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Cold-Water Survival Factors

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CHAPTER 2
Survivability Factors

Introduction

This Chapter addresses the various factors impacting survivability in maritime environments, and the skills needed to survive.

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Section A. Human Factors and Survivability

Introduction

Survival is the "preservation of one's own life under conditions of immediate peril." To preserve one's own life at sea requires the ability to live through extreme conditions of emotional and physical shock, and hardship for an indefinite period of time. When faced with an open water survival situation, it is important to remember that environmental obstacles are as much mental as physical. Before accumulating information on the use and operation of survival systems, it is important to first understand the psychological barriers to the will to survive that must be overcome.

The most predominant psychological barrier to survival is fear: fear of the unknown, fear of discomfort, and fear of one's own weakness. Fear of the environment in an open water situation leads us to fear our own chances of survival, and even though we overcome these fears to some extent, a lack of confidence in our ability may weaken our will to survive. Studies of survivors and their experiences show that the successful survival of any situation depends on several factors. The survivor must:

(01) Be mentally and spiritually prepared for the possibility,
(02) Be in good physical condition,
(03) Have the proper equipment available and know how to use it,
(04) Be properly dressed for any survival situation, and
(05) Be thoroughly familiar with vessel egress procedures.

The key to these experiences is developing a survivor's "attitude." In other words, to develop those traits and characteristics that will enhance one's chance of survival.

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A.1. The Will to Survive

Based on interviews with a number of sea survivors, twelve characteristics were identified to help in understanding the will to survive. They are:

(01) Courage
(02) Determination
(03) Cheerfulness
(04) Positiveness
(05) Flexibility
(06) Willingness
(07) Purpose
(08) Attentiveness
(09) Confidence
(10) Productiveness
(11) Persistence
(12) Certainty

A.1.a. Courage

Courage is the state or quality of mind or spirit that enables you to face danger or fear with self-possession, confidence, and resolution. Courage enables us to overcome these fears that can overcome us in a survival situation. Each time we encounter danger or fear and overcome it, we strengthen our courage.

It is important to realize the difference between fear and panic. Fear has a purpose. It is the mind's tool to pool all available resources. Panic on the other hand, is an unreasonable, overwhelming, and uncontrollable fear that can be one's worst enemy in a survival situation.

A.1.b. Determination

Stories about those who did not survive are usually founded on the idea that the would-be survivor did not realize they had it in them to carry on just a little further. Physically, the human body will rise to the occasion and call upon itself when needed. Many survival case histories show determination alone was the only factor in the successful return of the survivor.

Determination in thinking leads to quick, decisive action as you may have to act quickly. This excerpt to one survivor's story is evidence of determination:

> *The shore was about 50 yards away, but I experienced extreme difficulty in swimming due to the incoming tide. Several times, I had to turn on my back and try to float and propel myself with only my feet. It was only with extreme effort that I was able to make the shore. Upon reaching it, I was completely exhausted and in a state of partial shock, but forced myself to go on.*

A.1.c. Cheerfulness

A strong sense of humor is instrumental in influencing the outcome of any survival situation. The ability to use humor and stay cheerful in a stressful situation will help the survivor withstand the anxieties and apprehensiveness of the situation.

A.1.d. Being Positive	Being positive helps the survivor make the best of the situation. Thoughts of failure will hinder the survivor's ability to make sound and clear decisions. Self-fulfilling prophecies are usually manifested from negative thoughts and attitudes. Failure is inevitable when one believes there is no hope in sight. Self-discipline, adaptability, and tolerance all play parts in being positive in a survival scenario.
A.1.e. Flexibility	Athletes base their performance on being flexible as part of their overall fitness. Coast Guard personnel also maintain high levels of fitness to perform their duties. Flexibility is also a mental process. Being mentally flexible means having an open mind and the ability to act in a unique, creative and imaginative manner.
A.1.f. Willingness	Many studies suggest we avoid psychological pain and discomfort to a greater extent than we do physical pain. In most cases, freedom from mental stress is more important than those that are physical. Willingness is the ability to make decisions and a readiness to act even when the situation seems hopeless.
A.1.g. Purpose	Setting realistic goals (both near-term and long-term) and achieving them drives our sense of purpose. In a survival scenario, goal setting has a high survival value. Goal setting is a motivator, and as such, generates a will to live.
A.1.h. Attentiveness	One of the most dangerous aspects of Coast Guard life is being unprepared. Mental preparedness, whether it be for jogging around a track, executing a patrol mission, or finding oneself in an open water survival situation is absolutely key to efficient planning and effective mental attitude.
A.1.i. Confidence	Being properly trained is key in preparing for any situation. The skills and knowledge we obtain from training yields one important side-effect: confidence. Confidence can only be built through repetition and experience.
A.1.j. Productiveness	Keeping busy can also increase the chance of survival. Humans are social creatures, and teamed with loneliness and boredom can undermine the productive nature that is extremely important in a survival situation. Keeping the mind and body active will help to concentrate on the act of survival.

A.1.k. Persistence

The will to survive is fundamentally based on persistence. Emotionally, the survivor needs to stay active in spite of the situation. Concentrate on those items left behind. Family, friends, and personal goals will once again be met and achieved.

A.1.l. Certainty

The will to survive is inevitably dependent on the survivor's ability to remain certain that they will once again return to family, friends and co-workers. Those who have survived in the past have not depended on luck or magic, they have depended on the mental skills presented above and on the equipment and procedures presented in the chapters that follow.

A.2. Human Elements

Human Factors play an important role in survival situations. This Section provides detail on such areas of Human Factors as:

(01) Strength and Endurance,
(02) Skill Level,
(03) Intelligence,
(04) Age and Gender.

A.2.a. Strength and Endurance

Physical fitness standards are required to ensure crew members have sufficient strength and endurance to safely perform duties during normal and adverse conditions. These standards will also have a positive impact if a crew member is exposed to cold, wet environments. The combination of rough seas, cold temperatures and wet conditions can quickly cause the crew to become less effective.

Physical fitness increases the ability to maintain a higher degree of thermoregulation between the skin and vital organs. However, high levels of body fat can increase the potential for survival in cold, wet environments. Increased body fat acts similar to extra layers of clothing in that it adds more protection to vital organs.

If the crew member is able to get out of the water and onto the overturned hull, a life raft, or some other floatation device, survival will be highly dependent on the air temperature and wind velocity as well as their ability to sustain shivering. However, this state will decrease the rate of heat loss considerably due to the conductivity of air being less than that of water.

A.2.b. Skill Levels

All tasks require a certain skill level. The required skill level is a function of the situational demands and the experience of the operator. Exposure to a cold, wet environment also has an effect on a person's skill level. As core temperature decreases to 93˚F (34˚C), cognitive and motor functions become impaired. Skilled performance can be categorized into three levels: Knowledge-based level, Rule-based level, and Skill-based level.

(01) **Knowledge-based level** behavior is evoked when entirely new, unstructured, or complex problems are encountered. At this level, the individual uses meaningful concepts or physical properties to make decisions. Decision-making involves the identification of options or alternatives, assessing their relative attractiveness, assessing the likelihood of being realized, and integration of considerations to identify what appears to be the best option. Knowledge-based level behavior is the first level of behavior that is affected by exposure to cold, wet environments.

(02) At the **Rule-based level** an action is selected by activating in working memory a hierarchy of rules. Such rules may have been derived empirically during previous occasions, by instruction or by conscious problem solving and planning. Information from the environment is used to select or modify these rules. Rule-based level behavior is the second level of behavior that is affected by exposure to cold, wet environments.

(03) **Skill-based level** is when highly automated sensory-motor and cognitive performances and takes place without conscious control. This level of behavior is the final level to be affected by exposure to cold, wet environments.

A.2.c. Intelligence

Memory capacity plays an important role in open water survival situations. The rate at which we process cognitively (mental storage, retrieval, and manipulation) is not only a function of general intelligence but of individual aptitude as well. The better a survivor learns and acquires new information, the higher the probability of rescue.

A.2.d. Age and Gender

Aging is widely thought to compromise body temperature defense during cold exposure. Controlled laboratory comparisons show that older men may be less able than younger men to defend core temperature during cold exposures. Heat production due to shivering may also be less in older than younger men due to the reduction of muscle mass. These aging effects begin to be apparent after about 45 years of age in men. Older women defend core temperature during cold exposure as well as, or better than younger women; this is due to body composition changes attributable to aging. Older women tend to have more body fat than younger women, which accounts for impaired, as well as improved, thermoregulatory responses to cold environments.

Gender related differences in body size, body shape and composition contribute to a difference in cold tolerance between men and women, which is particularly apparent in cold water. Most women have greater body-fat content than men of comparable age. A thicker subcutaneous fat layer accounts for greater maximal tissue insulation and lower critical water temperature. Despite this difference, however, greater body-fat content may not provide women with a thermoregulatory advantage over men.

When women and men of equivalent subcutaneous fat thickness are compared, the women have a greater surface area and smaller total body mass. Although insulation is equivalent, women's total heat loss is greater due to the larger surface area. Because of their smaller body mass, body heat content is less in the women. Therefore body temperature falls more rapidly for any given thermal gradient and metabolic rate.

Comparison of men and women with equivalent total body masses shows that women still seem to be at a disadvantage in the cold. In this case, women's greater body-fat content enhances insulation, and surface area differences between genders are not as pronounced. Nevertheless, a smaller lean body mass limits a women's capacity for heat production, compared to men of comparable total body mass. However, under colder conditions that stimulate shivering the limited thermogenic capacity of women will result in a more rapid decline in their core temperature than in men of equivalent total body mass.

Section B. Environmental Factors and Survivability

Introduction

Recent technological advances have shortened the duration survivors spend in the open water. Search and rescue equipment, personnel training, and optimally designed equipment (as described in **PART 1 CHAPTER 3 Survival Equipment and Pyrotechnics**) have all attributed to increased successes in survivor recovery.

However, the possibility of being in an extended open water survival situation still exists. Being mentally prepared, using Coast Guard approved and correctly maintained equipment will increase your chances for survival.

Time is critical when forced to enter cold water. The loss of body heat is the greatest danger to survival in open water. Critical factors that increase the threat of hypothermia and other cold water injuries include:

(01) Sea State,
(02) Water Temperature,
(03) Air Temperature,
(04) Weather and Time of Day,
(05) Proximity to Land,
(06) Improper Use of Survival Equipment,
(07) Protection from Exposure.

This Section contains information on the external environment and those elements of human factors that contribute to the success of open water survival.

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B.1. Sea State

Sea states can range from calm and mirror-like to driving sea spray with exceptionally high waves. Survivability depends not only on the sea state the survivor deals with, but with the sea state the rescue vessel must bear.

B.1.a. Effects of Wind and Waves

There are several forces that create waves at sea, the most significant of which is wind. The factors which determine the characteristics of wind waves are: wind speed, wind duration, and fetch (the distance over open water which the wind has blown).

As the wind begins to blow, it creates seas, which are typically steep, choppy, and have little pattern. As the wind continues, the seas begin to become more defined. In heavy weather, observing and measuring waves is important; if you can get a general sense of the waves in which you are operating, it will allow you and your crew to operate accordingly.

Strong winds usually have the same effects as strong currents on wave behavior, but because of the infinite variables of wind speed, direction, and interaction with currents, it is often difficult to predict what effect the wind will have on waves.

The survivor must be more vigilant during high sea states and be ready to signal rescuers at a moment's notice. High seas contribute to severe motion sickness; feelings of frustration and water aspiration are major concerns.

NOTE

The sea anchor, supplied with life rafts provides the most stability in any wave pattern. To ensure proper positioning of the sea anchor, the sea anchor should rest in the trough of the wave as the bow of the craft is at the crest of the wave.

B.2. Water Temperature

Like sea state, water temperature has a significant impact on chances of survival.

B.2.a. Hypothermia

One of the greatest dangers in open water survival is hypothermia. When the human body is submerged in water, heat is lost approximately 26 times faster than it is on dry land. Hypothermia is described in the First Aid Handbook.

B.2.b. Application

Regardless of the type, all clothing will prevent the skin from reaching the temperature of water. Cooling rates will vary depending upon the type of protection, whether wet or dry suits. Clothing provides extra thickness between the skin and water or wind. Since heat is generally conducted away from the body by the movement of water, adding extra layers keeps the skin further away from the moving water thus reducing heat loss to varying extents.

Dry suits increase protection and decrease cooling rates in both rough and calm water. Dry suits are the most effective form of protection in both rough and calm water. However, the barrier must be maintained between the water and skin for the suit to remain effective. Cooling rates are slightly higher in rough water, though this is often linked to increased heart rate and exertion in an attempt to stay afloat. If water does penetrate a dry suit, they are not rendered useless; however, the effectiveness of the suit decreases and cooling rates may increase, especially if there is water exchange. A downside is that cold water causes diuresis, or increased urinary output.

It is important to remember that dry suits provide protection only to an extent and in all cases, with the exception of heated suits, will eventually lead to heat loss with the potential for hypothermic problems. Regardless of the suit worn, individuals should egress from the water as quickly as possible. A life raft or other floatation device should be used if available. Survival time will increase significantly once out of the water.

B.2.c. Symptoms of Lowered Body Core Temperatures

The body goes through noticeable symptoms when exposed to cold water as indicated in **Table 3-2**
Core Body Temperature.

°F	°C	Symptoms
98.6 to 96	37	(01) Cold sensations (02) Skin vasoconstriction (03) Increased muscle tension (04) Increased oxygen consumption
97	36	(05) Sporadic shivering suppressed by voluntary movements (06) Gross shivering spells (07) Further increase in oxygen consumption (08) Uncontrollable shivering
95 (Note 1)	35	(09) Mental confusion (10) Impairment of rational thought (11) Drowning possible (12) Decreased will to survive
93	34	(13) Loss of memory – speech impaired (14) Sensory function impaired (15) Motor performance impaired
91 (Note 2)	33	(16) Hallucinations, delusions, clouding consciousness (17) Shivering stops
90	32	(18) Heart rhythm irregularities (19) Motor performance grossly impaired
88	31	(20) Shivering stopped
86	30	(21) Loss of consciousness (22) No response to pain
80	27	(23) Death
Note 1: Voluntary tolerance limit in laboratory experiments.		
Note 2: 50% of those in survival situations do not survive at this body core temperature.		

Table 3-2
Core Body Temperature

B.2.d. Predicted Survival Time

Being prepared at the onset of a survival situation can help minimize heat loss. **Table 3-3** below shows the predicted survival times of the average person in 50° Fahrenheit water for various situations. Contrary to popular belief, the survivor should not swim around in efforts to keep warm. This will only increase the rate of heat loss and speed the onset of hypothermia.

Without Flotation	
Survival Floating	1.5 Hours
Treading Water	2.0 Hours
With Flotation	
Swimming	2.0 Hours
Holding Still	2.7 Hours
HELP Posture	4.0 Hours
Huddle w/ Others	4.0 Hours

Table 3-3
Predicted Survival Time

NOTE

When worn correctly, the appropriate anti-exposure coveralls or dry suit will protect the survivor and add layers of insulation. Thermal gloves, socks, underwear and neoprene hoods all add additional layers of protection.
Inflatable raft floors will provide an additional layer of insulation.

B.3. Air Temperature

Air Temperature is a prime contributor to hypothermia. The combination of cold air with cold water is a recipe for danger.

B.3.a. Effects of Wind and Waves

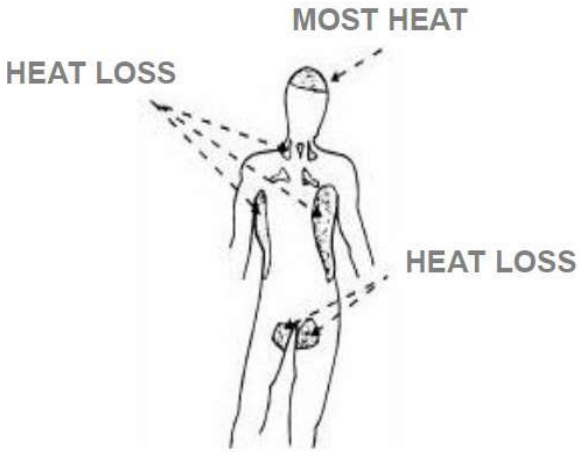
When the wind is blowing, heat loss in the body increases exponentially due to the wind chill factor. Actions must be taken to protect against wind chill. In open water survival situations, actions taken to protect the survivor from wind effects (e.g., laying low in a raft, using neoprene hoods, etc) can greatly enhance survivability and lessen the effects of hypothermia.

B.3.b. Wind/Wave Effects Mitigation

Survivors should be aware of the areas of the body that are most prone to heat loss. **Figure 3-4** represents those areas of the human body most prone to cooling. The majority of heat loss occurs in and around the top of the head.

NOTE

When worn correctly, the appropriate anti-exposure assemblies will protect the survivor and add layers of insulation. Insulated boots, balaclavas, watch caps, thermal gloves, socks, underwear and neoprene hoods all add additional layers of protection.



Drawing Courtesy of U.S. Navy

Figure 3-4
Body Areas Prone to Heat Loss

B.4. Weather and Time of Day

The weather and time of day play a major effect on any survival scenario.

B.4.a. Effects of Weather on Survival

Survivors in open water must realize that rescue efforts may be hampered or even postponed because of inclement weather. Survivors must be prepared for a prolonged evolution—even after the weather improves.

(01) **Fog.** Fog is composed of tiny water droplets hanging in the atmosphere, sufficiently dense to scatter light rays and reduce visibility. Fog makes locating anything more difficult, including survivors in the open water.

(02) **Waves.** Waves, seas, and surf can present the greatest challenges to survival skills. By understanding how waves form and behave, survivors know what to expect and how to minimize danger and increase the chance of survivability.

Of the two major types of waves, the broad, rounded waves are likely to be the type of wave an open water survivor will have to deal with. Breaking waves are the most dangerous kind of wave for open water survivors. How dangerous the wave is depends on the ratio of wave

height to length, and on wave frequency. Steep sloped waves are the most dangerous.

(03) **Rain, Sleet, & Snow.** As with fog, precipitation can limit the sight of the survivor as well as the rescue party. Precipitation can add to other complexities such as contributing to the onset of hypothermia.

B.4.b Time of Day

Statistically, rescues occur within a short time following a mishap. Wind and sea currents make pinpointing survivors more predictable when the mishap site is known. As time progresses, this predictability becomes more difficult. In hours of darkness, it becomes critical that the appropriate signaling devices are employed. Mentally, the first few moments an individual is in a survival situation are the most disorientating, however, the survivor must remember that rescue vessels may be nearby during this time. During hours of darkness, flares and lights are crucial when these vessels are near.

B.5. Proximity to Land / Decision Factors

With land in sight, the survivor must make a decision whether to swim or row for land or to wait. Swimming or rowing away from a "last known position" has inherent risk and survivors from a capsized boat are often safer staying with the boat or other visable debris. Shorelines are dotted with various hazards including sharp rocks, strong current, and breaking waves. Unless land is close and conditions appear favorable, the survivor should not try to swim to shore.

Considerations when making the decision to swim to shore include:

(01) **Distance.** With no visible reference from sea, distance can be deceiving and create the illusion that land is closer than it actually is. Glare from the water surface can hinder the ability to gauge the distance to shore.

(02) **Water Current.** Underlying current near the shoreline may hamper progress and severely rob the survivor of available energy.

(03) **Physical Condition**. As mentioned above when dealing with water currents, the survivor's physical condition can be the limiting factor in surviving a swim or row for shore.

(04) **Swimming Competency**. Swimming skills must be considered in making the shoreline. A poor swimmer will expend more energy to make the shoreline than an accomplished swimmer.

(05) **Water Temperature**. The colder the water temperature, the more energy will be required to swim the same distance in warmer waters. Also, cold water intrusion may occur and hasten hypothermia.

B.6. Protection from Exposure

The most inhospitable location on our planet is the open water. The survivor must be prepared for hot, temperate, cool, or cold conditions. Survivors must be aware of the dangers of too much exposure to the sun and take preventive measures to guard against a decrease in performance.

B.6.a. Hot Climates

Performance in open water can easily be affected by the heat and vibration of the boat, which can increase fatigue. This Section discusses the various sun and heat related factors that crew members may encounter during their activities.

Clothing and equipment should be worn so that there is free circulation of air between clothing and the body surface. Clothing acts as a barrier that prevents evaporative cooling. Many synthetic fabrics reduce the absorption and dispersal of sweat needed to achieve optimum heat loss by evaporation. Impermeable clothing does not "breath" and thus greatly increases an individual's susceptibility to heat related illnesses. Impermeable clothing must be avoided. When using impermeable clothing, take precautions to avoid the rapid buildup of body heat. Heat illnesses may be manifested in minutes if impermeable clothing is worn.

Survivors should shield themselves from the effects of sun and heat as best as possible. Sunshades should be fabricated from any means available. During the heat of the day, observe the following:

The body may be cooled by getting into the water; however, check for marine life and be sure you are secured to the raft. This action will also aid in dehydration, as survivors have actually absorbed enough water to activate the kidneys after only a short time in the water.

(01) Clothes can be kept wet by splashing water on them.

(02) Keep physical activity to an absolute minimum in the water.

(03) Use sun screen cream or similar ointment if available.

(04) Wear sunglasses or improvise eye cover made from cloth or paper.

Heat stroke can occur when the body's cooling mechanism (sweating) fails to adequately cool the body. The major symptom of heat stroke is red, hot and dry skin. Mitigating the effects of heat stroke can easily be accomplished by keeping the body cooled by the measures outlined above. Keep incapacitated survivors lying down with the head elevated. Outer clothing should not be removed. Underclothes may be removed and used to cover exposed head, neck or to parts of the body which would otherwise be exposed.

NOTE

Personnel who are not accustomed to strenuous physical activity in hot and humid environments are particularly susceptible to heat injuries. Excess body weight also contributes to this susceptibility.

B.6.b. Sunburn

Continuous exposure to the sun can cause sunburn and other complications such as heat stroke, dehydration, etc. Unprotected exposed skin will suffer from

premature aging and an increased chance of skin cancer. The limit to surface heating, the point at which skin becomes painful, is 109˚F (43˚C) and higher. At 113˚F (45˚C), pain is severe, and if that temperature is maintained burns will result.

Symptoms of sunburn are: redness, swelling, or blistering of the skin. Other effects of overexposure to the sun are fever, gastrointestinal symptoms, malaise, and pigment changes in the skin.

B.6.c. Dehydration

An adequate fluid intake is essential to remain healthy. Fluids are lost from the body in several ways. The most obvious loss is through the kidneys. The less obvious loss of body fluid occurs through perspiration from the skin and respiration through the lungs. As a result, an average, healthy adult requires two or three liters of fluid a day to replace these losses. Extremely warm weather significantly increases the loss of fluids. Try to stay away from liquids such as tea, alcohol, coffee, and soft drinks. These liquids speed up fluid loss.

Healthy adults must satisfy their water and electrolyte requirements. When water and electrolytes are not replaced, the body experiences dehydration. Drinking alcohol and caffeine increases dehydration. At first there is thirst and general discomfort, followed by an inclination to slow physical movement, and a loss of appetite. As more water is lost, an individual becomes sleepy and experiences a rise in body temperature.

By the time the body loses 5% of body weight in fluids, the individual begins to feel nauseated. When 6 to 10% of body fluids are lost, symptoms increase in this order:

(01) Dry mouth,
(02) Dizziness,
(03) Headache,
(04) Difficulty in breathing,
(05) Tingling in the arms and legs,
(06) Skin color turns bluish,
(07) Indistinct speech,
(08) Inability to walk,
(09) Cramping legs and stomach.

B.6.d. Effects of Cold Climates

In cold climates, the major problems range from hypothermia and frostbite, to immersion, or "Trench" foot. In cold climates, observe the following:

(01) Keep as dry and warm as conditions will dictate. If possible, remove wet clothing and replace with dry clothing.
(02) Clothing should be worn in loose fitting layers.
(03) Don anti-exposure suit (if available).
(04) Inflate raft floor or add available material for additional layers of insulation.
(05) Huddle with other survivors.
(06) Mild stretching and exercise improves circulation—this is key in preventing immersion foot.
(07) Avoid sitting in cramped positions for long periods. Move arms, feet, and legs as much as possible.
(08) Wiggle the toes inside boots.
(09) Keep feet as warm and dry as possible.
(10) Avoid the use of alcohol and tobacco.

Section C. Open Water Survival Skills

Introduction

In the event a crew member enters or ends up in the water due to an emergency, survival procedures should be pre-planned. By doing so, the chances for a successful rescue are increased.

This Section addresses the survival techniques that will greatly increase the survival for a person in the water (PIW) Crew members should never forget that wearing the proper PPE is the best insurance for survival.

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C.1. Cold Water Survivability

The length of time a person can stay alive in cold water depends on the temperature of the water, the physical condition of the survivor, and the action taken by the survivor. **Figure 2-1** illustrates the relationship between water temperature and estimated time of useful consciousness. Swimming typically reduces a person's chance of survival due to more rapid loss of body heat.

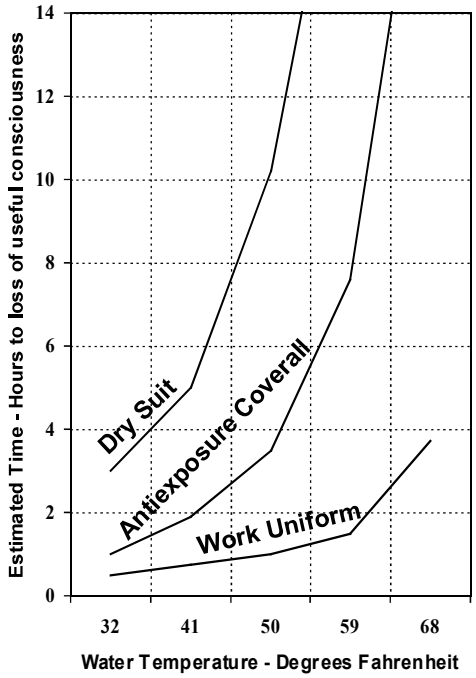

Figure 2-1
Outer Garment Comparison

C.2. Critical Factors

Time is critical when forced to enter cold water. The loss of body heat is one of the greatest dangers to survival. Critical factors that increase the threat of hypothermia and other cold-water injuries include:

(01) Prolonged exposure to cold-water temperatures,

(02) Sea spray,

(03) Air temperature,

(04) Wind chill.

C.3. Survival Measures

Several preventive measures that can be used to increase the chances for successful cold water survival include:

(01) Put on as much warm clothing as possible, making sure to cover head, neck, hands and feet.

(02) If the hypothermia protective clothing does not have inherent flotation, put on a PFD.

(03) Before entering the water, button up clothing, turn on signal lights (only at night), locate your survival whistle and make any other preparations for rescue.

(04) Avoid entering the water if possible. If it is necessary to jump into the water, cover nose and mouth with one hand and place other hand on the PFD or area between wrist and elbow.

C.4. Water Survival Skills

Water survival skills that should be utilized to increase the chances for surviving cold water immersion include:

(01) Immediately upon entering the water, become oriented to the surrounding area. Try to locate sinking boat, floating objects, and other survivors.

(02) Try to board a life raft, overturned boat (if floating), or other floating platform as soon as possible to shorten the immersion time. Body heat is lost many times faster in the water than in the air. Since the effectiveness of the insulation worn is seriously reduced by being water soaked, it is important to be shielded from wind to avoid a wind-chill effect. Huddling close to the other occupants in the craft will also conserve body heat.

(03) While afloat in the water, do not attempt to swim unless it is necessary to reach a fellow survivor or a floating object which can be grasped or climbed onto.

(04) Unnecessary swimming will pump out any warm water between the body and the layers of clothing and will increase the rate of body-heat

loss. Also, unnecessary movements of arms and legs send warm blood from the inner core to the outer layer of the body resulting in a rapid heat loss.

(05) The body position assumed in the water is very important in conserving heat. Float as still as possible with legs together, elbows close to your side and arms folded across the front of the PFD. This is called the Heat Escape Lessening Position (HELP) and minimizes exposure of the body surface to the cold water. Try to keep head and neck out of the water (see **Figure 3-2**). However, if wearing a Type III PFD, or if the HELP position turns the body face down, bring legs together tight and arms tight to sides and head back.

(06) Another heat conserving position is to huddle closely to others in the water making as much body contact as possible. A PFD must be worn to be able to maintain these positions in the water (see **Figure 3-3**).

(07) Keep a positive attitude about survival and rescue. This will extend survival time until rescue comes. **A will to live does make a difference.**

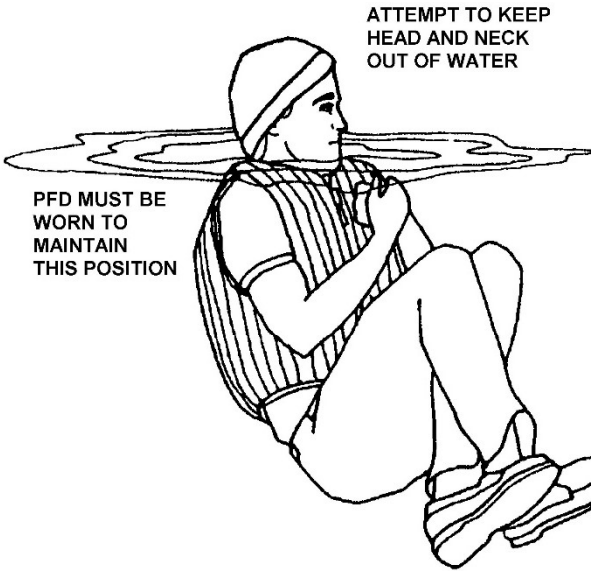

Figure 3-2
Single PIW

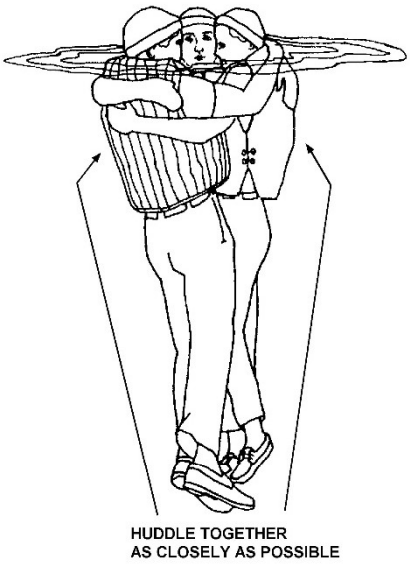

Figure 3-3
Multiple PIW Huddling

C.5. Climbing onto an Overturned Boat Hull

Regardless of what factors or condition contributed to the capsizing of your vessel, after you safely egress, you are now faced with an open water survival situation. The ability to think clearly and proficiently can make the difference between life and death. Climbing onboard an overturned vessel will provide greater protection from the elements and hypothermia. Once onboard, your chances of being spotted by rescuers (Coast Guard or good Samaritans) greatly increases because it is a larger object that can be seen from greater distances.

The majority of capsized vessels will inherently float and not sink for some time. The hull will float bow-up with the stern lying just beneath the surface of the water due to the vessel hull design and weight of the engines (see **Figure 2-2**). Although there is no standard procedure for climbing onto an overturned vessel, general procedures are listed below.



Figure 2-2
Capsized Vessel

Use the following procedures when climbing onto an overturned boat hull:

(01) Look for the easiest access point to climb aboard, this is often found towards the stern of the vessel since it will be lower in the water than the bow.

(02) Use the natural design of the boats hull for hand holds eg. keel, chine, through hull drains.

CAUTION!

Be careful of sharp edges, burs, and protruding objects that may cause injury or tear PPE when climbing on board the overturned boat hull.

(03) Be aware that some leverage points may be slightly below the surface, e.g. Rub rails, swim platforms, life lines.

(04) Assist other survivors in climbing aboard.

Once on board the overturned vessel, get as much as your body out of the water as possible to reduce your exposure to hypothermia. Apply training principles learned in the **Open Water Survival Skills** section and **Post Capsize Procedures** paragraph.

C.6. Boarding a Boat from the Water

After a vessel capsizes or sinks survivors may find themselves floating, awaiting rescue. Assistance can range from minutes to hours. Rescuers (Coast Guard or good Samaritans) will arrive and begin recovering all persons from the water.

There are many different types of vessels that may arrive on scene to assist. These will range from military, commercial, and/or recreationally operated vessels. Commercial and recreational vessel operators have limited experience with recovering persons from the water and their vessels are not specifically designed for rescue operations. For this reason, survivors need to become familiar with basic boat characteristics for boarding a boat from the water.

Vessel characteristics for recovery consideration:

(01) Swim platform or ladder,

(02) Lowest point of freeboard,

(03) Transom door,

(04) Jacobs ladder,

You may have to get creative and think about what specific characteristics are available on board the rescue vessel that can aid in your recovery. Depending on duration of exposure to the elements, survivors may have lost dexterity and have limited strength that will require additional assistance for recovery. Remember, you have the training, experience and may have to verbally communicate with the rescue vessel on the most prudent method for recovery.

If capable after being rescued, commence overseeing the recovery of remaining survivors and administering first aid as necessary.