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**ΠΤΥΧΙΑΚΗ ΕΡΓΑΣΙΑ**

**ΕΠΙΒΛΕΠΟΥΣΑ ΚΑΘΗΓΗΤΡΙΑ: Παπαλεωνίδα Παρασκευή**

**ΘΕΜΑ: SURVIVAL AT SEA**

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<b>ΤΕΛΙΚΗ ΑΞΙΟΛΟΓΗΣΗ</b>				

**Ο ΔΙΕΥΘΥΝΤΗΣ ΣΧΟΛΗΣ :**

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# **SURVIVAL AT SEA**

## **A FEW STARTING WORDS**

The aim of this essay is to provide the readers with a broad overview about surviving at sea, the harshest of environments. It is divided in five main parts.

The introduction is about two true case histories M/V LOVAT and RMS TITANIC which lead to major reforms of the existing maritime conventions for safety at sea (SOLAS).

At the beginning I will describe the personal life preserving equipment that will help keep you afloat during the first minutes of the incident.

After that follows a detailed presentation of survival crafts that will help support life for a longer period of time.

First aid directions and guidelines to confront any injuries and adverse weather conditions are also mentioned.

Lastly true incidents of surviving at sea demonstrate in real life situation all the factors that assist you to stay alive. When reading this essay one should always keep in mind the fundamental key to surviving:

**“YOUR WILL TO SURVIVE WILL KEEP YOU ALIVE”**



## **INTRODUCTION**

The greatest wilderness on Earth is the sea. It covers two thirds of the planet and, with the exception of the sun, has the greatest influence on global weather patterns. Although it may take hours or days to succumb in other environments, death at sea can happen in less than a minute. Compared with desert heat, high-altitude hypoxia, and polar subzero temperatures, water is the most hostile and life-threatening natural environment for inadequately equipped survivors.

We live in a global society which is supported by a global economy—and that economy simply could not function if it were not for ships and the shipping industry. Shipping is truly the lynchpin of the global economy: without shipping, intercontinental trade, the bulk transport of raw materials and the import/export of affordable food and manufactured goods would simply not be possible.

Shipping is perhaps the most international of all the world's great industries and one of the most dangerous. It has always been recognized that the best way of improving safety at sea is by developing international regulations that are followed by all shipping nations. Regulating the maritime industry to promote safety and security and prevention of pollution from ships world wide has been the function of the International Maritime Organization since its inception in 1959.

The work of IMO is well documented through its numerous conventions and codes and on the Organization's website. Of all the sectors that make up the global transport infrastructure, shipping probably has the lowest public profile and the least representative public image. Its importance is not well known although not a single area of our life remains unaffected by it.

The IMO Council at its 93<sup>rd</sup> session in November 2004, endorsed the proposal that the theme for World Maritime Day 2005 would be "International Shipping Carrier of World Trade". The theme was chosen to provide an ideal opportunity to draw attention to the vital role that shipping plays in underpinning the international economy and its significant contribution to international trade and the world economy as the most efficient, safe and environmentally friendly method of transporting goods around the globe.

### **Globalization and International Trade**

It may seem obvious to say that, today, we live in a global world, and it is certainly true that international trade among all the nations and regions of the world is nothing new. From the Phoenicians, through the Egyptians, the Greeks and the Carthaginians, the Chinese, the Vikings, the Omanis, the Spaniards, the Portuguese, the Italians, the British, the French, the Dutch, the Polynesians and Celts, the history of the world is a history of exploration, conquest and trade by sea.

It is generally accepted that more than 90% of global trade is carried by sea. Throughout the last century the shipping industry has seen a general trend of increases in total trade volume. Increasing industrialization and the liberalization of national economies have fueled free trade and a growing demand for consumer products. Advances in technology have also made shipping an increasingly efficient and swift method of transport as the following data reveals:

## **Total Gross Tonnage controlled by parent companies located in these countries and territories**

(Data based on IHS Fairplay “ World Fleet Statistics 2010” data as at 31 December 2010).

1. Japan (131,955,001)
2. Greece(118,089,051)
3. Germany (85,371,604)
4. China (67,156,101)
5. United States (42,982,683)
6. United Kingdom (40,700,626)
7. Norway (33,794,824)
8. Republic of Korea (29,547,097)
9. Denmark (26,445,159)
10. Hong Kong China (23,427,839)
11. Taiwan Province of China (20,917,259)
12. Singapore (19,977,240)
13. Italy (17,716,680)
14. Russian Federation (14,267,814)
15. Canada (13,242,100)
16. Turkey (12,438,626)
17. Malaysia (10,884,115)
18. India (10,751,903)
19. France (8,685,204)
20. Belgium (7,965,964)

## **Maritime Safety**

The sea has always been a potentially hazardous and dangerous working environment. Yet, ship operators today have new factors and new pressures to contend with. The structure of the global marketplace requires that goods and materials be delivered not only to the geographical location where they are required but also within a very precise timeframe.

Today, goods in transit are carefully factored-in to the supply chain and, as a result, the transportation industry—which embraces both shipping and ports—has become a key component of a manufacturing sector which sets its store by

providing a complete —door-to-door service .As a consequence, safety and efficiency have now, more than ever before, become two sides of the same coin: accidents are not only undesirable outcomes in themselves; they also have a negative impact on the supply chain that is at the heart of the global economy. Seen in this light, IMO's responsibility to ensure the highest practicable, globally acceptable, standards that will improve maritime safety and security and, at the same time, help prevent marine pollution takes on a new dimension .Shipping in the 21<sup>st</sup> century is the safest and most environmentally friendly form of commercial transport.

Commitment to safety has long pervaded virtually all deep sea shipping operations and shipping was amongst the very first industries to adopt widely implemented international safety standards. From the mid-19th century onwards, a number of international maritime agreements were adopted.

A treaty of 1863, for example, introduced certain common navigational procedures that ships should follow, when encountering each other at sea, so as to avoid collision, and was signed by some 30 countries. And the infamous Titanic disaster of 1912 spawned the first Safety of Life at Sea-or SOLAS Convention, which, albeit completely modified and updated, and nowadays within the responsibility of IMO, is still the most important international instrument addressing maritime safety today, covering, among others, such areas as ship design, construction and equipment, subdivision and stability, fire protection, radio-communications, safety of navigation, carriage of cargoes (including dangerous cargoes), safety management and maritime security loss of ships.

The safety level of a vessel can be influenced by many factors and it is therefore not so easy to measure. Such variables could be general ship particulars (flag, classification society, ship type, age, etc.), they change thereof, ship safety inspections and ship economic cycles.

It has been demonstrated by Bijwaard and Knapp (2008) by means of survival analysis based on ship life cycles that the shipping industry is a safe industry since its hazard rate is low. The hazard rate in this concept is to be understood as the instantaneous potential per unit time for the event to occur, given that the ship has survived up to time which can vary from zero to infinity. The baseline hazard which when based on age of the vessel varies per ship type and increases with age 20 significantly while it decreases in the first two age brackets (5-10 and 11-15 years). Another interesting relationship is the effect

of ship economic cycles where an increase in earnings decreases the hazard rate for all ship types except container vessels.

## CASE HISTORIES

The most famous maritime disaster was the sinking of the RMS Titanic which resulted in the Safety of Life at Sea (SOLAS) Convention being set up.

The incident occurred on the night of 14<sup>th</sup> April through to the morning of 15<sup>th</sup> April 1912 in the north Atlantic Ocean, four days into the ship's maiden voyage from Southampton to New York City.

The largest passenger liner in service at the time, Titanic had an estimated 2,224 people on board when she struck an iceberg at around 23:40 (ship's time)[a] on Sunday, 14<sup>th</sup> April 1912. Her sinking two hours and forty minutes later at 02:20 (05:18 GMT) on Monday, 15<sup>th</sup> April resulted in the deaths of more than 1,500 people, which made it one of the deadliest peacetime maritime disasters in history.

Titanic received six warnings of sea ice on 14 April but was travelling near her maximum speed when her lookouts sighted the iceberg. Unable to turn quickly enough, the ship suffered a glancing blow that buckled her starboard (right) side and opened five of her sixteen compartments to the sea. Titanic had been designed to stay afloat with four of her forward compartments flooded but not more, and the crew soon realised that the ship would sink. They used distress flares and radio (wireless) messages to attract help as the passengers were put into lifeboats. However, in accordance with existing practice, Titanic's lifeboat system was designed to ferry passengers to nearby rescue vessels, not to hold everyone on board simultaneously. So with the ship sinking fast and help still hours away, there was no safe refuge for many of the passengers and crew. Compounding this, poor management of the evacuation meant many boats were launched before they were totally full.

Titanic sank with over a thousand passengers and crew still on board. Almost all those who jumped or fell into the water died from hypothermia within minutes. RMS "Carpathia" later arrived on the scene about an hour and a half after the sinking and had rescued the last of the survivors by 09:15 on 15<sup>th</sup> April, some nine and a half hours after the collision. The disaster caused

widespread outrage over the lack of lifeboats, lax regulations, and the unequal treatment of the three passenger classes during the evacuation.

Subsequent inquiries recommended sweeping changes to maritime regulations, leading to the establishment in 1914 of the International Convention for the Safety of Life at Sea (SOLAS), which still governs maritime safety today.

The SOLAS Convention in its successive forms is generally regarded as the most important of all international treaties concerning the safety of merchant ships. The first version was adopted in 1914, in response to the Titanic disaster, the second in 1929, the third in 1948, and the fourth in 1960. The 1974 version includes the tacit acceptance procedure - which provides that an amendment shall enter into force on a specified date unless, before that date, objections to the amendment are received from an agreed number of Parties. As a result the 1974 Convention has been updated and amended on numerous occasions. The Convention in force today is sometimes referred to as SOLAS, 1974.

This ensured that all vessels were obliged to carry the required lifesaving equipment.

However, the lessons from this disaster were not learned as the plight of MV“Lovat” clearly demonstrated .

In January 1975 in a southwest gale the MV Lovat took on a severe list to starboard 18 miles off southwest England. A MAYDAY was transmitted. At 06:30 the order to abandon was given. The 13 crew members took to the 10-man inflatable life raft. Unfortunately, in the 15 or so minutes that it took to board the raft, the lower buoyancy tube was damaged so that by the time all 13 had boarded the raft, the tube was no longer fully inflated.

The crowded occupants were soon sitting waist deep in cold water (about 8 degrees Celsius) in ordinary clothing.

None of the occupants appeared to have experience or training on how to optimise the use of their raft.

The sea anchor was not streamed, and although an attempt was made to close the canopy, a combination of cold hands and familiarity prevented it from being achieved. The water was washing in faster than they could bail. They agreed to lighten the load by taking it in turns to enter the sea.

The container ship “Discoverer” arrived alongside the heavily listing ship at 07:05. The Lovat eventually sank 45 minutes after the crew had abandoned.

The raft occupants sighted “Discoverer” close by (“within shouting distance”).



Their numbed, cold hands could not open the life raft survival pack to get the flares. None were aware of the knife on one of the canopy support arches. By now many were semiconscious from the cold. A high-sided car ferry located them but could do no more than keep them in its lee and act as the on-site rescue coordinator. Fifteen minutes later (08:30), a small rescue helicopter arrived.

The raft was partially submerged with the four remaining conscious survivors standing, two to each entrance. Two dead bodies were floating inside the partially flooded raft; the sea had washed out the others. In strong wind and high seas the helicopter began to rescue the first survivor.

This rescue attempt was unsuccessful. About 40 minutes later a larger helicopter arrived, by now only 2 of the original 13 had survived the two and a half hour deal .

After this incident the British government's Department of Trade instituted an obligatory sea-survival training program that all seafarers must complete before being certified for a seagoing job.

The STCW convention and Code sets out the standards of training, certification and watch keeping for seafarers.

In both of these cases, lack of equipment and training were factors which led to loss of life. The real killer here was the cold. The most important thing to do is to STAY DRY. If you get wet, your chances of survival are greatly reduced.



M/V LOVAT

## **THE OPEN SEA**

As a survivor on the open sea, you will face waves and wind. You may also face extreme heat or cold. To keep these environmental hazards from becoming serious problems, take precautionary measures as soon as possible. Use the available resources to protect yourself from the elements and from heat or extreme cold and humidity. Protecting yourself from the elements meets only one of your basic needs. You must also be able to obtain water and food. Satisfying these three basic needs will help prevent serious physical and psychological problems. However, you must know how to treat health problems that may result from your situation.

Your survival at sea depends upon

- Your knowledge of and ability to use the available survival equipment
- Your special skills and ability to apply them to cope with the hazards you face
- Your will to live

As a professional mariner you will be familiarized to life savings means as soon as you board the vessel according to SOLAS convention.

If you are responsible for other personnel on board, make sure you know where they are and they know where you are.

### **ABANDON SHIP PROCEDURES**

The signal for muster stations on any ship should be seven short, rapid blasts followed by one prolonged blast on the ship's whistle. The order to abandon ship is given verbally by the Master.

After that the GMDSS officer must send a distress call in this order:

1. Transmit on radiotelephone tuned to 2182 kHz, send the radiotelephone alarm signal. Transmit on VHF marine radio, tune it to channel 16
2. Distress signal "MAYDAY", spoken three times
3. The words "THIS IS", spoken once
4. Name of vessel in distress (spoken three times) and call sign or boat registration number, spoken once.

5. Give position of vessel by latitude or longitude or by bearing (true or magnetic, state which) and distance to a well-know landmark such as a navigational aid or small island, or in any terms which will assist a responding station in locating the vessel in distress. Include any information on vessel movement such as course, speed and destination.
6. Nature of distress (sinking, fire etc.).
7. Kind of assistance desired
8. Number of persons onboard
9. Any other information which might facilitate rescue, such as length or tonnage of vessel, number of persons needing medical attention, color hull, cabin, masks, etc.
10. The word "OVER"

**An example of a Mayday call:**

MAYDAY-MAYDAY-MAYDAY

THIS IS M/V BLUE NORTH – BLUE NORTH MMSI 240942002

POSITION. 42<sup>0</sup> 13' NORTH 15<sup>0</sup> 25' WEST AT 12:34:15 UTC

STRUCK SUBMERGED OBJECT SINKING

25 CREW ONBOARD INCLUDING THE MASTER

OVER

When you arrive on the boat deck, carry out your duties as assigned by the muster list. Remember that you never abandon ship until you get the order from the Master and only leave your vessel as a very last resort. Your vessel is the best life raft. Many people have left their vessel believing it to be unsafe only to perish in the sea when the vessel remained afloat.

**Checklist for Abandon ship (alternative title: things to do before abandon ship )**

- Put on warm clothing
- Put on your SOLAS lifejacket, making sure it is on tight and has no loose ends

- Before abandoning ship, ensure that flares, EPIRB, SART and VHF emergency transceiver with spare lithium batteries are gathered for use on the life raft
- Check that a Mayday call has been sent and acknowledged
- Get off the vessel dry if possible



## **DOWN AT SEA**

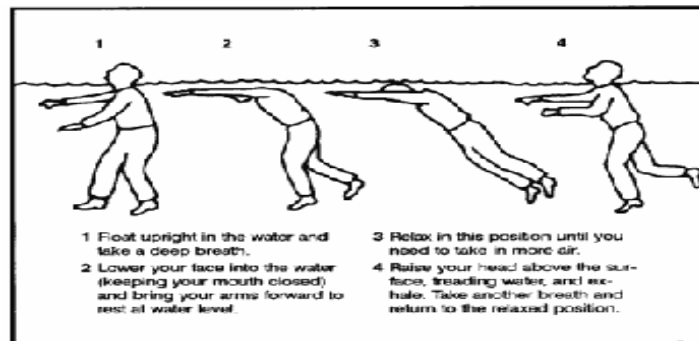
- Whether you are in the water or in a raft —Get clear and upwind of the sinking vessel as soon as possible, but stay in the vicinity until the vessel sinks
- Stay clear of an oil spillage if occurred
- Try to find other survivors; missing crew may be unconscious and floating low in the water

The best technique for rescuing personnel from the water is to throw them a life preserver attached to a line. If you are in the water, make your way to a raft. If no rafts are available, try to find a large piece of floating debris to cling to. Relax; a person who knows how to relax in ocean water is in very little danger of drowning. The body's natural buoyancy will keep at least the top of the head above water, but some movement is needed to keep the face above water. Floating on your back takes the least energy. Lie on your back in the water, spread your arms and legs, and arch your back. By controlling your breathing in and out, your face will always be out of the

water and you may even sleep in this position for short periods. Your head will be partially submerged, but your face will be above water. If you cannot float on your back or if the sea is too rough, float facedown in the water. The following are the best swimming strokes during a survival situation:

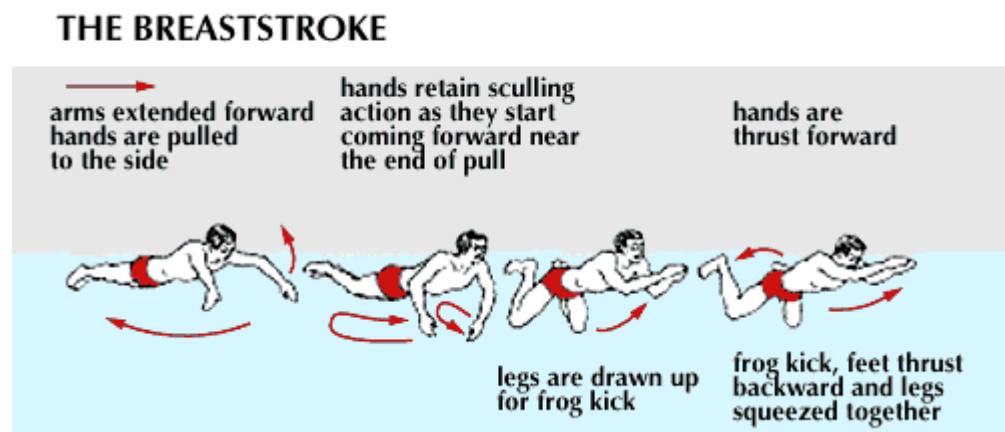
- Dog paddle.

This stroke is excellent when clothed or wearing a life jacket. Although slow in speed, it requires very little energy.



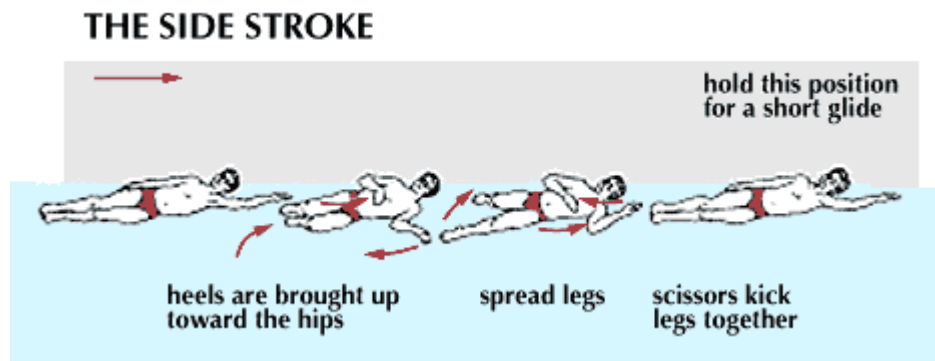
- Breaststroke.

Use this stroke to swim underwater, through oil or debris, or in rough seas. It is probably the best stroke for long-range swimming: it allows you to conserve your energy and maintain a reasonable speed.

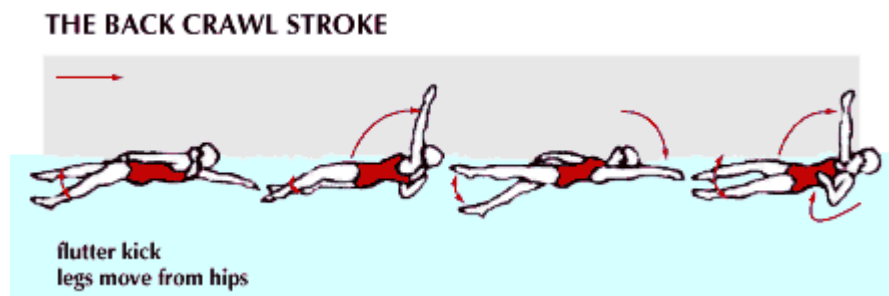


- Sidestroke.

It is a good relief stroke because you use only one arm to maintain momentum and buoyancy.



- Backstroke  
This stroke is also an excellent relief stroke. It relieves the muscles that you use for other strokes.  
If you are in an area where surface oil is burning discard your shoes and buoyant life preserver.



Note: If you have an uninflated life preserver, keep it. Cover your nose, mouth, and eyes and quickly go underwater. Swim underwater as far as possible before surfacing to breathe. Before surfacing to breathe and while still underwater, use your hands to push burning fluid away from the area where you wish to surface. Once an area is clear of burning liquid, you can surface and take a few breaths. Try to face downwind before inhaling. Submerge feet first and continue as above until clear of the flames. If you are in oil-covered water that is free of fire, hold your head high to keep the oil out of your eyes.

## SURVIVAL MEANS

### Personal survival means

- Life Buoys

- At least 1 buoy at each side will be provided with a floating cable
  - At least half of the buoys will be provided with lights with automatic ignition
  - Shall have  $D_{ext} < 800$  mm and  $D_{int} > 400$  mm
  - Built from intrinsically floating material and not dependent from granular material or from air compartments depending from inflation
  - Be capable to support  $> 14.5$  kg in fresh water during 24h Weight  $> 2.5$  kg
  - Be equipped with a cable for holding, with a diameter  $> 9.5$  mm, fixed in four points along the perimeter
- Life jackets
    - One for each person onboard + 10% for children
    - In ships with voyages with duration less than 24 hours, lifejackets for 2.5% of the total number of passengers
    - Shall be capable to maintain the mouth of an exhausted or unconscious person at no less than 120 mm above the water, with the body inclined backwards not less than  $20^\circ$  and not more than  $50^\circ$  from the vertical position
    - Shall be capable to turn the body of an unconscious person from any position into one where the mouth remains outside of the water in less than 5 seconds.
    - Shall be equipped with a whistle
- Thermal Suits
    - One for each crew member of the rescue boat
    - Fabricated with waterproof material
    - Have a conductivity less than  $0.25$  W/(m.K)
    - Shall reduce the loss of convective and evaporative heat of those who use it
    - Shall cover all the body of a person that is using a life-jacket, with the exception of the face
    - Shall allow to whom is using it to be removed in the water in less than 2 minutes.
    - Shall function properly in air temperatures in the range  $-30^\circ\text{C} < t < +20^\circ\text{C}$



Thermal suit

- Immersion Suits
  - Required for all crew members and the members of the crew of the rescue boat
  - Fabricated with waterproof material
  - Can be dressed-up in less than 2 min
  - Shall cover all the body with the exception of the face
  - Can be used together with a life-jacket
  - When made with insulating material it must guarantee that the temperature of the body does not lower more than 2°C after a period of 6 hours of immersion in water with a temperature  $0^{\circ}\text{C} < t < 2^{\circ}\text{C}$





#### Immersion suit

- Line Throwing Appliances

The ship must be provided with a line throwing device Every line-throwing appliance shall:

- be capable of throwing a line with reasonable accuracy
- include not less than 4 projectiles each capable of carrying the line at least 230 m in calm weather
- include not less than 4 lines each having a breaking strength of not less than 2 kN
- The rocket, in the case of a pistol-fired rocket, or the assembly, in the case of an integral rocket and line, shall be contained in a water-resistant casing.
- In the case of a pistol-fired rocket, the line and rockets together with the means of ignition shall be stowed in a container which provides protection from the weather

## Personal survival means analysis

- Life buoys  
Is a life saving buoy designed to be thrown to a person in the water, to provide buoyancy and prevent drowning. Modern lifebuoys are fitted with one or more seawater-activated lights, to aid rescue at night. The lifebuoy is usually ring- or horseshoe-shaped and has a connecting line allowing the casualty to be pulled to the rescuer in a boat. Deploy a life buoy to provide a floating datum. It does not matter if the person is visible at this time or not. The person in the water may see the flotation device/marker and be able to get to it, if not it serves as a reference point for maneuvering the boat back to the MOB.



Life buoy

- Life jackets  
SOLAS Lifejackets a SOLAS Lifejacket must be worn when abandoning ship. They are not intended for everyday use. It must be fitted with a signalling whistle, light, towing strap and retro-reflective tape. A lifejacket like the **one above**, is approved by SOLAS, and will keep a person afloat with their airway well clear of the water if properly fitted and tightly secured to the body. Because of their design these Lifejackets are less likely to be damaged and are not dependent on any mechanical operation in order to function. They cannot be worn while working on board as they are too bulky. Available in two sizes - 32kg or more and less than 32kg.  
When you hear the alarm you should put on as much extra warm clothing as possible and then put on your SOLAS lifejacket. You should be able to put on your lifejacket in no more than 30 seconds in the dark. Slip jacket over head and make sure straps are securely fastened.

There are many dangers to be aware of when jumping into the sea, such as cold shock and physical injury from hitting the water. It is important to keep your feet together and stand at the deck edge when jumping.

Cover your mouth and nose with one hand and use your other hand to hold down your lifejacket - this is what is called 'lock and block'. You are pushing your lifejacket down, locking it when you hit the water to prevent it riding up to injure you; and you are blocking your mouth and nose to avoid taking in water.

Before you jump, look down to see that all is clear below; then look straight ahead and step off. Keep your nose and mouth blocked until you float to the surface. You can stay afloat for an indefinite period. In this case, use the "HELP" body position: Heat Escaping Lessening Posture (HELP). Remain still and assume the fetal position to help you retain body heat. You lose about 50 percent of your body heat through your head. Therefore, keep your head out of the water. Other areas of high heat loss are the neck, the sides, and the groin .

Points to bear in mind before jumping overboard:

- a. Have your lifejacket securely tied on and hold it down by crossing the arms over the chest; blocking off the nose and mouth with one hand
- b. Keep your feet together, check that it is all clear below; look straight ahead; jump feet first
- c. Do not look down when jumping as it makes you unstable and likely to fall forward
- d. Wearing a lifejacket and possibly an immersion suit or thermal plastic aid and certainly wearing heavy clothing reserves body heat. It may be easier when swimming to a survival craft, to swim on your back. Do not swim or tread water unnecessarily; It wastes valuable body heat and energy.
- e. Never jump into a lifeboat, abandoning ship is hardly the right time to choose to deliberately break an arm or a leg or both.

## LIFE EXPECTANCY TIMES FOR IMMERSION IN WATER

WATER TEMPERATURE TIME	
21-15.5 ° C	12 hours
15.5-10 ° C	6 hours
10-4.5 ° C	1 hour
4.5 and less ° C	less than 1 hour

- Thermal suits

There are three kinds of heat transfer: conduction (exchange of heat through contact), convection (movement of air), and radiation. Air has a low thermal conductivity but is very mobile. There are thus two elements that are important in protecting from the cold:

- stopping the wind from penetrating and replacing the layer of warm air close to the body;
- setting up a layer of still air which serves as insulation.

Another important factor is humidity. Water is a good conductor of heat, thus if clothes are damp — because of sweat, rain, or immersion — water replaces some or all of the air between the fibres of the clothing, causing heat loss through conduction and/or evaporation. Next to flotation and the ability to keep your head above water, guarding against the onset of hypothermia is crucial to survival until help arrives. Remember, the body will lose heat 25 times faster in water than in the air. The best way to prevent hypothermia is to wear thermal protective clothing that's appropriate for the weather. Although clothing may provide warmth in the air, when immersed in cold water, it often provides more weight than warmth.

- Immersion suits

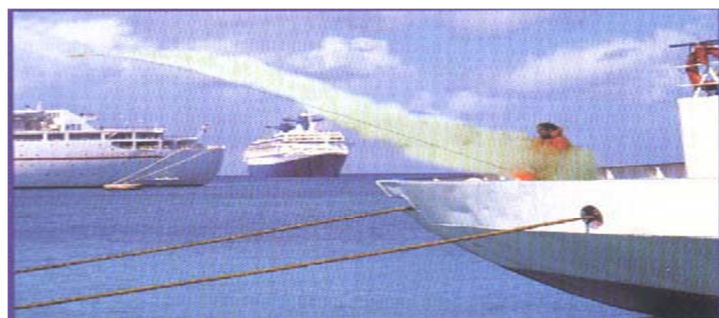
An immersion suit, or survival suit (or more specifically an immersion survival suit) is a special type of waterproof dry suit that protects the wearer from hypothermia from immersion in cold water, after abandoning a sinking or capsized vessel, especially in the open ocean. They usually have built-on feet (boots), and a hood, and either built-on gloves or watertight wrist seals. Unlike work suits, "quick don" survival suits are not normally worn, but are stowed in an accessible location on board the craft. The operator may be required to have one survival suit of the appropriate size on board for each crew member, and other passengers.

- Line throwing appliances

Line-throwing appliance is lifesaving appliance for use in all situations where a line is required to be passed accurately and quickly.

Line-throwing appliance consists of a water-resistant container incorporating an integral handle and trigger mechanism, with a solid fuel rocket and 300-m line itself. Technical data:

- Dimensions are Diameter, (mm) 235 Length, (mm) 310
- Gross weight, (kg) 5
- Line diameter, (mm) 4
- Line strength, (kN) not less 2
- Range of shooting, (m) up to 300 (for calm weather)
- Compactness, reliability of a design, simplicity in operation
- The increased tightness of the case provides a warranty period of a storage - 5 years
- Explosion-proofness at transportation and operation (because of the application of special solid rocket fuel)
- Ecological safety at a storage, operation, and recycling (because of the application of natural materials)



Line throwing appliances 1

## **LIFE SAVING APPLIANCES**

Marine life rafts are made of rubber material and are designed to support survivors and to keep them dry and clear of the water. This is achieved by two buoyancy chambers - one on top of the other and connected by non return valves.

The life raft is designed to keep its full load afloat even if one of these chambers is deflated. The life raft offers protection from the sea by having a floor which can be manually inflated in cold climates and a canopy which covers the occupants. The canopy is double-sheeted which traps a layer of air between the sheets. This layer of air heats up and helps to keep the survivors warm. The entrance can also be closed.

The life raft can help make you visible to rescuers because it has a bright orange canopy with strips of retro-reflective tape .A SART should also be deployed. There is also a light on the top of the life raft which is powered by a saltwater battery or normal battery built into the light unit.

Life support on the life raft is provided by a survival pack which contains food and water, location aids and other equipment. On board the ship, the inflatable life rafts are stored in reinforced plastic containers. Each raft is fitted with a quick release known as a Stenhouse Slip and a Hydrostatic Release Unit (HRU). On the top of the container, important life raft information will be displayed such as the number of people the raft will hold, the date of last service and next service due date.

### **Inflatable life rafts**

General life raft information

- The main flotation chamber consists of at least 2 separated compartments, each provided with a non-return valve.
- The life raft shall be inflated with a non-toxic gas, in a time interval less than 1 minute.

There are two ways to launch the life raft: manually or automatically.

## Deploying Manually

- Make the painter fast. (This is the rope coming out of the container)
- Release the securing arrangement
- Never roll the life raft container across the deck as you may damage the raft. Always slide or carry it
- Double check that the painter is secured
- Launch the life raft into the water
- Pull the painter until the life raft inflates. (There will be at least 15 meters of painter line)
- Once the life raft is inflated, try to prevent it from rubbing alongside if possible

## Deploying Automatically

Alternatively, a life raft can be launched automatically using the Hydrostatic Release Unit (HRU). The HRU is made fast to the securing arrangement of the life raft and to a strong point on the vessel and will work when immersed in water between 1.5 and 4 meters deep. Once the life raft container is clear of the cradle, the painter tightens and inflates the life raft.

After inflation, the buoyancy of the life raft is too great for the weak link on the HRU and this breaks allowing the raft to come to the surface. In shallow water it may be necessary to pull out the excess painter from the canister in order to inflate the raft.

It is very important to make sure that the HRU is fitted correctly and that it is replaced or serviced on a regular basis. It should also be noted that the HRU should not be painted over as this will prevent the unit from working effectively.

There are very important steps to take once everyone is on board the life raft  
Boarding procedures:

- Cut the painter
- Stream the drogue
- Close the canopy
- Maintain the environment

- Treat injuries
- Take anti-seasickness tablets
- Do not eat or drink anything for the first 24 hours
- Get a routine going to maintain a look out
- Do not give up the will to survive
- Close the canopy opening to keep the heat in and water out. Of course, if conditions are very hot, this can be left open
- Maintain the environment within the life raft. Pump the floor up, treat injuries, dry up the life raft and keep everyone busy
- Have the flares ready in case a passing ship or rescue craft passes by
- Be careful how you use the pyrotechnics and make sure to use them discriminately

The following equipment is in your survival pack:

- rescue quoit + 30 meters line
- floating knife
- sea anchor + line
- paddles
- sponges
- bailer
- repair kit
- hand pump
- raft operating instructions
- fishing kit
- waterproof signaling torch, spare batteries and bulb
- signaling mirror
- first aid kit
- anti-seasickness pills
- emergency rations, water in shrink-wrapped bags ,graduated plastic drinking cup

The survival pack will also contain pyrotechnics (flares), smoke canisters and a RADAR reflector.



## Life rafts

### Types of Liferafts

- Self-Righting
- Open Reversible
- Throw-Overboard
- Davit-Launched

### Inflatable Life Raft Analysis

#### Self righting

- Are to be used with slides or chutes installed on board RO-RO ferries.
- They may also serve as liferafts for direct boarding from decks not more than 1.5 m above the water level on small ferries and passenger ships

#### Open reversible



Open Reversible life rafts are available in various sizes 4 to 25 Person. These rafts (buoyancy tubes) are made from tough neoprene fabric .

#### Special Features

- Available in sizes 4 - 25 Person
- High Speed Craft (HSC) Code Annex 11 compliant
- Double Buoyancy Tubes
- Inflatable Boarding Ramp
- Circular construction (rides the cross waves better)
- Lead-weighted deep water pockets (more stability)
- Reliable & Durable
- Easy Boarding
- Lip-Sealed Fiber Glass Container or Valise Pack



- No vacuum bag required
- Cheaper servicing cost
- Thermal Insulated Floor
- Easy Deployment

### **Throw overboard life rafts**

Throw overboard life rafts are designed to be used as independent units or as part of evacuation systems. They can be stored almost anywhere on racks and ramps, saving valuable deck space and causing minimal disruption to sea views which is important for passenger ships.

Life rafts are packed in sturdy containers with a special sealing method that makes them especially durable, resistant to water ingress and makes them faster and easier to service. Standard rafts are available in sizes: 6, 8, 10, 12, 16, 20, and 25 persons

- Equipped with emergency packs and liferaft equipment according to SOLAS and flag requirements
- Provided with two individual buoyancy compartments. One compartment alone has sufficient buoyancy to carry the specified number of passengers
- Stored in a rigid fibre-glass container for durability
- Installed onboard either on cradles, racks, or stacked on top of each other

### **Davit launched life rafts**

Davit-launched liferafts are ideal supplements to slide and chute systems, providing safe evacuation for those unable to descend chutes or slides due to injury, disability or size. They can be launched from almost any type of vessel, regardless of deck height or hull shape.

Standard davit-launched liferafts are available in sizes: 12, 16, 20, 25 and 35  
Alternative or supplemental evacuation method directly from embarkation deck  
Special container racks are available for vertical stacking

Features

- Used in passenger ships and offshore facilities
- Shall allow the embarking of its total capacity in less than 3 minutes
- Shall be built to resist 30 days afloat in any sea state.

- When launched from a height of 18 m, the liferaft and its equipment shall remain in operating conditions.
- Shall resist to repeated jumps from a height of at least 4.5 m above the bottom, with or without the cover up.
- Shall have a cover, to protect the occupants against the heat and the cold, built from two layers of material separated by an air cushion.
- No liferaft shall have a capacity less than 6 people.
- Unless there is an approved launching system, the total weight of the liferaft including its container and equipment shall not be greater than 185 kg.



**Davit launched liferaft 1**

### **Boarding the life raft and action to take after boarding**

Once the life raft has been launched it is then time to start boarding. If at all possible, board the raft dry. If you are already in the water swim towards the raft.

Once you make contact with the life raft, do not let go as the wind can drive the raft away quicker than you can swim. If you let go, you may not get a chance to grab it again. If you get wet you will get cold and hypothermia will set in. A life raft is very difficult to board from the water. Get in while it is alongside the vessel.

If you do find yourself in the water and have to board the raft, then enter from the side with the step. Find the ladder, (the step); get your feet onto the top step of the ladder and reach up as far as possible to the hand holds at the entrance; then pull yourself in.

Do not jump into the life raft or jump on top of it as this may cause injury to yourself or other survivors already inside. Jumping on the life raft may also cause you to bounce off and land in the water.

# **SURVIVAL CRAFTS AND RESCUE BOATS**

- Lifeboats
- Rescue boats
- Fast Rescue Boats

## **Survival Craft and Rescue Boats analysis**

### General Requirements for Lifeboats

- Every survival craft shall have sufficient strength to:
  - Be launched with a complete load of people and equipment
  - Be capable of being launched and towed, in still waters, when the ship is moving forward with a speed of 5 knots.
- Shall have sufficient strength to resist side impacts against the ship's hull with a minimum speed of 3.5 m/s and water impacts from a height of at least 3 m.
- The capacity shall NEVER exceed 150 persons
- The arrangement shall allow its total capacity of people to embark, in a time interval not greater than 3 minutes.

### **Life boats**

- Partially covered
- Totally covered
- Free-Fall totally covered

### **Partially Covered Lifeboats**

- Shall be equipped with a rigid cover in at least 20% of the length, AFT and FWD
- Shall be equipped with movable covers that together with the fixed ones will cover completely the boat
- Shall have entrances at both extremities and at both sides

## **Totally Covered Lifeboats**

- Shall comply to the general requirements for lifeboat
- The cover shall be watertight and the arrangement will be such that:  
Protects the occupants against the heat and the cold
- The access is made through hatches that can be closed watertight
- The hatches to be positioned in such a way to allow the launching and recovery operations, without any of the occupants having to leave the interior of the lifeboat
- The access hatches can be opened and closed from both the interior and the exterior, with the means to keep them in a permanent opened position
- It is possible to row
- Includes windows or trans-lucid panels on both sides, which allow the entrance, with the hatches closed, of sufficient natural light to make artificial lighting unnecessary.
- Shall have ropes along the side shell that allow to circulate on the outside of the boat and help people to embark and disembark
- People shall be able to go from the entrance to their seats without having to climb through obstacles
- Every totally enclosed lifeboat shall be provided with a rigid watertight enclosure which completely encloses the lifeboat
- Except for a free-fall lifeboat, it is possible to row the lifeboat
- It is capable, when the lifeboat is in capsized position with the hatches closed and without significant leakage, of supporting the entire mass of the lifeboat, including all equipment, machinery and its full complement of persons
- its exterior is of highly visible color and its interior of a light color which does not cause discomfort to the occupants
- handrails provide a secure handhold for persons moving about the exterior of the lifeboat and aid embarkation and disembarkation
- during operation of the engine with the enclosure closed, the atmospheric pressure inside the lifeboat shall never be above or below the outside atmospheric pressure by more than 20 mbar

## **Freefall lifeboats**

Free-fall lifeboats (GES - Gravity Escape System) do have optimized design and a large number of ships and offshore installations are equipped with free-fall lifeboats.

The benefits are clear: rapid evacuation in emergencies, the boat slides out from a ramp onboard the ship/installation, and hits the water well away from the ship or installation with a high positive forward motion.



Passengers are safe and secure in an enclosed cabin, securely strapped to anatomically shaped seats. The lifeboat system is robust and can withstand high winds, powerful waves and extreme weather conditions. The boats can be fitted with a water spray and compressed air system for protection against fire. Largest boats can withstand drops from great heights up to 40 m and are highly space efficient. There are davits specially designed for free-fall lifeboats .

features include:

- capacities from 24 to 95 persons on board (POB)
- seating for an average body of 82.5kgs (SOLAS requirement) to 98kgs (common offshore requirement)
- maximum drop heights

- tanker versions available for crude carriers, FPSOs, MODUs and production platforms
- tanker versions include a compressed air supply to pressurise the lifeboat for a minimum of 10 minutes to prevent the ingress of smoke and an external water spray deluge system
- buoyancy to self-right when fully loaded and in a damaged condition

### **Rescue boats**

Rescue boats may be either of rigid or inflated construction or a combination of both and shall not be less than 3,8 m and not more than 8,5 m in length. They shall be capable of carrying at least five seated persons and a person lying on a stretcher. A rescue boat shall be fitted with an inboard engine or outboard motor. Petrol driven outboard engines with an approved fuel system may be fitted in rescue boats provided the fuel tanks are specially protected against fire and explosion. Using its driving power the rescue boat has to reach the following speeds:

Maneuvering speed of at least 6 kn and maintaining that speed for a period of at least 4 hours.

The towing speed shall be at least 2 kn.

Rescue boats shall have sufficient mobility and maneuverability in a seaway to enable persons to be retrieved from the water, marshal life rafts and tow the largest life raft carried on the ship. The rescue boat shall be stowed:

- Ready to be launched in less than 5 minutes
- In a position appropriate for launching and recovery
- In a way that does not interfere with the operation of the lifeboats

### **Fast rescue boats**

Combining superb seaworthiness, maneuverability and speed, these boats are ideal for all types of rescue.

The boats have a low freeboard to facilitate rescue operations, are self-bailing, have ample deck space, a self-righting system. With the use of developed davits with shock absorbers and tension system for severe weather the rescue boats are launched from a mother ship even in heavy seas.

In accordance with current IMO regulations, all RO-RO and RO-Pax vessels must have fast rescue boats with a minimum length of 6 m and a top speed of at least 20 knots.

Additional requirements for fast rescue boats are that Fast rescue boats shall have a hull length of not less than 6,0 m and not more than 8,5 m, including inflated structures or fixed fenders. Also the Speed of fully equipped rescue boats have to reach the following speeds: Maneuvering at a speed of at least 20 kn in calm water with a crew of 3 persons and maintaining that speed for at least 4 hours. A speed of at least 8 kn with a full complement of persons and equipment.

Rescue boats shall have sufficient mobility and maneuverability in a seaway to enable persons to be retrieved from the water, marshal liferafts and tow the largest liferaft carried on the ship.

Fast rescue boats have the same tasks as rescue boats. Because of a higher speed up to 20 kn they can be used for much quicker rescue operations.



Fast rescue boat 1

## **SURVIVING AT SEA**

A search for survivors usually takes place around the entire area of and near the site. Missing personnel may be unconscious and floating low in the water. The best technique for rescuing personnel from the water is to throw them a life preserver attached to a line. Another is to send a swimmer (rescuer) from the raft with a line attached to a flotation device that will support the rescuer's weight. This device will help conserve a rescuer's energy while recovering the survivor.



The least acceptable technique is to send an attached swimmer without flotation devices to retrieve a survivor. In all cases, the rescuer wears a life preserver. A rescuer should not underestimate the strength of a panic-stricken person in the water. A careful approach can prevent injury to the rescuer. When the rescuer approaches a survivor in trouble from behind, there is little danger the survivor will kick, scratch, or grab him. The rescuer swims to a point directly behind the survivor and grasps the life preserver's backstrap. The rescuer uses the sidestroke to drag the survivor to the raft. If you are in the water, make your way to a raft.

If no rafts are available, try to find a large piece of floating debris to cling to. Relax; a person who knows how to relax in ocean water is in very little danger of drowning. The body's natural buoyancy will keep at least the top of the head above water, but some movement is needed to keep the face above water. Floating on your back takes the least energy. Lie on your back in the water, spread your arms and legs, and arch your back. By controlling your breathing in and out, your face will always be out of the water and you may even sleep in this position for short periods. Your head will be partially submerged, but your face will be above water. If you cannot float on your back or if the sea is too rough, float facedown.

After boarding, check the physical condition of all on board. Give first aid if necessary. Take seasickness pills if available. The best way to take these pills is to place them under the tongue and let them dissolve. There are also suppositories or injections against seasickness. Vomiting, whether from seasickness or other causes, increases the danger of dehydration.

Try to salvage all floating equipment, clothing, and anything else that will be useful to you. Secure the salvaged items in or to your raft. Make sure the items have no sharp edges that can puncture the raft. If there are other rafts, lash the rafts together so they are about 7.5 meters apart. Be ready to draw them closer together if you see or hear any salvage aid. It is easier to spot rafts that are close together rather than scattered. Remember, rescue at sea is a cooperative effort.

Use all available visual or electronic signaling devices to signal and make contact with rescuers. For example, raise a flag or reflecting material on an oar as high as possible to attract attention.

Activate the emergency radio and get it into operation. Operating instructions are on it. Have other signaling devices ready for instant use.

Check the raft for inflation, leaks, and points of possible chafing. Make sure the main buoyancy chambers are firm (well rounded) but not overly tight. Check inflation regularly. Air expands with heat; therefore, on hot days, release some air and add air when the weather cools.

Decontaminate the raft of all fuel. Petroleum will weaken its surfaces and break down its glued joints. Throw out the sea anchor, or improvise a drag from the raft's case, bailing bucket, or a roll of clothing.

A sea anchor helps you stay close to your site, making it easier for searchers to find you if you have transmitted your location. Without a sea anchor, your raft may drift over 160 kilometers in a day, making it much harder to find you. You can adjust the sea anchor to act as a drag to slow down the rate of travel with the current, or as a means to travel with the current. You make this adjustment by opening or closing the sea anchor's apex. When open, the sea anchor acts as a drag that keeps you in the general area. When closed, it forms a pocket for the current to strike and propels the raft in the current's direction. Additionally, adjust the sea anchor so that when the raft is on the wave's crest, the sea anchor is in the wave's trough (Wrap the sea anchor rope with cloth to prevent its chafing the raft. The anchor also helps to keep the raft headed into the wind and waves.

In stormy water, rig the spray and windshield at once. In a 20-man raft, keep the canopy erected at all times. Keep your raft as dry as possible. Keep it properly balanced. All personnel should stay seated, the heaviest one in the center.

Calmly consider all aspects of your situation and determine what you and your companions must do to survive. Inventory all equipment, food, and water. Waterproof items that salt water may affect. These include compasses, watches, sextant, matches, and lighters.

Ration food and water. Assign a duty position to each person: for example, water collector, food collector, lookout, radio operator, signaler, and water bailers. Note: Lookout duty should not exceed 2 hours.

Keep in mind and remind others that cooperation is one of the keys to survival. Keep a log. Record the navigator's last fix, the time of ditching, the

names and physical condition of personnel, and the ration schedule. Also record the winds, weather, direction of swells, times of sunrise and sunset, and other navigational data.

### **Cold Weather Considerations**

If you are in a cold climate— Put on an antiexposure suit. If unavailable, put on any extra clothing available. Keep clothes loose and comfortable. Take care not to snag the raft with shoes or sharp objects.

Keep the repair kit where you can readily reach it Rig a windbreak, spray shield, and canopy.

Try to keep the floor of the raft dry. Cover it with canvas or cloth for insulation. Huddle with others to keep warm, moving enough to keep the blood circulating. Spread an extra tarpaulin, sail, over the group. Give extra rations, if available, to men suffering from exposure to cold.

The greatest problem you face when submerged in cold water is death due to hypothermia. When you are immersed in cold water, hypothermia occurs rapidly due to the decreased insulating quality of wet clothing and the result of water displacing the layer of still air that normally surrounds the body. The rate of heat exchange in water is about 25 times greater than it is in air of the same temperature. Your best protection against the effects of cold water is to get into the life raft, stay dry, and insulate your body from the cold surface of the bottom of the raft. If these actions are not possible, wearing an antiexposure suit will extend your life expectancy considerably.

Remember, keep your head and neck out of the water and well insulated from the cold water's effects when the temperature is below 19 degrees C. Wearing life preservers increases the predicted survival time as body position in the water increases the chance of survival.

### **Hot Weather Considerations**

If you are in a hot climate—Rig a sunshade or canopy. Leave enough space for ventilation. Cover your skin, where possible, to protect it from sunburn. Use sunburn cream, if available, on all exposed skin. Your eyelids, the back of your

ears, and the skin under your chin sunburn easily .Water is your most important need. With it alone, you can live for ten days or longer, depending on your will to live.

When drinking water, moisten your lips, tongue, and throat before swallowing. Short water rations when you have a limited water supply and you can't replace it by chemical or mechanical means.

Protect fresh water supplies from seawater contamination. Keep your body well shaded, both from overhead sun and from reflection off the sea surface. Allow ventilation of air; dampen your clothes during the hottest part of the day. Do not exert yourself. Sleep and rest are the best ways of enduring periods of reduced water and food intake. However, make sure that you have enough shade when napping during the day. If the sea is rough, tie yourself to the raft, close any cover, and ride out the storm as best you can. Relax is the key word—at least try to relax.

Fix your daily water ration after considering the amount of water you have, the output of solar stills and desalting kit, and the number and physical condition of your party. If you don't have water, don't eat. If your water ration is two liters or more per day, eat any part of your ration or any additional food that you may catch, such as birds, fish, shrimp. The life raft's motion and anxiety may cause nausea. If you eat when nauseated, you may lose your food immediately. If nauseated, rest and relax as much as you can, and take only water.

To reduce your loss of water through perspiration, soak your clothes in the sea and wring them out before putting them on again. Don't overdo this during hot days when no canopy or sun shield is available. This is a trade-off between cooling and saltwater boils and rashes that will result. Be careful not to get the bottom of the raft wet.

Watch the clouds and be ready for any chance of showers. Keep the tarpaulin handy for catching water. If it is encrusted with dried salt, wash it in seawater. Normally, a small amount of seawater mixed with rain will hardly be noticeable and will not cause any physical reaction. In rough seas you cannot get contaminated fresh water .At night, secure the tarpaulin like a sunshade, and turn up its edges to collect dew. It is also possible to collect dew along the sides of the raft using a sponge or cloth. When it rains, drink as much as possible

## **Desalting Kits**

When desalting kits are available in addition to solar stills, use them only for immediate water needs or during long overcast periods when you cannot use solar stills. In any event, keep desalting kits and emergency water stores for periods when you cannot use solar stills or catch rainwater.

## **Water From Fish**

Drink the aqueous fluid found along the spine and in the eyes of large fish. Carefully cut the fish in half to get the fluid along the spine and suck the eye. If you are so short of water that you need to do this, then do not drink any of the other body fluids. These other fluids are rich in protein and fat and will use up more of your reserve water in digestion than they supply.

## **Sea Ice**

In arctic waters, use old sea ice for water. This ice is bluish, has rounded comers, and splinters easily. It is nearly free of salt. New ice is gray, milky, hard, and salty. Water from icebergs is fresh, but icebergs are dangerous to approach. Use them as a source of water only in emergencies.

Sleep and rest are the best ways of enduring periods of reduced water and food intake. However, make sure that you have enough shade when napping during the day. If the sea is rough, tie yourself to the raft, close any cover, and ride out the storm as best you can. Relax is the key word—at least try to relax.

## **Food Procurement**

In the open sea, fish will be the main food source. There are some poisonous and dangerous ocean fish, but, in general, when out of sight of land, fish are safe to eat. Nearer the shore there are fish that are both dangerous and poisonous to eat. There are some fish, such as the red snapper and barracuda, that are normally edible but poisonous when taken from the waters of atolls and reefs. Flying fish will even jump into your raft!

## **Fish**

When fishing, do not handle the fishing line with bare hands and never wrap it around your hands or tie it to a life raft. The salt that adheres to it can make it a sharp cutting edge, an edge dangerous both to the raft and your hands. Wear

gloves, if they are available, or use a cloth to handle fish and to avoid injury from sharp fins and ill covers.

In warm regions, gut and bleed fish immediately after catching them. Cut fish that you do not eat immediately into thin, narrow strips and hang them to dry. A well-dried fish stays edible for several days. Fish not cleaned and dried may spoil in half a day. Fish with dark meat are very prone to decomposition. If you do not eat them all immediately, do not eat any of the leftovers. Use the leftovers for bait.

Never eat fish that have pale, shiny gills, sunken eyes, flabby skin and flesh, or an unpleasant odor. Good fish show the opposite characteristics. Sea fish have a saltwater or clean fishy odor. Do not confuse eels with sea snakes that have an obviously scaly body and strongly compressed, paddle-shaped tail. Both eels and sea snakes are edible, but you must handle the latter with care because of their poisonous bites. The heart, blood, intestinal wall, and liver of most fish are edible. Cook the intestines. Also edible are the partly digested smaller fish that you may find in the stomachs of large fish. In addition, sea turtles are edible. Shark meat is a good source of food whether raw, dried, or cooked. Shark meat spoils very rapidly due to the high concentration of urea in the blood, therefore, bleed it immediately and soak it in several changes of water. People prefer some shark species over others. Consider them all edible except the Greenland shark whose flesh contains high quantities of vitamin A. Do not eat the livers, due to high vitamin A content.

### **Fishing Aids**

You can use different materials to make fishing aids as described in the following paragraphs:

#### **Fishing line.**

Use pieces of tarpaulin or canvas. Unravel the threads and tie them together in short lengths in groups of three or more threads. Shoelaces and parachute suspension line also work well.

#### **Fish hooks.**

No survivor at sea should be without fishing equipment but if you are, improvise hooks .

#### **Fish lures.**

You can fashion lures by attaching a double hook to any shiny piece of metal.

### **Grapple.**

Use grapples to hook seaweed. You may shake crabs, shrimp, or small fish out of the seaweed. These you may eat or use for bait. You may eat seaweed itself, but only when you have plenty of drinking water. Improvise grapples from wood. Use a heavy piece of wood as the main shaft, and lash three smaller pieces to the shaft as grapples.

### **Bait.**

You can use small fish as bait for larger ones. Scoop the small fish up with a net. If you don't have a net, make one from cloth of some type. Hold the net under the water and scoop upward. Use all the guts from birds and fish for bait. When using bait, try to keep it moving in the water to give it the appearance of being alive.

### **Helpful Fishing Hints**

Your fishing should be successful if you remember the following important hints:

- Be extremely careful with fish that have teeth and spines.
- Cut a large fish loose rather than risk capsizing the raft. Try to catch small rather than large fish.
- Do not puncture your raft with hooks or other sharp instruments.
- Do not fish when large sharks are in the area.
- Watch for schools of fish; try to move close to these schools.
- Fish at night using a light. The light attracts fish.
- In the daytime, shade attracts some fish. You may find them under your raft.

- Improvise a spear by tying a knife to an oar blade. This spear can help you catch larger fish, but you must get them into the raft quickly or they will slip off the blade. Also, tie the knife very securely or you may lose it.
- Always take care of your fishing equipment. Dry your fishing lines, clean and sharpen the hooks, and do not allow the hooks to stick into the fishing lines.

### **Birds**

All birds are edible. Eat any birds you can catch. Sometimes birds may land on your raft, but usually they are cautious. You may be able to attract some birds by towing a bright piece of metal behind the raft. If a bird lands within your reach, you may be able to catch it. If the birds do not land close enough or land on the other end of the raft, you may be able to catch them with a bird noose. Bait the center of the noose and wait for the bird to land. When the bird's feet are in the center of the noose, pull it tight.

## **Medical Problems Associated With Sea Survival**

At sea, you may become seasick, get saltwater sores, or face some of the same medical problems that occur on land, such as dehydration or sunburn. These problems can become critical if left untreated.

Seasickness is the nausea and vomiting caused by the motion of the raft. It can result in—Extreme fluid loss and exhaustion. Loss of the will to survive. Others becoming seasick. Attraction of sharks to the raft. Unclean conditions.

### **To treat seasickness**

Wash both the patient and the raft to remove the sight and odor of vomit. Keep the patient from eating food until his nausea is gone. Have the patient lie down and rest. Give the patient seasickness pills if available. If the patient is unable to take the pills orally, insert them rectally for absorption by the body. Note: Some survivors have said that erecting a canopy or using the horizon as a focal



point helped overcome seasickness. Others have said that swimming alongside the raft for short periods helped, but extreme care must be taken .

## **Hypothermia**

Our normal body temperature is about 37 °C. When our inner core temperature falls to 35 °C, then hypothermia sets in. How quickly you lose body heat will depend on a number of factors:

- water temperature
- type of clothes worn
- relative water movement
- survival equipment
- your metabolism (the rate at which your body uses energy).

Some people will cool quicker than others .Humans are warm-blooded and when you fall into cold water, your body goes through a number of changes. The initial response when you're suddenly immersed in cold water is called cold water shock. If you lose control or panic at the cold shock stage of immersion, you can drown. The most common response to cold shock is the loss of ability to control breathing. If you take deep breaths, the water intake may lead to drowning. The colder the water, the worse the affects of cold shock. After about five minutes, your breathing should settle down as your body adjusts to the cold water. Shivering will be violent as your body tries to keep the inner core warm. Hands and toes become very cold because the blood vessels constrict to keep the warm blood around the vital organs such as the heart and lungs. As body temperature falls, you will become tired, confused and disorientated.

When your core temperature reaches about 31 °C, the shivering might stop and be replaced by muscle stiffness. By the time your core temperature drops to 30 °C, you might lose consciousness. Again this will depend on your metabolism. At this stage, it is very difficult to determine if a person is dead or alive as death is defined as 'failure to revive on re-warming.

To slow down body cooling, it is best not to swim unless you are very close to a place of safety. Float in the water with your knees raised up into your chest

and your hands tucked under your lifejacket. This is known as the Heat Escape Lessening Position (HELP) If body temperature above 34 °C.

Move out of wind to a warm dry place. Remove all wet outer layers Put on layers of dry clothes and/or place in a good sleeping bag If the victim is conscious, give them warm food and sweet drink NO alcohol .If body temperature is below 34 °C act as above but NO food or drink. No hot shower or bath unless fully conscious and monitored throughout

## **ELECTRONIC AIDS TO ASSIST IN OUR RESCUE**

### **SART**

A search and rescue transponder (SART) is a self-contained, waterproof transponder intended for emergency use at sea. These devices may be either a radar-SART, or a GPS-based AIS-SART (automatic identification system SART).

The radar-SART is used to locate a survival craft by creating a series of dots on a rescuing ship's radar display. A SART will only respond to a 9 GHz X-band (3 cm wavelength) radar. It will not be seen on S-band (10 cm) or other radar.

The radar-SART may be triggered by any X-band radar within a range of approximately 8 nautical miles Each radar pulse received causes the SART to transmit a response which is swept repetitively across the complete radar frequency band. SARTs are typically cylindrical, about the size of a person's forearm, and brightly coloured.



SART 1

### **AIS-SART**

The AIS-SART is a self-contained radio device used to locate a survival craft by sending updated position reports using a standard Automatic Identification System (AIS) class-A position report. The position and time synchronization of the AIS-SART are derived from a built in GNSS(Global Navigation Satellite System) receiver (e.g. GPS). Shipboard Global Maritime Distress Safety System (GMDSS) installations include one or more search and rescue locating devices. These devices may be either an AIS-SART (AIS Search and Rescue Transmitter) (from January 1, 2010), or a radar-SART (Search and Rescue Transponder).

The AIS-SART derives position and time synchronization from a built in GNSS receiver. Once per minute, the position is sent as a series of eight identical position report messages (four on 161.975 MHz and four on 162.025 MHz). This scheme creates a high probability that at least one of the messages is sent on the highest point of a wave. AIS SARTs are typically cylindrical and brightly colored. A typical model is 25cm high and weighs 450g



AIS-SART 1

## **EPIRB**

EPIRB (Emergency Position-Indicating Radio Beacon), are tracking transmitters which aid in the detection and location of boats, aircraft, and people in distress. Strictly, they are radio beacons that interface with worldwide offered service of Cospas-Sarsat, the international satellite system for search and rescue (SAR).

When manually activated, or automatically activated upon immersion, such beacons send out a distress signal. The signals are monitored worldwide and the location of the distress is detected by non-geostationary satellites, and can be located by some combination of GPS trilateration and doppler triangulation. The basic purpose of a distress radio beacon is to help rescuers find survivors within the so-called "golden day" (the first 24 hours following a traumatic event) during which the majority of survivors can usually be saved. Since the inception of Cospas-Sarsat in 1982, distress radio beacons have assisted in the rescue of over 28,000 people in more than 7,000 distress situations. In 2010 alone, the system provided information which was used to rescue 2,388 persons in 641 distress situations.



EPIRB 1

## **Survival craft handheld transceivers**

Very High Frequency (VHF) Survival Craft Transceivers (SCTs) are lightweight, portable, two-way, handheld VHF transceivers capable of radiotelephone on-scene communication between rescue units and the survival craft. Essentially these are hand-held VHF radio's that are used in any survival craft, such as a life boat or life raft. SCT's with re-chargeable type batteries may be used for on-board communications as well.<sup>[1]</sup>

The International Maritime Organization (IMO) requires the following from SCT's:

- Must be able to be operated by unskilled personnel
- Must be able to transmit and receive on 156.8 MHz (Channel 16) and 156.3 MHz (Channel 6) and one extra channel
- Withstand a drop of 1 meter on a hard surface
- Watertight to a depth of 1 meter for 5 minutes
- Power Minimum of 0.25 watts
- A power reduction switch to less than 1 watt must be available where power exceeds 1 watt
- Antenna must be vertically polarized and omni-directional
- Battery power capacity for 8 hours on a 1:9 duty cycle

The SCT's used for everyday operations have a rechargeable NiCad battery, and some radios that are strictly SCT's use a non-rechargeable lithium battery pack. These batteries must be replaced on or before the manufactures marked expiration date. SCT's are required to be capable of radiating a minimum Radio Frequency (RF) power of 250mW (milliwatts) A switch must be provided on the SCT if the transmitter has a power excess of one watt, this will allow the operator to reduce the power to less than one watt, resulting in a reduced battery power loss. Along with other requirements the IMO has made it mandatory that the antenna be vertically polarized, allowing all radio antennas to be within the same plane, this ensures that the energy transfer from each radio is high. The IMO requires that cargo ships between 300 and 500 gross tons must carry two SCT's. Passenger ships carrying more than 12 passengers on international voyages, and cargo ships of 500 tons or more must carry three SCT's



Handheld emergency transceiver 1

## **PICKUP OR RESCUE**

On sighting rescue craft approaching for pickup (boat, ship, conventional aircraft, or helicopter), quickly clear any lines (fishing lines, desalting kit lines) or other gear that could cause entanglement during rescue. Secure all loose items in the raft. Take down canopies and sails to ensure a safer pickup.

Fully inflate your life preserver. Remain in the raft, unless otherwise instructed, and remove all equipment except the preservers. If possible, you will receive help from rescue personnel lowered into the water. Remember, follow all instructions given by the rescue personnel.

If the helicopter recovery is unassisted, do the following before pickup: Secure all the loose equipment in the raft, accessory bag, or in pockets. Deploy the sea anchor, stability bags, and accessory bag. Partially deflate the raft and fill it with water.

Grasp the raft handhold and roll out of the raft. Allow the recovery device or the cable to ground out on the water's surface. Maintain the handhold until the recovery device is in your other hand. Mount the recovery device, avoiding entanglement with the raft. Signal the hoist operator for pickup

### **Incident report**

This is the true story of the American sailor Louis Jordan who survived 66 days in the open sea before being rescued by a passing vessel

The 37-year-old sailor embarked on a fishing trip on 23 January 2015. His ship, "The Angel," capsized but it righted itself and Jordan drifted further and further from the shoreline, to be eventually rescued 200 miles off of North Carolina's coast. He was missing for 66 days, but speaking to a news network following his rescue, he said the journey felt more like 100 days. His captain's log was lost in the water, along with his books, rice and most of his supplies.

"My boat got flipped and did a 180 on me while I was sleeping at night, and I was flying through the air and somersaulting and all my junk and all my equipment, all my GPS devices and everything, even my stove dislodged and it was all flying with me, all rolling around," he said. Jordan said he suffered a broken collarbone when his boat flipped over.

He survived on gumption, problem-solving and pancakes -- two or three each day, flour fried in oil. Jordan was able to capture rainwater .He also used his laundry to trap fish, which proved to be more successful than his net. He stayed inside the cabin to keep dry and avoid sun, he said, and he survived the first few weeks on his supply of canned food .Jordan says he rationed food and the water he collected in a bucket, and he tried to keep his calorie expenditure low. "That meant I had to stay inside the boat as much as possible, therefore I didn't have a sunburn, or blisters, as if I were found clinging to an upside-down boat," Jordan said.

"Every ounce of energy, there was food. And I was limited on food," he said. As the days passed and his supplies dwindled, Jordan floated on until people aboard a German-flagged ship, Houston Express, spotted him floating on the damaged boat's hull and contacted the Coast Guard in Portsmouth, Virginia. The ship took him aboard, and he was later airlifted by a Jayhawk helicopter, treated at a hospital for dehydration and released.

By reading this mariner's testimony we can easily make out that what kept him alive was the proper rationing of scarce food an water supplies, protection from the natural elements-in this case the sun-and keeping his mind busy.

## **FIRST AID TREATMENT FOR SURVIVORS OF DISASTERS AT SEA**

### **General Principles**

## **Purpose.**

This guide has been written to help you in giving first aid to ship wreck survivors before a medical officer can see them. To use this information to the best advantage, you should know the general principles of first aid, and you must know how to give artificial respiration and how to stop hemorrhage--and you must know the first-aid treatment of shock, burns, heat exhaustion, sunstroke, and of fractures.

## **Use of Own Judgment**

You will have to use your own judgment in caring for cases of this kind. No hard-fast rules can be laid down because no two cases are alike and some people can stand up under hardships better than others. Going without food and water may cause much suffering among some survivors whereas others may not suffer greatly. Some persons can withstand exposure to sun, moisture, heat and cold better than others.

## **What to Expect, and To Do**

Do not forget that burns, broken bones, flesh wounds and the condition of shock are found often among survivors. First-aid treatment must be given immediately for these conditions. Internal injuries cannot be seen and may be overlooked. However, there are certain symptoms you should watch for and be ready to take immediate action when they appear. Shock may be the first and only symptom, or it may develop after the appearance of other symptoms. If the lungs are injured, the victim will have difficulty in breathing. He may spit up or cough up frothy blood. With injury to the stomach and intestines, the victim will complain of pain in the abdomen. Later, due to the severe internal inflammation, you may find that the belly is swollen or very firm and unyielding. It may feel rigid and board-like when you put your hand on it.

## **Blast Concussion Injury, First-Aid Treatment.**

The first-aid treatment of these conditions due to blast should be given immediately. The victim should be made to lie down with his head low and he should be kept warm. If you have morphine give him sufficient morphine to relieve his pain and keep him comfortable. Water or other fluids may be given



if thirst is severe. If you suspect that an internal organ has been ruptured or that there has been internal hemorrhage, there is all the more reason for getting him medical attention promptly.

### **Breathing Hard and Coughing Blood.**

In the case of victims who are breathing hard and coughing blood, prop them up in a half sitting position and use morphine in small amounts only.

### **Effects of Exposure in Open Boat**

Survivors who have been at sea in an open boat or raft for several days or weeks usually will be suffering from one or more of the following conditions:

- Extreme thirst.
- Starvation (malnutrition and under-nutrition).
- Painful and swollen feet ("Immersion Foot").
- Frostbite and effects of prolonged exposure to cold.
- Sunburns.
- Inflammation of eyes caused by sun glare, oily water, or exposure.
- Mental disturbances.

Any one of several or a combination of them, or an injury, may cause shock. Survivors may be so weak that shock will develop unexpectedly when they attempt to climb out of a boat or raft.

### **Carrying and Handling of Survivors**

The survivors should be carried from the boat or raft if possible, and no avoidable exertion should be allowed unless you are sure that there are no serious injuries and that the general physical condition is reasonably good. A good rule to follow is to keep the survivors lying down with the head low and the feet raised. After carrying them to a dry and fairly warm place, remove all clothes, but be very careful to handle the legs and feet as gently as possible. Survivors should be warmed up, but never put a hot water bottle or any direct heat against their feet or legs, because permanent damage may result if they have a condition known as "immersion foot." Don't place survivors near a

radiator, stove, or anything hot. Keep your patients at rest in a warm bed until all signs of exhaustion, shock, and mental distress have cleared up.

### **Examination of Survivors**

You must examine each survivor carefully for injuries, burns, frostbite, swelling, numbness, paralysis, and unusual tenderness of any part of the body. Ask about pain in the arms and legs.



Rescued survivors of shipwreck. Note the physical condition of the patients. Stokes stretcher and blankets are shown in use.

- Comfort and Questions.

After you have made the survivor as comfortable as possible, and if his condition permits, ask him how many days he has spent in an open boat and what the weather was like and if he was injured or sick. Find out how much water and food he had and what kind of food rations were at hand. Ask him if he has taken any sea water to drink.

- Removal of Oil From Skin.

Shipwreck victims often are covered with a heavy coating of dirty oil. This happens when a tanker sinks and survivors are forced into oil covered waters. The oil can be removed by using another oil such as castor oil, mineral oil, lard, clean diesel oil, or other light oil as a wash and following it by the use of soap and water.

- What To Do for Oil in Eyes, Ears, and Stomach.

If the survivor is covered with a dirty coating of oil, some of it usually gets in his eyes. This causes an eye inflammation. Its treatment is described below in the section called "Eye Inflammation." Oil that gets

in the ears may cause earache. It can be relieved by gently flushing the ears out with lukewarm water. Oil that is swallowed may cause vomiting, diarrhea and abdominal pain. These symptoms disappear quickly with rest in bed and a diet of only soft or liquid foods.

- Sores on Body, Legs, and Feet.

Survivors who have suffered from severe exposure may have small sores like boils or ulcers, covering all parts of the body that are not protected by clothing. Carefully clean the dirt from the skin and remove the crust from the sores. Treat the sores with an antiseptic. Do not touch the sores on the feet or legs if the condition known as "immersion foot" is present. You will know how to recognize it after reading its description below.

- Pressure Ulcers and Bed Sores.

Among those who have suffered greatly from starvation, extreme weight loss and emaciation will occur. Pressure ulcers or bed sores may develop from prolonged contact and pressure of the skin against hard surfaces such as thwarts and boat bottoms. Protect the ulcers against further pressure and contact with clothing or bedding by using cotton rings or pads. Do not put the support or padding directly on the ulcer or the surrounding inflamed area. Change the position of the patient frequently by turning him. Cleanse the inflamed areas daily with alcohol and dust with antiseptic powder. Keep the areas clean and dry and do not apply a dressing.

- Caution About Starting Treatment.

Don't start treating anyone until you have carefully read the treatment for all conditions described in this guide. The treatment of special conditions caused by exposure and lack of food and water will now be taken up.

## **Care of Survivors Suffering From Extreme Thirst**

### **General Description.**

If the victim has been exposed for a long time and has not had enough water, he will be suffering from extreme thirst. Except for shock and serious injuries extreme thirst causes the greatest suffering and the most deaths among

survivors. The treatment of starvation is not important when survivors are dying of thirst.

- Food and water.

Without food the average man may be expected to live for about twenty-one days if he has water to drink. If he gets less than one pint of water per day, and provided he gets no moist food, he will suffer from thirst after a few days. However, survivors have been known to live for ten days or more on as little as two or three ounces of water per day without causing any apparent bodily damage. The amounts of water and food needed by a survivor depend upon weather conditions, physical exertion and individual resistance.

- Unconsciousness and shock.

Thirst may be so severe that it causes unconsciousness or extreme shock. Don't give water by mouth in cases of this kind. They should be treated for shock. After recovery from shock, they can usually take small amounts of sweetened water by mouth. It is best not to give alcoholic stimulants to survivors who are in need of water.

**Treatment of Extreme Thirst.**--Do not try to give fresh water or salt water through a rubber tube or other device inserted into the rectum. If shock or unconsciousness cannot be overcome, the immediate attention of a medical officer is necessary. Great loss of weight, high fever, very fast pulse, convulsions and being unable to urinate are symptoms which show that there is serious damage and that prompt medical attention is needed. In most cases, however, small amounts of water can be taken by mouth immediately. If severe thirst is present and there is difficulty in swallowing and a dry mouth, a few ounces of water with sugar added should be given every two hours and the amount should be gradually increased. Use about a teaspoon of sugar to a glass of water. Usually these cases are also suffering from starvation and the feeding of soft and liquid foods will help in providing water. If moderate thirst is present, it is treated by giving the victim all the water he can comfortably take and as often as he likes. Zinc oxide ointment may be used to treat the lips when dryness has caused cracks and sores.

**Swelling of Legs Following Treatment.**

After the water balance of the body has been brought back to normal, the survivor's feet and legs may swell. This swelling may be due to (1) "immersion foot", (2) lack of vitamins in the diet, (3) lack of meat and other proteins in the diet. Keep the victim's feet raised above the level of the body until the swelling goes down.

### **Note on "Urinating".**

Don't be alarmed if, for the first week or more after rescue, the survivor complains of urinating more often than usual.

## **Starvation**

### What to Expect.

Most of the survivors after long exposure are suffering from starvation. The effect of starvation is much like that of severe thirst. It may be so severe that unconsciousness or shock will result and no attempt to give food or water by mouth should be made until the shock has been treated. Usually the victims have lost a great deal of weight. They may have fever and breathing may be shallow and fast. Keeping them at rest in a warm bed is of the greatest importance in treating both starvation and extreme thirst. If they have trouble in swallowing, dry mouth, and difficulty in urinating, you must treat them for thirst before giving soft or solid foods.

### Feeding a Starved Survivor.

In general, the feeding of starved victims is like feeding a person who is just recovering from a serious illness. Give them small amounts of easily digestible foods at frequent intervals. For stimulants, give hot tea or coffee with sugar added. Victims who have been starved for three weeks or more and those who have been on a poor diet before shipwreck will usually need vitamins. To supply vitamins and fluids, give sweetened fruit juices (fresh orange juice, fresh lemonade, and canned grapefruit juice). The juice from ordinary canned tomatoes may be given and is usually less apt to cause an upset stomach than tomato juice cocktail.

## Effects Produced by Lack of Vitamins.

Extreme lack of vitamins often causes sore mouth, swollen and bleeding gums, ulcers of the eyes, skin troubles, and swollen legs and arms. The sores in the mouth may be very troublesome, causing ulcers and difficulty in eating. Concentrated vitamins (of the kind that contain several vitamins including vitamins B and C) should be given. Two or three times the usual daily dose should be given. Remember that the lack of vitamins is more apt to cause trouble in warm and tropical climates. If you do not have vitamin pills, the treatment for starvation which is described below will help until the victims get medical attention.

## First, Second, and Third Day of Treatment.

On the first day of treatment, give either fresh milk, condensed milk, or canned evaporated milk. Water must be added to the canned milk so that it has about the thickness of fresh milk. Sugar should be added to the fresh milk and evaporated milk, but it need not be added to sweetened condensed milk. Do not give cream or greasy foods for the first few days. Clear soups and broths are good if they do not contain much fat. Gruel, such as oatmeal, cream of wheat, or other well-cooked cereals with sugar and milk added are good. Usually on the second day toast and bread can be added to the victims' diet, and by the third day regular full well-balanced meals can ordinarily be given.

## Nutritional or Famine Edema (dropsy)

A condition known as nutritional or famine edema (dropsy) may be seen in victims who have been starved for a period of two months or more. It is a result of not getting enough meat and other protein foods. In addition to the starved appearance, there is a swelling of the feet, legs, hands, and arms. To treat such cases give foods having a high protein content, such as eggs or meat. At first, give egg drinks and broth or soups. Try to get such cases under medical attention as soon as possible because they usually need hospital care.

## Bowel Movements.

Survivors who have been on small food or water rations or without food or water for several days often become alarmed because they have few or no bowel movements. This is to be expected and no first-aid treatment is

necessary. However, if desired, for such cases an enema may be given for the treatment of constipation.

### **Immersion Foot**

#### Cause and Symptoms.

If a survivor has been sitting in an open boat for a long time, his feet are often cold and wet. Actually they may have been immersed in icy water in the bottom of the boat. This causes a condition called "immersion foot." It may develop even though the victim has been wearing shoes or boots. Usually the first thing noticed is painful feet, and then a few days later the feet and legs begin to swell. These first symptoms are much like chilblain, even though the water temperature may have been above freezing. After a time discoloration of the skin appears and blood or water blisters, ulcers, and even death of the tissues may occur. The feet feel numb and they may become paralyzed. Numbness and tingling sensations may be felt in the arms and hands.

#### First-aid Treatment of Immersion Foot

First-aid treatment for "immersion foot" is very important because the vitality of the legs and feet has been lost and the tissues are easily damaged. With treatment the circulation of blood in the legs and feet is improved, but remember that too rapid a return of circulation may cause severe pain and further damage. Be very careful in handling the limbs while numbness is present to keep from injuring the flesh. Keep the victim's feet and legs raised above his body level and put cold compresses on them for fifteen or twenty minutes out of every hour to relieve the pain. For compresses, use cloths that have been wrung out of cold water.

Do not let the skin get wet. Use a rubber sheet or layer of other waterproof material to protect the skin from the moisture. Instead of compresses, ice bags may be used if a towel is placed underneath to protect the flesh. An electric fan blowing cool air over the feet may be as comforting as either compresses or ice bags. Keep the rest of the victim's body warm by applying heat. The arms may be placed in hot water to gradually warm him up.



"Immersion Foot." Salt water caused these sores on the legs of this castaway after seven days on a life raft.

Never put direct heat on a foot or leg of a victim suffering from "immersion foot." Massage is harmful and the legs should not be washed and antiseptic should not be used. If you have sulfanilamide powder, you should dust it into any ulcers, cuts or sores that may be present on the limbs. Place the injured limb or limbs in dry cotton or wool and keep them cool. Don't apply any tight dressings or bandages because they may stop the circulation. You may have to keep up the treatment several days or weeks before the symptoms of "immersion foot" disappear. As long as there is paralysis or swelling or pain, the patient should not be allowed to walk and the treatment should be kept up.

### **Frostbite and Prolonged Exposure to Cold**

#### General Description and Care

Survivors who are in a weakened condition and who are starved are apt to suffer severely from the effects of cold. When the whole body has been exposed to severe cold the victim becomes numb, it is difficult for him to move, his eyesight fails, and he may become unconscious. In such a case, carry the patient to a cool room and warm him up very slowly. If breathing has ceased, give artificial respiration. Rub the limbs with cloths wet in cool water. When he begins to come to, give him a warm stimulating drink, such as coffee, tea or cocoa. Also slowly make the room warmer or move him to a warmer room. Then put the patient in a warm bed. If the patient is only chilled and is not unconscious and no parts of his body are frozen, he should be put in a warm bed at once and given hot stimulating drinks.

#### Frostbite



Frostbite is the freezing of single parts of the body most often the nose, ears, cheeks, fingers and toes. Frostbitten hands or feet are usually very painful. Frozen ears, cheeks and nose are not painful and the victim usually does not realize they are frozen until someone notices the color change and tells him about it.

### Thawing Out Frozen Parts

In thawing out frozen parts of the body, never use heat. If the parts thaw too fast, pain and swelling result. The skin may peel off leaving a raw surface and there is danger of infection.

### First (chilblain), Second, and Third Degree Frostbite

In first-degree frostbite, sometimes called chilblain, the skin is a dark red color and the part is painful. In second-degree frostbite, the skin is bright red and there are blisters. In third-degree frostbite, the frozen part is pale, stiff, and brittle.

### Treatment

Treatment should be started by putting cold wet cloths on the frosted part. Do not rub snow or ice on it. The temperature of the water in which the cloths are soaked should be raised gradually (a degree or two every few minutes) until it is luke-warm. If there are blisters, do not open them. Stop this treatment when the skin color is normal again and apply boric acid ointment to the frozen areas. Parts that are dead as a result of third-degree frostbite will, of course, not improve with treatment, and gangrene (death of the tissues) will set in. Cases like this need medical attention as soon as possible.

## **Sunburns**

### Results and Causes

Sunburn of survivors can be very serious and deaths have resulted from it when large areas of the body have been burned as a result of scanty clothing.

Exposure in an uncovered boat or raft can cause sunburn even under a cloudy sky. A well-tanned skin does not protect always against sunburn.

### Moderate Sunburn First-Aid Treatment

First-aid treatment for sunburn is the same as for any burn. For moderate sunburn where the skin is reddened and very small blisters appear, use a burn ointment such as tannic acid ointment or boric acid ointment. Use zinc oxide ointment in cases where the skin has begun to crack and peel

### Symptoms and Treatment of Severe Sunburn

For more severe burns where large blisters are present, put on boric acid ointment and cover with sterile gauze. If boric acid ointment is not available, use vaseline. Be careful not to open any blisters that have not already broken. Usually fever is present in cases of this kind and in cases where large areas of the body are moderately sunburned. Feverish patients should be kept in bed and drinking water and other fluids should be plentifully given.

## Eye Inflammation

### Causes of, In Survivors

Eye inflammation often occurs among survivors. It may be caused by exposure to wind, cold, or salt water; another kind called reflection blindness is caused by exposure to sunlight or sun glare reflected from water, snow, or ice. Eye inflammation is also caused by oil that may get in the eyes when survivors have to swim in oil-covered water.

### Symptoms of Eye Inflammation

The symptoms of eye inflammation are about the same whatever the cause. Where oil is the cause, the eyes look oil stained and dirty. Eye inflammation causes the eyes to be red, bloodshot, overflowing with tears, sometimes painful, and there is often a sticky crust on the lids. Looking at a bright light is usually painful to the victim.

### Treatment of Eye Inflammation

Use a 2 percent baking soda solution or a boric acid solution to wash out the eyes. The solution should be dropped in the eyes using an eye dropper or medicine dropper. You can make the baking soda solution by adding one level teaspoonful of baking soda to one-half pint of water. If you cannot make up the baking soda solution, use boric acid solution. Cold compresses (ice bags or cloths wrung out of cold water) should be placed over the eyes for 10 minutes out of every hour that the eyes are painful. Don't use the cold compresses if

there are ulcers in the eyes, but get medical attention as soon as possible. If you have a supply of clear, clean, mineral oil on hand, use a drop of its in each inflamed eye three or four times per day. Use an eye dropper or medicine dropper to drop it into the eyes. Do not put any bandages or covering over the eyes. Have the victim wear dark glasses until all the inflammation is gone.

### **Mental Disturbances**

Mental disturbances are common among survivors as a result of their severe hardships. Such complications are most often seen in victims of middle age or older who are in poor physical condition. Fatigue and exhaustion cause nervousness or depression. When victims are rescued they may be so happy and excited that their minds are temporarily unbalanced. Survivors may become boisterous and very excitable or they may be so depressed that they appear to be unconscious.

#### **Require Watching**

If possible, have someone stay with them as long as mental disturbances are present.

#### **Delirium and Fever**

When a victim is delirious, it usually shows that he has a fever and is seriously ill. Convulsions and delirium sometimes result when desperate survivors have taken to drinking sea water. People who drink considerable quantities of sea water seldom ever live to tell about it.

#### **Treatment**

Survivors must be reassured that "everything is all right," and that there is nothing to fear. Mental disturbances usually clear up with rest and with treatment for the other conditions described in this guide. You may have to give mild sedatives such as phenobarbital or bromides to help the victims relax and sleep. Rest in bed in a quiet room and sedatives should be provided for several days or weeks when the mental condition is especially serious and slow to improve.

## **FINAL WORD**

Life at sea is surely one of the most intriguing and profitable professions but one must never underestimate that seas will always remain untamed and will

always pose a threat to the life of those who choose to work at sea, therefore our only shield against this force of nature is our preparation, readiness and above all our will to survive at sea.

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