Damage Control
(with a special segment on keel loss)

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Common Damage Control Scenarios

• Flooding: Hull holed at or below the waterline as a result of collision with floating or submerged object or failed below-the-waterline plumbing (seacock, stuffing box, hose, etc).
• 40% of all underway sinking are result of striking submerged object

• 16% are a result of broken prop shaft or strut

• 16% result of damaged or deteriorated below the waterline plumbing
• Spar collapse: Mast falls as a result of metal fatigue or standing rigging failure.

• Rudder failure or loss.
Unfortunately, not every day at sea is like this…
Some are like this…
Others are like this
And still others are like this
Dealing With Flooding

• Find and gain access to the flooding; stop the water flow *first*, then worry about pumping out.

• Shut seacocks, fill or patch the leak.

• Seacocks. Location, location, location.
Post a Seacock Location “Map”
Flood Rates
• A 1” hole 1 foot below the waterline = 1200 gallons per hour.
• A 2” hole 2 feet below the water line = 111 GPM or 6660 GPH.
• Larger electric bilge pumps are typically in the 1500-2000 GPH range, under ideal conditions.
• Actual is often half rated capacity
100 gallons/hour for every foot of boat length.

Submersibles only

Don’t forget the alarm.
Bilge debris is your pump’s worst enemy
“Electric Bilge Pump Systems Debunked and Done Right”

Professional Boat Builder Magazine
January/February 2014

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Avoid the “hidden seacock” syndrome

You should be able to find and access every seacock aboard your vessel, *in total darkness*, *with your eyes closed* and *without the aid of tools*. 
Labeling

- Bow
- Head Intake
Cedar/soft wood plug assortment
Does this make sense?
“Leveraging” your seacocks
Seacock Durability and Strength

The 500 lb -30 Second Rule.
Do yours measure up?
The “Liner” Hull Dilemma
Access, access, access.

Options for improving access to the *interior* of the hull in the event of damage...
Plan B
Cordless reciprocating saw and drill

Spare batteries

Kindling hatchet

Spare high quality blades

Hole-saws
Thin plywood patches

Drill and sheetrock screws (not for thick FRP)

Sealant
Self Tapping Screws

For FRP/Fiberglass

“Cutting Point” or PK Screws

Phillips Drive

Square or Robertson Drive
Adhesives, Sealants and Cleaners
If You Can’t Access The Damage From The Inside…
Running The Rigging Failure
Gauntlet

• Assess damage to the hull quickly.
• Cast off the rig as quickly as possible.
• Save what you can, particularly the boom, for use as a jury rig.
An Ounce of Prevention...

Conduct regular rig inspections

Go up there

Remove tape and chafe gear

Un-step every 5 yrs.
Inspect it even if it works...
Crevice corrosion and rust...
Under Cover Shroud...
The real damage revealed...
Rudder Damage or Loss
Prepare A Back-Up Rudder In Advance
(Preventing) Keel Loss

Photo US Coast Guard
Keel Failures 2008 ISAF study 72 cases since 1984, 44% w/ defined causes...

• Welded fin 11
• Grounding/Collision 8
• Internal Structure 8
• Keel Bolt 3
• Canting System 2
Interior Inspection
Keel Fasteners
Look For:

• Corrosion
• Engagement
• Load Distribution
When to drop’em.....
Exterior Inspection
Stainless Steel’s Nemesis...

Stagnant water and the crevice corrosion it causes.
Cheeki Rafiki MAIB Findings...

“...a combined effect of previous groundings and subsequent repairs to its keel and matrix (or lining) had possibly weakened the vessel's structure where the keel was attached to the hull."
"It is also possible that one or more keel bolts had deteriorated"

"A consequential loss of strength may have allowed movement of the keel, which would have been exacerbated by increased transverse loading through sailing in worsening sea conditions."
• Find the leak and fix it without delay. Keep the pumps clear.
• Don’t succumb to the shock of losing your rig or rudder, or you may succumb to the shock of losing your boat.

• Act quickly and calmly to prevent the rig from damaging your (life) boat.
Every cruiser, at one time or another, faces a damage control scenario, wherein a piece of gear fails, sometimes benignly, sometimes catastrophically. The “gear” could be anything from a failed raw water hose to a breached hull. If it hasn’t happened to you yet, you’ve been fortunate.

To be sure, a well-maintained vessel is less likely to suffer avoidable failures that require damage control measures, or they may be less intensive. However, regardless of a vessel’s operating condition, difficult to predict events, striking a submerged object or running aground, for instance, can lead to flooding and the need quickly and effectively deal with it.

By the same token steering system failures and rig collapses all represent “opportunities” for a vessel’s crew to either rise to the occasion and stem the tide, figuratively as well as literally, or break out the EPIRB and abandon ship. Naturally, the former is preferred wherever possible, keeping the vessel afloat, first and foremost, and then underway, are priorities where damage control measures are concerned.