasing with seacocks closed; if so breathe easier as leak is in a hose (and with seacocks closed should stop) and we now have time to find. If not...
5. Bailing is an option!
6. Do not stop looking for leak and bailing until water drives you out. The best chance of survival is to keep the boat afloat.
7. At some point, prepare life raft, grab bags, etc. for abandoning ship, then return to searching.

**B. Hull holing equipment and LOCATIONS**

1. Bungs of various sizes in red bag in bottom step of companionway ladder. (*I differ from many by not liking bungs attached to each seacock, although they do have to be very accessible. First, in a flood they may be difficult to untie, see and/or work with if tied to the seacock. They also collect dirt, grime & mold and are continually damp which undermines the swelling expected once banged in place.*)
2. Collision mat in forepeak forward
3. Emergency Hull Repair Kit with waterproof epoxy near water heater.
4. 1/4" plywood 14"x 3' under starboard settee cushion with many other various options.
5. 5200 (2 fresh caulking gun size tubes) and sheet rock screws near water heater.
6. A quite creative suggestion (I suspect from the "old salts" manual) is a lead sheet, pre-perforated, with sheet rock screws.

**C. Seacock and thru-hull locations (The bag of bungs is in the bottom companionway step).** (In our safety manual, in addition to the above text, there are 2 pages of diagrams, port and starboard side, giving visual indications of where the thru-hulls exist.)

1. Hull openings below waterline: 7 seacocks (listed below) plus propeller shaft and two sending units for instruments (under floorboards forward of table).
  - a. Two seacocks under floorboards in front of mast.
  - b. One in the port side forepeak bilge locker under cushion in middle.
  - c. One under floorboards near galley sink.
  - d. Three under head sink.
2. Numerous hull openings just above the waterline, again see diagrams.

Diagrams of (manufactured) openings in Alchemy below.

