

## **CHAPTER 2 – PERSONAL LIFESAVING EQUIPMENT AND PROCEDURES**

Time: One hour

**GOAL: Students will understand the effects of accidental immersion in man overboard and abandon ship situations and master the use of personal lifesaving equipment required aboard their vessels under the Commercial Fishing Industry Vessel Safety Act (CFIVSA).**

### **NEED STATEMENT:**

1. All the safety gear in the world won't save you if you don't know how to use it.
2. Lack of familiarity, and improper maintenance and stowage of personal safety equipment contribute to marine casualties. (Example, FT Aleutian Enterprise).
3. Since most of North America's waters are defined as cold (70 degrees or less), we need to be prepared to handle cold water emergencies. People can become hypothermic in water less than 91 degrees. E.g., the water temperature in the winter in the Gulf of Mexico is the same as the water temperature in SE Alaska.
4. Effective recovery procedures in man overboard situations can mean the difference between recovering a survivor or searching for a body.

### **OBJECTIVES:**

1. Given the pamphlet, *Federal Requirements for Commercial Fishing Industry Vessels*, determine the personal flotation device (PFD), immersion suit and throwable flotation device requirements for a specific vessel.
2. Identify at least five types of PFDs; demonstrate at least two points in proper fit.
3. Inspect and identify at least five routine maintenance points (zipper, bag snaps, light reflective tape, PML, seams, inflation test, suit material) and five steps in stowing an immersion suit in bag or PFD.
4. State the seven "STAY" rules regarding cold water survival.
5. Don an immersion suit following eight steps in 60 seconds.
6. Demonstrate three steps of jumping into the water with an immersion suit.
7. Demonstrate three steps of jumping into the water with a PFD.
8. Demonstrate chain swim and "rafting" survival techniques in water.

### **SKILLS CHECKLIST:**

1. Properly don an immersion suit following eight steps in 60 seconds
2. Inspect, service, and stow an immersion suit or PFD. Record in safety maintenance log.
3. Demonstrate proper water entry in an immersion suit or PFD.
4. Demonstrate the HELP and HUDDLE positions.
5. Demonstrate three steps of jumping into the water with an immersion suit and a PFD.
6. Practice chain swim and “rafting” survival techniques in water.

### **EQUIPMENT NEEDED:**

Examples of PFD types

Immersion Suits

Immersion suit zipper lubricant/wax

Plastic bags for feet

USCG approved PFD light

Whistle

Personal Floatation device lights for immersion suit

USCG Pamphlet *Federal Requirements for Commercial Fishing Industry Vessels* (one per student)

Blank station bills, representative vessel schematics

Spare CO<sub>2</sub> cartridges for inflatable PFDs

## TEACHING TIPS:

- \*The in-water practicum is an extension of this lesson; it is an excellent way to reinforce the classroom information on water skills and PFDs. Use the in-water practicum to complete skills checklist items.
- \*Use a local or regional example (w/o stating names and vessel name) of an emergency where the lack of knowledge or skills in using an immersion suit or PFD led to an ineffective response to the problem.
- \*To introduce PFD types have students in groups of two or three select WEARABLE, comfortable, PFDs at random. Give them information on PFDs. After taking a minute to acquaint themselves with the PFD and information provided, ask them to try to sell it to the other participants based on its good points. This works well if done in a circle (PFDs in the middle); it can be disastrous if you expect participants to get “up in front of the class” alone. Try to keep it an informal, fun session. Have examples of the top rated PFDs in the NIOSH study.
- \*Be sure to have examples of PFD types available.
- \* With five or six students, have them don suits step by step per your instruction. Stop anyone who moves to next step without everyone being ready for next step. Once everyone has donned the suit correctly under your guidance, have them stow suits properly in bag and on the count of three, time them to don suits completely within 60 seconds. Monitor students carefully to avoid damage to suits or others.
- \*Have students locate and don PFDs/immersion suits in the dark; note the problems with size, fit and condition.
- \*Lighten the lecture load in this section by using lots of demonstrations and hands-on activities – remember, the goal of this section is for students to become familiar and comfortable with the use of personal lifesaving equipment. USE IT!!
- \*Plastic bags worn over shoes can ease donning and save wear and tear on immersion suits.
- \*With this section, students begin constructing station bills for practice drills. This is a good time to divide the class up into crews, reflecting the type of practice vessel that will be used and needs of the students. Allow about ten minutes at the close of each section to have class crews construct station bill assignments and discuss emergency instructions.

## **INSTRUCTIONAL OUTLINE:**

**I. ACCIDENTAL IMMERSION** – wet but not willing. The worst case scenario in a vessel casualty takes you from the vessel environment to the water where you are subject to cold water shock, hypothermia, and drowning.

### **A. Cold Water Shock**

1. Sudden immersion in cold water can produce:
  - a. Pain
  - b. Uncontrollable gasping; aspiration of water
  - c. Hyperventilation
  - d. Rapid changes in blood pressure and heart rates, even cardiac arrest
  - e. Drowning, especially in rough seas when breathing cannot be controlled.
  - f. Swimming is not effective while this initial shock is in effect.
2. May explain why persons disappear suddenly (Sudden Disappearance Syndrome)
3. Hyperventilation, gasping will slow within five minutes

### **B. Immersion Hypothermia**

1. Hypothermia – when the body loses more heat than it generates; can cause death in the water or contribute to drowning if the victim loses consciousness.
2. In cold water, lack of muscle coordination can develop within 15 minutes hindering self rescue or ability to respond to assistance.
3. Heat is conducted away from the body by water; hypothermia can begin to develop within 30 - 60 minutes.
  - a. Water conducts heat away from the body 25 times faster than air at the same temperature.
  - b. The rate of onset varies with age, body size, movement, water temperature and clothing.

#### 4. Heat Retention:

- a. Aided by clothing/survival gear/PFD
- b. Stay dry
- c. Reduce movement of water next to skin
- d. Protect main heat loss areas:
  1. Chest/back, head, neck
  2. Underarms and sides of chest
  3. Groin
- e. Decrease circulation in the limbs by staying still

#### C. Drowning

1. General term for water related deaths.
2. Can result from aspiration of water into lungs or obstruction of airway (a reflex action, laryngospasm, that closes the windpipe).
3. Cold water near drowning: victims of cold water drowning (less than 70 degrees F) can sometimes be revived with proper treatment, even after prolonged submersion (up to 60 minutes)(Explain the effects of Mammalian Dive Reflex)

## **II. SURVIVAL FACTORS IN ACCIDENTAL IMMERSION AND COLD WATER EMERGENCIES**

A. Will to live – very important in all survival situations.

#### B. Flotation

1. Buoyancy: the ability to keep afloat.
2. Inherent buoyancy:
  - a. The majority of people can float; ability varies based on individual characteristics.
  - b. Breath holding increases inherent buoyancy.

### 3. Buoyancy Aids:

- a. Personal Flotation Devices (PFDs) assist in flotation and controlling gasping.
- b. Air trapped in clothing can assist.
- c. Capsized boat or debris can assist in flotation efforts.

### C. Heat Retention:

1. Clothing/survival gear/PFD afford varying degrees of thermal protection.

## **III. STAY RULES FOR SURVIVING ACCIDENTAL IMMERSION AND COLD WATER EMERGENCIES**

A. In most cases of accidental immersion, rescue is not immediate. Even in “warm” waters (70 degrees or more), prolonged exposure can result in hypothermia. Practice the STAY rules.

### 1. Stay Afloat

1. Must be able to breathe to prevent drowning.
2. Must be able to overcome panic to control breathing.

### 3. With PFD:

- a. Non-swimmers may need assistance with PFDs
- b. Provides advantage of recovering from cold water shock and allows better breathing control, flotation and thermal protection.
- c. In rough seas additional flotation is needed to counteract submergence in breaking waves.

### 4. Without PFD:

- a. Flotation is possible even with heavy clothes.
- b. Air trapped in clothes and boots assists in flotation.
- c. Hold onto debris.
- d. Panic decreases ability to float, removes air trapped in clothing, flushes water over the body.

2. Stay Dry as possible – put immersion suit on BEFORE getting wet

- a. If there is any warning, immerse slowly.
- b. Get out of the water as soon as possible.
- c. Get the main heat loss areas out of the water as much as possible (e.g., chest, head).
- d. Do not use “drownproofing” (face floating survival technique); this increases heat loss by 80% over staying still with head out of the water.
- e. Immersion suits offer the best protection against hypothermia; also provide flotation and serve as a signal.

### 3. Stay Still

1. Movement increases circulation in the arms and legs. Cooled blood returns to the body core (heart, vital organs) further reducing core temperature.
2. Staying still over swimming or treading water decreases heat loss by 30%.
3. Flotation is possible without a PFD but it is difficult to remain still without one.
4. Any movement causes flushing replacing the warm “boundary layer” of water next to the body with cold.

### 4. Stay Warm

1. Protect main heat loss areas – if there is any warning, add clothes and hat.
2. If getting out of the water is impossible, assume HELP (heat escape lessening position) or HUDDLE positions. DEMONSTRATE.
  - a. These positions double survival time over that of swimming or treading water.
  - b. These positions cannot be assumed without flotation aids.

### 5. Stay With The Boat

1. Climbing on top of an overturned boat can keep you dry and increase the chances of being spotted.
2. The decision whether or not to swim to shore is a difficult one. Depends upon:

- a. Tides
- b. Currents
- c. Other boats in the area.
- d. Distance to shore less than about 15 minutes of swimming?
- e. Swimming ability. As a general rule, a strong swimmer can swim in cold water one-tenth the distance possible in a warm pool.
- f. Beware of changing your plan after an extended period of being cold – a warm brain makes better decisions.

#### 6. Stay together

- 1. Increases morale
- 2. Bigger target to find for Search and Rescue(SAR)

#### 7. Stay Sober

- 1. Alcohol/drugs involved with over 50% of marine casualties, according to the Coast Guard
- 2. Affects judgment, reaction time, fatigue & alertness while underway

### **IV. PFD Types**

#### A. Types of Personal Flotation Devices (PFDs)

##### 1. Type I

- a. Flotation primarily in the chest area.
- b. Provides maximum buoyancy (22# minimum).
- c. Tends to turn most unconscious victims face up in water unless worn over anti-exposure coveralls or an immersion suit.
- d. Poor thermal protection.
- e. Often too bulky to wear for fishing.

##### 2. Type II

- a. Horse collar shaped device.

- b. Minimum buoyancy 15.5#.
- c. Tends to turn some unconscious victims face up in water.
- d. Poor thermal protection.

### 3. Type III

- a. Includes most variety in styles – vests, float coats and coveralls.
- b. Same buoyancy as type II (15.5# minimum)
- c. Little or no ability to turn unconscious victim face up in water.
- d. Variety of styles, colors and sizes.
- e. Fair thermal protection; however, cooling rate can double in rough water over calm.
- f. Flotation coveralls (Type V) meet Type III type reg only if worn.
- g. Fair to good thermal protection. Cooling rate increases in rough seas

### 4. Type IV

- a. A USCG-approved throwable device.
- b. Designed for rescue.
  - 1. Ring buoys, buoyant cushions.
  - 2. Buoyant cushions should be worn on front of body.
- c. Minimum of 16.5 # of buoyancy.
- d. Never take the place of Type I or II.
- e. Should have a floating line attached for throwing or retrieving.
- f. Commercial grade Lifesling® qualifies as a Type IV.

### 5. Type V

- a. Any USCG-approved PFD for restricted use (e.g. flotation coveralls)

### 6. USCG-approved inflatables

- a. Maximum comfort

- b. Maximum flotation
- c. Manual, oral and automatic inflation

7. PFDs not approved by US Coast Guard – Best PFD is the one you wear!

- a. Stormy Seas® brand
  - Many styles, comfort levels
  - Only manual, oral inflated
- b. Regatta rain bibs
  - inherent flotation
- c. Unapproved suspender types – many brands

8. Immersion Suits – not classed as a PFD

- a. Also called survival, “gumby” or exposure suits, but don’t guarantee survival.
- b. Provide excellent buoyancy (min. 22#)
- c. Designed to be worn when abandoning ship.
- d. Offers the best hypothermia protection.
- e. Should be stored in an accessible location.
- f. Must have proper fit (size, face seal, mobility)

9. Entering the water in a PFD\*

- a. Don PFD.
- b. Enter the water as slowly as possible, feet first.
- c. With one hand hold nose and cover mouth.
- d. With the other arm cross over the first arm and grab the opposite shoulder of the PFD.
- e. This method helps prevent inhalation of water and prevents the PFD from coming up over the head.

\* This should be demonstrated at the in-water practicum.

10. Entering the water in an immersion suit.\*

- a. Don suit completely with face flap closed.

- b. Best spot to embark is on lee side as close to the water as possible; specific location will be determined by the type of vessel, nature of the casualty, obstructions, etc.
- c. Face bow or stern, sideways to the boat.
- d. With neck of suit open, squat down and press against suit to remove extra air from suit.
- e. Stand with arm nearest boat to protect the head and hold top of hood in place.
- f. Other outboard hand holds the suit away from face (insert thumb or finger) to let air escape, and covers nose and mouth.
- g. CAUTION!! Do not inflate air bladder before jumping into water (may cause neck injury or tear away).
- h. Check water for debris or people.
- i. Slip slowly into the water if possible; if not jump feet first with legs crossed.
- j. Once in the water, inflate air bladder unless getting into the liferaft.

\* This should be demonstrated at the in-water practicum.

## **V. PFD and Immersion Suit maintenance**

- 1. Marking immersion suit
  - a. Name of vessel OR
  - b. Name of owner OR
  - c. Name of crewmember
- 2. PFD care & maintenance
  - a. Prospective buyers should read the information pamphlet generally accompanying the PFD to insure that the PFD meets their needs and requirements.
  - b. Periodic / monthly inspection a MUST. Record in safety maintenance log.
  - c. Kapok vests and seat cushions should be checked for leaks in the sealed plastic flotation pouches.

### 3. Immersion suits

- a. Store unzipped – zipper an inch or two from bottom to prevent inability to undo a snag when donning
- b. Lubricate zippers regularly with non-petroleum product recommended by manufacturer.
- c. Inflate bladders and check for leaks.
- d. Check for holes at seams and stress points
- e. Inspect monthly / record in log.
- f. Inflation test with small shop vacuum
  - cover seams/zipper with mild soapy water.
  - look for bubbles which indicate leaks.
  - rinse and dry suit and use appropriate repair.
- g. A serviceable CG approved PFD light with up-to-date power supply must be attached to front shoulder area.
- h. Attaching whistles to PFDs is recommended.

### 4. Inflatable PFDs:

- a. Take special care of inflation mechanisms.
- b. Follow manufacturer's instructions.

### 5. Other Considerations – federal requirements:

- a. Determine the PFDs required for your vessel and area of operation. (Pamphlet, *Federal Requirements for Commercial Fishing Industry Vessels*).
- b. All PFDs must carry USCG approval, be serviceable and an appropriate size for the wearer.
- c. All wearable PFDs and immersion suits must be readily accessible.
- d. Throwable devices must be immediately accessible.

### 6. Personal considerations

- a. Cost – wide range.
- b. Color – bright colors facilitate rescue.

- c. Work/life style – will it be worn?
- d. Maximize safety – PFDs can be made safer by attaching signals, etc.
- e. Area of operation
  - Distance from help
  - Water temperature, seasonal operations

## **VI. SUMMARY**

### **A. Survival Factors**

1. Will to live
2. Flotation
3. Heat retention

### **B. Stay Rules for Surviving a Marine Emergency**

1. Stay afloat
2. Stay dry
3. Stay still
4. Stay warm
5. Stay with the boat
6. Stay together
7. Stay sober

### **C. Find the PFD that meets your needs and wear it.**

1. Consider these qualities when choosing a PFD:
  - a. Thermal protection
  - b. Federal requirements
  - c. Life style
2. The best PFD is the one that will be worn.

## **REVIEW QUESTIONS:**

1. List three general factors to survive accidental immersion.

ANS: Will to live, flotation, heat retention.

2. List the seven STAY rules.

ANS: Stay afloat, stay dry, stay still, stay warm, stay with the boat, stay together, stay sober.

3. Why does the HELP position increase survival time?

ANS: It protects high heat loss areas of the body.

4. What three factors do you consider in choosing a PFD?

ANS: Thermal protection, lifestyle and federal requirements.

5. What is the best type of PFD?

ANS: The one that will be worn.

## **SKILLS CHECKLIST:**

1. Students have the opportunity to demonstrate proper donning of immersion suit during class demonstrations, in-water practicum, or the drills.
2. Make it a practice that every time an immersion suit is used, it is inspected, air dried, the zipper lubricated, and stowed properly. This reinforces the proper procedure throughout the class. There will be opportunities to observe this skill during classroom practice, the in-water practicum, and drills.
3. Water entry can be demonstrated during the water practicum and reinforced during drills.
4. Difficulties in retrieving a MOB can be reinforced during the in-water practicum; the need for retrieval device, flotation and possibly a rescue swimmer.
5. Survival gear must be maintained and logged in maintenance log book.