

## Safety At Sea Studies - Safety Tips

### SAFETY TIPS

When presenting a US SAILING Safety at Sea Seminar, the Moderators not only give sage advice, they also listen and learn from the audience sharing their experiences. Read on to see what is learned and shared -

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### Light Displacement Yachts Fitted With Fin Keels Built Subject To Pre-1994 ABS Approval

Modern designs have been known to push the limits on keel attachments with the possible consequence of losing the keel in heavy weather or grounding. A Coronial Inquiry in Australia was instigated after two crew members drowned following a keel failure. The advice (for light displacement yachts fitted with fin keels not built to 1994 ABS criteria) is to have a naval architect and marine surveyor inspect the design and installation of the keel on your boat.

[Read more on this development.](#)

[Read the Australian Coroner's Report.](#) (PDF File)

### Man Overboard Victim Tips

If you go overboard, what can you do to increase your chances of recovery?

The first answer is that if you are wearing flotation a Lifejacket, also called a Personal Flotation Device (PFD), your chances of recovery are 12 to 15 times better than if you

don't have one on. That's an awesome fact!

If you aren't wearing flotation there are several things that you can do to improve your chances of being seen in the water and getting back aboard safely. A few of these hints are listed below:

1. Make sure you are seen and heard as you go over. Make yourself visible in the water.
2. Don't swim after the boat. Swim to any flotation that is thrown in the water.
3. Conserve energy. Don't shout. Blow a whistle, if you have one. Float in the HELP position.
4. Learn how to get into and fasten yourself into the MOB Recovery equipment on your boat.

### **MOB / VICTIM TIPS FOR THE PERSON IN THE WATER (PIW)**

- ↯ Shout and try to attract attention as you are falling overboard.
- ↯ Don't try to swim after the boat. Swim to any flotation that is thrown over instead.
- ↯ Try to make yourself visible (put hood up on foul weather gear, splash water around you, wave arms)
- ↯ Don't shout needlessly. Blowing a whistle is more likely to be heard aboard the rescue vessel.
- ↯ Wait for the boat to circle and return to you.
- ↯ Look for the Lifesling and its retrieval/trailing line or a throw rope in the water.
- ↯ Keep clothing on, trapping air inside it if possible.
- ↯ Get rid of heavy non-buoyant items including boots that fill with water.

### **LIFESLING**

1. If a Lifesling is used let the retrieval/trailing line slide through your hands until you reach the knots or bowline.
  2. Put the Lifesling over your head and under your armpits
  3. Clip together the two sides of the buckle next to each D ring, if you can find them.
  4. If you are in the Lifesling and the boat starts to pull you through the water before it stops, TURN AROUND so that you will be towed backwards keeping the wake out of your face. This can be the most dangerous part of the whole procedure and must be avoided.
  5. If the Lifesling is equipped with a thigh strap pull it down from the outer circumference of the sling to a point under your knees, adjusting it for comfort just before you are hoisted aboard.
  6. Help the remaining crew get you aboard, if you can, but don't take the Lifesling off until you are on deck.
- ↯ If the boat misses you, or can't immediately find you, try to get to anything that floats like a cushion, MOB Pole or MOM, if you see one. You become more visible to those left on the boat when you do this.

- ↳ Get into any horseshoe or MOM and clip the two sides together, if it has clips.
- ↳ If you can't reach any flotation and you have to wait to be rescued, assume the Heat Escape Lessening Posture (HELP) as much as possible. Keep a hat on, your head out of the water, arms against your sides and across your chest and PFD, and your lower legs crossed, knees together and raised as the seas permit.
- ↳ Use signaling devices that you might have in your jacket (signal mirror, flares, flashlight)
- ↳ At night, activate a personal strobe, if you have one, and leave it on until the rescue boat makes its approach to pick you up. At that point turn the strobe off and an incandescent light on, if you have one, so that the strobe flashes do not disorient or temporarily blind the helmsman.
- ↳ Recognize that hypothermia will cause you to stumble, fumble and mumble within minutes of entering the water. Your fine motor skills will be reduced and you will begin to shiver. This is why you should get attached to flotation as soon as possible and let people help you get back aboard.
- ↳ For more information about the Lifesling see [Lifesling Owner's Preparation Guide](#).

### **Jackstays (Jacklines), Clipping Points and Static Safety Lines**

**A. Jacklines** must be attached to through-bolted or welded deck plates on the port and starboard sides of the center line. They must provide secure attachments for safety harness tethers on each racing sailboat in Category 0, 1, 2, and 3 monohull and multihull races. These lines must be made of uncoated stainless steel wire or webbing of equivalent strength. Multihulls should have at least two jacklines fitted on the underside in case of inversion.

**B. Clipping Points** for harness tethers must be attached to through-bolted or welded deck plates or other strong anchorage points adjacent to stations such as the helm, sheet winches, and masts, where crew members work for long periods. Two-thirds of the crew must be able to be clipped onto clipping points simultaneously, without depending on jacklines.

**C. Static Safety Lines** together with jacklines and clipping points must enable crew to clip on before coming onto deck and unclip after going below. While continuously clipped on, crew must be able to move readily between working areas and in cockpit(s), including being able to cross the deck athwart ships, with a minimum of clipping and unclipping.

For the complete wording of jackstays, clipping points and static lines requirements and recommendations see Special Regulation 4.04 with the US SAILING Prescription copied below from the 2002- 2003 Special Regulations (Helpful hints and recommendations for the rigging and use of jackstays are also included below).

#### **4.04 Jackstays, clipping points and static safety lines**

4.04.1 The following shall be provided:

a) Jackstays:

i attached to through-bolted or welded deck plates or other suitable and strong anchorage fitted on deck, port and starboard of the yacht's center line to provide secure attachments for safety harness

ii comprising stainless steel 1X19 wire of minimum diameter 5 mm (3/26 in), or webbing of equivalent strength. (20kN – 2040 kgf or 4500 lbf breaking strain webbing is recommended)

**US SAILING prescribes that wire jackstays may be of configurations other than 1X19.**

iii which, when made from stainless steel wire installed on or after 1/99 shall be uncoated and used without any sleeving

iv at least two of which should be fitted on the underside of a multihull in case of inversion.

4.04.2 Clipping points:

a) attached to through-bolted or welded deck plates or other suitable and strong anchorage points adjacent to stations such as the helm, sheet winches and masts, where crew members work for long periods.

b) which, together with jackstays and static safety lines shall enable a crew member:

i to clip on before coming on deck and unclip after going below

ii whilst continuously clipped on, to move readily between the working areas on deck and in the cockpit(s), including being able to cross the deck amidships, with the minimum of clipping and unclipping operations

c) to enable two-thirds of the crew to be simultaneously clipped on without depending on jackstays

d) in a trimaran with a rudder on the outrigger, adequate clipping points that are not part of the deck gear or the steering mechanism, in order that the steering mechanism can be reached by a crew member whilst clipped on.

***e) Warning – U bolts as clipping points – see 5.02.1 (a)***

#### ADDITIONAL INFORMATION ABOUT JACKLINES AND CLIPPING POINTS

Special Regulation 5.02.1 (a) warns that it is possible for a plain snaphook to disengage from a U-bolt if the hook is rotated under load at right angles to the axis of the U-bolt or clipping point. For this reason the use of snaphooks with positive locking devices is

strongly recommended on all Jacklines and Clipping Points.

#### JACKLINE DISCUSSION

There are two significantly different schools of thought on how jacklines should be used. One is that they should be taut and act as a 'third leg' to steady a person moving along deck while holding their tether tightly in hand. The other is that the Jackline and tether are there to catch a person should they fall. The Special Regulations allow both styles of jacklines, so it becomes an owner's choice.

There is also an ongoing discussion whether the amount of stretch in webbing jacklines (estimated by some to be 20%) is dangerous? An overboard person attached to a webbing jackline could very well wind up being towed astern if the jackline stretches and the tether attached to it is full length (6ft). Some have suggested that this could be prevented or reduced by attaching the after end of the jackline at least 6 feet forward of the transom. Another discussion that favors webbing over wire jacklines is that webbing is generally a contrasting color and it does not roll under foot.

Webbing jacklines are prone to more chafing and sun/UV damage than wire.

Some race organizers allow line instead of webbing as long as it has a breaking strength of 4500 lb or greater. Others will not accept nylon jacklines of any type. One, (Sydney Hobart) requires that the jacklines be made of 12 mm low/no stretch spectra material. A possible compromise that might be acceptable to race organizers is to insert a low/no stretch line inside the tubing of a webbing jackline.

#### **Safety Lines (Tethers)**

The ISAF Special Regulations state that each crew member aboard a racing sailboat is required to have a safety line (tether) not more than 2m (6 ft) long with a snaphook at each end in Category 0, 1, 2, and 3 monohull and multihull races. In addition to this, at least 30% of each crew is to be provided with either a short safety line (tether) not more than 1 m (3 ft) long or a mid-point snaphook on their longer safety line (tether).

Any safety line (tether) purchased after January 2001 should have a colored flag embedded in its stitching to indicate if the safety line has been overloaded.

Other strong recommendations given in the Special Regulations include:

- A. Have static safety lines (tethers) securely fastened at work stations (e.g. near the mast and helm).
- B. Have a contrasting color in the stitching to make it easier to detect wear and damage.
- C. Use only snaphooks with positive locking devices at the boat end of safety lines (tethers) that will not self-release when twisted around an attachment point.
- D. Have a snap shackle at the body end of the safety line (tether) that can be released under load.
- E. Carrying a personal knife that can be used to cut the safety line (tether) in an emergency.

For the complete wording of Harness and Safety Line (Tether) requirements and recommendations see ISAF Special Regulation 5.02 with the US SAILING Prescription copied below from the 2002- 2003 Special Regulations.

Also below see the definition of "snaphook" and the results of a 1998 test where 47% of the tethers tested failed PLUS several helpful hints for the care and use of Safety Lines (Tethers).

## **5.02 Safety harness and safety lines (tethers)**

**5.02.1** Each crew member shall have a safety harness, and safety line not more than 2m (6 ft) long with a snaphook at each end and:

*a) Warning it is possible for a plain snaphook to disengage from a U-bolt if the hook is rotated under load at right-angles to the axis of the U-bolt. For this reason the use of snaphooks with positive locking devices is strongly recommended.*

**5.02.2** At least 30% of the crew shall each, in addition to the above be provided with either:-

- a. a safety line not more than 1m (3 ft) long, or
- b. a mid-point snaphook on an existing 2m (6 ft) safety line

**5.02.3** A safety line purchased in 1/01 or later should have a coloured flag embedded in the stitching, to indicate an overload. A line which has been overloaded shall be replaced as a matter of urgency.

**5.02.4** A crew member's harness and lifejacket shall be compatible.

**5.02.5** It is strongly recommended that:

- a. a harness and safety line should comply with EN 1095 (ISO 12401) or near equivalent
- b. static safety lines should be securely fastened at work stations
- c. a harness should be fitted with a crotch strap or thigh straps
- d. to draw attention to wear and damage, stitching on harness and safety lines should be of a colour contrasting strongly with the surrounding material
- e. snaphooks should be of the type which will not self-release from a U-bolt (5.02.1 (a)) and which can be easily released under load (crew members are reminded that a personal knife may free them from a safety line in emergency)
- f. a crew member before a race should adjust a harness to fit then retain that harness for the duration of the race

**US SAILING prescribes that the safety harness may be integrated with an inflatable**

**personal floatation device (see 5.01) and recommends that such devices be employed whenever conditions warrant, and always in rough weather, on cold water, or at night, or under conditions of reduced visibility or when sailing short-handed.**

### **EXPLANATION OF TETHER COMPONENTS:**

**Snap Shackle** – Easy to release under load, but can be released accidentally if the lanyard is pulled. Best suited for the harness end of the tether.

**Snap Hook** – Easy to attach, difficult to detach under load, and can become undone accidentally if used on U-shaped pad eyes. Not a favorite.

**Gibb Snap Hook** – Double action gate keeps the snap attached until you press both gates in succession. Very Secure. Hard to release under load.

**Wichard safety hook** – Relatively secure design makes it difficult for this safety hook to come undone until both backside and gate are squeezed simultaneously.

**Double tethers** – Enable you to remain attached as you move about the boat. You can also attach both at the same time for additional security.

**Elastic tethers** – Length of shock cord inside the webbing, causing them to retract to about 3 ft when not under tension, and stay out from underfoot.

**1999 HARNESS AND TETHER STUDY**: This study, conducted by the Sailing Foundation of Seattle, consisted of an in the water test to determine towing characteristics, a static test to determine comfort and ease of use, and a dynamic load test to ascertain compliance with the Special Regulations. Harnesses were also evaluated for desirable features such as reflective tape, stitching, quick release capability, and general quality.

The dynamic testing yielded the most noteworthy results. 8% of the harnesses failed the test (one a prototype), while fully 47% of the tethers failed the test.

See the **1999 HARNESS AND TETHER STUDY** for a complete copy of this study, including a list of those harnesses and tethers that failed the test.

### **HINTS ON CARE AND USE OF TETHERS**

When wearing a harness and using a safety line or tether:

1. Never unhook a shipmate's tether unless he/she asks you to do so. Unhook your own and move it if you must move past a shipmate along the jackline.
2. Always attach a tether with the gate side up when attaching to a jackline.
3. Always hook on below decks before climbing through a companionway to go topside.
4. Never unhook before climbing below. Wait until you get below then reach back up

- to unhook.
5. Consider wearing two tethers when steering in heavy weather, one hooked on each side of the helm.
  6. NEVER, ever hook a tether onto a lifeline.
  7. Never hook a tether onto a steering pedestal or pedestal guard. (they are not often strong enough)
  8. Check your tether frequently for worn webbing and broken stitches.
  9. A tether which has been overloaded (just once) must be replaced as a matter of urgency.
  10. After using a tether and harness on a passage rinse them off with fresh water and let them dry thoroughly before storing them in a clean, dry place.

### **Safety Harnesses**

The Offshore Special Regulations state that each crew member aboard a racing sailboat is required to have a safety harness in Category 0, 1, 2, and 3 monohull and multihull races. Safety harnesses must be compatible with each crew member's Personal Floatation Device (PFD). In the US, the safety harness may be integrated with a personal floatation device, including an inflatable PFD. It is strongly recommended that harnesses be fitted with a crotch strap or thigh straps and that the stitching on harnesses be of a contrasting color so that wear and damage can easily be spotted. Every crew member should adjust their harness to fit before each race and keep that harness for the duration of the race. Safety harnesses should be worn whenever conditions warrant, and always in rough weather, on cold water, or at night, or under conditions of reduced visibility and when sailing short-handed.

For the complete wording of Harness and Safety Line (Tether) requirements and recommendations see Special Regulation 5.02 with the US SAILING Prescription copied below from the 2002 - 2003 Special Regulations plus several helpful hints for the care and use of Harnesses.

#### **5.02 Safety harness and safety lines (tethers)**

**5.02.1** Each crew member shall have a safety harness, and safety line not more than 2m (6 ft) long with a snaphook at each end and:

*a) Warning it is possible for a plain snaphook to disengage from a U-bolt if the hook is rotated under load at right-angles to the axis of the U-bolt. For this reason the use of snaphooks with positive locking devices is strongly recommended.*

**5.02.2** At least 30% of the crew shall each, in addition to the above be provided with either:-

- a. a safety line not more than 1m (3 ft) long, or
- b. a mid-point snaphook on an existing 2m (6 ft) safety line

**5.02.3** A safety line purchased in 1/01 or later should have a coloured flag embedded in the stitching, to indicate an overload. A line which has been overloaded shall be replaced as a matter of urgency.

**5.02.4** A crew member's harness and lifejacket shall be compatible.

**5.02.5** It is strongly recommended that:

- a. a harness and safety line should comply with EN 1095 (ISO 12401) or near equivalent
- b. static safety lines should be securely fastened at work stations
- c. a harness should be fitted with a crotch strap or thigh straps
- d. to draw attention to wear and damage, stitching on harness and safety lines should be of a colour contrasting strongly with the surrounding material
- e. snaphooks should be of the type which will not self-release from a U-bolt (5.02.1 (a)) and which can be easily released under load (crew members are reminded that a personal knife may free them from a safety line in emergency)
- f. a crew member before a race should adjust a harness to fit then retain that harness for the duration of the race

**US SAILING prescribes that the safety harness may be integrated with an inflatable personal floatation device (see 5.01) and recommends that such devices be employed whenever conditions warrant, and always in rough weather, on cold water, or at night, or under conditions of reduced visibility or when sailing short-handed.**

### **ADDITIONAL INFORMATION ABOUT HARNESES**

- 1.** In many cases, harnesses should be the first line of defense; they may be more important than PFD's in saving lives.
- 2.** Harnesses are probably underused, especially in near-shore situations. Oceanic and especially single handed racers understand their value, but it doesn't matter how far from shore you are ...
- 3.** Keep your harness handy. One boat requires that a crew member's harness is stowed in one of his or her sea boots when not in use. Another provides a string hammock above each bunk for ready stowage of personal safety gear.
- 4.** "Safety harnesses should be worn whenever conditions warrant" is the governing advice.
- 5.** US SAILING's SAS Committee is studying use and advisories re. harnesses. Your input will be helpful.

Contact any member of the [SAS Committee](#) or E-mail the Temporary Chairman [Bruce Eissner](#) with your comments.

The 23 October 2002 edition of the E-mail newsletter OFFSHORE NEWS made the following announcement:

"The Safety at Sea Committee has opened the discussion to identify what course of action US SAILING should take to best serve and guide Offshore racing. Currently there is a US Prescription *recommendation* in the ISAF Special Regulations Governing Offshore and Oceanic Racing that defines situations and conditions that should warrant the use of PFD's and harnesses. The committee plans to review the current wording. The revised prescription will be circulated among the Offshore racing community to solicit input on content and whether it should be a mandatory or a recommended statement. Current text can be found in section 5.02.5 (f). The revision will be announced and reported at [www.ussailing.org](http://www.ussailing.org) and in the E-mail newsletter Offshore News."

## **LIFEJACKETS OR PFD'S**

### LIFEJACKETS or PFD's (Personal Floatation Devices)

The Offshore Special Regulations state that each person aboard a racing boat in the US is required to have a lifejacket equipped with a whistle, reflective tape, and marked with either the yacht's, or the wearer's name. Lifejackets must be compatible with harnesses and, if it is an inflatable, it must be regularly checked for air retention. A light, crotch (or thigh) strap(s) and a face splash guard are all recommended as well as buoyancy (greater than 150 N buoyancy) to float an unconscious person face up.

In the US PFD requirements can be met with a USCG Type 1 PFD, or an Inflatable PFD for Category 1, 2, and 3 races and a Type III PFD for category 4 races.

All crew members on deck must wear a PFD at the start and finish of a race and at all times until the captain of the boat relaxes the regulation during the race. This requirement assures every crew member that their lifejacket is fitted properly and that they know where it is during the race, should they need it.

For the complete wording of the **2002-2003 requirements** see Special Regulation 5.01 with US SAILING Prescriptions and Special Regulations 4.17 and 4.18, copied below.

### **5.01 Lifejacket**

**5.01.1** Each crew member shall have a lifejacket as follows:

- a. equipped with a whistle
- b. fitted with marine grade retro-reflective material (4.18)
- c. compatible with the wearer's safety harness
- d. if inflatable, regularly checked for air retention
- e. clearly marked with the yacht's or wearer's name

**5.01.2** It is strongly recommended that a lifejacket has:-

- a. a lifejacket light in accordance with SOLAS LSA code 2.2.3 (white > 0.75 candelas, > 8 hours)
- b. 150n/35lbs buoyancy, arranged to securely suspend an unconscious man face upwards at approximately 45 degrees to the water surface – in accordance with EN 396 or near equivalent.
- c. A crotch strap or thigh straps
- d. A splashguard. See EN 394

US SAILING prescribes for categories 0, 1, 2, 3 either a Type I U.S. Coast Guard approved personal flotation device or an inflatable personal flotation device meeting the definition in the above paragraph and manufactured to either British national or European Community standards. A light should be fitted and a crotch strap is recommended on each lifejacket. Each inflatable device should be inflated and inspected annually. Service dates shall be marked on the flotation devices. This inflatable device may be integrated with a safety harness (see 5.02)

US SAILING prescribes for Category 4 lifejackets as above or U.S. Coast Guard approved Type III personal flotation devices.

US SAILING prescribes that all personnel on deck shall wear personal flotation while starting and finishing without exception, and at all other times except when the Captain of the boat directs that it may be set aside.

US SAILING note: As is true of all of these regulations, the prescriptions above do not necessarily replace the requirements of other governing authorities.

#### 4.17 Yacht's name

Yacht's name shall be on miscellaneous buoyant equipment, such as lifejackets, oars, cushions, lifebuoys, and lifeslings, etc.

#### 4.18 Marine grade retro-reflective material

4.18.1 Marine grade retro-reflective material shall be fitted to lifebuoys, lifeslings and lifejackets.

### **INFLATABLE PFD MAINTENANCE**

How do you know if your inflatable Personal Flotation Device is working? Every inflatable has an Owner's Manual that describes a visual inspection of the inflator and the CO2 cylinder before each use. In addition, each inflatable should be blown up annually and leak tested overnight. If it has an automatic inflator, the water-sensitive bobbin should be replaced annually as well. A record of this maintenance should be marked on every inflatable.

*WE ARE SEEING FAILURES OF THESE PFD's AS THEY AGE AND ARE BEING ROUTINELY WORN.* Become a survivor not a statistic by checking your own safety gear.

#### **PFD OWNER'S MANUAL**

Each inflatable Personal Flotation Device (PFD) is sold with an Owner's Manual that describes the following items:

- ⚓ Approval Conditions and Carriage Requirements. Most inflatable PFD's that have USCG approval are Type V because they are approved only when worn. When inflated they have

- Type II performance.
- ↯ Instructions for Use. "It's Mandatory that the User Check the Status of the CO2 Inflator and the CO2 Cylinder Before Each Outing".
  - ↯ Donning Instructions, Safety Harness Instructions, Inflation and Deflation, Care and Maintenance, Rearming Instructions, Folding Instructions, and Testing Instructions are all included too.
  - ↯ If you do not have an Owner's Manual for your Inflatable PFD you should get one from the manufacturer for your specific model.

### **HOW TO VISUALLY INSPECT AND LEAK TEST YOUR PFD**

To check for leaks, remove the CO2 cylinder, orally inflate the device until firm and leave overnight. The PFD should still be firm in the morning. This leakage test should be performed at the beginning of the boating season and at least every two months thereafter if you are a light user, and more often if you are a heavy user. After this test deflate, and rearm the inflator. Then fold your PFD in accordance with the folding instructions in your Owner's Manual.

### **ANNUAL TEST RECORD**

US SAILING Prescription to the ISAF Special Regulations Governing Offshore and Oceanic Racing (Special Reg 5.01.2) states the "Each inflatable device should be inflated and inspected annually. Service dates shall be marked on the floatation devices. The inflatable device may be integrated with a safety harness."

### **INFLATABLE PFD CHECKLIST. When preparing for an outing, ask yourself:**

- ↯ Have I checked the status of the inflator and made sure that the CO2 cylinder is not punctured? Check both before each outing.
- ↯ Is it armed in the appropriate mode for this outing?
- ↯ Have I checked my inflatable PFD for leaks I the last two months?
- ↯ Do I have the right PFD for this activity?
- ↯ How does my PFD work in the water? Have I tested it this season?
- ↯ Do I have the right size PFD for each person (according to the label) and do they fit snugly?
- ↯ Have I checked my other inflatable PFD's in the same manner in which I checked my own?

### **WHISTLE**

John Bonds recently sent me a Storm (TM) Safety Whistle, which claims to be the "world's loudest whistle" that "works in wind and water." It is certainly loud, and at around \$4 with the lanyard, it's an inexpensive but thoughtful safety device for a gift.

### **LIGHT UP**

The key factor in finding a victim in the water is visibility. Get some reflective tape for and put it on your outer garments for sailing. Take a look at the inexpensive chemical light tubes or at

the personal flashlights that clip to a jacket. (Be careful about personal strobes that can blind the rescuers, look for combination strobe with a switch to steady light).

### **QUICK STOP**

Do you know about the Quick Stop? If you don't know this essential life saving maneuver cold, or don't practice it regularly, make Quick Stop a part of your sailing day (you'll find it in the *International Sailing Federation Special regulations Governing Offshore and Oceanic Racing for 2002-2003 including US SAILING Prescriptions*).

### **CLIP IN**

Safety harnesses, with specifications described in an Appendix to the *"International Sailing Federation Special regulations Governing Offshore and Oceanic Racing for 2002-2003 including US SAILING Prescriptions,"* are the essential piece of personal safety equipment. Buy one for yourself or for a friend, and carry it with you whenever you're aboard a boat. Most of all, wear it and be prepared to clip in whenever conditions warrant.

### **RIG FAILURES**

There has been an incidence of failures of upper diagonal shrouds in deeply-reefed boats sailing in ocean conditions. When mainsails are reefed, the diagonals essentially become the mast's upper shrouds. This increased demand, combined with the shock loading that can occur in ocean wave conditions, may account for a number of the failures that have been reported. We would appreciate hearing about other experiences with modern rig failures, and we advise that sailors should be judicious in reviewing the strengths of upper diagonal shrouds and their attachments.

### **DELAMINATION**

There are continuing reports of delamination of composite construction hulls. It is especially important for sailors as consumers to understand that the composite construction process involves not only specifying the proper materials for the components or layers of the composites, but also ensuring that those materials (some of which are complex chemicals) meet strict quality-control standards, and that the composite building process must follow a strict timing schedule in order to achieve the inter-laminate bonds that are required for a proper hull. The finest hull, built of any material, may be subject to damage or degradation. Because delamination is a special concern for composite-construction hulls, some sailors have asked their builders for "delamination repair kits," an idea that seems to have merit.

### **FIRE EXTINGUISHERS**

The best fire extinguisher on your boat is still Halon. Since it is a CFC, which harms the ozone layer, it has not been in manufacture since 1993. As a result, extinguisher manufacturers stockpiled the substance, which should allow them to provide refilling service for several years. Halon doesn't require refilling if the seals and pressure fittings remain intact, so if you have a good unit it need be only inspected annually for safety. For those who feel that Halon use is too

detrimental to the environment, most experts will point out that toxins released by your boat burning out of control will harm it more. Nothing works as well as Halon in an automatic engine room installation. It disrupts the combustion process itself at the molecular level and is spectacularly effective. If you don't want to use Halon, the dry powder units are pretty good. They just make a terrible mess. If you use them on electrical panels, it usually destroys them. CO<sub>2</sub> is the standard substance for electrical fires, but it only displaces oxygen, and the fire will re-flash as soon as oxygen returns.

Industry is working hard on finding a good replacement for Halon, but it is not here yet. So keep what you've got, don't discharge it for training and have extinguishers inspected annually. If you've got dry powder units, you may want to try them on a yard fire or something similar to see how they work and how long they will work for you.

Generally a 2-lb. unit will give you two-seconds of solid bursts at the fire, which should be aimed at the base of the fire.

Placement of extinguishers is important too. Put them where they can be used to fight the most likely locations of fire. I like an extinguisher in the cockpit when the stove is being used. It can be under a cockpit lid, but if there's a problem in the galley, it will likely be fought from the cockpit. Another needs to be forward, so that people up there can use it to fight their way out of the boat in the event of a big fire.

### **"SON, YOU GETS WHAT YOU INSPECTS, NOT WHAT YOU EXPECTS"**

by Captain John B. Bonds

One of my early Executive Officers gave me this advice when I was a young officer. My division had not completed their assigned cleaning tasks, and I had trusted my petty officers to make sure it was done as directed. It was a painful lesson, administered with the usual Navy colorful language, and not to be forgotten.

It applies equally well to our own boats. The Safety Seminars are full of stories of disaster, or at least misadventure, which have as their ultimate parent an EXpectation that some critical work was done correctly. Quite famous people have lost boats because they "sprang a leak somewhere..." The owner simply didn't know where the through-hulls were located, so he could check them one-by-one before the cabin was awash. When the pumps clogged or the batteries shorted, the boat was abandoned to the seas. Incredible? Do you know where each of your hull penetrations is located? Does the valve work easily? Does it actually work? (Some early production boats had common plumbing gate valves fitted, which turn quite well but don't do anything to stop water coming in.) Is there a soft wooden plug adjacent to it, ready for instant use? Are all your hoses in good shape, and fitted with two hose clamps? When did you last check them?

Are your batteries securely fastened, and in a box to contain acid in the case of a knockdown? What will happen to your cabin if you invert? My "racing boat" came with an icebox lid held down solely by gravity. It weighs about 10 pounds and has sharp enough edges to be a dangerous missile in a violent knockdown. (Barrel bolts solved that.) Will the bilge plated stay in place, etc.?

You get what you INSpect. Particularly early in the season, and before each deep ocean excursion, you should start at one end and work to the other, inspecting. Go from the keel bolts to the masthead, inspecting. So that you know. Make a list of things that have to be fixed, attack them in order and be ready for the challenges out there. It's just good seamanship; good management. And it's more fun to be ahead of the game. Enjoy!

### **RIGGING**

Rod Stephens suggested the following: Because you may have to get rid of a broken mast quickly at sea, rig your boat to make this easy. On the lower clevis pin on each shroud and stay (where they attach to the chain plates), use nothing but a proper-sized BRASS cotter pin to retain the clevis pin. Cut it so that about 1/4" extends through the clevis pin, and then spread the ends no more than about 15deg. Then if you have to get rid of the rig, a sailor's knife's spike will easily pull out the pin, and then you can punch out the clevis pin. It's a lot easier than trying to cut through rigging!

If you have wire halyards, you'll still need cable cutters to cut the halyards that will be left between the stub and the rest of the mast. But cable cutters work well on halyards and on the electrical wires. If you have no-stretch rope halyards, a sharp Spyderco knife will slice them quickly.

Another tip, this one required for ocean racers and recommended for all: Ensure that you secure the mast butt to the step. The *International Sailing Federation Special regulations Governing Offshore and Oceanic Racing including US SAILING Prescriptions* don't tell you how to do that, so you can use your imagination. The test is, will the butt come off the step and destroy the cabin if the mast breaks above deck?

### **BARREL BOLTS**

When Dodge Morgan built AMERICAN PROMISE to sail around the world (non-stop, single-handed), he used barrel bolts on every drawer and cabinet. The Naval Academy followed this practice on their Navy 44. There's a good reason. The barrel bolts provide very positive and visible security for all sorts of things. The *International Sailing Federation Special regulations Governing Offshore and Oceanic Racing including US SAILING Prescriptions* require racers to rig their boats and all equipment to withstand a 180deg capsize. Barrel bolts can help in this problem. Check your icebox lid. Will it become a projectile at 180deg? Many will, and two barrel bolts will fix it. How about that tool drawer that relies on lift and slide security. It isn't likely to stay closed in a capsize. The list can get pretty long. Just go through your cabin (outfitted as you sail, with the "jewel box" full of spare blocks, the toolbox in normal position, etc.) and imagine what would happen if the world were turned upside down. And consider barrel bolts when you start to remedy the problem!

### **JACKLINES**

Jacklines are the other half of the safety harness system, to keep you from becoming a crew overboard victim. We suggest you consider wearing harnesses as the Naval Academy does-- anytime you have to hold on, and always at night. Keep in mind that even with our improved

methods of recovering a crew overboard, at night your chances are sharply reduced and in really rough weather there is a point at which overboard is DEAD. For harnesses to be really useful, you need to be able to snap on before you leave the cabin when you're coming on deck. For this a sturdy eye on either side of the companionway, outside in the cockpit, will work well. But from there on, you need to have jacklines rigged. These traditionally are plastic-covered wire, and nylon-webbing of 4,000# breaking strength has also been used. In the Sydney-Hobart Race of 1998, most competitors reported the nylon webbing stretched too much, and *International Sailing Federation Special regulations Governing Offshore and Oceanic Racing including US SAILING Prescriptions* now suggests the use of similarly strong Kevlar or Spectra rope. Whatever you use, the jacklines must be secured to strong points on the boat. Special eyes, suitably backed up, are best, starting far enough back to allow the helmsman to clip on. But you can use the bow and stern cleats quite nicely with screw pin shackles for attachments. If you use anything except wire, you should take the jacklines in when you return to port, to avoid sun damage to the artificial fiber materials. The technique for using jacklines is simple. Snap your harness tether onto the jackline and then go forward to the bow attached to the boat. In many cases you'll find that you can use both hands for the job required when you secure your tether tautly somewhere. Bowmen say at first that they don't like harnesses, and people racing around the buoys can afford the luxury of a crew overboard drill--but in the ocean you should think quite seriously about accepting this excuse. The odds in a crew overboard search are not good, and running a long search is almost guaranteed to take you out of the top finishers. Jacklines and harnesses will keep your crew on board and you in the running for silver!

### **HYPOTHERMIA OFFSHORE**

When we first began learning about the effects of hypothermia in our safety seminars, we realized right away that our ocean racing crews often had suffered degradations in watch performance due to the effects of hypothermia. Sitting on the rail in improper clothing, inadequate foul weather boots, light boat shoes which are water soaked, no hat in the chill night air--our midshipmen became chilled, and lost coordination and judgment without realizing it. When a wind shift or change in the tactical situation required a sail change, a peel-away, or a quick jibe, often at night, the evolution was not executed crisply. You may recognize this phenomenon in your own crew. Hypothermia is insidious and it's inevitable unless you mount an active defense against it. Clothing that is adequate for a warm afternoon is no longer adequate after sunset. Too often, our younger members of the crew watch the sunset and neglect their protection until hypothermia has set in. There are some really good defenses these days, beginning with polypro long johns (ladies often prefer these garments made from silk which works just about as well and feels a lot more luxurious), adding bulky layers and finally, some good foul weather gear on top. Don't forget a hat of some type. Your head loses a lot of heat, and even a cotton hat will help. The standard Navy wool watch cap has survived for generations of seamen because it works, even when wet. So as skipper, leadership is needed to remind your younger crewmembers that they need to dress properly if they're going to be good "night fighters" for you. Hypothermia will slow them down and make them inaccurate, with much the same effect as alcohol. It's dangerous, and unnecessary. Keep 'em warm, dry and effective--to win at night!

### **SEASICKNESS AND THE RACER**

There has been a lot research into seasickness in the last 25 years. NASA has put time and money into the problem because space motion sickness is very much like seasickness. One of the most basic discoveries they have made is that EVERYONE with normally functioning inner ears is probably susceptible to seasickness. As one of the researches says about the centrifuge on which they test subjects, "everyone gets sick. Some just take more spinnin'!" Skippers particularly need to ensure that they don't get sick themselves, as they can't afford to be impaired. Crewmen who are seasick are nearly worthless, and when racing you need everyone on their toes. So, insist that your crew know what remedy works for them, and that they take their medicine as a prophylactic before they get sick. Most remedies require that treatment start BEFORE seasickness begins. If you wait until you're sick, any remedy may be totally ineffective. There are some practices that contribute to seasickness and incapacitation. Heavy drinking or eating the night before you sail exacts a toll on your system. Recovery from this abuse lowers your resistance to motion sickness. So some advice: Have your parties prior to the night before you sail, and have a quiet dinner together and then an early bedtime the night before--if you're serious about your racing.

Seasickness can cripple even the best crew, particularly those which don't sail a lot. But the medicine now available can take care of the problem, for most of us, if taken ahead of the problem. It's just another case of getting ahead of the problem, and staying in control.

### **CHECK YOUR SWAGES**

Normal wire rigging swages have a general lifespan of about five years in a freezing climate. The usual cause of failure is the intrusion of water down the grooves of the wire into the barrel, where it lodges, starts corrosion and holds moisture. Then when the air temperature falls below freezing in the winter, this trapped water expands and cracks the swage. There's really no permanent remedy for this, although Rod Stephens has long advocated the use of anhydrous lanolin to fill these cracks. Monthly applications are required. (lanolin is available in drugstores and smells awful...) Others use silicone sealants to keep out the water. We're really not sure either of these work, but they're surely worth trying!

If you have wire swages, you should think about non-destructive testing of the swages each season. Dye penetrant is the usual method, and the purchase of a kit (3 aerosol cans comprise a kit) is a good club project which can be used by perhaps 10 boats. Instructions come with the kit, and the test will reveal very small cracks which will enlarge. Broken swages are a major cause of dismastings (and lifeline breakage). A little Inspection and care will prevent it happening to you.

### **Disposal of Out of Date Flares**

Use them for practice (call local and USCG authorities and get permission first.)  
Donate them to the Coast Guard Reserve which readily accepts them and uses them in training.  
Donate them (hand flares) to your local fire department who uses them to set fires for training.  
They can be recycled into fireworks.

### **Transporting Liferrafts for Recertification**

Did you know that it is illegal to carry a charged liferaft aboard a commercial aircraft? This includes forwarding your liferaft through any freight forwarding company like UPS, FEDEX, etc. The dangerous element issue revolves around the charged CO2 tank and any flares that may be packed inside. Plan extra time so that you can truck your liferaft to your preferred service station.

### **LADDERS**

Much has been written and said about the use of stern ladders and scoop sterns to get the PIW back aboard. I think it is Chuck that uses the term 'cheese grater' to describe the motion of a stern ladder in any type of wave or sea action. I have talked to several people who participated in the 4-500 actual recoveries associated with the development of the Lifesling and they used the term 'head knockers' to describe stern recoveries. They also reported wearing helmets during their trials.

Alternates include ladders attached to or hung down the sides near or close to amidships. We had a swim ladder that worked if you could get it out of the cockpit locker and rig it. Some boats have their swim/boarding ladder built into the life line system. Another option is a rope ladder, kept in the bottom of the Lifesling bag/container. I can't climb aboard using a rope ladder but have talked to people who claim that it is possible to climb a vertical surface if you keep your arms above your head as you climb up. Many folks have something called an SAS (Save A Soul) rope ladder rigged on the outside of the lifelines with a string hanging down so that they can pull it down themselves. I think it is important to point out that many lives have been lost because people cannot reboard their own boats after falling in. I'm told that PEI (Prince Edward Island) requires all fisherman to have a ladder permanently rigged so that they can pull it down from the water. A major point about any ladder is that it should have one to two rigid steps under water so that the PIW can climb up using their leg muscles rather than their arm muscles because they will weight much more with wet gear on.

### **ELEVATOR**

Another variant is the clever use of a sheet/line attached to a cleat at one end and a winch at the other. The PIW stands in the bight and is winched up to the deck level. This was not easy when I tried it. It requires strength and coordination that many PIW's may not have, especially if they have been in the water for any time.

### **LIFESLING**

I am a big supporter of this system because it works under a wide range of skill levels and sea conditions on both sail and power boats. It also establishes contact and provides a lifting capability to the conscious PIW better than anything else that is available. We developed a paper describing the four variants of Lifesling and several recommended ways to personalize it to your boat and improve it's performance which is still available on the US SAILING web site ([http://www.ussailing.org/safety/Studies/2001\\_bc1.asp](http://www.ussailing.org/safety/Studies/2001_bc1.asp)). It bothers me that this system isn't more widely accepted, especially by the sailing schools and their instructors. We are currently am using a prototype of the new Inflatable Lifesling on our trawler and think that this is an even

better system because it can be tossed like a throw rope to the PIW by a relatively unskilled person or it can be towed around the PIW until contact is made.

### **MOB POLES, LIFE RINGS/Horseshoes, MOMs and West Marine's LIFE SAVER BUOY**

A common thing with all of these devices is that they provide floatation to the PIW and they can be hooked to a lifting device if the recovering boat can maneuver close enough to the victim. The jury is still out, but I am convinced that these items are nearly worthless because they wind up being too far from the PIW by the time they are released/deployed. They also blow and drift away faster than the PIW can swim after them. These are serious limitations which I feel need to be studied and corrected because we place too much emphasis and depend too much on this type of gear if it is not going to be effective.

### **THROW ROPES**

This piece of safety equipment doesn't get enough emphasis IMHO. I do not understand why some people stow their throw rope tied to a stern pulpit. This forces it to be used from the cockpit instead of on deck where there usually is more room and fewer interferences when heaving it to a PIW. I recommend that people buy the 75 ft version and put two loops in the end that goes into the bag first. These loops can be put around the PIW like a sling and used to pull the person alongside and even hoist them aboard. A photo of my wife hoisting me with this rig is still posted on the US SAILING SAS web site (<http://www.ussailing.org/safety>). There is another type of throw rope used by beach guards that is thrown like a Frisbee that should be tried by boaters.

### **DINGHY/LIFERAFTS**

One popular scenario that is discussed is that it might be easier to pull a PIW into a dinghy or raft than up to the deck of most boats. Some recommend deflating one tube in an inflatable dinghy so that an unconscious, weakened or large PIW can be rolled into it easier. This means putting a crew member into the dinghy, hopefully with a PFD and tethered harness on.

### **GALE RIDER**

This device can be used as a basket to hoist an injured, unconscious or weak PIW out of the water. It works well but tends to roll the PIW into a ball and reduce their capability to help the reboarding process. We tried this one time.

### **HARNESS**

This could be one of the best ways to hoist someone aboard. The caution here is that people slip out of harnesses when crotch straps are not used. I think we are not far away from an international requirement to use crotch straps. RORC has required them for several years and incidents like Sydney Hobart 98 documented the need to have them when four people slipped out of harnesses that did not have crotch straps.

### **MACHO STRAP**

This is a piece of webbing that goes around the PIW like a Lifesling and can be used to hoist or lift the person much easier than grabbing/pulling arms and legs, etc. They used to be in the Survival Technologies Catalog. I make my own and carry one in the dinghy and another on the larger boat.

### **BLOCKS & HOISTING TACKLE**

Many boats can use a halyard to a major winch to hoist the PIW back aboard. This usually requires having a longer tail on the halyard so that it can lead to the water all along the side of the boat. Many boats claim that they will use the boom vang but the same is true there. A block and tackle used to hoist a PIW aboard often requires 50 to 100 feet of line to have it high enough above the deck and then lead to a winch. Additionally, if the winch is self tailing, the line may have to be larger than the one that comes with a vang or even the prepared block & tackle sold for the Lifesling. Here again is the situation where methods need to be tried and proven for each boat and each scenario rehearsed/practiced. We use a five to one block & tackle with a jam cleat at the top. We use this every day to hoist the dinghy engine and dinghy aboard. Hopefully we will be familiar enough with the way this is stuffed into it's bag and used to make it work when/if we ever have to hoist a PIW aboard.

### **MOB-UP**

This piece of equipment is imported from Europe and is our favorite lifting tackle. It won SAIL magazine's innovative award several years ago. Basically it is a series of jam cleats arranged so that a lever can be used to hoist up to 300 lbs. It comes with a sling and line all stowed together in a bright bag about 3 feet long. It can be attached to any vertical standing rigging wire or put into the top of a tube on a stanchion similar to a fishing rod holder.

### **SAILS and over the side devices like JASON'S CRADLE and REBOARD**

People that have tried to roll the PIW up the side of the boat in a sail attached to the rail report that it is very hard to lift the weight of the water and that PIW nearly drowns in the process. We have something called EASYLIFT which is a mesh triangle like a jib that allows the water to drain out. It still is a scary ride to be rolled up the side. Jason's Cradle and Reboard do a similar type of hoist. I have only seen them in videos.

PIW TRAINING. A very important part of this formula is that the PIW can help in the rescue, perhaps more than any other person. Familiarization with the equipment that will be used and how to put it on, etc. can save the day. A list of items to be considered in this training is also posted on the US SAILING SAS web site.

### **UNCONSCIOUS VICTIM**

Every discussion on MOB/PIW leads to the question of how to handle the unconscious victim. Getting alongside them is one challenge but getting a hoist attached to them is another. We have experimented with hooks used to remotely attach a mooring pendant to a ring such as the Happy Hooker, another similar one and our favorite which is the Grab-N-Go made by Johnson. They all go on the end of a boat pole and either attach to the mooring or pass a line through it and back

to the hook. Johnson's hook attaches and is tested to 1500 lbs. All of this assumes that there is a harness on the PIW that will not slip off. An unconscious victim will probably slip out of a Lifesling unless it is fitted with a thigh strap. The most likely scenario is that a swimmer would probably have to enter the water to attach something to the PIW before they could be raised up the side.

## **ELECTRONICS**

I'm not sure whether any of the MOB electronics will be tried in August. IMHO the advertising of GPS capable PLB's is misleading because they only tell the shore based search & rescue authorities where the PIW is, not the boat that has lost a person and is searching for him/her. I also think that homing devices that use 121.5 MHz beacons are very difficult for the average boat to use, especially in any type of heavy weather. This whole subject needs some kind of unbiased testing. What I would like to see is a real time position of the PIW transmitted back to the vessel that lost the person. This could be done using DSC (Digital Selective Calling) with the development of a beeper size VHF device with a GPS in it (like a cell phone). The antenna for the VHF could be built into inflatable PFD's like they are in the US Navy's 121.5 systems used to locate MOB's from carriers. DSC already is capable of displaying emergency positions on compatible plotters like Northstar and Standard Horizon as well as Rescue 21. High end VHF radios (like ICOM 602) already provide incoming DSC positions to plotters. Several handheld VHF's are DSC capable but fall short because they transmit the GPS position recorded when they are removed from their charger. This idea wouldn't require much development or change to the current system. Development money should not be hard to find either. All we need is someone interested in the project.

The conclusion to every lecture and demonstration that I give or attend is that how it discussions like this are only the first step. They are intended to show what methods work for others and not to sell any specific piece of equipment. It also helps to know that others are practicing and actually trying different ideas. There is no one recovery method that is better than another, IMHO. The way that is most likely to succeed is the one that has been worked out ahead of time and practiced until all of the kinks are resolved and every crew member understands works on their specific boat, with the crew that is left aboard. I think our records show that the PIW is more often the most skilled crew member which means that the rest have to solve the problem without him or her.