



Chapter 6: Survival Equipment and Pyrotechnics

Introduction

The danger of falling overboard, capsizing, or sinking is always present while underway. Few people can stay alive for long in the water without some type of survival equipment. Fear, fatigue, and exposure are the enemies of water survival. The desire to live, and the ability to think clearly and proficiently use available equipment can make the difference between life and death. The Vessel Officer has overall responsibility for the safety of the boat and crew including ensuring that all required safety equipment is onboard, readily accessible, in working condition, and its use and operation understood by all. However each boat crewmember has the personal responsibility to stay alert and knowledgeable in these matters. This chapter addresses the characteristics and use of survival gear and signaling devices, including pyrotechnics.

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Section A. Parks Policy

Introduction

The Utah Division of State Parks and Recreation recognizes its employees and volunteers as its most important asset and wearing a PFD while on board a Division vessel may be the first step to saving a crewmember's life should they be involved in a boating mishap while on-duty.

The wearing of a PFD while on board a Division vessel also portrays an appropriate image of a safe boating activity to the boating public. According to U.S. Coast Guard statistics, it is estimated that nearly

80 percent of people who drowned as the result of a boating accident would have survived the accident had they been wearing a PFD.

A.1. Required to Wear PFD

State Parks Administrative Guideline PR-a-10-22 requires all employees, volunteers, and passengers to wear a U.S. Coast Guard approved PFD (life jacket) while on board a Division vessel that is underway. This policy is an addition to the PFD wearing requirements of the Utah Boating Act (UCA 73-18) and related Rules of the Board of State Parks and Recreation and to Administrative Guideline PR-08-18.

A.1.a. Acceptable PFD's

A type I, II, III, or V PFD, if used in accordance with its approved labeling, is acceptable. This includes inflatable PFD's. PFDs worn by Division law enforcement officers must be authorized by the Division and/or Boating Program with the exception of undercover operations and emergency situations.

A.1.b. Hazardous Operating Conditions Restrictions

Inflatable PFD's may not be used in Hazardous Operating Conditions. These are defined as:

- Water conditions where the waves are consistently 2 feet or greater in height
- Wind conditions where the wind is consistently blowing at 20mph or greater
- Environmental conditions where the outside ambient air temperature is consistently below 60 degrees Fahrenheit
- Water conditions where the water temperature is less than 50 degrees Fahrenheit
- Situations of restricted visibility, where visibility is less than a ½ mile
- Between sunset and sunrise
- Any condition or combination of conditions, not listed above, where the VO or Boat Operator determines the safety of persons on board the vessel may be at a high level of risk of falling overboard and/or being immersed in the water

A.1.c. Transportation of Prisoners

A TYPE I PFD is required for any person who is placed into custody and transported on a vessel by a Division law enforcement officer, unless exigent circumstances exist. All Type I PFD fasteners shall be connected.

A.1.d. Service and Inspection

On a semi-annual basis, all PFDs worn by Division employees or volunteers should be inspected for serviceability, proper sizing, and regular maintenance as per manufacturer recommendations.

Section B. Personal Flotation Device (PFD)

Introduction

The term personal flotation device (PFD) is a general name for the various types of devices designed to keep a person afloat in water. PFDs include life preservers, vests, cushions, rings, and other throwable items. They are available in five different types: Type I, II, III, IV, and V. Each type of PFD provides a certain amount of flotation.

Regardless of the type, all PFDs must be Coast Guard approved, meaning they comply with Coast Guard specifications and regulations relating to performance, construction, and materials. A usable PFD is labeled Coast Guard approved, in good serviceable condition, and of appropriate size for the intended user. Each boat crewmember must wear a usable PFD appropriate for the weather conditions and operations in which he/she will be performing.

NOTE: A wearable PFD can save a life, but only if it is worn.

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Type I PFD

B.1. Description

The Type I PFD, or “offshore life jacket,” is a one-piece, reversible PFD intended primarily for use by survivors, passengers on towed vessels, or prisoners aboard vessels. A Type I PFD provides an unconscious person the greatest chance of survival in the water. The Type I PFD is the only wearable device required to be reversible. It comes in two sizes, an adult size (90 pounds and over) which provides at least 20 pounds of buoyancy and a child size (less than 90 pounds) which provides at least 11 pounds of buoyancy. The PFD must be international orange in color.

B.2. Advantages

A Type I PFD is effective for all waters, especially open, rough, or remote waters like Great Salt Lake where rescue may be delayed. It is designed to turn most unconscious wearers in the water from a face-down position to a vertical or slightly backward position, allowing the wearer to maintain that position. It provides at least 11-20 pounds of buoyancy. This buoyance will allow the wearer to relax and save energy while in the water, thus extending survival time.

B.3. Disadvantages

There are three major disadvantages to this type of PFD:

- It is bulky and restricts movement
- Its buoyancy restricts the underwater swimming ability needed to escape from a capsized boat or to avoid burning oil or other hazards on the surface of the water.
- It provides minimal protection against hypothermia

NOTE: This type of PFD is not recommended for use by boat crew members as it restricts mobility.

B.4. Donning

Before entering the water, don and adjust a Type I PFD using the following procedures:

WARNING: For safety, always tuck all loose straps into your pockets, shirt, or belt. Adjust straps on injured people before they are lowered into the water.

Step	Procedure
1	Grasp the PFD at the lower part of head opening and pull outward to expand opening
2	Slip your head through opening
3	Pass the body strap around the back and fasten at the front of the PFD, then adjust the strap for a snug fit

B.5. Entering the Water

Use the following procedures to enter the water:

NOTE: Follow these steps before entering the water wearing any type PFD or combination of cold weather protective device (e.g., dry suit) and PFD.

Step	Procedure
1	Ensure all straps on the PFD are securely fastened, tightened to a snug fit, and tucked in to prevent them from snagging
2	Stand on the boat's gunwale, on the windward side, at a point closest to the water.
3	Check surrounding area for hazards and verify depth of water
4	Fold arms across chest and grip the PFD with fingers. This will prevent the PFD from riding up and striking the chin or neck
5	Keep the body erect and legs held together and crossed when entering the water. It is better to gently slip in, if possible, rather than jump
6	If jumping into water is necessary with chemicals, oil, or burning oil on the surface, place one hand over mouth with palm under chin and split fingers tightly squeezing nostrils shut. Place other hand on the PFD collar to keep it in place.

Type II PFD

B.6. Description

The Type II PFD, also known as a "near-shore buoyant vest," is a wearable device that will turn some unconscious wearers to a face-up position in the water. It comes in different colors and in three categories:

- Adult (more than 90 pounds) which provides 15.5 pounds of buoyancy
- Child, medium (50 to 90 pounds) which provides at least 11 pounds of buoyancy
- Infant (available in two sizes, less than 50 pounds and less than 30 pounds), which provides at least 7 pounds of buoyancy

B.7. Advantages

This type is usually more comfortable to wear than the Type I. It is usually the preferred PFD if there is a chance of a quick rescue, such as when other boats or people are nearby.

B.8. Disadvantages

The turning characteristic of the Type II is not as strong as with a Type I because of a lesser amount of flotation material, and therefore, under similar conditions, will not be as effective in turning a person to a face-up position.

B.9. Donning

Before entering the water, don and adjust a Type II PFD using the following procedures:

Step	Procedure
1	Grasp the PFD at the lower part of the head opening and pull outward to expand opening
2	Slip head through opening
3	Pass the body strap around the back and fasten at the front of the PFD, then adjust the strap for a snug fit
4	Secure the chest ties with a bow knot for a snug fit

B.10 Entering the Water

To enter the water while wearing a Type II PFD, follow the instructions in paragraph B.5 above.

Type III PFD

B.11. Description

The Type III PFD, also known as a “flotation aid,” is routinely worn aboard boats when freedom of movement is required and the risk of falling over the side is minimal. It is not designed to turn an unconscious wearer to a face-up position; the design is such that conscious wearers can place themselves in a vertical or slightly backward position. It has a minimum of 15.5 pounds of buoyancy and comes in many sizes and colors. **Figure 6-1** shows the Type III PFD vest that boat crews typically wear. Most flotation coats (float coats) are also Type III PFDs.

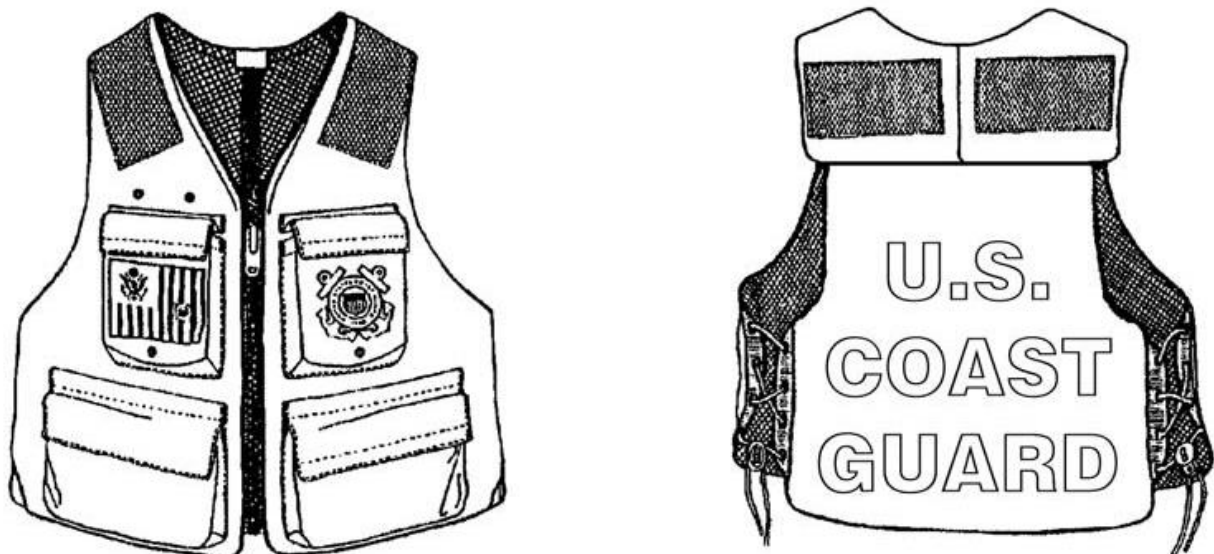


Figure 6-1

B.12. Advantages

Type III PFDs offer boat crewmembers greater comfort and freedom of movement. It is designed so wearers can place themselves in a face-up position in the water. The Type III PFD allows greater wearing comfort and is particularly useful when water-skiing, sailing, hunting from a boat, or other water activities.

WARNING: The Type III PFD will not provide an adequate level of buoyancy when worn with a full complement of law enforcement gear in any body of water except Great Salt Lake. If unable to remain afloat, jettison easily accessible equipment.

B.13. Disadvantages

The following are some disadvantages to Type III PFD:

- Flotation characteristics are marginal and not suitable for wear in heavy seas.
- Tendency to ride-up on the wearer in the water
- Wearer may have to tilt head back to avoid face-down posture in the water
- While the Type III has the same amount of buoyancy material as the Type II PFD, the distribution of the flotation material in a Type III reduces or eliminates the turning ability

B.14. Donning

Before entering the water, don and adjust a Type III using the following procedures:

Step	Procedure
1	Place your arms through the openings in the vest
2	Close zipper, if provided. Close front slide fasteners
3	Adjust waist straps for a snug fit
4	Secure any additional belts, zippers, and straps the PFD provides for high-speed operation

Type IV PFD

B.15 Description

The Type IV PFD is a Coast Guard approved device that is thrown to a person in the water and is gasped by the use until rescued. The most common Type IV devices are buoyant cushions and ring buoys. Buoyant cushions come in many different colors. Ring buoys must be white or orange in color.

Rescue One and Rescue Four are equipped with a ring buoy. See Figure 6-2.



Figure 6-2

B.16. Advantages

An advantage of the Type IV PFD is that since it is not worn like other PFDs, there are no size restrictions. This type of PFD is designed to be stored on deck for easy deployment should someone fall overboard. If quickly deployed following a man overboard, the Type IV PFD also acts as a marker assisting in returning to the area where the person originally fell overboard.

B.16. Disadvantages

A disadvantage of the Type IV PFD is that it is not worn, although some can be secured to the body once reached in the water.

Type V PFD

A.18. Description

Type V PFDs are also known as “special-use devices.” They are intended for specific activities and may be carried instead of another PFD only if used according to the approval conditions on the label. For example, a Type V PFD designed for use during commercial white-water rafting will only be acceptable during commercial rafting. It is not acceptable for other activities unless specified on the label.

Examples of Type V PFDs are

- Coast Guard work vest with unicellular foam pads.
- Thermal protective PFDs (anti-exposure coveralls/immersion suits).
- CG authorized hybrid automatic/manual inflatable PFDs

A.19. Hypothermia Protection

Some Type V devices provide significant hypothermia protection.

B.20. Inflatable PFDs

As with other Type V PFDs, the Automatic/manual inflatable is designed for specific operating conditions that give it certain advantages and disadvantages.

B.21. Advantages

The Type V inflatable PFD offers boat crewmembers greater comfort and maneuverability compared to the typical Type III vest. Lightweight and not as bulky, the Type V inflatable is especially beneficial to crewmembers during the hot summer months on Great Salt Lake. When inflated, the Type V provides more buoyancy as well as the positive righting feature found in a Type II PFD.

B.22. Disadvantage

The initial purchase price and preventive maintenance costs of the Type V inflatable are greater than that of the typical Type III vest. It also requires more frequent and complicated preventive maintenance. As with any other automated feature, if the auto-inflate mechanism were inoperative, the PFD would have to be manually inflated. This could be a problem if the crewmember was knocked unconscious while falling overboard. Also, current inflatable PFDs are not dynamic strength-tested for high-speed boat operations.

B.23 Donning

There are several different styles of Type V inflatable PFDs approved for boat crewmember use. Each has a specific method of donning, equipment storage, and activation. Prior to use, each crewmember must complete the performance qualification standards for that specific style of inflatable PFD.

PFD Storage and Care

B.24. Description

Despite the mildew inhibitor treatment that is required by manufacturers for PFDs, stowing them in moist locations will increase deterioration of the fabric. Heat, moisture, and sunlight will increase the deterioration of the parts of PFDs.

B.25. Storage

PFDs should be stored in a cool, dry place out of direct sunlight. A 'dry' area is considered any suitable area where water will not condense on a PFD. All PFDs should be kept away from oil, paint, and greasy substances. The Coast Guard does not consider any PFD "readily accessible" if it is kept in its original wrapper. Persons under stress may be unable to get them out promptly. Also, the wrapper can trap moisture leading to mildew and rot.

B.26. Care

If a PFD requires cleaning, it should be washed with fresh, warm water with a mild detergent, then rinsed in clean, fresh water.

PFD Survival Equipment

B.27. Description

PFD survival equipment is attached to a PFD to provide a means of signaling a position from the surface of the water using sight and sound signals.

B.28. Recommended Outfitting

Although not required by the Division, it is recommended all PFDs being used on the Great Salt Lake be outfitted with two accessories:

- Whistle secured to the PFD with a lanyard
- Distress signal light (battery-operated strobe light or the personnel marker light (PML. Chemical light secured to the PFD

B.29. Personal Marker Light

A PML is a device that uses either battery or chemical action to provide light for the wearer to be seen during darkness. The yellow-green light of a PML is visible for a distance of approximately one mile on a clear night, and lasts as long as eight hours.

B.29.a. Design

Large marine supply houses carry Coast Guard-approved PMLs. PMLs are specifically designed to be attached to a PFD without damaging or interfering with the PFD's original performance. The PML's hard plastic sleeve protects the glass ampules inside the tube from breakage and deterioration from the effects of light.

B.29.b. Activation

There are three procedures needed to activate the PML;

Step	Procedure
1	Squeeze the handle to break the glass vials of activating chemical compounds suspended inside the tube
2	Remove the black sleeve
3	Squeeze the handle again if the PML does not light

B.29.C Effects of Temperature

The intensity of the PML's light signal in cold weather (below 10°) is reduced. In colder temperatures, the light will last longer, but will not have the same brilliance as in warmer conditions.

NOTE: Most batteries or chemicals have a useful shelf-life of about two years. Therefore, check PMLs for the expiration date (located somewhere on the device) to find out when the replacement is in order.

NOTE: The time period a chemical light provides effective illumination depends upon its age and the temperature. A recently purchased light stick used in 70-80° temperatures (ideal conditions) will provide 8 to 12 hours of light. As the device gets older its effective period is considerably less.

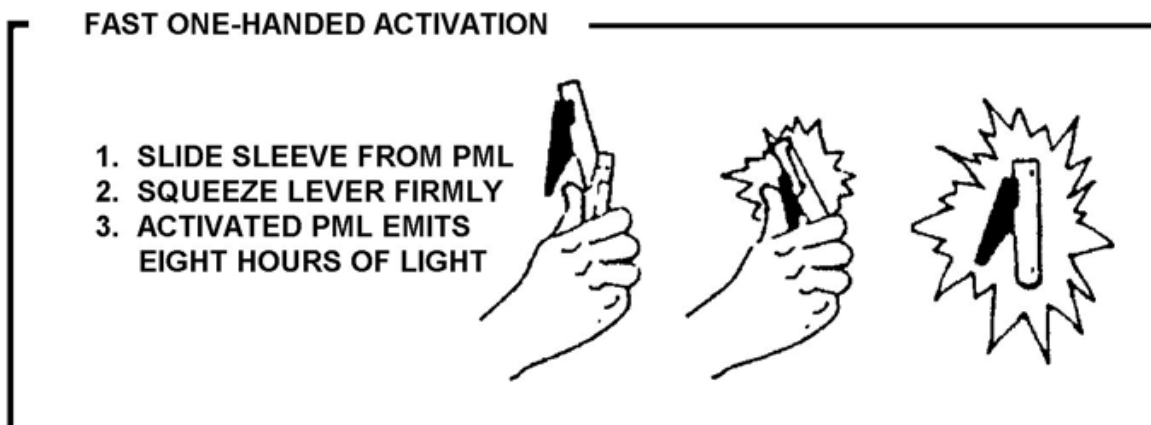
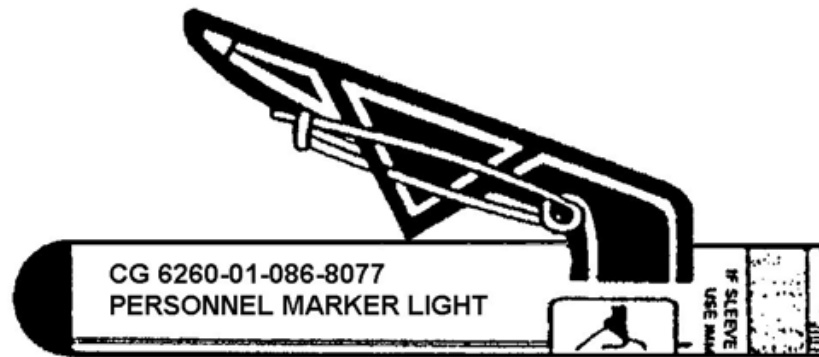


Figure 6-3
Personal Marker Light (PML)

B.30. Retroreflective Material

Most style PFDs used today have retroreflective material already attached. When this material is illuminated by a light source, it is reflected back, making it much easier to locate the PFD in the dark. However, some PFDs do not come with retroreflective material attached. Although not required it is recommended that boat crewmembers purchase Coast Guard approved reflective material and attach it to their PFDs.

Section C. Hypothermia Protective Clothing

Introduction

Accidentally falling into the water has two potentially lethal consequences: drowning and hypothermia. Previously, the protection provided by PFDs against drowning was discussed. Currently the Division does not have a policy regarding requirements to wear hypothermia protective clothing. But it is highly recommended that crewmembers have hypothermia protective clothing and wear it when hypothermia is a risk. Hypothermia protective clothing is designed to permit functioning in cold weather and water conditions. There are four primary types recommended:

- Anti-exposure coverall.
- Dry suit
- Wet suit
- Immersion suit.

NOTE: A special type float coat, with a Type V-approval label, meets the same flotation requirements as the anti-exposure coverall, but provides only partial covering and less thermal protection.

C.1. Layered Clothing

The best way to avoid cold-related injuries is to wear proper clothing. When choosing clothing combinations, the best advice is to layer clothing. As the work effort changes or when an article of clothing becomes damp, the number of layers can be adjusted for comfort.

C.2. Maintaining Body Heat

Wet clothing robs the body of heat by breaking down the thermal protection of insulated clothing. It is extremely important to replace wet clothing as soon as possible to prevent cold-related injuries, particularly if the person is idle after a period of heavy perspiring. Many cold weather medical problems involve wet hands, feet and head. These areas should receive special care.

C.3. Wearing a PFD

Boat Crewmembers shall wear a PFD at all times when wearing a dry suit. Crewmembers should not wear a PFD over an anti-exposure coverall.

C.4. Distress Signal Device

Many crewmembers prefer to attach a strobe light to their PFDs. This is good practice but it must be understood that the strobe must be attached in a way as to not interfere with the flotation qualities of the PFD. Attaching a strobe to an inflatable PFD in a way that would restrict its ability to inflate properly can lead to a dangerous situation. [Strobes are required to be turned off while on a rescue vessel at the Great Salt Lake so as not to blind the boat operator.](#)

Anti-Exposure Coverall

C.5. Description

Anti-exposure coveralls are Type V PFDs. It provides good durability and out-of-water protection from the elements, but limited protection from hypothermia in the water. (See **Figure 6-5**)

C.6. Characteristics

Anti-exposure coveralls are constructed with a fabric cover and a closed cell foam lining. These suits provide a full range of movement and come in a variety of sizes. They provide adequate mobility and protection from limited exposure to outside elements such as wind and spray. The flotation characteristics of the coverall are similar to those of the Type III PFD. The approved coveralls feature an orally inflated pillow for a better flotation angle for extended periods of exposure.

WARNING: Wearing a type I or III PFD over an anti-exposure coverall may be dangerous in certain situations. The additional buoyancy may restrict the wearer's ability to swim out from under a capsized

boat. In extreme situations, where buoyancy is a limitation instead of an advantage, it may be necessary to remove the PFD.

CAUTION! When wearing this type of suit, it is important to tighten all adjustments before entering the water. A loose-fitting suit may allow too much water in and greatly reduce the thermal effectiveness of the suit, leading to hypothermia.

C.7. Use

Anti-exposure coveralls provide hypothermia protection when the wearer is only periodically exposed to conditions which cause hypothermia. When more than periodic exposure is anticipated, even on boats with closed cockpits, a dry suit should be worn.

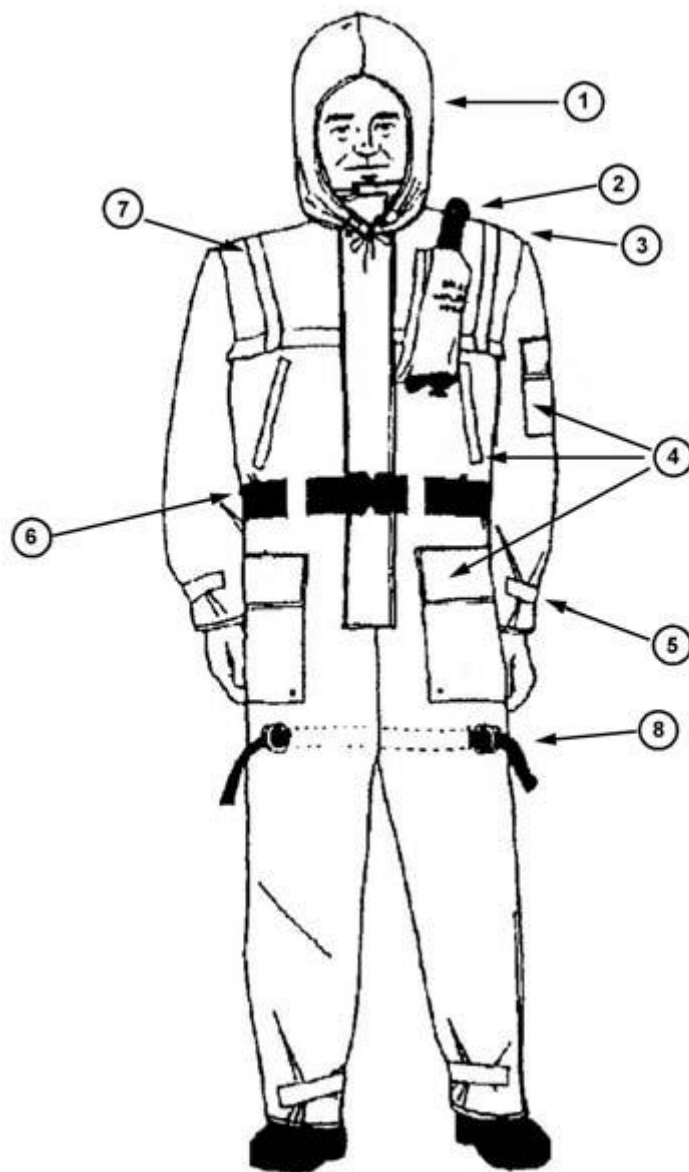
C.8. Donning

Anti-exposure coveralls are designed to be worn over the uniform. For added protection, polypropylene thermal underwear should be worn as a moisture wicking layer next to the skin. Also, insulated socks and boots (with reinforced toe), hoods, face masks, goggles and gloves should be used to protect against the elements.

C.9. Entering the Water

Before entering the water with anti-exposure coveralls, perform the following procedures:

Step	Procedure
1	Ensure the zipper is completely closed.
2	Tighten straps at the neck, waist, thigh, and ankle to reduce transfer of cold water inside the suit. This increases the degree of hypothermia protection.
3	Orally inflate the pillow behind the collar. This will provide support for the head.



1. Lined Hood
2. Oral Inflation Tube
3. Inflatable Hood
4. Pockets
5. Wrist Closures
6. Adjustable belt
7. Retroreflective Tape
8. Leg Straps

Figure 6-5
Anti-Exposure Coverall

Dry Suit

WARNING: Dry suits provide no inherent buoyancy. A PFD must be worn over a dry suit at all times while underway.

C.10. Description

The dry suit provides protection in areas where exposure to wind, spray, cold water, and hypothermia is likely. The dry suit, with proper undergarments, provides the best protection for crewmembers in adverse weather and cold-water immersion.

When the mission performed by the member is more likely to cause excess damage to a dry suit (Aton maintenance, boardings), other hypothermia protective clothing might be worn.

C.11. Characteristics

Dry suits are constructed of a trilaminate, breathable fabric. They have watertight seals at the neck, wrist, and ankles to keep the wearer dry and are designed so that one common size will fit most adults.

WARNING: Dry suits alone provide inadequate insulation or hypothermic protection. Wear thermal underwear layered underneath the dry suit. Fully close the zipper prior to entering the water.

C.12. Use

When worn with a PFD and proper undergarments, a dry suit offers mobility and superior protection against the effects of wind, spray and cold-water immersion.

C.13. Donning

Don a dry suit as described in the owner's manual. Multifilament polypropylene thermal underwear should be worn under the suit for proper protection against cold. By layering underwear, crewmembers achieve maximum protection from hypothermia. Consequently, this suit is more bulky and loose fitting than a wet suit. PFDs must also be worn because a dry suit has no inherent buoyancy. A dry suit is not a PFD.

C.14. Entering the Water

Before entering the water, perform the following procedures:

Step	Procedure
1	Slip on a wet suit hood.
2	Close all zippers and tighten all wrist and ankle straps.
3	Put on gloves.

Immersion Suit

C.15. Description

The immersion suit (also known as a survival suit) is worn when abandoning ship. They provide flotation as well as excellent hypothermia protection. (See **Figure 6-6**)

C.16. Characteristics

The immersion suit is a one-piece international orange garment constructed of nylon-lined neoprene or polyvinyl chloride foam. It is also equipped with an inflatable pillow to help keep the wearer's head out of the water. The suit has a built-in hood, boots, and gloves. The immersion suit is designed as one size fits all.

C.17. Use

The immersion suit is used when extended exposure to the elements is expected. It is the recommended PFD when abandoning ship. It should not be used as a working outfit due to the wearer's limited dexterity when wearing the suit.

C.18. Donning

The immersion suit is similar to a regular pair of coveralls with a central zipper closing the one opening. Before putting on the immersion suit, care should be taken to ensure all sharp objects (knives, pens, and collar devices) are stowed to prevent puncturing the suit. Footwear should also be removed before donning to reduce the possibility of tearing. Donning an immersion suit may be awkward and is best done in pairs with another crewmember.

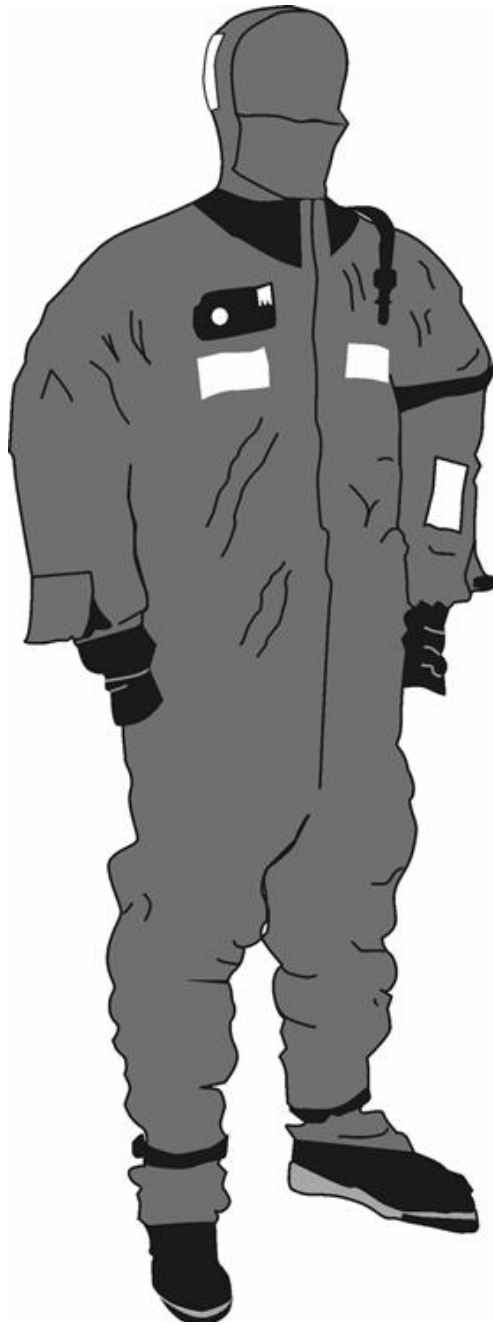


Figure 6-6
Immersion Suit

NOTE: Not all Division vessels are equipped with immersion or dry suits. Check your Park's inventory so you know what suits are available at your park.

Section D. Headgear

Introduction

Boat crew personnel may wear headgear for protection in cold weather conditions and during hazardous conditions such as heavy weather and high-speed operations.

D.1. Thermal Protection

Wool caps may be worn for thermal protection. However, under extreme weather conditions it offers little protection to the face and neck. When operating in a cold environment, the polypropylene or fleece balaclava should be worn in conjunction with a wool cap or protective helmet.

If wearing a dry suit, a neoprene hood should be used by the crewmember.

D.2. Protective Helmet

The wearing of helmets on boats under hazardous conditions, such as heavy weather operations, is an option for crewmembers. A lightweight kayaker-type helmet is best.

NOTE: Many helmets are equipped with a headlamp. These headlamps SHALL be in the off position while onboard rescue vessels on Great Salt Lake so as not to blind the boat operator. Lights shall only be used when off the rescue vessel.

Section E. Boat Crew Optional Survival Equipment

Introduction

Some boat crewmembers carry survival equipment on their person. Although not required to carry these items by the Division (the Division/park may or may not supply this equipment), this section covers some of the more popular survival equipment.

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Emergency Signaling Mirror

E.1. Description

The emergency signaling mirror is a pocket-sized mirror with a sighting hole in the center and a lanyard attached. (See **Figure 6-7**) However, any common mirror is useful as an emergency signaling device.

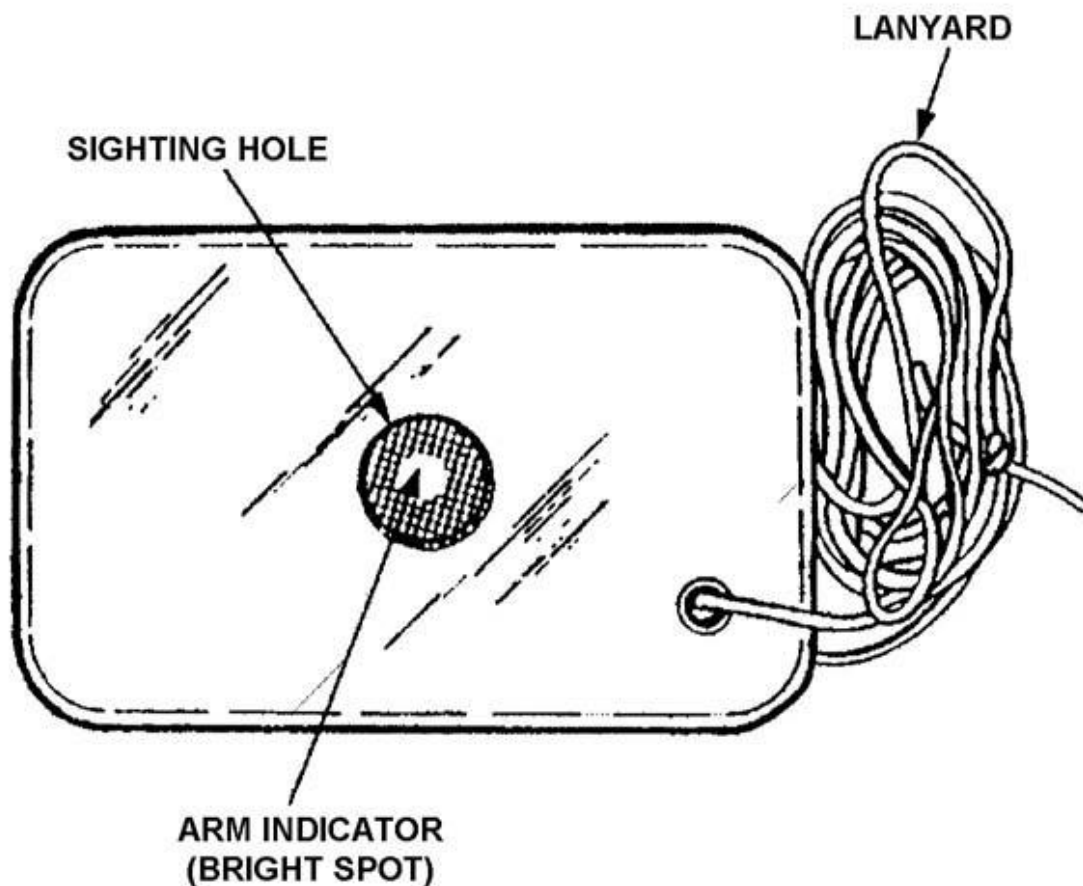


Figure 6-7
Emergency Signaling Mirror

E.2. Use

The mirror is used to attract attention of passing aircraft, boats, or ground rescue teams by reflecting light at them.

E.3. Characteristics

Light reflected in this manner can be seen at a great distance from the point of origin. Practice is the key to effective use of a signal mirror.

E.4. Operation

Instructions for using the mirror are usually printed on its backside. If these instructions have been worn away or are unreadable, the mirror should be replaced. The following procedures describe how to properly use the signal mirror:

Step	Procedure
1	Face a point about halfway between the sun and an object you wish to signal.
2	Reflect sunlight from the mirror onto a nearby surface such as the boat, your hand, etc.
3	Slowly bring the mirror up to eye-level and look through the sighting hole. You will see a bright light spot, this is the aim indicator.
4	Hold the mirror near your eye and slowly turn and manipulate it so the bright light spot is on the target.

Signal Whistle

E.5. Description

The whistle is a small, hand-held device that produces a loud sound when it is blown. (See **Figure 6-8**) The standard whistle is constructed of plastic and resembles a police officer's whistle.

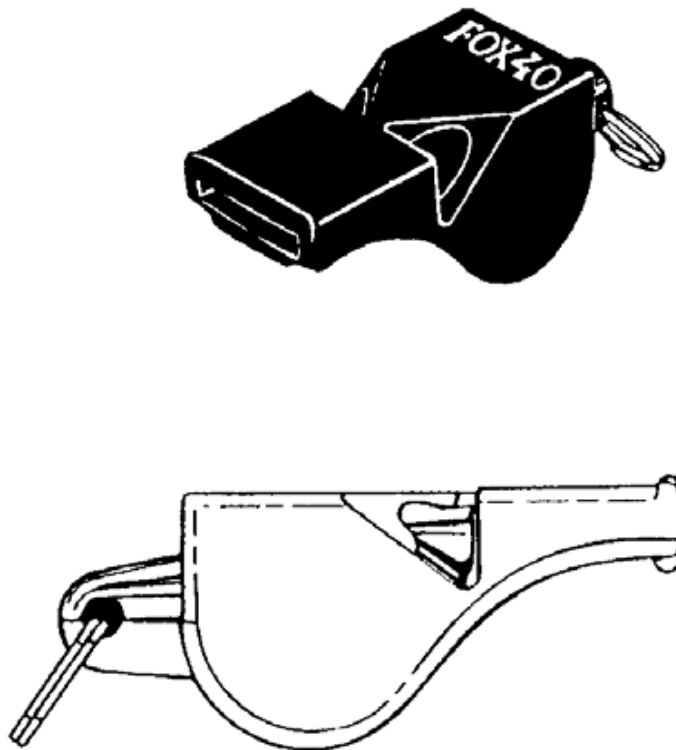


Figure 6-8

Signal Whistle

E.6. Use

The sound produced by a whistle will attract the attention of rescuers and guide them to the whistle's origination. During periods of restricted visibility, fog, and darkness, rescuers may hear the sound it produces before they sight the distress signal light.

E.7. Characteristics

Depending on weather conditions, a whistle's audible sound may be heard up to 1,100 yards away. Any wind has the effect of carrying the sound downwind.

E.8. Operation

To operate the signal whistle, perform the following procedures:

Step	Procedure
1	Place the reed part of a whistle between the lips and blow.
2	If the whistle does not produce a distinct whistle-like tone, quickly turn the whistle over and blow the water out of the bail air relief hole and try again.

Personal Hand-Held Rocket Flares

E.9. Description

Personal hand-held rocket flares are compact and can be worn in the sleeve pocket of flotation jackets. (See Figure 6-9)



Figure 6-9
Personal Hand-Held Rocket Flare

E.10. Use

The rocket flare is used to attract vessels, aircraft, and ground rescue teams.

E.11. Characteristics

These signals produce a red star display for a minimum of 4.5 seconds. Their luminous intensity is about 12,000 candle power.

E.12. Operation

Follow the operation instructions on the side of the flare.

Distress Signal Light

E.13. Description

The distress signal light is a lightweight, compact, battery-operated strobe light that emits a high intensity visual distress signal. (See **Figure 6-10**) There are many acceptable models on the market.

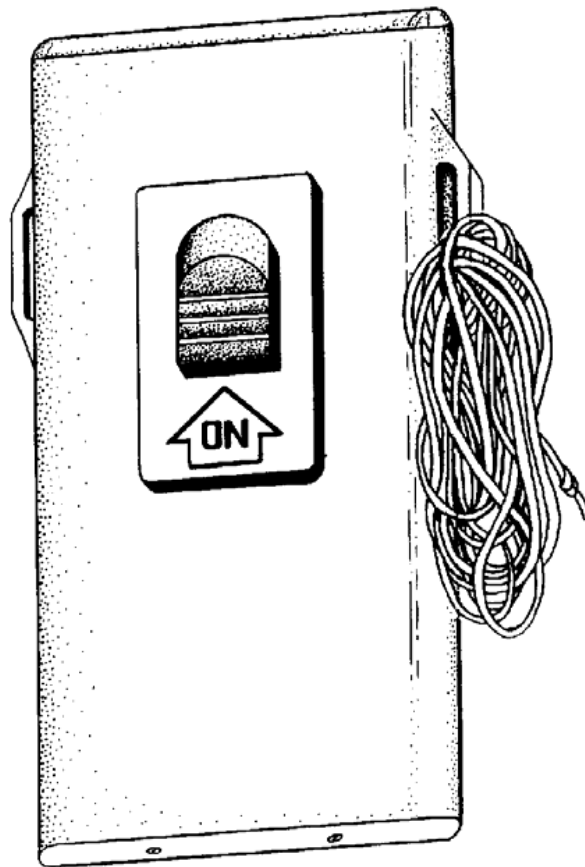


Figure 6-10
Distress Signal Light

E.14. Use

The distress signal light is used to attract the attention of aircraft, ships, or ground parties. One side is equipped with a hook so that it can be attached to a PFD or other clothing. This eliminates the need to hold the distress signal light, freeing up hands to operate other signaling equipment.

E.15 Characteristics

Distress signal lights emit approximately 50 flashes per minute. At the peak of each flash, the luminous intensity is 100,000 candlepower. Under continuous operation, they will flash for 9 hours, or 18 hours when operated intermittently. On a clear night, the distress signal light has a minimum visual range of five miles. However, the range of visibility will be determined by the height of eye of the observer. For an observer low on a boat, the range will most likely be much less than the advertised five miles.

E.16. Operation

Follow the manufacturer's instructions on operating your personal distress beacon.

Survival Knife

E.17. Description

The survival knife is a basic tool used to free the crewmember from entangling lines. It is also used to cut material blocking a path in escaping a capsized or sinking boat. Knives come in various forms. [The knife recommended to be worn by all crewmembers at Great Salt Lake, should have a folding blade that is at least partially serrated for cutting through hard materials. The knife should be able to be worn in a pants pocket, attached to a life vest or worn elsewhere where quick and easy access is possible.](#)

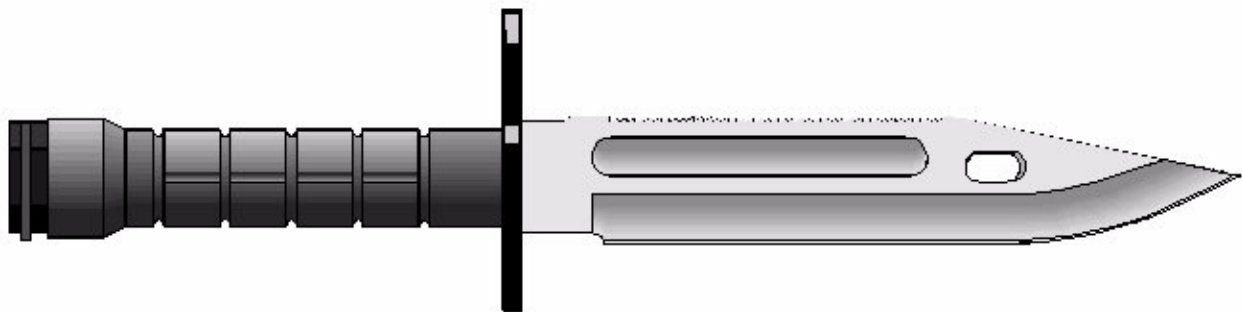


Figure 6-11
Survival Knife

Personal Locator Beacon

E.18. Description

Personal locator beacons (PLB), also known as a GPS tracker (commonly known as SPOT) is a small GPS tracking device that, when activated, allows a third party to track your location and movement. Most trackers have an SOS feature that, when activated, will notify a chosen person that you are in trouble and will give your coordinates. These trackers are small, lightweight and compact. Many come with holsters that can be strapped to a belt or arm. They are typically waterproof and are quite reliable. (See **Figure 6-12**)



Figure 6-12
PLB or GPS Tracker

E.19. Use

The PLB is for emergency use only. This device should be used primarily as a distress signal and should be activated immediately to signal for help. Once activated, do not turn it off. Once search vessels or aircraft have reached the transmitting position area, use the other signaling equipment (radio, signal mirror, flares, etc.) to vector them to the position.

Vessels involved in SAR missions on Great Salt Lake will often activate a SPOT unit so that IC command can track the vessel and watch an active search pattern.

Section F. Pyrotechnics

Introduction

If the boat becomes disabled during a mission, its crew must have some means of signaling aircraft or vessels for assistance. Signaling devices include pyrotechnics depending on whether a Division vessel was equipped with a pyrotechnic kit. *Rescue One and Rescue Four on the Great Salt Lake are both equipped with a complete pyrotechnic kit.* When you become assigned to a park, check to see what equipment each vessel is stocked with. Visual distress signals, in general, are discussed in *Chapter 11, Communications*.

NOTE: Pyrotechnic devices should not be used until a rescue craft is actually in sight.

F.1. Parachute Flare

A parachute flare is a night time illumination-signaling device. When fired, it climbs to an altitude of 650 to 1000 feet before igniting. Upon ignition, it produces a parachute-suspended red star flare that burns for about 40 seconds with 30,000 candlepower. The signal descends at a rate of 10 to 15 feet per second. (See **Figure 6-13**)



Figure 6-13
Parachute Illumination Signal

F.1.a. Firing Instructions

The following are procedures for firing the parachute illumination signal:

Step	Procedure
1	Do not remove a signal from its container until just before use.
2	Remove a signal from the container.
3	In all handling, avoid striking the signal primer.
4	Do not use signals that are dented, cracked, or otherwise damaged.
5	Hold the signal in left hand in accordance with the instructions on the signal.
6	Withdraw the firing cap from the lower end of the signal.
7	Point the ejection end of the signal away from the body and away from other people, equipment, and materials.
8	Hold the signal FIRMLY at arm's length with the left hand, with the ejection end facing straight up. The signal should be held in a vertical position (90° elevation) when firing.
9	Fire the flare in accordance with the instructions on the flare.
10	If a signal misfires while on land, place it in a secure position to prevent people from being hurt should the signal fire. If a misfire occurs while underway, toss it overboard.

WARNING: If a signal is fired at an angle less than 90° elevation (directly overhead), the altitude reached is reduced and the altitude of the candle burnout is lessened. If the firing angle is 60° or less, the candle will, in almost all cases, still be burning when it strikes the surface.

WARNING: When conducting SAR operations with a helicopter, extreme caution and coordination must be used by surface units using pyrotechnics. Do not fire pyrotechnics without first informing the aircraft.

F.1.b. Firing Angles

Firing a signal at angles other than a vertical position may be necessary under the following circumstances:

- To compensate for high wind velocities.
- To gain maximum illumination of the area.

Section G. Emergency Procedures in the Event of Capsizing

Introduction

The key to surviving capsizing is to avoid it ever happening. If it cannot be avoided, then the crew must recognize when it could happen and be prepared. *Chapter 9, Stability, Chapter 10, Boat Handling, and Chapter 20, Heavy Weather Addendum*, all discuss situations and conditions where capsizing could result. These chapters also present warning signs and measures to take to minimize risk. The VO must continually assess the conditions to ensure the safety of the boat crew and of those in distress; however, all crewmembers have the responsibility to keep VO advised if the situation changes.

G.1. Prevention

A boat is less likely to capsize in deep, open water. The chances of capsizing are greatest while operating in or near the surf of breaking waves. The force needed to capsize is most likely to come from heavy waves directly astern (following seas), or large breakers striking abeam. The safest point for most boats to take heavy seas is nearly bow-on. A boat should not operate or tow in conditions beyond the capability of the boat or crew. Conditions present in many capsizings include:

- Surf or breaking seas
- Shallow water depth (less than 20 feet)
- Escorting or towing another boat through an inlet.
- Restricted visibility due to darkness, rain, or fog.
- Stability reduced due to excessive amounts of water in bilges, or too many people onboard.

G.2. Precautions

If the hull is intact after capsizing, it will not sink for some time, even in rough seas. The crew will have time to escape if panic is avoided. Precautions ahead of time include:

- Learn the boat's interior. Initially the crew will be disoriented due to being upside down and with a lack of lighting.
- Stow all loose gear, and have all equipment and doors operating properly for ease in escaping.
- Know the location and use for any survival equipment that may be onboard. Check it regularly to be sure that it is adequate, in good repair, and that all signaling devices work.
- Be ready to grab a sturdy support to prevent being thrown about.

G.3. Escape Procedures

If trapped in or under the vessel, crewmembers should seek out an air pocket near the top, (inverted bottom). The crew should be gathered together in the air pocket. Everyone should settle down and focus on planning a safe escape. The escape route and objects of reference along the route should be discussed. Everyone should look down; light may be visible and escape immediate.

- Make every effort to escape. The boat may sink or the air will eventually escape through hull fittings, cracks, or holes, or become unfit to breathe (fuel vapors, bilge waste, or lack of oxygen due to survivors breathing).
- Before attempting to escape, check for needed survival equipment, especially flotation and signaling devices.
- Activate personal strobes (if you are wearing one) to assist in locating other survivors particularly at night. Extinguish if it becomes disorienting.
- PFDs may have to be removed temporarily for people to fit through spaces or to go underwater to reach an exit. [This will definitely be the case at Great Salt Lake. You will not be able to push yourself underwater to escape a capsized boat without removing your PFD.](#) If necessary, tie a line to the PFD and pull it out after exiting.
- Avoid the stern if the engines are still running.
- If caught in an open cockpit area, swim down below the gunwales and surface alongside the boat.

G.3.a. Escape from an Enclosed Compartment

Escape from an enclosed compartment will require additional planning. Advice includes:

- All exits are upside down when the boat capsizes. Locate an exit route and reference points from the compartment to open water.
- PFDs may have to be removed temporarily for people to fit through spaces or to go underwater to reach an exit. [This will definitely be the case at Great Salt Lake. You will not be able to push yourself underwater to escape a capsized boat without removing your PFD.](#) If necessary, tie a line to the PFD and pull it out after exiting.
- Swim underwater through the exit and out from the boat. If a line is available, the best swimmer should exit first through a cabin door or window, carrying the line. If no line is available, have the best swimmer go first, followed by a poorer swimmer and lastly a good swimmer. (if the poorer swimmers are left alone inside, they are likely to panic and not escape.) The first swimmer, when free, should tap on the hull to signal success in getting out to the others.
- Cold water decreases the length of time anyone can hold his or her breath underwater. Immersion in cold water may also give a sensation of tightness in the chest. Experiment inside a compartment before attempting to escape. This will decrease the possibility of panic during the escape attempt.

G.3.b. Alongside a Capsized Boat

Survivors from a capsized boat should attempt to stay with the boat or other visible floating debris.

- Get onboard the overturned hull, if possible.
- Otherwise hold onto the largest floating object available.

- Generally, everyone should stay with the boat and not swim for shore. Distances to the beach can be deceiving, and strenuous activities such as swimming in cold water can hasten the onset of hypothermia.

Survivors should consider tying themselves to the boat if there is a rapid means of untying or cutting free, in case the boat shifts or sinks. Most people are likely to become tired or develop hypothermia.

G.3.c. Remaining Inside a Capsized Boat

If someone cannot exit the capsized boat:

- Remain calm and stay within an air pocket.
- Trap the air in the compartment (e.g., close any hull valves that can be located).
- When hearing rescuers, attempt to communicate to them by shouting or tapping on the hull.
- Conserve oxygen by remaining calm and minimizing physical activity. If possible, get out of the water to reduce hypothermia.
- Remember that rescuers should arrive soon.