

MARINE SURVIVAL EQUIPMENT AND MAINTENANCE

HANK PENNINGTON



FISHERIES SAFETY AND SURVIVAL

SERIES

ALASKA SEA GRANT COLLEGE PROGRAM
EDUCATION PUBLICATION NO. 6
SECOND EDITION 2005

MARINE SURVIVAL EQUIPMENT AND MAINTENANCE

HANK PENNINGTON



SG-ED-06
Second edition 2005
Price \$4.00

Alaska Sea Grant College Program
University of Alaska Fairbanks
P.O. Box 755040
Fairbanks, AK 99775-5040
907-474-6707
fypubs@uaf.edu
<http://www.alaskaseagrant.org>

FISHERIES SAFETY AND SURVIVAL SERIES

Elmer E. Rasmuson Library Cataloging-in-Publication Data

Pennington, Hank.

Marine survival equipment and maintenance, Second Edition
(Fisheries safety and survival series)(SG-ED-06)

1. Survival and emergency equipment. 2. Wilderness survival—Study and teaching—Alaska. 3. Survival skills—Study and teaching—Alaska. 4. Fisheries—Alaska—Safety measures. I. Alaska Sea Grant College Program. II. Title. III. Series. IV. Series: Sea Grant education publication; no. 6.

GF86.P46
Second Edition 2005
ISBN 1-56612-089-6

ABOUT THE AUTHOR

Hank Pennington served as Alaska Sea Grant marine advisory agent in Kodiak for 22 years. He promoted safety training in Alaska in cooperation with Kodiak Fishermen's Wives and other fishing organizations, and nationwide with the cooperation of National Sea Grant and the National Council of Fishing Vessel Safety and Insurance. Pennington is a board member for the Alaska Marine Safety Education Association (AMSEA). Jerry Dzugan, director of AMSEA, updated the 2005 edition.

ACKNOWLEDGMENTS

Gratitude is expressed for the time, effort, and good comments from a diverse group of people. This book and the video it accompanies would not have been possible without them.

Alaska Marine Safety Education Association
Alaska Sea Grant College Program
Alaska State Troopers
Alaska Fisheries Development Foundation
Alaska Television Network,
University of Alaska Anchorage

Eagle Enterprises
MJV 3-Bears, Kodiak
NASA
Switlik Foundation
Yukon Fire Equipment Company

This project was funded by the United States Marine Safety Association and by Saltonstall-Kennedy Fishery Development Funds as administered by the National Marine Fisheries Service under cooperative agreement number 86-ABH-00031. The book was produced by the Alaska Sea Grant College Program which is cooperatively supported by the U.S. Department of Commerce, NOAA Office of Sea Grant, under grant number NA90AA-D-SG066, project numbers A/75-01 and A/71-01; and by the University of Alaska with funds appropriated by the state. The University of Alaska is an affirmative action/equal opportunity employer and educational institution.

Most artwork is by Bruce Morser, whose drawings originally appeared in the *Vessel Safety Manual*, and are used here with permission of the North Pacific Fishing Vessel Owners' Association. Cover design is by Karen Lundquist, and editing is by Sue Keller.

TABLE OF CONTENTS

iv	Preface
1	Marine Survival Equipment and Maintenance: An Overview
1	What This Workbook Covers
2	What Emergency Equipment Can Do for You
2	Emergency Communications: Calling for Help
3	Pre-Emergency Notice
4	Mayday
5	EPIRB: When All Else Fails
5	How Does an EPIRB Work?
5	Are There Different Kinds of EPIRBs?
6	How Do You Maintain an EPIRB?
7	How Do You Use an EPIRB?
7	Fire Extinguishers
7	Using a Fire Extinguisher
8	Use the Right Extinguisher
10	Put Extinguishers in the Right Place
11	Make Sure Extinguishers Work
11	Use Extinguishers Safely
12	Fire Training
12	Fire Prevention
12	Immersion Suits
13	Is an Immersion Suit a Personal Flotation Device?
13	How Do I Take Care of an Immersion Suit?
14	How Do I Use an Immersion Suit?
15	What about “Used” Suits?
15	How Can I Improve My Suit?
16	Life Rafts
16	What Is a Life Raft?
17	How Do I Choose a Life Raft?
18	Where Do I Put a Life Raft on My Boat?
19	How Do I Use a Life Raft?
20	How Do I Take Care of a Life Raft?
21	Summary
22	Training
22	Why Should I Be Trained with Emergency Equipment?
23	Where Do I Get Training?
24	Quiz Yourself
25	Quiz Answers
27	For More Information

PREFACE

This workbook is designed to provide general information on fishing vessel emergency equipment. It is distributed with the understanding that the publishers and authors are not rendering medical service. If further assistance is required, the services of a competent medical or other professional person should be sought.

The workbook was prepared on the basis of the best information available in 2005, updated by Jerry Dzugan, director of the Alaska Marine Safety Education Association. The information contained herein is true and accurate at the time of printing. Although every effort is made to ensure the correctness of this booklet, experimentation and research dictate that changes in procedures and techniques be made periodically during the time this workbook is in print. Accordingly, if any procedures or techniques included herein conflict with information subsequently published by the organizations involved, the most recent procedures should be followed. The author, agencies involved, and publisher shall not be held liable in the event someone is injured as a result of any action taken by the person or on his behalf by another person as a result of the use or implementation of the information in this booklet.

Marine Survival Equipment and Maintenance: An Overview

This workbook can be used by itself or with an eleven-minute video on emergency equipment for fishing vessels. The workbook is one of five that make up the Fisheries Safety and Survival Series. The others are *Hypothermia* (SG-ED-15), *Cold Water Near-Drowning* (SG-ED-10), *Shore Survival* (A-2-033), and *Frostbite and Other Cold Injuries* (SG-ED-07). The booklets and videos by the same titles are available from the Alaska Sea Grant College Program in Fairbanks.

Most fishermen have heard the statistics about the high accident rates in the fishing industry: Commercial fishing is the most dangerous occupation in the nation. It is seven times as dangerous as the average U.S. industry, and twice as dangerous as mining, the next most dangerous industry. (Recently, however, this rate has fallen due in part to emergency equipment and training.) Because fishing is such a dangerous occupation, the U.S. Congress passed the Commercial Fishing Industry Vessel Safety Act of 1988.

This law requires emergency equipment, and established other conditions for the operation of commercial fishing vessels. The purpose of this workbook is to help commercial fishermen with the process of selecting, installing, using, and maintaining the emergency equipment for a commercial fishing vessel. For more information on the details of fishing safety laws, contact your nearest U.S. Coast Guard Marine Safety Office. Additional sources of information on emergency equipment are recommended at the end of this workbook.

If you are studying this workbook and the related video in a group, your group facilitator will suggest ways for you to cover the materials. If you are studying by yourself, we suggest that you read through the workbook, then complete the questions at the end as a review. Regardless of your study methods, you should keep this book for future use as a handy review.

What This Workbook Covers

The purpose of this workbook is to help you install, use, and maintain emergency equipment effectively on your fishing vessel. More specifically you should understand the following:

- The need to do more than purchase and forget emergency equipment.
- How to send a good mayday that will help you get rescued.

2 Marine Survival Equipment and Maintenance

- How to stow emergency equipment.
- How to effectively use emergency equipment.
- How to properly maintain your emergency equipment.

Remember, this is not all there is to know about emergency equipment. Keep in mind that training, practice, and regular maintenance are critical.

What Emergency Equipment Can Do for You

Commercial fishing vessel fatalities are too frequent. In order to reduce the number of accidents, the attitude of the people on board the fishing vessels needs to change. Nevertheless loss of life in the fishing industry could be reduced even without decreasing the number of accidents, with the skillful use of standard emergency equipment. Many fishermen treat their emergency equipment like an insurance policy: they toss it on a shelf or into a compartment and don't look at it until they need it.

You should do more than just try on an immersion suit in the store where you bought it, or while your vessel is tied up at the dock. If your vessel loses power and lights in rough seas or takes on a list in beam seas, can you reach your immersion suit? Can you put it on? Can you find and turn on your Emergency Position Indicating Radio Beacon (EPIRB) while wearing your immersion suit? Can everyone aboard use the radio and give a mayday? Can everyone get to and launch the life raft, even at night in rough seas?

With everything working perfectly, do you have the skills necessary to survive a rough night offshore without the boat? If a piece of emergency equipment fails will you give up, or do you have the skills and courage to survive? Even if your accident occurs in circumstances that aren't quite so bad, preparation for the worst will make any accident more survivable.

Emergency Communications: Calling for Help

The history of the fishing industry is littered with maydays that didn't do the job. Even when the victims were desperate they were unable to communicate effectively with would-be rescuers. In some cases technical problems with a radio or atmospheric interference prevented communication. But too often the

people in distress did not send a mayday that helped rescuers find them. They waited too long to let someone know they were having problems, or in the panic of the boat's last minutes they just didn't do a good job of communicating.

Pre-Emergency Notice

Your odds of surviving an accident increase dramatically if you begin communications with rescuers before you really need them. Let them know that you have a problem and are working to correct it. But if things get worse you are going to need the help of other people to get out of your predicament. Many skippers don't call in about their troubles until the last moment, because of pride or fear of embarrassment. Too often the last moment is too late.

If you begin communications before you desperately need help, several things can happen. First and most important, someone will know you are having problems and a radio schedule can be established. If you are scheduled to talk every half hour and you miss making a call, that is one kind of mayday. If rescuers know your location, they can begin searching for you within minutes. If your boat capsized suddenly without any opportunity for a mayday, you would rather have someone miss you in half an hour than in half a week.

If you let people know you are having problems, a vessel just over the horizon can steam toward you and run with you until the problem is solved or until you need another form of transportation. If your situation gets worse, rescue can be speeded up greatly by rescuers who are on full alert. And in the case of flooding or fires, the extra pumps or fire-fighting equipment should be underway long before you need it, rather than after it becomes obvious that you need it.

Each of us has listened to or heard about those gut-wrenching half-maydays: "MAYDAY! MAYDAY! This is . . ." and nothing more. Things just happened too fast. Or maybe nothing was heard at all when a boat disappeared. Many fishermen know they are in trouble long before they reach for the radio, according to the few survivors of such incidents.

Mayday

When things are out of control and you need the help of others, the word "mayday" tells everyone within hearing that you need help. But that's all it does. You have to provide additional information, especially your location, if you expect

4 Marine Survival Equipment and Maintenance

someone to help you in time. In the infamous *St. Patrick* incident off Kodiak, Alaska, in which 10 of 12 people on board perished, other mariners heard the *St. Patrick's* mayday over an extended period. But the person sending the mayday never gave a position for the vessel, a name, or any other information that might help rescuers.

Every person on board should know how to operate each of the vessel's radios, how to determine the vessel's position, and how to give a mayday. The vessel's radios should have an independent power source above the engine room, so that you can maintain communications even in cases of flooding or fire.

The following information should be provided in a mayday:

1. MAYDAY, MAYDAY, MAYDAY
2. Vessel Name _____
3. Position _____
4. Nature of Problem _____
5. Number of People on Board _____
6. Your Emergency Equipment on Board _____
7. Vessel Description _____

The first five (MAYDAY, name, position, problem, and number of people on board) are most important. You want to get them transmitted first, in case that is all the information you can send. The other information is convenient because it gives your rescuers more information to work with. You might get a little frustrated when the Coast Guard asks you a lot of seemingly useless questions during a time of trouble. If you are needed to save yourself or the vessel, just give them the first five points in the mayday clearly and do what you need to do to save the vessel and crew. Do not stay on the radio if life is endangered; however, do give them as much information as they ask for if time allows. Keep in mind that the Coast Guard would like as much information as possible.

EPIRB: When All Else Fails

The EPIRB is one of the most important lifesaving systems for fishing vessels. For many accidents at sea, the more quickly rescuers can find the victims, the more likely they are to survive. If your equipment fails, or if an accident happens too quickly for a mayday, an EPIRB is critically important. And when all of your emergency gear works fine, an EPIRB can be helpful by cutting down the time for rescuers to get to you. In the worst cases without maydays, an EPIRB might be the only indication to the world that you are in trouble.

Effective in 1989, EPIRBs are required on all commercial fishing vessels, tenders, and processing vessels operating beyond three miles offshore. Even for boats that don't go beyond three miles offshore, EPIRBs are a good idea. In addition, fishermen should consider individual EPIRBs for their survival suits.

How Does an EPIRB Work?

An EPIRB is a radio transmitter that sends a signal to indicate your position. This signal can be picked up by satellites, airplanes or boats, depending upon the type of EPIRB. The newest "406" EPIRBs can even tell search and rescue satellites the name of the boat, the name, address and phone number of the owner, and the home port of the vessel.

When you turn on your EPIRB you are transmitting a distress call. Accidentally setting off your EPIRB will be interpreted as a call for help. It is important to avoid false alarms, because the people and aircraft devoted to tracking down a false alarm might be needed simultaneously in a real emergency. It is vital that you send in the registration form so this information is on file. Registration can save hours of rescuer time and thousands of dollars in expenses responding to a false alarm.

Are There Different Kinds of EPIRBs?

There are several kinds of EPIRBs. Each serves a different purpose and is suitable for a different application. Following is a brief description of the various EPIRBs.

Class A and B EPIRBs, which alerted satellites and some planes on 121.5 and 243 Mhz, are being phased out. The only EPIRBs one should consider buying today broadcast to satellites on the more effective 406 Mhz frequency. They still

6 Marine Survival Equipment and Maintenance

retain a low power 121.5/243 Mhz signal, but only for use by radio direction finders on search and rescue units.

Category 1 EPIRBs transmit on a dedicated frequency of 406 Mhz, which is monitored by satellites on a joint agreement with the United States, Russia, France, U.K., and Canada. Category 1 EPIRBs turn on automatically when they float free from a vessel, plus they send out a coded signal. This signal is registered to a particular vessel and can help distinguish between a mayday and a false alarm with a simple phone call to the registered owner. 406 EPIRBs give a more accurate fix and result in a faster response time.

Category 2 EPIRBs have the same characteristics as category 1 406 but they do not float free. Personal Locator Beacons (PLBs), sometimes called Personal Emergency Position Indicating Radio Beacons (PEPIRBs), have all the characteristics of a category 2 EPIRB. However, their size is small enough that they can be carried on your person or in any immersion suit. Not all brands float, so be sure to use a lanyard.

We strongly recommend you contact the manufacturer of your PLB to determine if yours is really waterproof or merely is “splashproof” and not intended for immersion.

GPS-enabled EPIRBs, called GEPIRBs, are also available. They are very similar to a category 1 or 2 EPIRB except that they contain an additional Global Position System (GPS) unit that transmits a more accurate position fix.

How Do You Maintain an EPIRB?

Maintenance of an EPIRB requires that you have the batteries changed at prescribed intervals, generally every five years. Normal shipboard precautions should be taken to prevent loss of the EPIRB or damage to it. Hydrostatic float free releases also need to be changed every several years.

Make sure EPIRBs are in the “armed” position when they are mounted, and if designed to float free they are not mounted under overhangs. Mounting near deck speakers may interfere with testing.

Caution!

At this time class B EPIRBs carry a Federal Communications Commission “waterproof” designation and not a U.S. Coast Guard “waterproof” designation.

How Do You Use an EPIRB?

EPIRBs vary from manufacturer to manufacturer and they operate differently. Look yours over carefully and read the instructions. Can you find the switch and activate it in the dark? Can you do it with gloves on and while wearing an immersion suit? Does everyone on board know where the EPIRB is and how to operate it? Following are some pointers:

- Keep antenna out of the water, vertical, and not touching metal when it is activated.
- Test EPIRBs once a month, and log.
- Be sure the EPIRB is in “armed” or “ready” position when the vessel is in use.
- If there is an emergency, leave the EPIRB on. Do not turn on and off.

Fire Extinguishers

Fires on vessels get out of control quickly and are devastating. Extinguishers are too often used unsuccessfully on fires. It is easy to overlook both the limitations and the effectiveness of fire extinguishers. They can be the wrong type for a particular fire, or they may be poorly maintained or inaccessible during the critical first moments after a fire is discovered. Remember that the number and size of fire extinguishers required by law is minimal. At sea, you are the fire department.

Using a Fire Extinguisher

It has been demonstrated that a person can rarely put out a small fire the first time they use an extinguisher. Should it be difficult to use a fire extinguisher? Not really, so long as it is the right kind of extinguisher, it is the right size, and it is **used** properly. The basic steps to fighting a fire are:

- Determine the type and extent of the fire. Secure power source if appropriate.

8 Marine Survival Equipment and Maintenance

- If it is a stove fire, make sure the fuel is shut off to the stove.
- Rescue anyone trapped by the fire. Account for all onboard.
- Confine the fire. Check “boundary” of fire for hot spots and remove any hazards and survival equipment.
- Extinguish the fire as quickly as possible, always working in pairs if possible.
- Maintain a fire watch to ensure fire and embers are out.

Most people fighting their first fire are like a trophy big game hunter who sees his first large animal. He is so overwhelmed by the horns that he shoots at the horns rather than the heart of the animal! People trying to use fire extinguishers usually “shoot at” the big part of the fire, rather than at the base or heart of the fire.

Work within the range of your extinguisher, which is generally from 4 to 8 feet. To get the most effect from a fire extinguisher, always shoot at the base of the fire to separate the base of the flame from the fuel source. Move the extinguisher **quickly** from side to side across the base of the flame. Hand-held fire extinguishers last only a few seconds, so you get only one chance to do it right.

Use the Right Extinguisher

Fires and fire extinguishers can be divided into four broad types, although extinguishers are commonly encountered as combination-types.

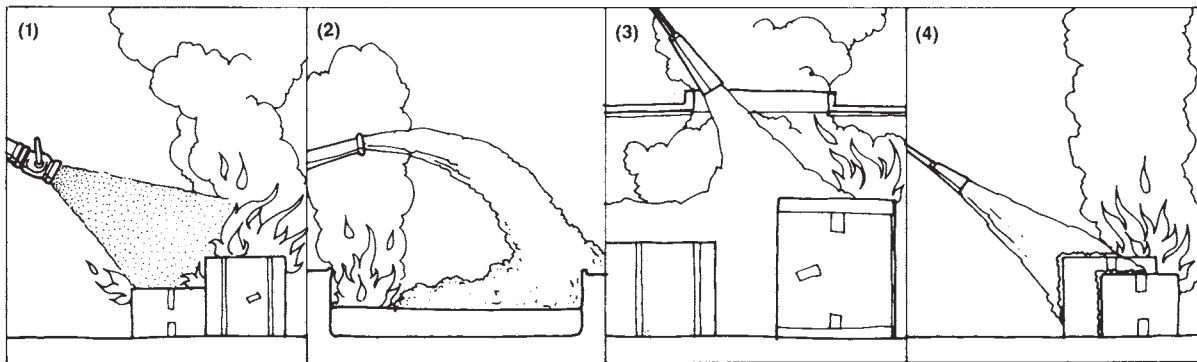
- *Type A*: Paper, wood, or fabric
- *Type B*: Flammable liquids
- *Type C*: Electrical
- *Type D*: Combustible metals

Some extinguishers are more effectively used with water. Take caution, however, because on certain types of fires water should never be used. Water can be very effective for type A fires, but should not be used for type B and C fires after

extinguishers are used to suppress them. On the other hand, water can be used to cool heated areas and prevent re-ignition.

Fires need three components to burn, often called the “fire triangle”: fuel, heat, and oxygen. Fire extinguishers work by removing one of these components or breaking the chain reaction. Fire extinguishers, whether hand-held or fixed systems, usually contain one of the following:

- Water cools the fire, and deprives it of heat. A mist works better than a stream in removing heat. Water conducts electricity.
- Dry chemical interrupts the chain reaction, but is corrosive to electronics.
- Carbon dioxide (CO₂) smothers the fire, depriving it of oxygen, but also depriving you of oxygen in an enclosed space.
- Halon and halon substitutes interfere with the chain reaction.
- Foam smothers and cools the fire and is especially effective on class B fires.



Methods of putting out a fire: (1) Cooling with water. (2) Smothering with foam. (3) Removing the oxygen with CO₂. (4) Breaking the chain reaction with dry chemical or halon.

Hand-held extinguishers are also categorized by number, either roman numerals (I, II, III, IV, or V), or arabic numerals (1, 2, 3, etc.) to indicate their size. The right size for you will be determined by your budget and the amount of room you have for storing the extinguishers. Extinguishers may seem like a lot of expense, trouble,

10 Marine Survival Equipment and Maintenance

and inconvenience when you don't need them. But if you find yourself serving as your own fire department, and the extinguishers are the only thing between you and a ride in your life raft, you may wish you had more fire-fighting equipment.

The type of extinguisher you select will depend on how you want to use it, where you store it, how quickly you need to operate it, and how much money you have to spend.

Put Extinguishers in the Right Place

A fire extinguisher is of no use if you can't get to it when you need it. Fire extinguishers should be placed in an accessible spot near each compartment where fire is likely to occur. They should be kept in all compartments regularly used by the crew. A very good rule of thumb for placing extinguishers is: one to fight your way in, and one to fight your way out. Place extinguishers by the entrance and exit to each compartment, as well as near but not next to fire sources such as galley stove, electrical panels, and main and auxiliary engines.

In addition to hand-held extinguishers you should consider fixed systems using CO₂, halon, or halon substitutes especially for your engine room. These systems can be very simple or elaborate. Simple systems may be nothing more than a permanently mounted bottle with a trigger outside the compartment. The more elaborate systems are better, even if they are more expensive. They include:

- Heat or smoke sensors to activate fire alarms.
- Automatic activation in addition to manual triggers.
- Delays between alarm and activation to allow personnel to escape confined space.
- Shut-down switches for vents and engines (to prevent loss of extinguishing agent from confined space and damage to engines from ingested extinguishing agent).

If the fire and the extinguishing agent aren't confined to a compartment, the odds are very good you won't control the fire. Be sure that each compartment can be quickly isolated and that the extinguishing agent can be confined. Also be sure that all personnel are clear of enclosed spaces before fixed systems are activated.

Make Sure Extinguishers Work

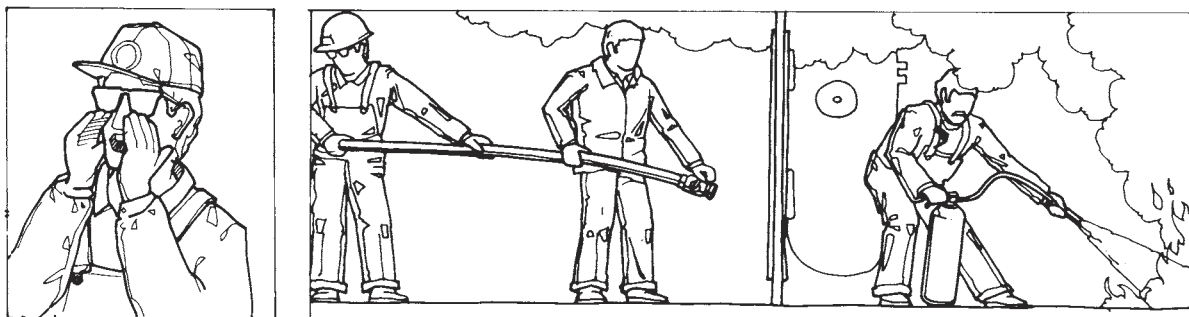
All extinguishers should be inspected annually and recharged after each use.

Maintenance will for the most part consist of inspection. The weight of CO₂ extinguishers is stamped on the container. Regularly heft the extinguishers and determine if they weigh as much as they should. Weigh them on an accurate scale. If they are too light, get them to an extinguisher service station right away. CO₂ extinguishers need to be hydrotested by a facility every 5 years. For extinguishers with gauges, check gauges frequently.

For dry chemical extinguishers, you should be especially cautious about settling and packing of the powder within the extinguisher. Time and vibrations can cause the powder in the extinguisher to settle and harden to an ineffective solid. At least every three months dry chemical extinguishers should be removed from their mount, inverted, and actively shaken or hit on the bottom with a rubber mallet to dislodge and redistribute the contents.

Use Extinguishers Safely

Don't let the urgency to control and extinguish a fire lead to entrapment and fatality of crew members. Wherever possible you should fight fires with a partner. You should be sure there is a safe exit as you approach the fire. You should never take your eyes off the fire, even as you move away from it. Stay low for better visibility.



Fighting a fire: First sound the alarm. Always back up the lead fire fighter.

12 Marine Survival Equipment and Maintenance

Be prepared to leave a confined space quickly if you are using halon or CO₂, or if the fire is generating a lot of smoke. Asphyxiation is a deadly threat with fires. After the fire is “out,” do not enter confined spaces too quickly due to the potential for residues of CO₂ or halon, as well as poisonous gases and smoke produced by the fire. Also beware of opening confined spaces too quickly. The fire may not be out. If it is smoldering rather than out, opening the compartment too soon will provide the needed oxygen for the fire to re-ignite. When opening such a space, always be prepared to start fighting the fire again and to re-isolate the space. Reflash is especially common with CO₂.

Fire Training

You should do more than sit in your rack or at the galley table and read about fire fighting. To increase the chances for saving your vessel and crew from a fire, training is essential. For untrained persons, the author recommends in the strongest possible terms that you acquire training in fire fighting as soon as possible. Week-long fire-fighting courses are available in Juneau, Kenai, and Seward.

In addition, you can arrange demonstrations in the use of hand-held extinguishers at your local fire department. If you contact them ahead of time, any fire department should be able to put on an excellent demonstration and training session for a group of fishermen.

Fire Prevention

It is always best to extinguish fires before they start. Do everything in your power to prevent fires by understanding how they start and eliminating conditions that can lead to fires. Be especially alert in the engine room, in the galley, around electrical systems, and near stateroom heaters.

Immersion Suits

Whether you call them “immersion suits,” “survival suits,” or “exposure suits,” they are one of the most important pieces of survival equipment on your boat. They give you the best chance of survival, should you be forced into the water, and they provide additional insulation should you have to spend time in a life raft. Immersion suits are required on Alaska commercial fishing boats under the terms of the Commercial Fishing Industry Vessel Safety Act of 1988.

Immersion suits should be carefully selected, they should be properly maintained and stowed, and you should drill with them regularly.

Is an Immersion Suit a Personal Flotation Device?

If an immersion suit is marked with a Coast Guard approval number beginning with “160.071” and it is equipped with a Coast Guard–approved personal flotation device (PFD) light (if beyond three miles from shore), and retro-reflective tape, it can be substituted for a Type I, II, or III PFD on board a fishing vessel. Each immersion suit should also be equipped with a “flotation ring,” “pillow,” or “bladder” designed to provide additional flotation in rough water. The suit should be stowed in a safe location to prevent loss overboard or theft, yet it should be easily accessible from any location on board the boat.

Also ensure that the suits are appropriate sizes for each person on board and that you have not grown out of your suit!

How Do I Take Care of an Immersion Suit?

Regular maintenance and careful storage are the key to long life and good performance for an immersion suit. It should be maintained at least once a year, but more often is better. It should also be maintained immediately after each use, and once again about a month later to assure all salt has been removed. During monthly drills is a good time to inspect your suit.

To maintain a suit:

1. Remove it from the bag and inspect all zippers for corrosion and proper operation at least once every three months.
2. If the suit has been used, rinse it inside and out to remove salt. If it was used near any source of oil (in a boat harbor, etc.), the suit should be washed with a mild soap such as Ivory or Dove, then rinsed.
3. Dry the suit inside and out.
4. Inspect all seams for leaks or wear.
5. Treat all zippers with paraffin or the lubricant provided by the manufacturer.

14 Marine Survival Equipment and Maintenance

Never use petroleum products such as Vaseline or WD40!

6. Inspect the inflation tube on the flotation bladder and make sure it is secure.
7. Stow suit with zipper up just one inch, so it can be worked down if snagged.
8. Roll the suit in such a way that permanent creases don't develop, and return it to its storage bag.
9. Stow the suit away from sources of heat, and protect it from direct sunlight or physical damage.

How Do I Use an Immersion Suit?

You should be able to put on your immersion suit in one minute. Put it on over your clothing, even over your shoes if there is room. Plastic bags placed over shoes make it easier to don with shoes on. If you can't put the suit on over your shoes, take your shoes off and put them into the suit before you close it up. Immersion suits should be put on in an emergency *before* the last minute. If you still have work to do after the start of the emergency, put your suit on but pull it up to your armpits and knot the arms of the suit around your waist. That way you will have it with you if the boat should suddenly capsize or sink. Also, avoid sweatshirt hoods, and caps, which can make immersion suit hoods slip off the head.

Do not inflate your flotation ring or bladder until you are outside the vessel. You don't want to take a chance on the extra buoyancy helping to trap you below decks, should the vessel sink or capsize quickly while you are working to save it.

There are specialized techniques for stowing suits, putting them on, entering the water, and helping other people with their suits. The best way to learn about these is to attend a class, watch a survival suit race, or watch one of the many videos on safety. For more information on using immersion suits, contact the Alaska Marine Safety Education Association (AMSEA). See section on "Training" in this booklet for address and phone number.



Putting on an immersion suit: A sharp jerk on the carrying sack ejects the suit. Leave plenty of clothes on. Insert weaker arm first. Put the hood over your head. Put strong arm in last. Zip. To avoid problems zipping the suit, arch your back to remove wrinkles in the fabric. Secure the face closure before entering the water. (Illustration by V. Culp.)

What about “Used” Suits?

Used suits are not a good buy unless you can be sure how old they are and that they are in the best possible condition. Old suits are not dependable due to the normal deterioration of the neoprene fabric from which they are manufactured. Some companies recommend only a five year life for their neoprene!

How Can I Improve My Suit?

Experience and a lot of trial and error have produced several worthwhile modifications to the original immersion suit. If your suit was not already equipped with the following items by the manufacturer, consider adding them yourself.

1. *Zipper Toggle.* Attached by a short line to the zipper pull, a zipper toggle makes it much easier for you to find the zipper pull in the dark and to pull it while wearing the bulky survival suit gloves. It can be easily fabricated from a piece of $\frac{3}{4}$ -inch dowel or broom stick and attached by a short length of parachute cord or halibut gangion.

16 Marine Survival Equipment and Maintenance

2. *PFD Light.* These simple lights usually cost less than \$30. More expensive strobe lights are available and are highly visible, even during the day. A PFD light is a must for night location and rescue of survivors. Depending upon your style of suit, a PFD light should be mounted on the breast pocket of the suit so you will be visible to rescuers as you lie on your back in the water.
3. *Signaling Devices.* It is a good idea to add several flares or other signaling devices to your survival suit. Most suits have a small breast pocket available for such use, but flares and other items tend to fall out easily. It may be necessary to devise an additional pouch or pocket to prevent losing articles.

See the video, *When Seconds Count: Care and Use of Immersion Suits*, for a complete demonstration of suit use and care.

Life Rafts

Countless lives could be saved if fishing vessels of all sizes would carry life rafts or floats adequate for the conditions in which they operate. The Commercial Fishing Industry Vessel Safety Act of 1988 requires life rafts on many fishing vessels. Contact your nearest Coast Guard unit to find out if your vessel is included. A fisherman should know what a life raft is, where to store it on the boat, how to use it, and how to take care of it.

What Is a Life Raft?

A life raft is more than a spare skiff or inflatable. It is an inflatable “boat” designed not only to float in the worst conditions, but also to give you protection from the cold and provide emergency supplies to help you stay alive until you are rescued. A life raft should be capable of getting you through the roughest seas you are likely to encounter, day or night, without power. Popular inflatable skiffs are not a good alternative to a life raft because they are open to the weather and do not necessarily contain emergency supplies and ballast systems for stability.

Some companies manufacture small lightweight alternatives to life rafts, which are useful for nearshore work as long as the passengers are wearing survival suits. One example is the “rescue pod” manufactured by the Switlik Parachute Company. Again, the small lightweight non-Coast Guard approved alternative rafts should be used only by nearshore boats too small to hold conventional life rafts, and they should always be used in conjunction with survival suits. If you

are required to have a life raft, make sure it is Coast Guard approved for the distance from shore where you operate.

How Do I Choose a Life Raft?

The surest way of selecting a good life raft is to look for a Coast Guard–approved one. This assures that the raft has passed specific tests, is made from quality materials, and will work for you if you have it serviced regularly. Be sure to select one large enough for the number of people you are likely to have on your vessel.

If you are not required to have a Coast Guard–approved raft, can't afford one, or simply don't have the space for one, your job in selecting a life raft becomes more difficult. In short, you have to decide which features of a Coast Guard–approved raft you must do without. Some of the minimum items you should find in your raft survival kit are:

Boarding Ladder	Heaving Line
Survival Instructions	Safety Knife
Paddles	Interior and Exterior Canopy Lights
Painter Line	Manual Inflation Pump
Sea Anchor	Bailer
Flashlight	Repair Kit
Distress Signals	Sponge
EPIRB	First Aid Kit
Signaling Mirror	Emergency Drinking Water
Provisions	Whistle

For Alaska waters it is also important that your raft have a canopy that can be closed off to seal out weather and seal in body heat. Coast Guard–approved rafts

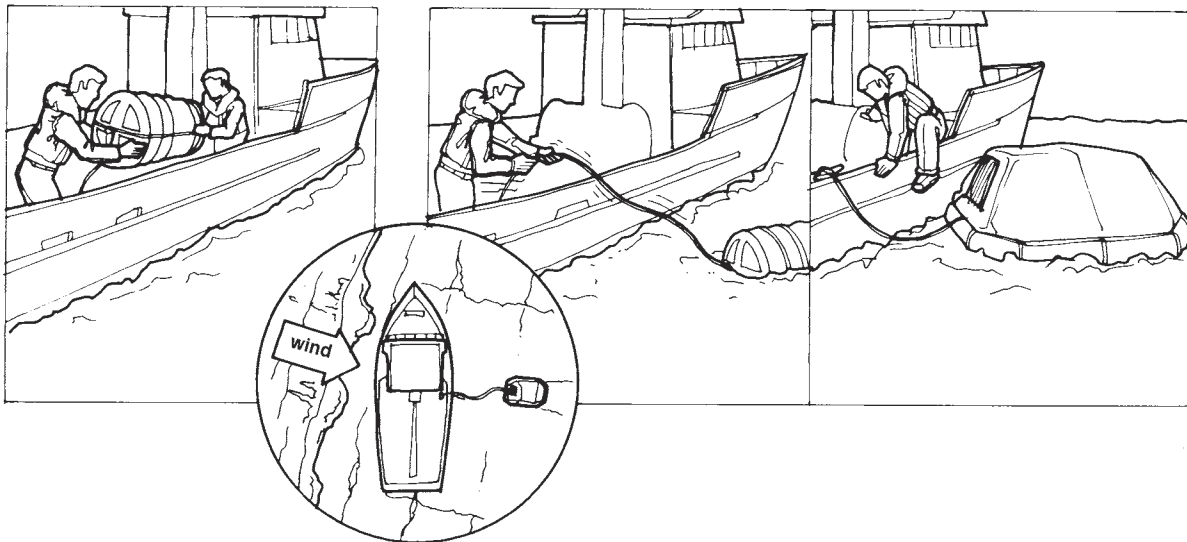
18 Marine Survival Equipment and Maintenance

have double canopies to provide insulation, as well as an inflatable floor to provide a layer of insulating air between you and the water under the raft. Even if you are wearing an immersion suit, these features can become important if you have to wait more than a few hours for rescue.

Where Do I Put a Life Raft on My Boat?

Life rafts are available either in rigid cannisters or in a “soft pack” or valise. Life rafts packed in soft containers are easier to carry on small vessels than cannister-packed life rafts, but soft-packed rafts have inherent problems. The principal concern is the lack of a way to automatically launch or deploy the raft, should your vessel sink suddenly. Another problem with soft-packed life rafts is a tendency to stow them so well that they are difficult or impossible to get to when they really are needed. In addition, soft-packed life rafts can be damaged more easily than cannister-packed life rafts.

A life raft packed in a cannister should be stored in an outside location so it will float free and avoid entanglement.



The raft should be launched from the lee side (circle). The cannister may hold 100 feet of painter or more. Inflate the raft by pulling the painter out to its full length. Be sure you have the painter firmly secured to the vessel before launching and inflating the raft.



In cold climates, pump up the floor as soon as possible for insulation.

Coast Guard publications have excellent diagrams for mounting life rafts either with a “float” free storage rack or a hydrostatic release. The cradle your raft sits in should be firmly mounted to the deck.

Regardless of the system used on your vessel, be sure that you attach the painter line of the life raft to your vessel when you mount the raft. This will help assure that when the raft does come free, it will self inflate. Also ensure that the hydrostatic release is correctly mounted.

How Do I Use a Life Raft?

A cannister-packed life raft is designed to release itself from a sinking vessel, and float to the surface and inflate itself as long as it has been properly mounted and does not become fouled in the rigging. However, if at all possible you should launch the raft yourself.

To launch the raft, release the hydrostatic release. If it is necessary to move the raft to a safer location in the lee of your vessel, be sure to disconnect the painter line before moving the cannister. Make sure that the painter line is secure by pulling out some slack and tying off to a strong point, toss the raft overboard, then haul the painter back toward you. The painter on a Coast Guard–approved life raft should be at least 100 feet long, so you may have to pull a lot of line from the cannister until you come up tight against the end of it. Once you reach the end and the painter comes up tight, give a sharp hard pull on the painter to start the flow of CO₂ to inflate your raft.

20 Marine Survival Equipment and Maintenance

If you are in the water and have to inflate the raft, pull the painter out as described above. When you reach the end it will be almost impossible to start the flow of CO₂ by simply jerking on the painter line. In this case, to start the flow of CO₂ simply put your knees up against the raft on either side of the painter line to keep the raft from moving toward you when you pull on the painter.

When the raft inflates, excess pressure valves will allow excess gas to escape for some time, causing a normal hissing sound. Don't worry about it. Climb into the raft and help everyone else inside. Close the doors to the raft to keep out the wind and weather and help preserve body heat.

A Coast Guard-approved life raft should have a survival pack. Open it and survey the contents. Take the seasick pills to help preserve body fluids. Locate the manual pump and inflate the floor of the raft to lift you up off the cold water. Use the bailing bucket and the sponge to remove all water from the raft. Locate all signaling devices and have them ready in case rescuers approach. Make sure contents are secure at all times, to prevent loss or being washed out.

You should also make sure that everyone in the raft is fit and ready for a long wait. Check each person for injuries, and while you are at it remove any sharp objects that might damage your raft. If anyone is injured perform first aid. Keep checking everyone for hypothermia, and work to prevent it at all times. Make sure your EPIRB is deployed and working properly.

How Do I Take Care of a Life Raft?

The two most important aspects of caring for a life raft are regular maintenance and protection from damage. Maintenance is usually accomplished at a "repack" or service station. Make sure your repack station is **authorized** by the manufacturer and the people trained **by the manufacturer of your life raft**. Ask to see a service station's authorization letter from the manufacturer of your raft before you let them work on your raft. Unauthorized "pirate" service stations may seem like a good deal, but too often they do the work incorrectly, use inappropriate materials, or simply don't do the work they charge you for. Don't bet your life on a pirate.

New rafts are required to be repacked two years from date of sale and every year thereafter.

A life raft is packed with a number of perishable or “dated” materials on board. Batteries for the flashlight and canopy lights have a limited life expectancy, as do the batteries in an EPIRB. The flares used in life rafts are also dated, and should be replaced regularly to assure that they will work when needed. Patch kit glue, emergency water supplies, and food rations all can deteriorate.

But most important, the raft itself can deteriorate due to factors such as heat, moisture, and age. The CO₂ bottle could have a slow leak, the trigger could develop problems, the glue on the seams can start to give way, and there could be a small undetected flaw in the fabric which would get worse with time. It is important that these types of flaws be looked for at a repack station, and that the raft be inflated and held overnight as a part of the inspection.

An important part of servicing cannister-packed life rafts is inspection and testing of the hydrostatic release mechanism. Be sure that you include the hydrostatic release when you send your raft for service.

It is also a good idea to have your crew look over the life raft and its contents every time you have it serviced. Everyone can do a better job of staying alive in an emergency if they have some idea of what is inside that big fiberglass cannister.

The AMSEA video, *A Matter of Survival*, is available from AMSEA and Alaska Sea Grant, and demonstrates the use of life raft equipment.

If regularly and properly maintained, the service life of a raft is approximately ten years. Life expectancy of the rafts can vary dramatically, depending on the climate and quality of care a raft is given.

Summary

Purchasing emergency equipment for your fishing vessel is not enough. You and everyone on your vessel have to maintain it properly and know how to use it.

Emergency communication means more than a mayday. You should have a radio on an independent power source that will work in an emergency. You should let someone know when you are in trouble even if the situation is not out of control. And you should make sure everyone on board knows how to use the radio to find your location, and how to send a mayday.

22 Marine Survival Equipment and Maintenance

Fire extinguishers are a critical part of any fishing vessel. They should be properly placed and mounted on your vessel, and everyone on board should know how to use them.

Life rafts should be suitable for use in Alaska and should be maintained annually by a service station authorized by the manufacturer of your raft. Make sure your raft is mounted securely in a sheltered location, but also that it can come free if your vessel sinks too quickly to launch it manually.

Your EPIRB is a critical link between you and rescuers in an emergency. If the accident happens too quickly to send a mayday, an EPIRB is the only way to let someone know you are in trouble and where you are. It sends out a radio signal that can be picked up by airplanes or satellites.

Immersion suits are designed to put on over your clothing when you have to go into the water. They keep you dry and provide vital insulation against the cold and buoyancy. They should be equipped with an inflatable bladder or flotation ring for extra buoyancy. Every person on board should have one and know how to use it.

All emergency equipment must be maintained to ensure it will be useful when you need it most. Consult the manufacturer for proper maintenance schedules and techniques.

Training ensures that emergency equipment will save your life. The time to learn how to use the equipment is before an accident, not while you are reading the instructions in the weak beam of a flashlight as your vessel sinks from under you. Drills are required on documented boats beyond the “boundary line” on a monthly basis. This is an excellent time to practice with your survival equipment and ensure everyone is familiar with it.

The video, *Beating the Odds: Emergency Onboard Drills*, demonstrates the proper steps in conducting onboard emergency drills.

Training

Why Should I Be Trained with Emergency Equipment?

Over the years a lot of people have used emergency equipment to try to save their lives. Some were successful and some were not. Unfortunately some of the same mistakes are made over and over. The best time to profit from the experience of survivors is during training. If you were to need help from others on your boat during an accident, wouldn't you feel better if they were trained?

Where Do I Get Training?

The best training is provided by an instructor, whether in a classroom, on your boat, or in a workshop. A good instructor can make it very easy to learn. The instructor will not only tell you about a procedure, but will also demonstrate it, show a film or video about it, and probably let you practice it yourself.

Training is available in the form of workshops, short courses, and formal training courses. For information on the types of training available and how to find it in your area contact the following:

Alaska Marine Safety Education Association (AMSEA)
2924 Halibut Point Road
Sitka, AK 99835 (907) 747-3287
www.amsea.org

Alaska Vocational Technical Center (AVTEC)
P.O. Box 889
Seward, AK 99664 (907) 224-4141

North Pacific Fishing Vessel Owners' Association
1900 W. Emerson #101
Fishermen's Terminal
Seattle, WA 98119 (206) 285-3383

24 Marine Survival Equipment and Maintenance

Quiz Yourself

Directions: Based on the material covered in this workbook, circle “T” if the statement is true; circle “F” if the statement is false. You may refer back to the workbook sections if necessary.

1. T F It is okay if only one person on board knows how to send a mayday.
2. T F Used immersion suits are probably not a good buy.
3. T F Fire extinguishers don't need any maintenance.

Directions: Fill in the blanks below with the correct word or words, based upon the materials covered in this workbook. You may refer back to the workbook sections.

4. The newest type of EPIRB, called a _____, broadcasts a signal on a dedicated 406 Mhz frequency which is monitored by satellites from several countries and is small enough to keep on your person.
5. Life raft service stations should show you an _____ from your manufacturer before you let them service your raft.
6. Immersion suits are important to protect you from _____ if you have to go into the water.
7. A fire extinguisher marked with AB is suitable for _____ and _____ fires.
8. Never use water to try and put out a _____ fire.
9. To protect yourself from heat loss through the bottom of a life raft, you should _____.
10. When you have your life raft repacked or serviced, you should also have your _____ serviced or replaced.

11. Among the things inside a life raft that can become too old or “dated” are (name two) _____ and _____.
12. If you are in the water and your life raft has not inflated, you should _____.
13. The two most common active agents for “fixed” fire-fighting systems are _____ and _____.
14. After discharging a fixed CO₂ system you should never _____.
15. It is a good idea to put a _____ on the zipper pull of your immersion suit if the manufacturer did not already provide one.

Quiz Answers

1. FALSE Everyone should know how to send a mayday. If everyone were busy trying to save the boat, the person closest to the radio would be able to send the mayday.
2. TRUE You have little control or knowledge about the age or past history of a used immersion suit. There are a lot of very old suits in circulation at this time, and none of the old suits are as dependable as a new ones.
3. FALSE Like any other piece of equipment, fire extinguishers need regular maintenance.
4. The newest type of EPIRB, a PLB or PEPIRB, broadcasts a signal on a dedicated 406 Mhz frequency which is monitored by satellites from several countries and is small enough to keep on your person.
5. Life raft service stations should show you an authorization letter from your manufacturer before you let them service your raft.
6. Immersion suits are important to protect you from hypothermia if you have to go into the water.

26 Marine Survival Equipment and Maintenance

7. A fire extinguisher marked with AB is suitable for paper, wood and fiber, and flammable liquid fires.

8. Never use water to try and put out a flammable liquid fire.

9. To protect yourself from heat loss through the bottom of a life raft, you should inflate the inflatable floor.

10. When you have your life raft repacked or serviced, you should also have your hydrostatic release serviced or replaced.

11. Among the things inside a life raft that can become too old or “dated” are (name two) pyrotechnic devices, batteries, patching cement, rations, emergency water.

12. If you are in the water and your life raft has not inflated, you should pull the painter line out until it stops, then place your knees against the life raft cannister and give the painter a sharp pull.

13. The two most common active agents for “fixed” fire-fighting systems are carbon dioxide and halon.

14. After discharging a fixed CO₂ system you should never open the confined space to see if the fire is out.

15. It is a good idea to put a zipper toggle on the zipper pull of your immersion suit if the manufacturer did not provide one.

For More Information

Fisheries Safety and Survival Series. *Hypothermia* (SG-ED-15), *Cold Water Near-Drowning* (SG-ED-10), *Shore Survival* (A-2-033), and *Frostbite and Other Cold Injuries* (SG-ED-07). Available from Alaska Sea Grant in Fairbanks (<http://www.uaf.edu/seagrant/bookstore/safety.html>).

Marine Safety Update. [a newsletter] Alaska Marine Safety Education Association, 2924 Halibut Rd., Sitka, AK 99835, (907) 747-3287. (<http://www.amsea.org>).

Beating the Odds on Northern Waters: A Guide to Fishing Safety, MAB-41 (2002), Alaska Sea Grant College Program, University of Alaska Fairbanks, P.O. 755040 Fairbanks, AK 99775-5040, (907) 474-6707. (<http://www.uaf.edu/seagrant/bookstore/MAB-41.html>).

Vessel Safety Manual. 1986. North Pacific Fishing Vessel Owners' Association, 1900 W. Emerson, Suite 101, Fishermen's Terminal, Seattle, WA 98119, (206) 285-3383.

Videos

Hypothermia (MAPV-1)

Cold Water Near-Drowning (MAPV-2)

Sea Survival (MAPV-3)

Shore Survival (MAPV-4)

Marine Survival Equipment and Maintenance (MAPV-11)

Frostbite and Other Cold Injuries (MAPV-17)

Beating the Odds: Onboard Emergency Drills (M-24)

Rescues at Sea: A Guide to Helicopter Rescues and Dewatering Pumps (M-27)

When Seconds Count: Care and Use of Immersion Suits (MAPV-38)

A Matter of Survival: Liferaft Survival Packs (M-32)

Available from Alaska Sea Grant in Fairbanks (<http://www.uaf.edu/seagrant/bookstore>)