Life Jackets

Cruising Club of America

Safety at Sea program

Background:

The Cruising Club of America jointly with the New York Yacht Club conduct the US Sailing certified "International Offshore Safety at Sea with hands-on training" courses 6 or 7 times annually for a total of more than 350 students a year. This experience allows us to accumulate observations on how equipment performs, and field questions students have about equipment.

One area where we get many questions is life jackets. We observe the use of hundreds of life jackets. This paper shares our observations in an effort to provide sailors with best, current guidance that we can offer. This represents our opinions and we welcome feedback to improve this paper.

This paper is ***focused on adult sailboat sailors sailing offshore***.

When to wear life jacket:

> **ALWAYS**. This is simple intentionally. We mean it when we say wear a life jacket at all time when you are topside and sailing offshore. Don the life jacket below decks before going topside and take it off only when you are back below decks.
>
> Think of wearing a lifejacket like wearing a seat belt in a car. Just do it. Its value has been proven long ago. Therefore it is critical that you have a life jacket you will want to wear.

Characteristics of life jackets to consider:

- **Inherently buoyant (e.g. closed cell foam), inflatable, or hybrid:** The offshore sailor needs to be able to wear the life jacket for many days and remain agile in order to operate the boat. The life jacket must be comfortable, or it will not be worn. An inherently buoyant life jacket is bulky and rigid, so it does not meet these criteria. Hybrid life jackets we have seen are suitable for activities like paddle boarding and kayaking but do not have the buoyancy or other characteristics for offshore sailing. Therefore, we feel the only practical choice for an offshore sailor is an inflatable life jacket. The remainder of this paper will address an inflatable life jacket. We will use the term "life jacket" in this paper rather than the term "PFD" (personal flotation device).
- **Classification:** An offshore inflatable life jacket must be useable with foul weather gear. It should turn an unconscious person into a safe position and require no action by the user to maintain this position. This is a "level 150" life jacket using the new performance level classification system. 150 Newtons is about 34 lb of buoyancy (sometimes referred to as

"35 lb inflatables"). This type with an integral harness was formerly called a Type V life jacket and this designation is still used (see the "certification" section).

- **Method of inflation pros and cons:**
    - **Manual only**: Manual inflators must be activated by the user pulling a lanyard. Most models are designated 3F which means the status of the CO2 cartridge can be determined without removing the cartridge but there is are some models that do not have this feature. The pro is that they are super reliable (pull the lanyard). This assumes the user can find the lanyard, so it is vital that the lanyard handle be a bright, obvious color and that it is exposed (not tucked into the vest). The two cons are (1) you have to be conscious to pull the rip cord and (2) in very cold water you may not be able to pull the lanyard due to cold shock.
    - **Water activated inflators (i.e. bobbins):** Water activated inflators are designated 1F, 2F, or 6F. 1F and 2F only display green when both the CO2 cartridge and water sensing element are ready to go. 6F shows green when the water sensing element is ready. The pros are (1) the life jacket will inflate if the user is unconscious or unable to manually inflate the life jacket, (2) in our experience in our courses these inflators have proven to be extremely reliable, and (3) these inflators can be adapted to be manual only with a manufacturer's accessory (as may be desirable where entrapment is a concern, i.e. a catamaran). The con is that this type of inflator can inflate when the user is not in the water such as in adverse weather on the foredeck.
    - **Hydrostatic:** These are designated 1F and show a green readiness indicator. They have the same advantage as water activated inflators in that the life jacket will inflate if the user is unconscious or unable to manually inflate the life jacket. They have the additional advantage of being highly resistant to accidental inflation since they require water pressure to activate. These automatic inflators (manufactured by Hammar) can be converted to manual only on some brands (Mustang & Crew Saver) as may be desirable where entrapment is a concern, i.e. a catamaran. The cons are our experience in our classes has been that (a) a person may not go far enough underwater to trigger the mechanism and (b) we see 1 or 2 out of every 50 of the hydrostatic inflators simply not work which then requires the user to pull the lanyard.

- We contacted Spinlock with this data and got a response from Ted Winston, US Chief Marketing Officer.
- Spinlock noted that all life jackets with hydrostatic inflators use the same Hammar mechanism. We acknowledge that but point out that we are only seeing this issue with the Spinlock 5D Deckvests. He further stated:
- *"The unit is not water sensitive it has to be held below the water long enough for the pressure difference to release the spring valve in the sensor.* ***It [hydrostatic inflator] is generally a specialist unit for use in extreme very wet conditions.***
- *For most users who want the security of an instant inflation on water contact then we would always recommend using a UML head, which relies on water sensitive paper to release a spring. However even these are protected in a jacket to avoid accidental inflation from waves and rain, and I think some might have struggled in your tests as the heads were underwater for such a short period.*
- *All users should be aware of the Manual handle which should be the primary inflation if there is any delay with the auto head."*
- The UML head referred to is a "bobbin" style mechanism.
- The CCA provides students a paper on life jackets that shares the experience of seeing over 500 life jackets inflate in courses over the last three years. We discuss the characteristics of life jackets and give pro's/con's of various features including inflaters. We do not give specific brand or model recommendations. As a result of the experience accumulated in 2020 and now this session, we are changing that paper to recommend users that have the Spinlock 5D Deckvest (no longer manufactured) be ready for the vest not to auto-inflate. If the users want the feature of the vest auto-inflating when the MOB is unconscious, then they should get rid of the 5D Deckvest and get another model – with the UML inflator in the case of Spinlock.

- **Integral harness:** Essential so that a tether can be used. Our experience has shown that the alternative of using a life jacket and a separate harness is difficult. We have not found equipment designed to work together in this manner. Belts interfere with each other, the equipment does not fit together well, etc.
- **Leg straps:** Also essential. In our opinion life jacket's that come equipped with dual leg straps (as opposed to a single crotch strap or thigh straps) are most effective. If your life jacket does not have leg straps, kits may be purchased to add them.
- **Light:** Another must. Permanently attached as high as possible. Spinlock's pylon light is particularly effective. The big problem we see is that the lights are not checked periodically (at least annually) so sometimes they do not work due to the battery being dead.
- **Whistle:** A must. No ball so that it works in the water.
- **AIS man overboard beacon:** We feel that an AIS man overboard beacon should be mounted in every offshore life jacket because it enables any AIS equipped vessel in range to be alerted that there is a man overboard and get a real time position on the person. Some newer life jackets are now available with these devices already installed. If

purchasing a new life jacket, check to be sure your selected device will fit in the life jacket.

- **Spray Hood:** A spray hood is highly recommended. Survivors can become exhausted from the effort of keeping their face out of the water and spray. The hood can be built into the life jacket or carried separately.
- **Optional "Nice to have" items:**
    - **Pouch:** Sailors often carry items that they may need topside such as rigging tape, multi-tools, a rag, etc. Pockets in clothing may not be readily accessible when wearing a life jacket. Some life jackets have optional pouches that attach to the life jacket. These can be quite useful for these items. Pouches on a life jacket have the additional advantage over pockets in clothing in that they are always being available regards of what clothing is worn.
    - **Flashlight pouch:** You need a flashlight at night for sailing and the flashlight can double as a beacon to attract attention if you are in the water. We have seen life jackets with pouches purpose built that neatly hold a flashlight. This is a very nice feature if available.

Annual Maintenance:

- **Follow the manufacturer's instructions!!** Obviously, this is first and foremost.
- **We recommend this maintenance at least annually.** If used extensively or in more adverse environments that frequently wet the life jacket, you should inspect the life jacket more often.
- **Winter:** If you are in an area where boats are hauled out in the winter, we recommend taking all your PFD's home and servicing before spring. You can take advantage of boat show or spring sales for rearm kits and updated accessories. Your PFD's will all be ready for the next season.
- **Inflation test:** Remove the CO2 cartridge and for water activated inflators remove the water sensing element (bobbin). Orally inflate the life jacket. Inspect the life jacket after at least 8 hours to insure it did not lose pressure.
- **Rearming and repacking:**
    - We recommend that you replace the water sensing element (bobbin) annually. The manufacturer's recommendations may have a manufacture date or a replacement date. Generally, bobbins are inexpensive. Replacing them annually ensures that they have not degraded in humid environments.
    - Hydrostatic mechanisms have an expiration date which is five years from the manufacturing date. Replace if they will expire in the coming season or before the next inspection.
    - Verify the CO2 cartridge is not punctured. Reinstall and screw it in firmly.
    - Test the light(s) to be sure the batteries work. Sealed units (typically water activated) have expiration dates – replace if needed. Note that newer Spinlock life jackets have Lume-on" lights under each side bladder that also should be tested.
    - Check the expiration date of the AIS MOB beacon if installed. We recommend that these beacons be installed in the "armed" or the equivalent state of readiness, so they are ready to activate if the users goes overboard.

- Inspect fasteners such as snaps, zippers, and Velcro. These are the items that commonly fail as the life jacket gets older.
- Each manufacturer provides repacking instructions, and most are available as U-Tube videos. In general, fold bladders as an accordion, do not roll up the bladder.
- A tip to help folding the bladder: Put the life jacket on a flat surface. For a zipper style PFD, if the lifejacket has opened due to inflation, move the zipper to the proper end of the zipper. Smooth out the bladder. Look for the folds from the manufacturer. Fold the bladder along the lengthwise folds and put clothes pins and the top and bottom to hold the bladder folded. Then assemble and position all other components such as spray hood, light, AIS MOB beacon, etc. Complete packing the lifejacket per the manufacturer's instructions.

Useful life of an offshore life jacket:

We have both new and older donated life jacket's in our courses. From our limited experience with older life jackets, we have the following observations regarding the useful lifetime of the life jacket's:

- Useful life seems to depend primarily on the environment the life jackets have been exposed to and the care with which they are stored. We can't give a specific number of years.
- The components we most often see fail are fasteners. Metal snaps corrode. Plastic snaps can pull out of the material they are attached to. Velcro gets clogged with threads and junk (but can be cleaned). Zippers that close the life jacket become more difficult to operate.
- We have seen 10-year-old life jacket's in pristine condition and 5-year-old life jacket's that are no longer useable. It sees depends on how they have been used and stored. As a life jacket ages, we see fabric start to stiffen or start to delaminate. Coatings degrade and flake off. Straps get stiff. If the straps are difficult to adjust, you won't wear the life jacket correctly. It's time for a new life jacket when this starts happens.
- Multiple inflations with CO2 cartridges do not appear to damage or shorten the life of a life jacket. We have some that have been inflated 15 or more times.

Certification

- In US waters recreational vessels must have a life jacket for each person onboard. US regulations require that these life jackets must be approved by the USCG.
- Offshore races (e.g. the Newport Bermuda Race) generally allow life jackets that meet either USCG or ISO standards.
- In 2014 the US removed the categorization of life jackets as Type I, II, III, and V. The goal is to harmonize the US standards with ISO standards and in particular with Canada in order to create a single North American standard. As US sailors we will see the new standards and associated labeling phased in over time as the testing methods are approved and as the manufacturer's introduce new models.
- The new label format has been approved but can only be used if the UL testing standard for the various performance levels has also been published.

- The UL standard for Level 70 (the former Type III life jacket for use when vessels are close to shore or where rescue may be imminent) has been published and some life jackets are starting to appear with this designation.
- The UL standard for Level 150 which is the level we need for offshore life jackets has still not yet been published. So life jackets cannot yet be certified to this new standard. Thus at this time manufacturer's are still labeling these life jackets with the old system.

"Double Inflation":

If a life jacket is inflated by blowing into the oral inflation tube before entering the water, what will happen when the actuator then goes into the water? The answer is 2 parts because the inflators behave differently in this circumstance.

Bobbin Automatic Type

If the PFD is inflated orally before going into the water and then goes in, the bobbin type automatic will initiate and 'double' inflate the PFD

Hydrostatic Automatic Type

A hydrostatic initiates based on pressure difference on a valve in the inflator. When it is orally inflated prior to going in the water, the air pressure inside will usually prevent the valve from opening. If might 'double' inflate but often would not.

Manual Type

If you orally inflate and then manually inflate you have a 'double' inflation event

USCG-approved inflatable PFD's are tested to withstand the overpressure of a 'double' inflation. While the products can withstand the extra pressure, I would suggest the double inflation is undesirable if it can be avoided. If it happens, the wearer should immediately relieve some of the overpressure by pressing the valve on the oral inflation tube to let some of the gas out.

Caveats for certain conditions:

- USCG warns that integrated harnesses may be dangerous for people under 5 feet 5 inches tall. Shorter sailors may need to find a life jacket/harness combination that can be adjusted to keep the chest belt high enough. Adult life jackets are for people 16 or older weighing over 80 pounds. Younger sailors should use life jacket's certified for their age.

Feedback:

Your feedback is welcome. We strive to make this document as useful as possible.