Appendix A
Harness & Tether

A body harness and tether are required personal gear that you must bring with you since all crewmembers are required to clip to a safety line when in the cockpit at night or when going forward on deck or when warranted by rough sea conditions or when ordered by the Captain.

I'll start this discussion with the tether used to attach you and your harness to the boat since this is the most controversial part of this subject.Tethers are a subject of considerable debate and disagreement among experienced sailors and Captains, and we find that there is no perfect answer that will satisfy all points of view and the variety of conditions encountered aboard a small yacht at sea. You can Google "harness & tether" to find a wealth of information, products and test results about the wide variety of tethers available on the market.

The tether is intended, first and foremost, to keep you attached to the boat because of the low probability of being found and recovered if you become separated from the boat even in moderate wind and wave conditions and good visibility.

Basic Tether #1

The simplest tether for accomplishing this aim has a braided or sewn loop at the chest connection to the harness and a spring hook at the other end. Unfortunately, tethers of this type are not readily available on the market as more complex and expensive tethers are now in vogue as will be discussed below.

But, tethers are not rocket science. In the simplest form, a piece of strong rope with a strong spring hook is really all you need (*Fig 1 & 2)*. You can make a tether like this for under $50 by purchasing a spring hook and a length of 1/2 inch braided dock line with a loop already spliced in the end from the following sources:

Fig 1: 3/8 inch Spring Hook, part # S0172-0100 from www.bosunsupplies.com

Fig 2: 1/2 inch Braided Dock Line, part #5528534 from www.westmarine.com

Cut the braided dock line to 7 feet long including the braided loop, whip the cut end with whipping twine or vinyl tape and tie it to the eye of the spring hook with a buntline hitch as shown in *Fig 3 & 4*:

Fig 3: Buntline Hitch

Fig 4: Buntline Hitch to Spring Hook

You can see an animated demonstration of how to tie the buntline hitch at http://www.animatedknots.com/buntlineboating/index.php?LogoImage=LogoGrog.jpg&Website=www.animatedknots.com

And here's what your basic tether will look like:

Fig 5: Basic Tether #1

If you'd like a slicker look, you can attach the braided line to the spring hook with an eye splice instead of the buntline hitch; refer to http://www.thecoastalpassage.com/eye_splice.html for an animated demonstration of how to tie an eye splice in braided line.

Attach the 1/2 inch braided line to the harness D-ring by making a cow hitch with the loop end of the braided line (*Fig 6 & 7*).

Fig 6: Cow Hitch	*Fig 7: Cow Hitch to Harness D-ring*

With a single D-ring harness, the tether is permanently attached to the single D-ring using a cow hitch, and you will need to unbuckle the harness belt to remove the harness and put it back on.

With a double D-ring harness, the tether is permanently attached to one of the D-rings using a cow hitch and it is passed through the other D-ring as shown in *Fig 8*. The harness is put on or taken off by spreading the two D-rings apart and slipping the harness over your head like a sweater. Ensure that you pass the tether through the second D-ring otherwise the harness will not be securely attached to your body.

Fig 8: Basic Tether #1 attached to a Double D-ring harness using a cow hitch and passed through the other D-ring.

Basic Tether #2

If you prefer three strand rope instead of braided line, I'd recommend 1/2 inch nylon, and you can splice an eye in both ends for attachment to the spring hook and the harness D-ring as shown at http://www.tollesburysc.co.uk/Knots/Eye_splice.htm and many other internet sites.

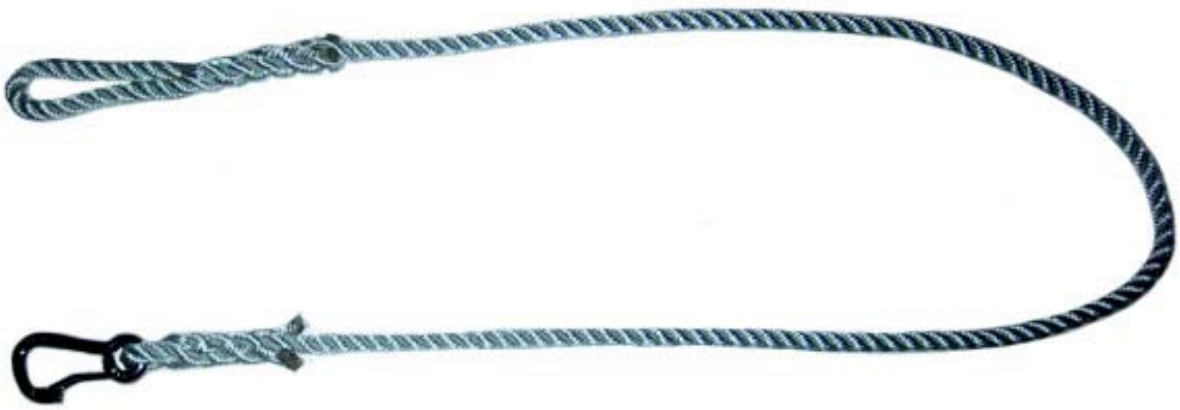

Fig 9: Basic Tether #2 made with 3-strand nylon rope

Basic Tether #3

Or, if you prefer to use webbing instead of rope, ask a sailmaker to provide a strong UV resistant webbing and to machine sew loops to attach to the spring hook and the harness *(Fig 10)*.

Fig 10: Basic Tether #3 made with UV resistant webbing

Basic Tether #4

A commercially available tether similar to the Basic Tether #1 is the Wichard 7016 shown in *Figs 10 & 11*. It's listed on the Wichard website at www.wichard.com/documents/safety.pdf Most chandlers do not carry the 7016 tether in stock, but they can special order it from Wichard, and I recently found that http://www.pyacht.com will accommodate such special orders.

The Wichard 7016 is made from webbing with a sewn loop, but it has a locking spring hook that can be difficult for some people to operate. This hook incorporates the yellow spring lock shown below *(Fig 11)* that needs to be depressed to release the spring, and this action can slow you down when hooking and unhooking and requires practice doing this in various hand positions. Some people may require two hands to activate the release, and this may require that you let go of your firm hold to the boat in order to release the hook.

The Wichard 7016 is a good alternative if you're not inclined to make the any of the basic tethers as described above, and if you can adequately activate the spring lock.

Fig 10: Wichard 7016 Tether with Sewn Loop

Fig 11: Wichard Locking Spring Hook

Quick Disconnect Tether

Many sailors prefer to use a quick disconnect hook at the chest *(Fig 12)* instead of the sewn loop to provide the conveniences discussed below. I do not recommend the quick disconnect hook due to the possibility of accidental release at the wrong time, and I have seen them accidentally pop open. However, my opinion on this is contrary conventional wisdom, SOLAS, ORC, The Sailing Foundation, many Captains and West Marine et al since quick disconnect tethers are approved or widely distributed by these organizations.

Quick-disconnect hook

Fig 12: Wichard Quick Disconnect Elastic Tether

Following are some of the reasons given for use of a quick-disconnect hook at the chest:

- <u>If the boat sinks, you can release the quick-disconnect to prevent being dragged under by the sinking boat</u>. Here are some thoughts to ponder on this theory:

    - Which do you think is more likely: Falling overboard and the quick-disconnect accidentally opening <u>or</u> you being dragged down by a sinking boat? The chances of going overboard at sea are very high and remaining attached to the boat is an absolute essential to survival.

    - If the boat does sink, chances are that it will not happen instantly, and you'll be spending the last few frantic minutes launching the life raft and other abandon ship preparations, and you'll likely have an opportunity to release your tether.

    - If you wear a double D-ring harness without a waist buckle and use a quick disconnect hook at the chest, all of the impact force of falling overboard will be applied to the quick disconnect hook as the two D-rings try to separate from the force, increasing the possibility the it will pop open with you in the water.

    - Conversely, if you wear a double D-ring harness with a sewn or spliced-loop tether rigged as shown above *(Fig 8)* the weight of your fall will pull the D-rings together thus tightening the harness around your body and holding you more securely.

    - If you are super concerned about being dragged down by a sinking boat, you could carry a knife to cut the tether in lieu of a quick-disconnect hook.

    - There is no authoritative answer to these questions that would apply to all situations at sea, but my opinion is that falling overboard and accidentally disconnecting at the quick-disconnect hook is more likely than being dragged

down by a sinking boat. For this reason, I prefer a sewn or spliced-loop tether rigged as shown above.

- If you do fall overboard, you can release the quick disconnect to prevent being dragged under by the moving boat.

    - If you go overboard, the helmsman should immediately stop the boat using the quick stop technique. This of course requires that certain rules of seamanship be established and rigorously practiced onboard. In particular, the helmsman is responsible to constantly watch any crewmember going forward and be ready to execute a quick stop should one go overboard. At night, the helmsman should use deck lights and a flashlight where necessary to track the crewmember forward, and hand signals should be established in advance. Also, the helmsman should be told what the crewmember will be doing on the trip forward so as to understand the risks and possible emergency actions.

    - If no one saw you go overboard and the boat continued on, would you want to release the quick-disconnect and never be seen again?

- If you get tangled in your tether while working on deck, you can release the quick disconnect to escape.

    - There are many ways to get tangled in lines on a boat at sea, and one needs to learn caution, care and safe procedures in all activities, and this is one of them. Plan your steps and handholds ahead being constantly aware of pitfalls and entanglements.

- When going below, you can release the quick disconnect from the harness and leave it in the companionway with the other end attached to the cockpit safety line.

    - This is a sad laziness that has no place on a boat at sea, as well as a hazard to other crewmembers who will assuredly trip on the errant tether hanging in the companionway.

There is no authoritative answer as to the likelihood of which of these events may occur at sea, so we are dealing with relative probabilities, guesses and the seriousness of being lost at sea. A chain is as strong as its weakest link, and I have seen the quick-disconnect tether hooks accidentally release, fortunately not with someone overboard.

Elastic Tether

Some sailors and Captains prefer the use of a stretchable elastic tether (*Figs 12 & 13*) with an internal shock cord to take up slack in the tether when not under tension; the idea being to prevent a slack tether from dragging and tangling with your feet. I've used these with poor results as I was fatigued by the constant tension tugging at me over a few hour period as I stood watch.

Also, when I was moving about the deck, the tether had a different opinion than I had as to which way I should go or lean; when I wanted to go this way, the tether wanted me to go that way... No thanks!

Double Tether

Some sailors and Captains prefer use of a double tether *(Fig 13)* to enable getting by an obstruction on deck while always remaining attached to the boat with one hook. This is an abundance of caution on the far end of the tether while at the same time wearing a risky quick-disconnect at the chest. A better solution in my mind is to rig safety lines on the boat so that you can go all the way forward and aft without the need to disconnect to get around obstructions. The added tether adds a complication that can lead to entanglements or tripping, and requires you to think about an extra step when going forward under possibly adverse conditions.

Fig 13: Elastic double tether with quick disconnect chest hook

Body Harness

Pictured below (*Figs 14, 15 & 16*) are three body harnesses used in boating applications that can be purchased separately without an inflatable life vest.

Fig 14: West Marine 315715 or 315731 Double D-ring Harness

Fig 15: Mustang MA1900 Double D-ring Harness

Fig 16: Crewsaver 10089 Single D-ring Harness

There are a few safety considerations that you should know about with respect to these or any other harness:

- The waist belt on all three of these harnesses will impart the most of the force of your falling weight onto your rib cage since the shoulder straps do little more than hold the waist belt up in position. So, I recommend that you try on these harnesses and give them a body weight test before deciding which is best for you.

- It's essential that your tether attachment to the harness fully engage both D-rings on harnesses with two D-rings like the West Marine and Mustang. If the tether is attached to only one D-ring, the tether force will yank the harness off of you with the impact of your falling weight since the waist belt on the Mustang has no closure buckle, and the West Marine has a very meager buckle that I'd not want to trust my life to.

- The waist buckle on the Crewsaver harness must be securely fastened for the reasons given above since the full force of your falling weight will be transferred from the single D-ring to the waist buckle.

- Similar harnesses are available from other manufacturers. If you purchase a single D-ring harness, ensure that the belt buckle is made of metal and securely locks closed and will support the full load of your falling weight. Some harnesses have a plastic belt buckle, and these should not be trusted to support your falling weight.

- Ensure that the D-rings are welded closed; to do this you may need to rotate the joint of the D-ring partly out of its webbing loop. In cheaper harnesses the D-rings may simply be bent closed and not actually welded at the joint.

These harnesses shown above are available through the following and probably additional suppliers:

- http://www.pyacht.com/cgi-bin/pagegen.pl?pr+musMA1900

- http://www.westmarine.com and search "315731"

- Google "crewsaver 10089" or go to http://www.landfallnavigation.com and search "crewsaver 10089"

Full Body Harness

There are a number of full body harnesses availing in the sail racing and industrial safety fields, which you can find by Googling "full body harness." Also, some of the harnesses shown above can be provided with crotch straps.

Harness & Tether Tests

Harness and tether tests conducted by The Sailing Foundation, P.O. Box 4213, Tumwater, WA 98501 can be reviewed at http://www.ussailing.org/safety/H&T/harness_study.htm

Fig 3 Buntline Hitch and Fig 6 Cow Hitch courtesy of *Chapman Piloting, Seamanship & Small Boat Handling.*