Setrac College of Offshore Training

PROFICIENCY IN

PERSONAL SURVIVAL TECHNIQUES

Trainee Handout

PERSONAL SURVIVAL TECHNIQUES

ISSUE DATE – Oct 2014		
DATE	REVISION	REVISED BY
01 Jan 2016	Rev 01	Training Coordinator
01 Jan 2020	Rev 02	Training Coordinator
01 Jan 2023	Rev 03	Training Coordinator
01 Jan 2024	Rev 04	Training Coordinator

TIME TABLE			
SL	TOPIC	MODE	DURATION
	Introduction Safety & Survival	Lecture / Presentation	0.75 H
	Emergency situations - Types of emergencies,Precautions - Fire Provisions,Foundering Crew expertise and initial familiarisation,Muster -	Lecture / Presentation	1.5 H
	Evacuation Abandoning ship ' last resort,Personal preparation for abandoning ship,Need to prevent panic,Crew	Lecture/ Presentation	0.75 H
	Survival Craft and Rescue boats	Presentation/ Workshop/ Exercises	2.0 H
	Personal Life-saving appliances Lifebuoys, Lifejackets, Immersion suits/anti-exposure suit, Thermal Protective aids	Lecture/ 0 Demonstration of Equipment's	0.75 H
	Personal Life-saving appliances (Demonstrations) -	Lecture/ Presentation/ Workshop/ Exercises	7.75
	Survival at sea Dangers to survivors,Best use of survival craft facilities	Lecture/ Presentation/ Workshop/ Exercises	0.50 H
	Emergency radio equipment (Lecture and Demonstrations) --- Emergency position-indicating radio beacons (EPIRBs)	Lecture/ Presentation/ Workshop/ Exercises	2.0 H
	Helicoopter assistance Helicopter pick-up	Lecture/ Presentation/ Exercises/ Contingency plans for various security related emergencies	1.5 H

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CHAPTER – 1

INTRODUCTION SAFETY AND SURVIVAL

1. The value of regular training of all personnel in lifeboat, life raft and any survival equipment cannot be over-emphasised. Personnel must be always prepared to respond to any emergency necessitating launching, embarkation or manning of survival craft and equipment. There is no substitute for thorough knowledge, periodic training and practical drills in regard to survival at sea.

2. **Principle of Survival at Sea.** The principles of survival at sea are :-

(a) Regular Training and Drills

(b) Preparedness for any emergency

(c) Knowledge of action to be taken:

(i) When called to survival craft stations

(ii) When required to abandon ship

(iii) When in the water

(iv) When aboard a survival craft

(d) Knowledge of the main dangers to survivors.

3. **Definitions.** The various definitions as associated with survival craft and appliances are listed below :-

(a) **Survival Craft** is an approved craft capable of sustaining the lives of persons in distress from the time of abandoning the ship.

(b) **Rescue Boat** is a boat designed to rescue persons in distress and to marshal Life Raft.

(c) **Free Fall Launching** is the method of launching a survival craft whereby the craft with its complement of persons and equipment on board is released and allowed to fall into the sea without any restraining apparatus.

(d) **Inflatable Appliance** is an appliance which depends upon non-rigid, gas filled chambers for buoyancy and which is normally kept uninflated until ready for use.

(e) **Immersion Suit** is a protective suit, which reduces the body heat loss of a person wearing it in cold water.

(f) **Thermal Protective Aid** is a bag or suit made of waterproof material with low thermal conductivity.

(g) **Launching Appliance** is a means of transferring a survival craft or rescue boat from its stowed position safely to water.

CHAPTER – 2

EMERGENCY SITUATIONS

1. An emergency is not qualified by time, place or season. It may occur at any time. This is particularly true of life at sea. A mariner so often encounters the elements of nature first hand. Modern technology has greatly advanced in improving ship design, better life saving and survival equipment, navigational aids and weather forecasting. Nevertheless risks, dangers and uncertainties associated with passage by sea still exist.

2. The present day seafarer can be however much better prepared and equipped to tackle an emergency at sea even when there may arise a need to “abandon ship”. The chances of survival at sea are much higher today than ever before.

3. **Types of Emergencies.** The various emergencies that may occur at sea are :-

(a) Fire

(b) Collision

(c) Gas Explosion

(d) Flooding

(e) Shifting of Cargo

(f) Gas leak

(g) Stranding

(h) Engine failure

(i) Unforeseen mishap such as an accident, serious illness

(j) Foundering.

Precautions

4. Precautions should be taken in all aspects of ship operations so that such emergencies do not occur. General precautions consist of the following :-

(a) Safe Navigation of the Vessel.

(b) Fire Prevention.

(c) Proper handling, stowage and care of cargo.

(d) Training of crew and regular practice of emergency drills aboard ships.

Fire Provisions

5. All vessels are well equipped with adequate appliances for fire fighting to tackle any fire that may occur on board. The means available to fight a fire are :-

(a) Fire pumps, pipelines, hydrants, hoses and nozzles.

(b) Fixed fire detection and extinguishing system such as sprinkler

system,

inert gas system, CO_2 system, foam system etc.

(c) Various types of fire extinguishers to suit location and expected types of fires. Types of extinguisher normally provided are water/ CO2, foam, dry chemical powder, CO_2 etc.

(d) Personal protection and safety equipment, such as breathing apparatus sets, fire protection suits and an array of safety gear.

(e) Design and construction of the vessel which contributes immensely in restricting the spread of fire.

Foundering

6. A vessel is said to "founder" when she has lost her reserve buoyancy and / or has become unstable and is consequently unable to stay afloat.

7. Foundering is prevented by the watertight integrity and stability of the vessel. In order to maintain the watertight integrity of a vessel, it is essential that all watertight closing appliances, such as hatch covers, water tight doors, bow stern and side doors and ramps, ducts etc. are securely closed and battened down prior proceeding to sea.

8. Further, in case of ingress of water, resulting in flooding and/ or bulging of a watertight space or compartment, means are provided to pump out the water by the bilge and ballast systems.

Crew Expertise

9. The human resource factor is absolutely vital to the tackling of emergency situations that arise on board. It is therefore essential that the ship's crew is competent, skilled and thoroughly familiar with the operating environment. They must be fully schooled in safe working procedures. They should be well trained in the operation of life saving and fire fighting appliances and be fully geared to handle any emergency.

10. Regular conduct of emergency procedure training and drills will establish which crew members should be given a particular emergency duty. This is essential to the success of the emergency procedure. Crew should be thoroughly familiar with boat and fire drills. It is essential that in an emergency, if the order to abandon ship is given, the same be carried out in an organised and disciplined manner. There should be a sense of urgency without resorting to any panic or commotion.

Muster List and Emergency Signals

11. The Muster List provides clear instructions for every person to follow in the event of an emergency. The Muster List is exhibited in conspicuous locations throughout the ship, including Navigation Bridge, machinery space and crew/passenger accommodation spaces. Illustrations and instructions in the appropriate language are also posted in conspicuous locations, crew/passenger cabins and displayed at muster stations / notice boards to inform crew and passengers with regard to : -

(a) Their muster station.he essential actions that they should take in an emergency.

(c) The proper method of donning life jackets.

EMERGENCY STATION & BOAT STATION MUSTER LIST

M.T. _____

COMMAND TEAM

Primary muster location

Secondary muster location

Name	Rank	Duty
	Master	O.I.C
	NWKO	Asst.
	Radio Off	Commun
	SH Man	Steering
	SH Man	Messenger

TECHNICAL TEAM

Primary muster location

Secondary muster location

Name	Rank	Duty
	C.E. Off	Leader
	3.E Off	Deputy
	E.E Off	
	E.E Off	
	ERPC	
	ER Serang	
	DG	
	DG	

SUPPORT TEAM

Name	Rank	Duty
	Cat Off	Leader
	CC Off	Deputy
	2nd Cook	
	Crew Cook	
	Lman	
	SUH	

General Emergency alarm: Seven or more short blasts followed by one long blast on the ship's whistle or siren and additionally on an electrically operated bell.

Fire alarm : Continuously sounding of an electrically operated bell.

Abandon Ship Signal : Shall consist of the general emergency alarm signal followed by the spoken word

ABANDON SHIP : by the master of the vessel or Chief Officer in the event of incapacity of master.

EMERGENCY TEAM I

Primary muster location

Secondary muster location

Name	Rank	Duty
	Ch. Off	Leader
	4.E. Off	Deputy
	POM	
	SH Man	
	Seaman I	
	Seaman II	
	ERR II	
	GS	

EMERGENCY TEAM II

Primary muster location

Secondary muster location

	Rank	Duty
	2.E. Off	Leader
	2nd Off	Deputy
	5.E. Off	
	EPRO	
	DG	
	ERR II	
	Seaman I	
	GS	

BOAT PREPARATION TEAM

Primary muster location

Secondary muster location

Name	Rank	Duty	Name	Rank	Duty
	TNOC	**Leader**			
	DK Sarang Serang	Deputy		2 E Off	
	SH Man			AWKO	
	GS				
	DUH				

BOAT STATION

Life boat No. 1			Lifeboat No. 2		
Name	**Rank**	**Duty**	**Name**	**Rank**	**Duty**
	Master			C.h. Off	
	2nd Off			NWKO	
	Radio Off			2.E. Off	
	C.E. Off			4.E. Off	
	3.E. Off			Cat Off	
	E.E. Off			ERPO	
	ERPO			SH Man	
	Deck Hand			SH Man	
	SH Man			Seaman II	
	SH Man			Seaman II	
	Seaman I			DG	
	DUH			DG	
	ER Rating			EPR II	
	DG			2nd Cook	
	ERR II			GS	
	CC Bkr			GS	
	Crew Cook			SUh	
	GS				
	Liferaft (Starboard)			**Liferaft (Port)**	
	5.E Offf	**Leader**		**TNOC**	**Leader**
	L Man			SUH	
	Rating			Rating	
				Rating	

12. **Embark Dry.** The survivors should try to board the survival craft dry preferably onboard the ship before it is lowered and should avoid jumping into the water. But in case a survivor misses the boat, he should try to get into the survival craft by means of a ladder or a rope.

Jumping into Water

13. **Be Ready to Jump.** Quite often it becomes essential for the survivors to jump into the water and in that case they should not jump into the water from a height greater than 6 meters (20 ft). If the survivors have to jump they should jump near and slightly ahead of the survival craft wearing the lifejacket.

14. **Jump Correctly.** It is important that the correct procedure for jumping into the water is followed, which is stated below :-

(a) Block off nose and mouth.

(b) Hold the lifejacket with the other hand.

(c) Keep the feet together.

(d) Check below to see that it is all clear in the water. NEVER jump into the boats or on top of the rafts from a height.

(e) Look ahead, parallel to the horizon and jump with the feet first.

(f) After jumping into the water, swim and get into the survival craft as fast as possible.

The General Emergency Alarm Signal

15. It is provided to alert all crew and passengers of an emergency. The general emergency alarm signal consists of seven or more short blasts followed by one long blast on the ship's whistle or siren and additionally on an electrically operated bell or klaxon or other equivalent warning system. The system is powered from both the ships mains supply and the emergency source of electrical power.

16. The system is capable of operation from the Navigation Bridge and except for the ship's whistle, also from other strategic points. The system shall be audible throughout the accommodation and normal crew working spaces and supplemented by a public address system or other suitable communication system.

17. An emergency communication system comprising of either fixed or portable equipment or both is provided for two-way communication between emergency control stations, muster and embarkation stations and command centre.

Emergency Drills

18. Should be held at regular intervals to familiarise crew and passengers about their muster stations, duties and use of survival and emergency equipment. Frequent practice

builds up confidence and contributes significantly in the successful handling of an emergency.

19. Practice emergency musters and drills are required to be carried out at regular intervals, as enumerated below :-

(a) **On Cargo Ships.** Each member of the crew shall participate in at least one Abandon ship Drill and Fire drill every month. The drills of the crew shall take place within 24 hours of the ship leaving a port if more than 25% of the crew have not participated in abandon ship and fire drills on board that particular ship in the previous month.

(b) **On Passenger Ships.** On a ship engaged on an International voyage, which is not a short International voyage, musters of the passengers shall take place within 24 hours after embarkation.

(c) Passengers shall be instructed in the use of life jackets and actions to be taken in the event of an emergency. If only a small number of passengers embark at a port after the muster has been held it shall be sufficient, instead of holding another muster, to draw the attention of these passengers to the emergency instructions.

(d) An abandon ship drill and a fire drill shall take place weekly.

Crew and Emergency Instructions

20. Personnel should, as soon as possible after joining a ship, acquire knowledge of :-

(a) The meaning of emergency signals.

(b) Instructions on the muster list and their duties.

(c) The location and use of life-saving equipment.

(d) The location and use of fire-fighting equipment.

(e) Escape routes and equipment.

(f) Emergencies involving sinking of the ship.

(g) The means provided for survival on ship and survival craft.

Extra Equipment and Survival

21. Survival crafts are adequately provisioned and provided with drinking water and equipment. However, if time permitting, effort should be made to supplement the aforesaid by taking extra material from the sinking ship.

22. In case it is obvious that a ship is in danger of sinking, but that there is still time in hand before it becomes necessary to abandon ship, the coxswain would do well to have some extra gear put in the boat. However, it must always be remembered that more

extra gear in the boat means that there would be that much lesser room available for survivors.

23. A recommended list of extra gear which may be taken from the ship to the survival craft, if time permits, is given below :-

(a) Blankets.

(b) Tinned milk, milk tablets, fruit, biscuits and sweets.

(c) Note-book, pencil and a water-proof watch.

(d) Torches, batteries and bulbs.

(e) Palm, needles and sail twine.

(f) Ship's pyrotechnics, if unused.

(g) EPIRB's.

(h) Plastic bags and a small pocket radio receiver.

(i) Fog Horn.

(j) Thermal protective aids and immersion suits.

(k) Take extra water, fuel and lubricating oil, three quarter full clean bottle - necked containers or jerry cans, then cork, float and tow them.

(l) Take a grapnel and line (in a boat only).

Abandoning Ship Complications

24. It must always be remembered that an emergency can never be adequately simulated. There is a distinct difference between drills and real emergency situations. The knowledge and practice acquired during drills is important for handling a real emergency situation. Yet this alone may not be enough. Personnel should be prepared to perform additional tasks in an actual emergency.

25. If the crew/members assigned to certain duties are incapacitated, then others would have to perform additional tasks to make up for them. This means that during drills each member should watch the whole team at work in addition to carrying out his own duties.

26. Absence of lighting and listing of the ship may lead to disorientation which can be prevented if the ship's personnel know by heart their emergency stations and how to get to them.

27. Damage to their assigned survival craft may force personnel to embark in other craft.

28. To summarise, complications in abandoning ship may be caused by :-

(a) Some of the survival craft not capable of being launched.

(b) Absence of lighting.

(c) Absence of personnel assigned to certain duties.

CHAPTER – 3

EVACUATION

1. The decision to abandon ship is taken after considerable thought and only as a last resort. The ship is the best "survival craft". Thus in case of any emergency it is a constant endeavour to be on board and tackle the emergency itself. However as and when it becomes evident that remaining on board would be detrimental to survival and life threatening, the decision for evacuation may be taken. This decision to evacuate is executed by an order from the Master to "Abandon Ship".

2. **Last Resort.** When disaster strikes a ship, the Master may be compelled to order the vessel to be abandoned. Since the ship provides all life support systems, any decision to abandon is normally a last resort. Should the vessel be no longer safe because of collision, fire explosion, toxic substance or caprice or any other reason the order to abandon may be given.

3. **Personal Preparation.** The circumstances will dictate what action should be taken by personnel. In an escalating emergency where abandonment is a likely outcome, warm clothing preferably a thermal suit, covered by an immersion or survival suit is essential. A life jacket should be donned and secured tightly. Once immersed in cold water with a badly secured life jacket, survivors would find the task of re-securing with wet, cold hands extremely difficult if not impossible.

4. **Prevent Panic**. It is normal practice that the order to abandon ship is passed by word of mouth. Personnel in boats are to be seated and strapped into position. The officer in-charge assumes command of operation within the craft, and persons should remember that the launching period is critical, and that the concentration of the officer in charge should not be interrupted except in exceptional circumstances. It is a period of tension and it is within the survivor's own interests to allow persons with designated task to be left alone to get on with the job in hand. Keep alert, and unless you have constructive comments regarding the situation, keep quiet, assist other people inside the craft, especially injured personnel, if you can. Make casualties as comfortable as possible and try to reassure them that everything is going well, even when the situation may appear to be difficult.

5. **Crew Duties to Passengers.** SOLAS regulations specify that there shall be sufficient number of trained persons on board a ship for mustering and assisting untrained persons. These may be deck officers or certified persons. The muster list shows several duties assigned to members of the crew in relation to passengers in case of emergency. The duties shall include :-

(a) Warning the passengers.

(b) Seeing that they are suitably clad & have donned their life jacket correctly.

(c) Assembling passengers at muster stations.

(d) Ensuring that a supply of blankets is taken to the survival craft.

(e) Keeping order in passengers and on the stairways and generally controlling the movements of the passengers.

6. **Crew Duties Launching Survival Craft.** There shall be sufficient number of crew members, who may be deck officers or certified persons, on board for operating the survival craft and launching arrangements required for abandonment by the total number of persons on board. Personnel required on board for the operation of survival craft and implementation of launching arrangements are as follows :-

(a) Bowman.

(b) Ford Gripes safety pin and painter.

(c) Brakesman.

(d) After gripes and safety pins.

(e) Ladder and help passengers to man the boat.

(f) Stern sheet.

7. **Master's Order to Abandon Ship.** The order to abandon ship is given directly by the master when disaster strikes a vessel and she is no longer safe due to :-

(a) Collision.

(b) Fire.

(c) Explosion etc.

"NO SHIP IS TO BE ABANDONED, EXCEPT BY ORDER OF THE MASTER".

8. **Means Essential to Survival.** After the ship has been abandoned the following are the essential means required to survive at sea:

(a) **A Means of Keeping Float.** This is a primary requirement. The aim is to remain afloat with minimal loss of body heat or energy. The means available are life jackets, life rafts and lifeboats.

(b) **A Means of Keeping Warm (Appropriate Warm Clothing).** Hypothermia or loss of body heat is the major killer of personnel who have abandoned ship at sea. Water being a good conductor causes the body to lose heat rapidly. The best means are good preparation by donning appropriate warm clothing prior to abandoning ship, including thermal protective aids.

(c) **Nourishment - Drinking Water and Food.** First 24 hours nothing, then issue ½ litre per person per day. Only eat carbo - hydrates such as sweet, glucose etc.

(d) **A Means to Communicate.** This is essential to subsequent location and rescue. The means available are lifeboat radio, EPIRB, pyrotechnics, day light signalling mirror waterproof torch, etc.

CHAPTER – 4

SURVIVAL CRAFT AND RESCUE BOATS

Lifeboats

1. SOLAS regulations specify that all survival craft shall be properly constructed and shall be of such form and proportions that they have ample stability in a seaway and sufficient freeboard when loaded with their full complement of persons and equipment. The numbers of lifeboats that are to be carried by passenger and cargo ships are laid down in Regulation 20 and Regulation 26 of Part B, Chapter III of SOLAS.

2. **Passenger Ships.**

(a) Passenger ships engaged on international voyages which are not short international voyages shall carry by the requirement of the regulation on each side of such aggregate capacity as will accommodate not less than 50% of total number of persons on board.

(b) The administration may permit the substitution of lifeboats by life rafts of equivalent total capacity provided that there shall never be less than sufficient lifeboats on each side of the ship to accommodate 37.5% of the total number of persons on board.

3. **Cargo Ships.** Cargo Ships shall carry one or more totally enclosed lifeboats, of such aggregate capacity on each side of the ship as will accommodate the total number of persons on board. The administration may, however, permit cargo ships (except oil tankers, chemical tankers and gas carriers) operating under favourable climatic conditions and in suitable areas, to carry partially enclosed life boats, provided the limits of the trade areas are specified in the cargo ship safety equipment certificate.

4. **Types of Life Boats.** Different types of lifeboats are :-

(a) Open.

(b) Partially enclosed.

(c) Self-righting partially enclosed.

(d) Totally enclosed.

(e) Totally enclosed with a self-contained air support system.

(f) Fire Protected.

5. **Open Lifeboat.**

(a) Most modern lifeboats for ships are now manufactured in Glass Reinforced Plastic (GRP); older boats currently in use are aluminium alloy or steel, with very few wooden built boats still operational. The maintenance and natural life of wooden boats are two major reasons for their being superseded by boats of GRP type construction.

(b) Interior section of the open lifeboat is moulded in one-piece design. This provides the boat with a double hull from the gunwales down. Internal compartments are filled with buoyancy foam, the amount of which is increased with the added volume of the double hull. Additional items such as thwarts, gunwales, keel, buoyancy tanks and small gear lockers, are all manufactured in GRP and forms integral parts of the hull. A GRP boat has great strength, and requires almost nil maintenance compared with wooden or steel boats.

(c) Seating is provided on thwarts, benches or fixed chairs fitted as low as practicable in the lifeboat and constructed so as to be capable of supporting the required number of persons each weighing 100-kg.

(d) All lifeboats shall have inherent buoyancy or fitted with inherent buoyant material, which shall not be adversely affected by seawater, oil or oil products, sufficient to float the lifeboat with all its equipment on board when flooded and open to sea.

(e) The lifeboat shall be propelled by a compression ignition engine. The fuel used should have a flash point above 43°C. The engine should be capable of operating for not less than 5 min after starting from cold with the lifeboat out of water.

(f) All lifeboats shall be provided with at least one drain valve fitted near the lowest point in the hull, which shall automatically open to drain water from the hull when the lifeboat is not waterborne and shall automatically close to prevent ingress of water when waterborne.

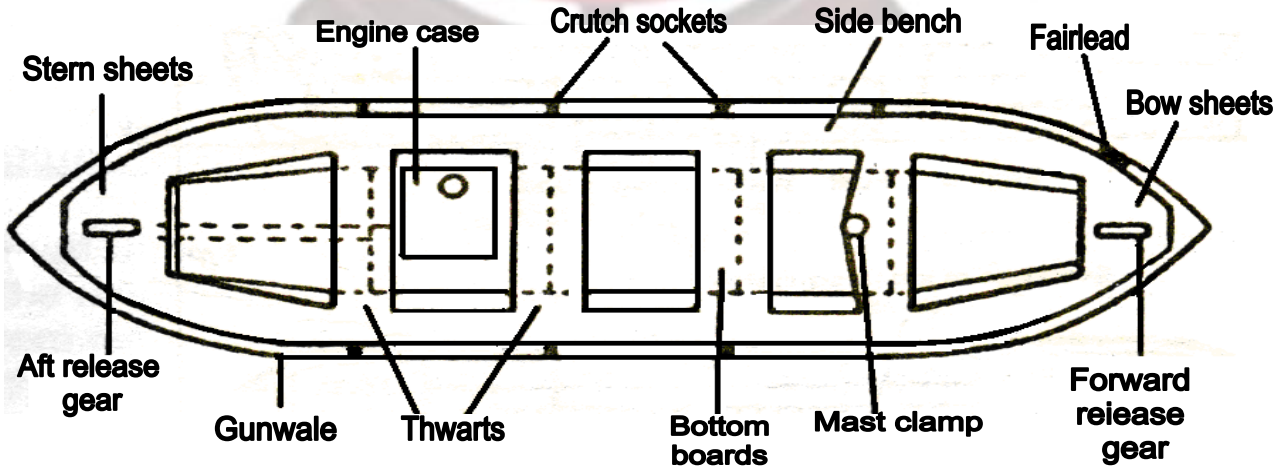


Fig 1 - Open Lifeboats

(g) A rudder and tiller shall be provided in every lifeboat. Even when remote steering is provided the tiller shall be capable of controlling the rudder in case of failure of steering system.

(h) A buoyant lifeline shall be becketed around the outside of a lifeboat except in the vicinity of the rudder and propeller.

(i) Lifeboats, which are not self-righting when capsized, shall have suitable handholds on the underside of the hull to enable persons to cling to the lifeboat.

(j) There shall be sufficient small watertight lockers or compartments in the lifeboat to carry prescribed equipment, water and provisions.

(k) Every lifeboat shall be provided with effective means of bailing or be automatically self bailing.

6. **Partially Enclosed Life Boats.**

(a) These boats are made of glass re-enforced plastic (GRP). Partially enclosed lifeboat shall have the following specifications :-

(i) Partially enclosed boats must comply with general requirements for lifeboats.

(ii) Every partially enclosed boat shall be provided with effective means of bailing or be automatically self bailing.

(iii) They shall be provided with permanently attached, rigid covers extending over not less than 20 % of the boats length from the stem, and 20% of the length from the after most part of the boat.

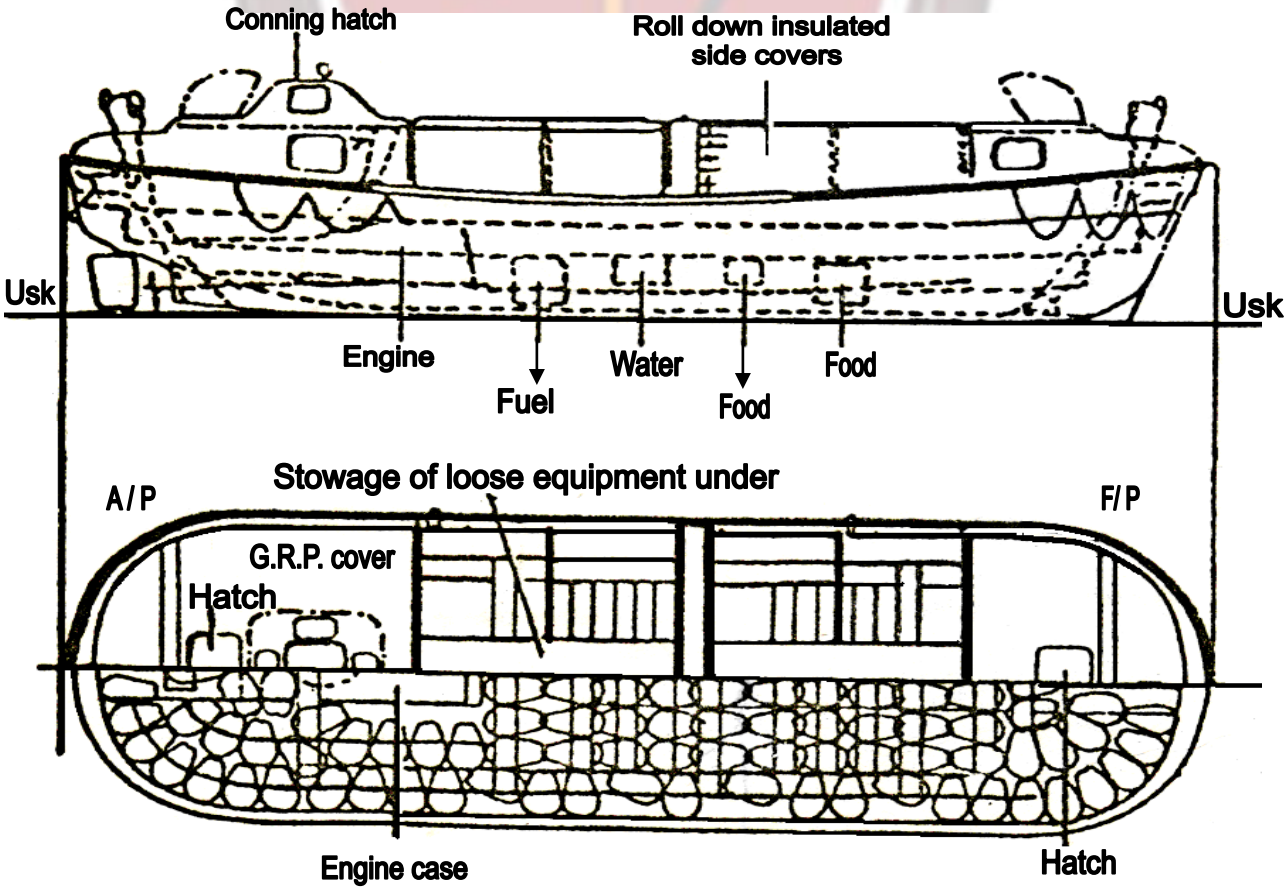


Fig 2 - Partially Enclosed Lifeboat

(b) The arrangement of the canopy is governed by the following requirements:-

(i) It must be provided with adequate rigid section or battens to permit the erection of the canopy.

(ii) It must be easy to erect by not more than two persons.

(iii) It must be insulated to protect the occupants against heat and cold, having not less than two layers of material separated by an air gap or other efficient means of insulation Means must be provided to prevent the accumulation of water in air gap.

(iv) Its exterior is of a highly visible colour.

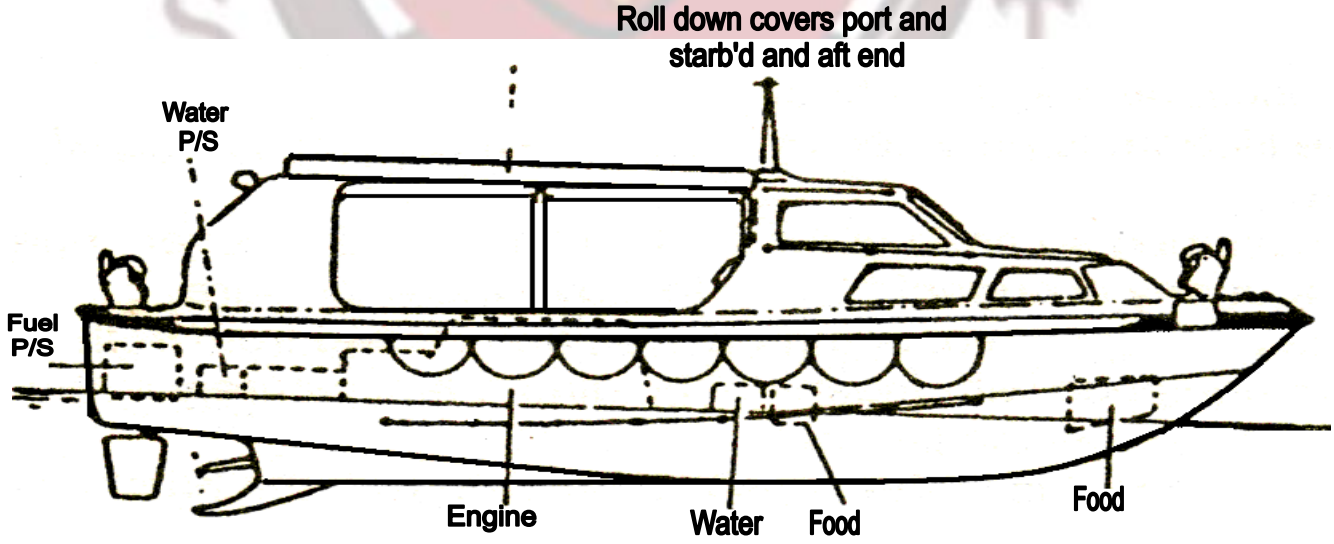
(v) It has a means for collecting rainwater.

(vi) The occupants can escape in the event of the lifeboat capsizing.

7. **Self-Righting, Partially Enclosed Lifeboats.**

(a) The lifeboat shall have permanent, rigid covers, which extend over not less than 20% of the length of the lifeboat from the stem and not less than 20% of the lifeboats length from the after most part of the lifeboat.

(b) The rigid covers shall form two shelters. If the covers have bulkheads then openings of sufficient size to permit easy access by persons clad in protective clothing and lifejackets, must be provided. The interior height under the shelters must allow easy access to seating arrangements in the bow and stern of the lifeboats.



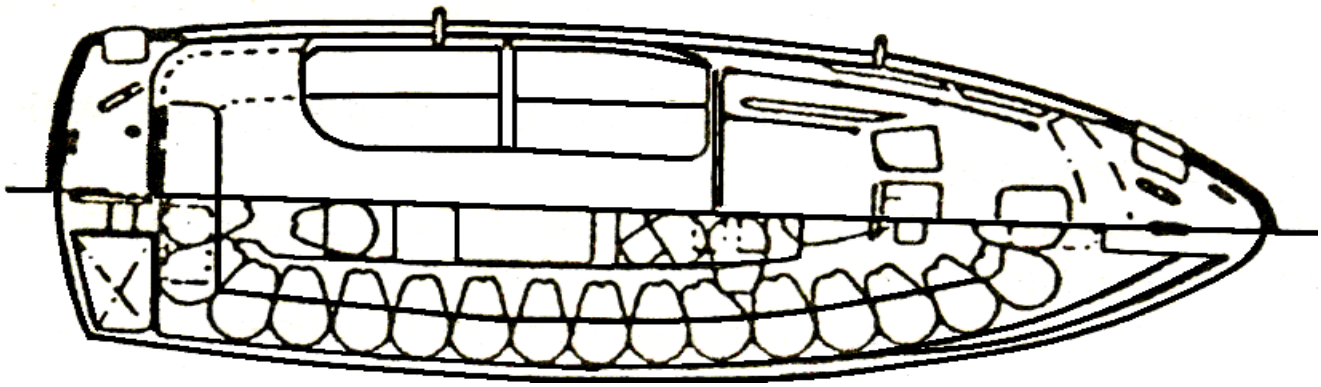


Fig 3 - Self Righting Partially Enclosed Lifeboat

(c) Rigid covers must be provided with windows or clear view panels to admit daylight with opening closed, sufficient to make artificial light unnecessary. Open parts of the boat shall be provided with permanently attached folding canopies so that :-

(i) It can be easily erected by not more than two persons, within two minutes.

(ii) It is insulated by not less than two layers of material, separated by an air gap in order to protect the occupants from cold.

(d) A safety belt shall be fitted at each indicated seating position. The safety belt shall be so designed as to hold a person of a mass of 100 Kgs. securely in place when the lifeboat is in a capsized position.

(e) The stability of the lifeboat shall be such that it is inherently or automatically self-righting when loaded with its full or a partial complement of persons and equipment and the persons are secured with safety belts.

8. **Totally Enclosed Life Boat.** Every totally enclosed lifeboat shall be provided with a rigid enclosure. The enclosure shall be so arranged that :-

(a) It protects the occupants against heat and cold.

(b) Access into the lifeboat is provided by hatches, which can be closed to make the boat watertight.

(c) Hatches are positioned so as to allow the launching and recovery operations to be performed without any occupant having to leave the enclosure.

(d) Access hatches are capable of being opened and closed from both inside and outside and are equipped with means of holding them securely in the open positions.

(e) It must be possible to row the lifeboat.

(f) Lifeboat capable, when it is in the 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.

(g) It includes windows or translucent panels on both sides, which admit sufficient daylight to the inside of the lifeboat with the hatches closed to make artificial light unnecessary.

(h) Its exterior is of a highly visible colour and its interior of a colour, which does not cause discomfort to the occupants.

(i) Handrails provide a secure handhold for persons moving about the exterior of the lifeboat and aid embarkation and disembarkation.

(j) Persons have access to their seats from an entrance without having to climb over thwarts or other obstructions.

(k) The occupants are protected from the effects of dangerous sub-atmospheric pressures, which might be created by the lifeboat's engine.

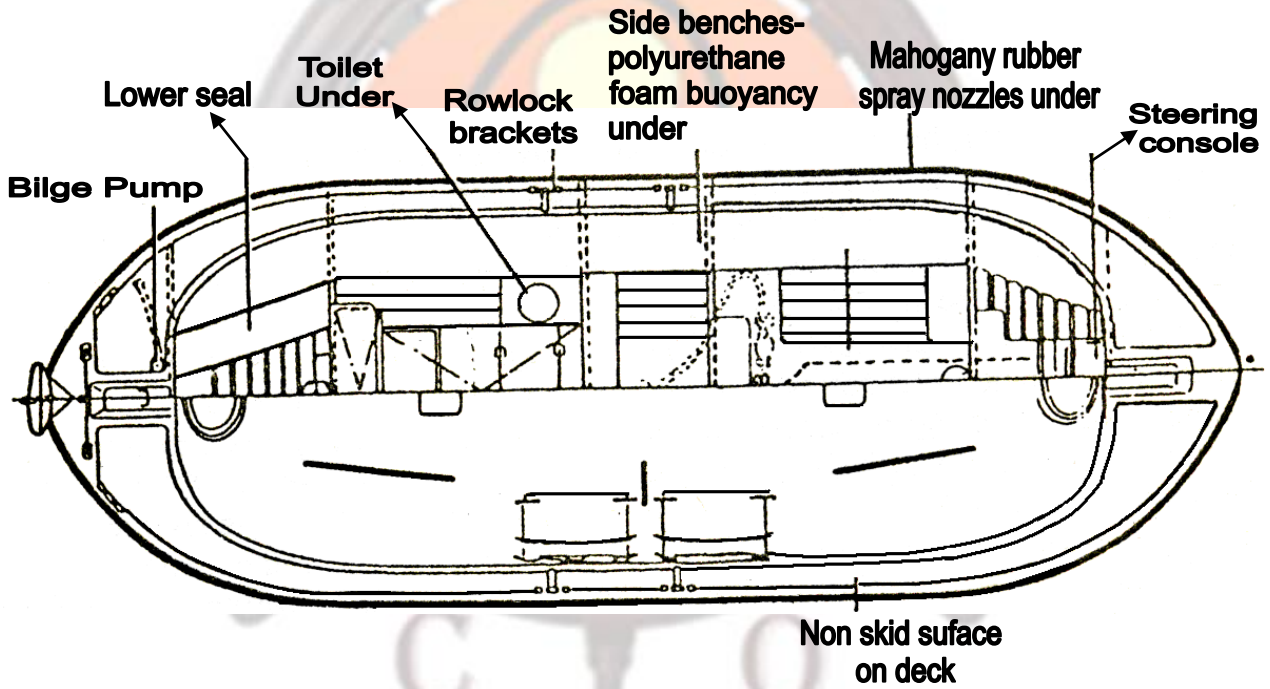


Fig 4 - Totally Enclosed Lifeboat

9. **Self-Righting, Totally Enclosed Lifeboat.** Additional requirement for self righting totally enclosed lifeboat are :-

(a) A safety belt shall be fitted at each indicated seating position. The safety belt shall be designed to hold a person of a mass of 100 Kgs securely in place when the lifeboat is in a capsized position.

(b) The stability of the lifeboat shall be such that it is inherently or automatically self righting when loaded with its full or partial complement of persons and equipment and all entrances and openings are closed watertight and the persons are secured with safety belts.

(c) The lifeboat shall be capable of supporting its full complement of persons and equipment when the lifeboat is in a damaged condition (holed at one location below the water line) and its stability shall be such that in the events of capsizing, it will automatically attain a position that will provide an above water escape for its occupants.

(d) The design of all engine exhaust pipes, air ducts and other openings shall be such that water is excluded from the engine when the lifeboat capsizes uprights and becomes upright.

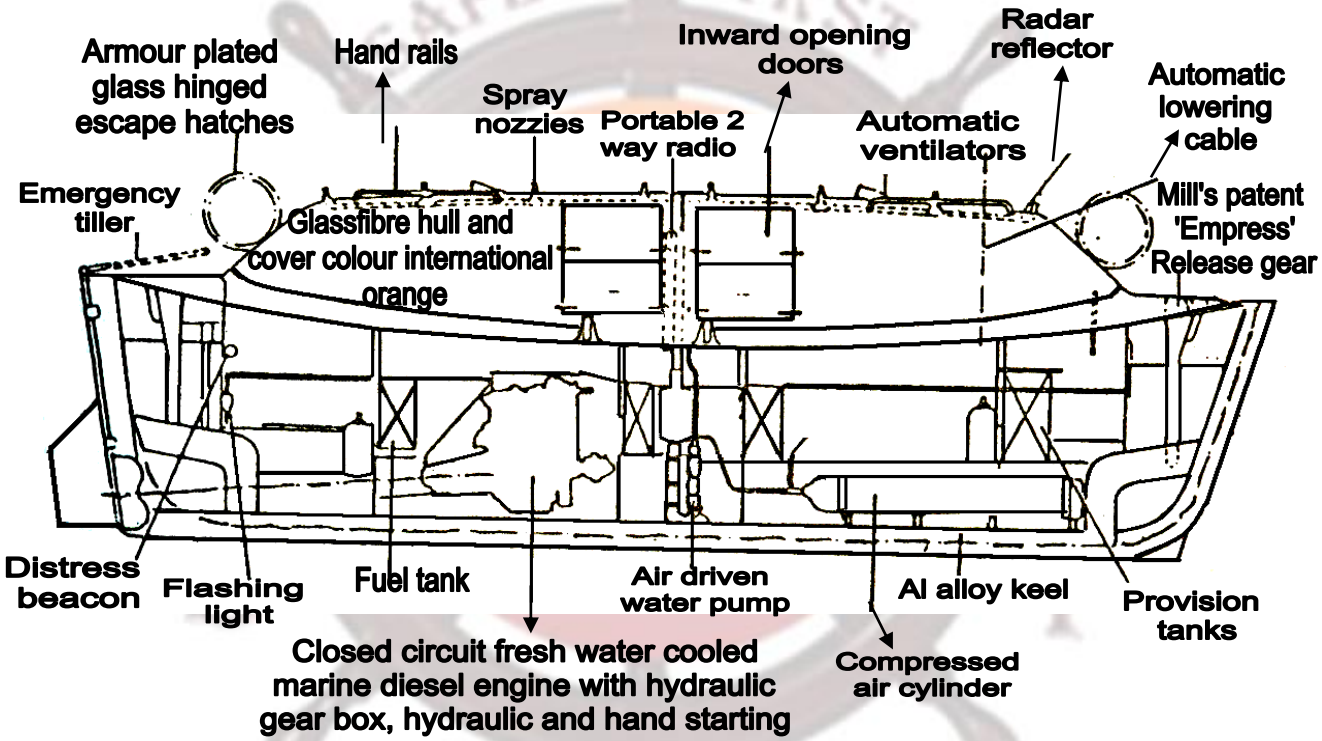


Fig 5 - Self Righting Totally Enclosed Lifeboat

10. **Lifeboat with Self-Contained Air Support System.** Such Lifeboats shall comply with the provisions of the general requirements of a lifeboat and that of a totally enclosed lifeboat. Additionally they shall meet the following requirements:

(a) When proceeding with all entrances and openings closed, the air in the lifeboat must remain safe and breathable.

(b) The engine should run normally for a period of not less than 10 minutes. During this period the atmospheric pressure inside the lifeboat must not fall below the outside atmospheric pressure nor exceed it by more than 20mbar.

(c) There must be a visual indication system to show the pressure of the air at all times.

11. **Fire Protected Lifeboats.**

(a) A fire protected lifeboat, when waterborne, shall be capable of protecting the number of persons it is permitted to accommodate when subjected to a continuous oil fire that envelopes the boat from a period of not less than 8 minutes.

(b) **Water Spray System.** A lifeboat with water spray system shall comply with the following :-

(i) Water for the system shall be drawn form the sea by a self-priming motor pump. It shall turn 'ON' and turn 'OFF' the flow of water over the exterior of the lifeboat.

(ii) The seawater intake shall be so arranged as to prevent the intake of flammable liquids from the sea surface.

(iii) The system shall be arranged for flushing with fresh water and allowing complete drainage.

Launching of Lifeboats

12. **Requirement of Launching Appliances.**

(a) The launching appliance together with all its lowering and recovery gear shall be so arranged that the fully equipped survival craft or rescue boat it serves can be safely lowered against a trim of upto 10^0 and list of upto 20^0 either way.

(b) The launching appliance should not depend on any means other than gravity or stored mechanical power, independent of the ship's power supplies to launch the survival craft or rescue boat it serves.

(c) The launching mechanism should be capable of being actuated by one person from a position on the ship's deck, and from a position within the survival craft or rescue boat.

(d) The launching appliance should be capable of recovering the lifeboat with its crew.

13. **Gravity Davits.**

(a) The gravity davits operate on the principle of the boats own weight doing the work to bring about the launching. The construction of davits includes a safety device, usually a trigger arrangement attached to the gripes. When launching, care must be taken to ensure that the trigger is clear before proceeding.

(b) Gravity davits must be fitted with steel wire rope falls and operated by a controlled winch. The rate of descent of the boat is separately controlled by a centrifugal brake. A main ratchet brake is also incorporated in new designs, which allows the boat to be held at any stage of lowering. This may be operated in some cases from inside the lifeboat itself so that the launching cycle can be carried out remotely.

(c) The davits are fitted with tricing pendants, to allow the boat to be kept

alongside when the parent vessel is listed over. Bowsing in system must also be provided, to allow the release of tricing pendants.

14. **Crew for Launch of Lifeboat.** The crew for the launch of a lifeboat comprises in addition to the coxswain consists of :-

(a) Bowman.

(b) For'd Gripes, Safety Pin and Painter.

(c) Brakesman.

(d) After Gripes and Safety Pins.

(e) Jacob ladder and passenger assistance.

(f) Stern sheet.

15. **Launching of Lifeboat with Gravity Davits.**

(a) **"Stations".** At this order the boat crew proceeds to their stations. On the order, "Clear away" see that there is no obstruction for launching the boat. The crew in addition to the coxswain comprises of :

(b) **"Unship Safety Pins".** On this order No. 2 and No. 4 unship the harbour safety pins forward and aft.

(c) **"Let go Gripes Forward and Aft".** No. 2 and No. 4 let go the gripes, making sure that the triggers have fallen. The Bowman passes the painter forward till it is well clear. The sternsheet checks that the rudder and plug are shipped. The Bowman and sternsheet check that the falls and lifelines are clear.

(d) **"Lower boat to embarkation deck".** The Brakesman lowers the boat to the embarkation deck by releasing the brake.

(e) **"Make fast bowsing in tackles".** The Bowman and sternsheet hook on the bowsing in tackles on to the floating blocks, and connect it to the ringbolts on the shipside or on the davit arms. The bowsing in tackles are then hauled in and the boat made fast to the embarkation point.

(f) **"Let go tricing pendant".** The tricing pendant is removed and the weight of the boat is now on the falls and the bowsing in tackles.

(g) **"Embark passengers and crew".** Passengers and crew now embark the boat. All personnel in the boat must be seated as low as possible.

(h) **"Ease bowsing in tackles",** followed by "**Let go bowsing in tackles".** The bowsing in tackles are eased, let go and left hanging on the shipside.

(j) **"Lower Away".** The boat is lowered by the Brakesman steadily on to the crest of the waves and allowed to drop into the trough. This overhauls the falls and on the next crest the boat is unhooked. Both Bowman and stern sheet must see that both forward and aft falls are unhooked together.

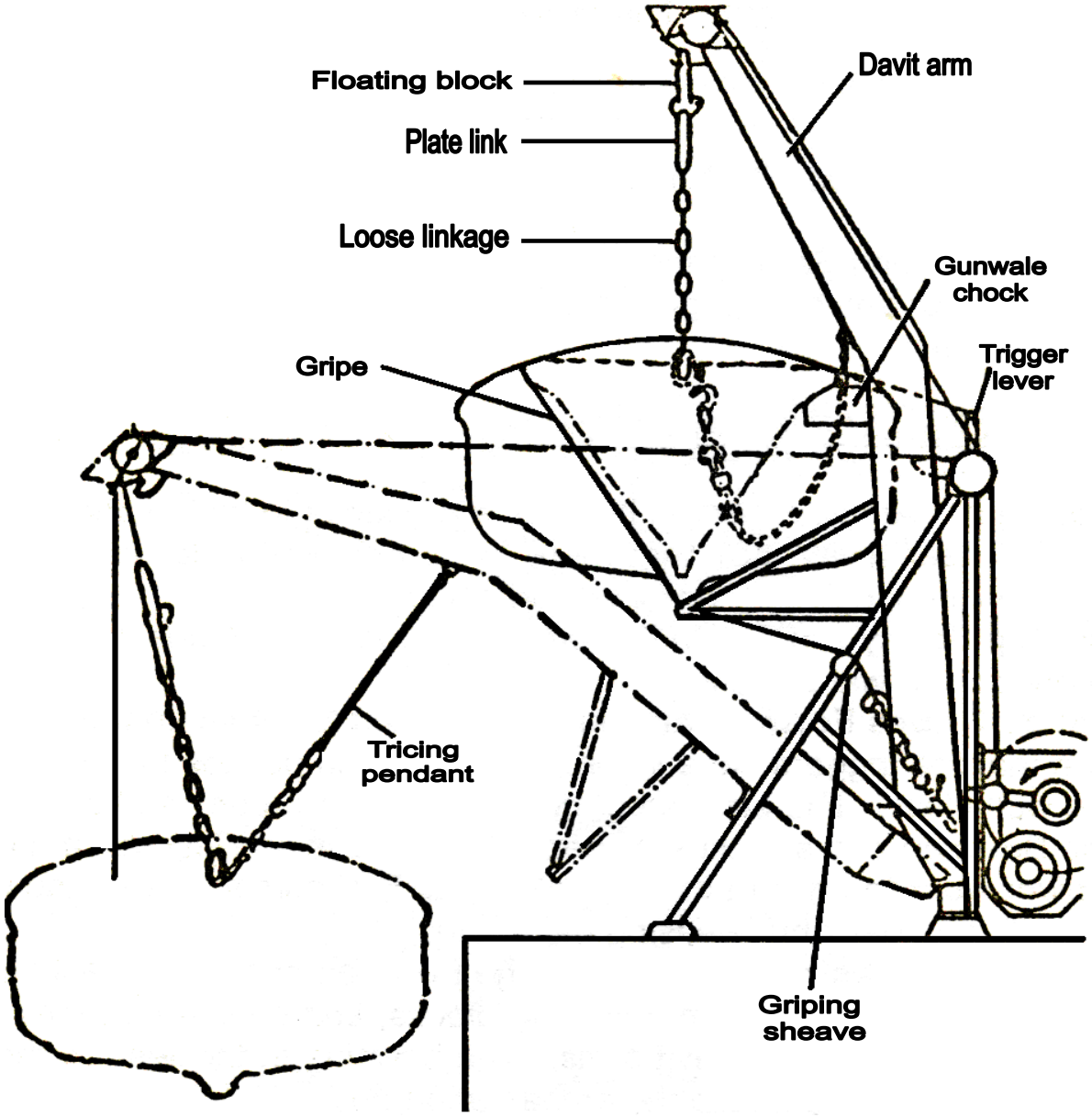


Fig 6 - Gravity Davits

16. **Free Fall Method.** Free fall launching is that method of launching a survival craft when the craft, with its complement of persons and equipment on board is released and allowed to face into sea without any restraining apparatus.

(a) Launching appliance together with all its lowering and recovery gear shall be so arranged that the fully equipped survival craft or rescue boat it serves can be safely lowered against a trim of upto 10^0 and a list of upto 20^o either way, when embarked as required with its full complement of persons.

(b) Lifeboat launching appliance for oil tankers, chemical tankers, and gas carriers with a final angle of heel greater than 20^0 calculated in accordance with the International Convention for the prevention of pollution from ships, 1973 as modified by the 1978 protocol, shall be capable of operating at the final angle of heel on the lower side at the ship.

(c) The launching appliance will be efficiently protected against corrosion and constructed in a manner to prevent incentive friction of impact sparking during launching procedure of the craft.

(d) The launching appliance should be arranged so that excessive forces are not experienced by person occupying the craft during the launch.

(e) The launching appliance should be a rigid structure with such a ramp angle and length which permits the survival craft to effectively clear the area of the ship/ structure.

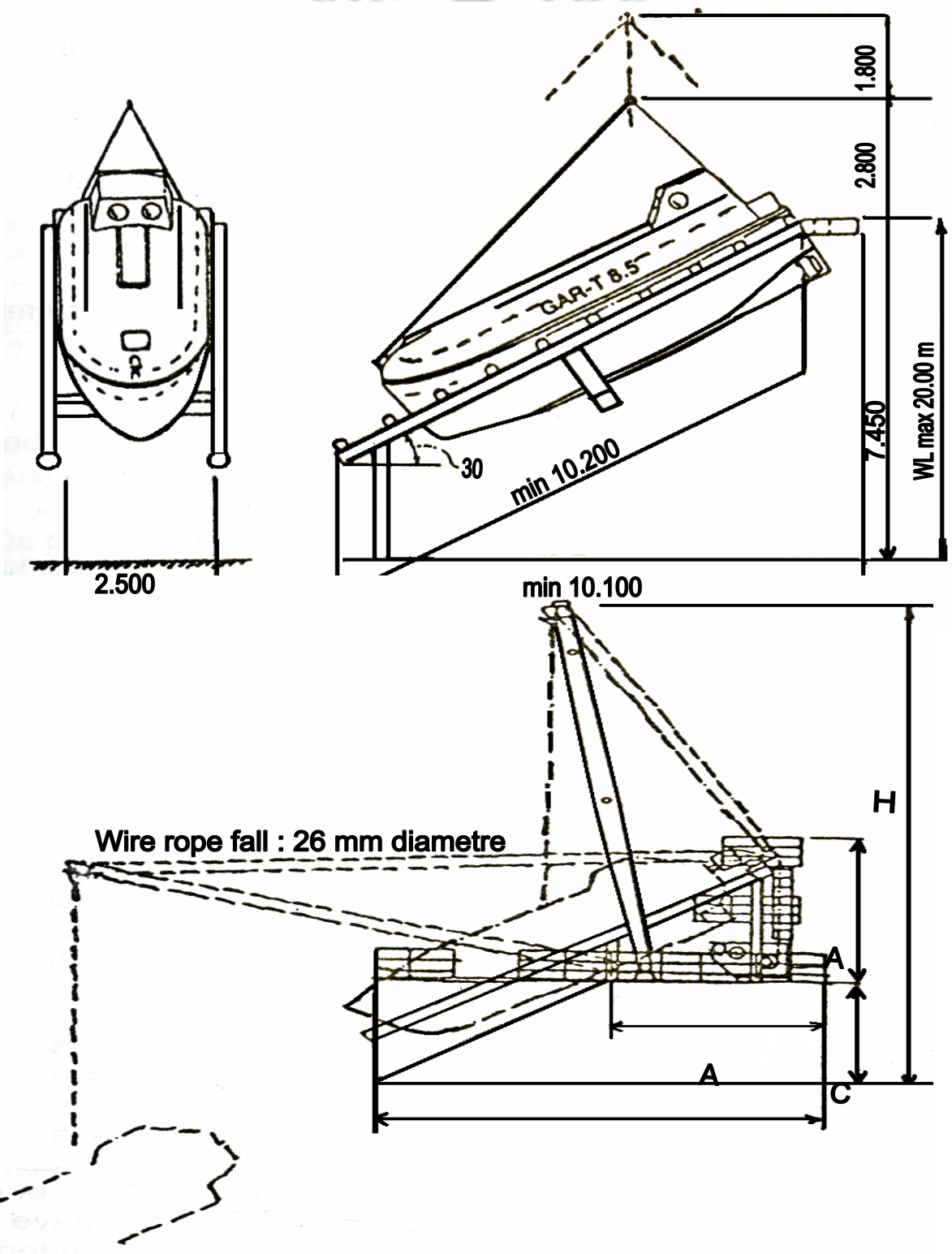


Fig 7 - Recovery Method and Design Size of Freefall Lifeboat.

17. **Precautions to be Taken to Ensure Personal Safety During Launch of Lifeboats.**

(a) Davit Winch hoisting handle should be un-shipped when lowering the lifeboat.

(b) No person should stand between the boat falls.

(c) When boat is being lowered bowmen and stern sheet should hold on to the lifelines.

(d) Check override to ensure that the shipside is clear.

18. **Means of Embarkation.** Suitable arrangements are provided for embarkation into the lifeboat and which shall include:

(a) An embarkation ladder extending in a single length from the deck to the water line, in the lightest sea going condition, under unfavourable conditions of trim and with the ship listed not less than 15^0 either way at each launching station or at every two adjacent launching stations. However, the administration may permit such ladder to be replaced by approved device to afford access to the survival craft when water borne provided that there shall be at least one embarkation ladder on each side of the ship.

(b) An embarkation station shall be adequately illuminated by lighting supplied from the emergency source of electrical power.

(c) Where necessary, means shall be provided for bringing the davit launched survival craft against the shipside and holding them alongside so that personnel can be safely embarked.

Liferafts

19. There are two types of liferafts which are carried on board ships :-

(a) Inflatable liferafts.

(b) Rigid Liferafts.

Inflatable Liferafts

20. Inflatable Liferafts come in varying capacities from a minimum of 6 to a maximum

of 42. General description of an inflatable liferaft is outlined below :-

(a) **Material.** Inflatable Liferafts are made from nylon fabric covered on both sides with rubber. The material used for the inflatable hull and the arches is designed for abrasion resistance on the outside and for gas holding properties on the inside, and is usually black/gray in colour. The canopy is normally orange (highly visible) colour.

(b) **Operating Cord and Painter.** The operating cord is secured firmly to a strong point on the ship. When thrown overboard and stretched to the full length a sharp pull on this cord will fire the firing mechanism of the gas bottle. The same cord then acts as the painter. The painter is to be not less than 15 m, or, twice the distance from the stowed position to water line when the vessel is in the lightest sea going condition, whichever is greater.

(c) **Buoyancy Chambers.** The liferaft is required to have an even number of separate buoyancy compartments, usually two independent of each other. Each chamber must be able to support the liferaft weight by itself. The normal pressure in the life raft is around is 2 lbs. per square inch. If this pressure is exceeded the relief valve will blow.

(d) **Gas Cylinder.** Inflatable liferafts use carbon dioxide as gas for filling the buoyancy chamber. A little nitrogen is added as anti freeze, which also ensures that the CO2 is discharged completely.

(e) **Rain Pocket.** There is a pocket on the canopy provided for collecting rainwater. From this pocket a tube runs into life raft for collecting this water.

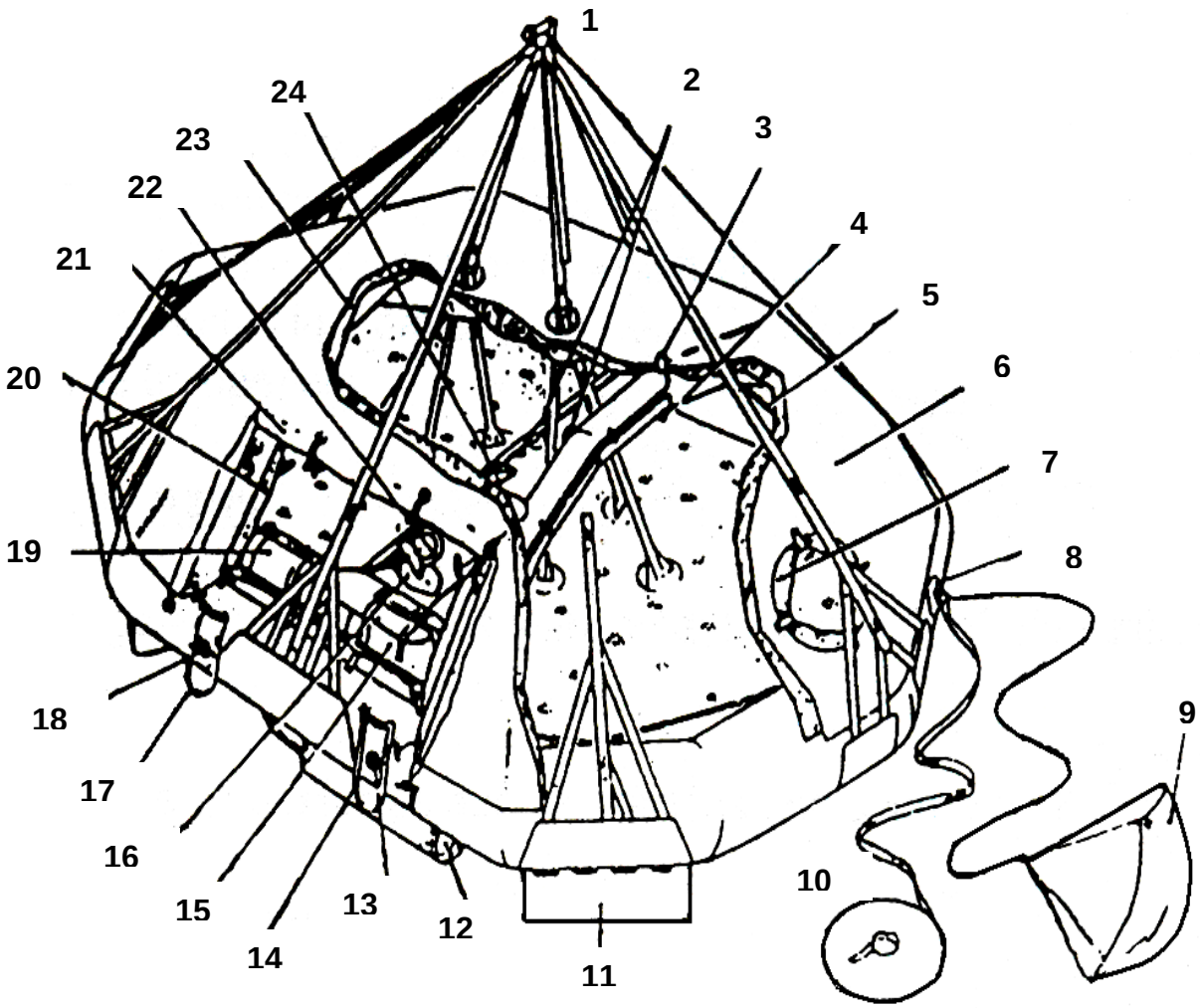
(f) **Lamp.** A lamp is fitted both inside and outside the raft, powered from water activated battery. These batteries can operate for at least 12 hours. The battery can be disconnected when not required.

(g) **Canopy.** The tent formed by the canopy is doubled skinned. The outer layer is fluorescent orange in colour for easy spotting.

(h) **Access.** There are usually two openings called the bow and the stern entrances. Each entrance is provided with two flap covers connected to the canopy on the outside and buoyancy chamber on the inside. These covers prevent rain and spray from coming inside the raft, while allowing fresh air to be admitted.

(j) **Life Line.** Lifeline is becketed around the outside of the raft, so that the persons in the water can hang on to it. There is also a handline becketed around the inside of the raft, for the purpose of helping to support the survivors in a seaway.

(k) **Towing Patch.** A Towing Patch is fitted on the outside of every life raft. This is used to tow the life raft, attach a sea anchor or to tie two life rafts together.



1. Suspension shackle and webbings
2. Thwart deflation plug
3. Exterior light
4. Interior light
5. Handling
6. Outer canopy
7. Lookout port
8. Towing patch
9. Sea anchor
10. Painter line
11. Water pocket
12. CO_2 Cylinder
13. Main buoyancy deflation plug
14. Boarding ramp
15. Emergency pack
16. Draw string bag
17. Boarding ramp
18. Main buoyancy deflation plug
19. Emergency pack
20. Inner entrance cover
21. Outer entrance cover
22. Rescue line and quoit
23. Inner canopy
24. Knife pocket

Fig 8 – Life Raft


SAFETY FIRST
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21. **General Requirements for Construction of Life Rafts.**

(a) Every life raft shall be so constructed as to be capable of withstanding exposure for 30 days afloat in all sea conditions.

(b) When dropped into water from a height of 18 meters the life raft and its equipment shall operate satisfactorily.

(c) The life raft should be able to withstand repeated jumps on it from a height of at least 4.5 meters above its floor both with and without the canopy erected.

(d) It should be capable of being towed at a speed of 3 knots in calm water when fully loaded and with one sea anchor streamed.

(e) The canopy shall comply with the following :-

(i) Provide insulation with two layers of material separated by an air gap or other suitable means.

(ii) Interior should be of a colour that does not cause discomfort to the occupants.

(iii) Each entrance should be clearly indicated and be provided with efficient adjustable closing arrangements. Life rafts with more than eight men capacity shall have at least two diametrically opposite entrances.

(iv) Should admit sufficient air at all times even with entrances closed.

(v) Should be provided with at least one viewing port.

(vi) Should have means for collecting rainwater.

(vii) Should have sufficient headroom for seating all occupants under all parts of the canopy.

22. **Life Raft Equipment (SOLAS 'A' PACK).**

(a) A buoyant rescue quoit with at least 30 meters of buoyant line.

(b) Two sponges, one salt free for collecting condensation.

(c) One safety knife with a buoyant handle for 12 persons or below and 2 safety knifes 13 persons and above.

(d) One buoyant bailer, for 12 persons or below and two buoyant bailer 13 persons and above.

(e) Two sea anchors, one permanently attached. Second sea anchor can be secured in case of rough weather.

(f) Two buoyant paddles.

(g) One rust proof graduated drinking vessel.

(h) One survival instruction manual card.

(j) Instructions for immediate action.

(k) A puncture repair kit and a toping up pump or bellows.

(l) One first aid kit in water proof casing.

(m) One plastic whistle

(n) One water proof electric torch

(p) One radar reflector or one (SART)

(q) One day light signalling mirror or heliograph

(r) One set of fishing tackle

(s) One set of life saving signals

(t) Six anti sea sickness tablets and sea sickness bag for each person

(u) Thermal protective aids sufficient for 10% of carrying capacity of the raft or minimum of two.

(v) Six hand flares.

(w) Four rocket parachutes.

(x) Two buoyant smoke signals.

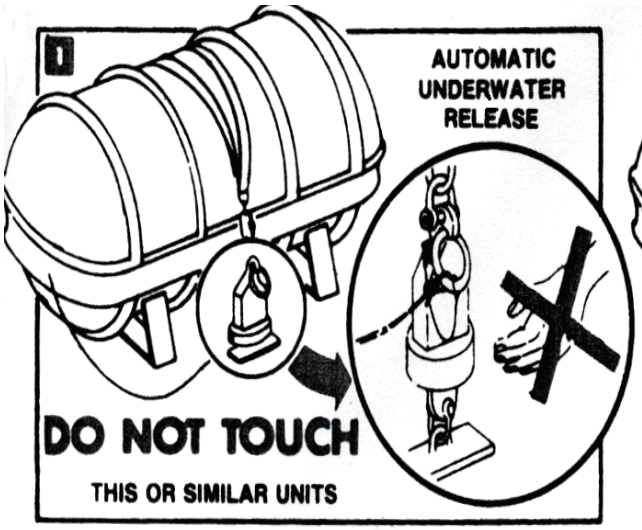
(y) A food ration totalling not less than 10,000 kJ for each person.

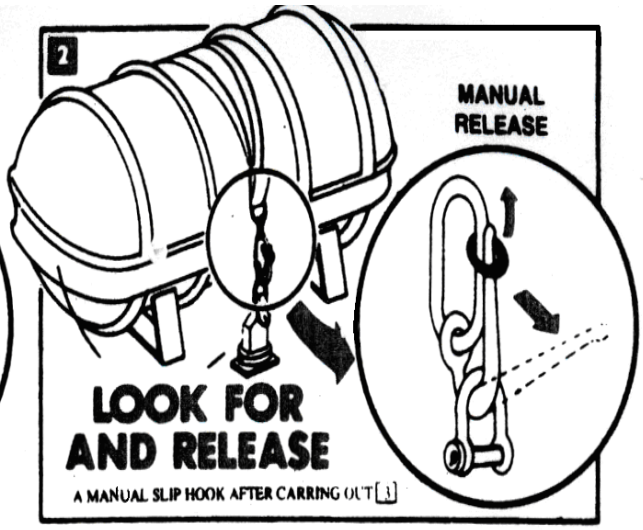
(z) Water 1.5 litre, per person of which ½ litres may be replaced by desalting apparatus in 2 days.

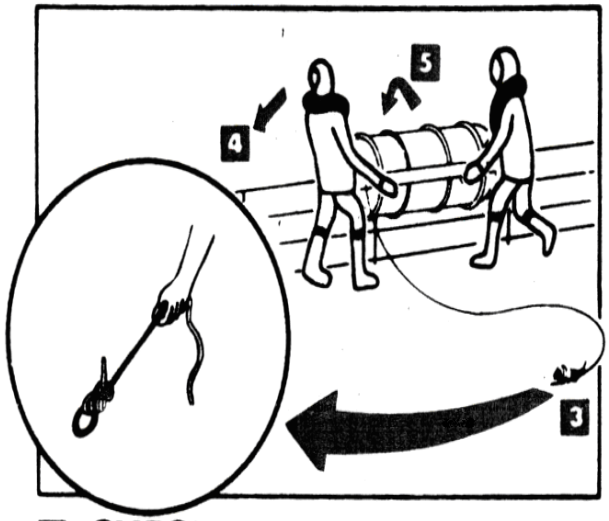
(aa) Three tin openers.

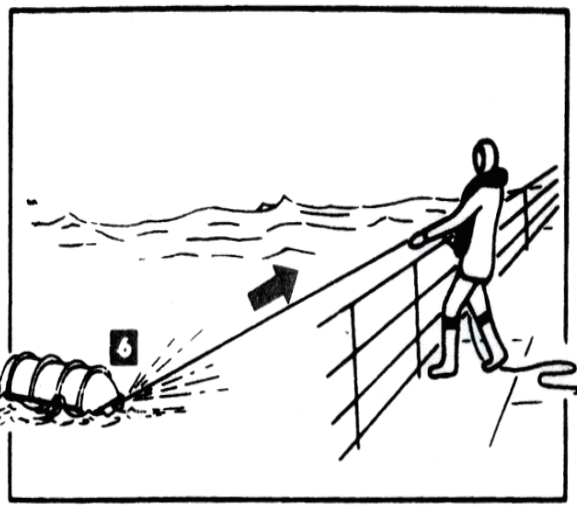
Launching of Life Rafts

23. **Life Raft Launching Procedure.** The general instructions with regard to launch of life rafts are given in Fig 9 – Life Raft Launching Procedure.







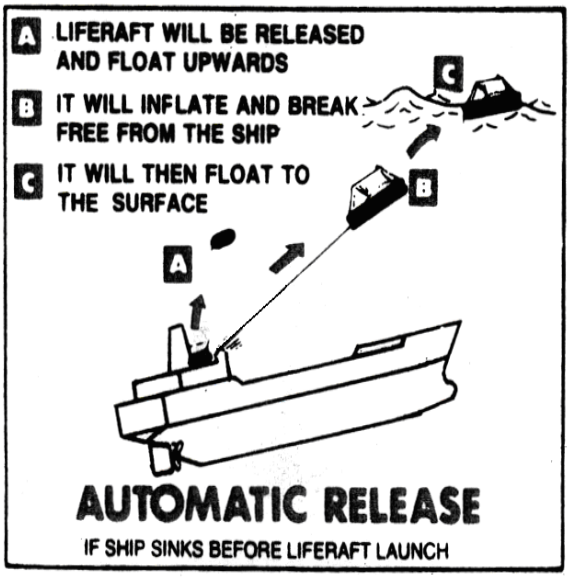


3 CHECK PAINTER IS MADE FAST
4 CHECK IT IS CLEAR OVER THE SIDE
5 THROW / SLIDE LIFERAFT INTO THE SEA

6 PULL ON THE PAINTER

UNTIL THE LIFERAFT INFLATES THEN PULL IT TO THE SHIP'S SIDE

NEVER LAUNCH A LIFERAFT UNTIL YOU ARE READY TO USE IT!



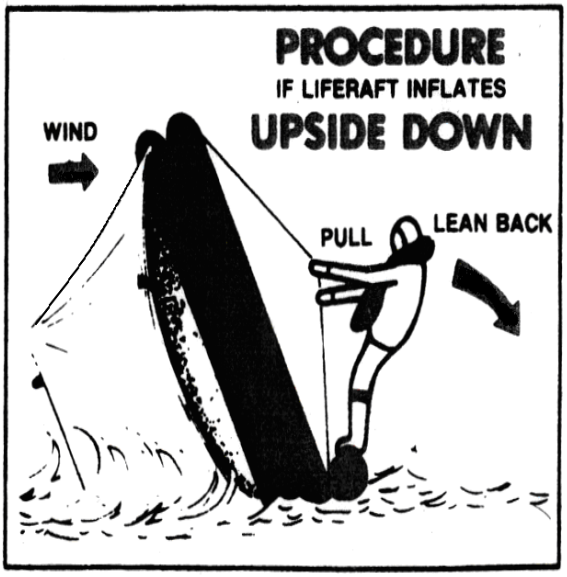


Fig 9 – Life Raft Launching Procedure

24. **Vital Actions after Launching**. The vital action to be taken after launching an inflatable life raft are shown in Fig 10.

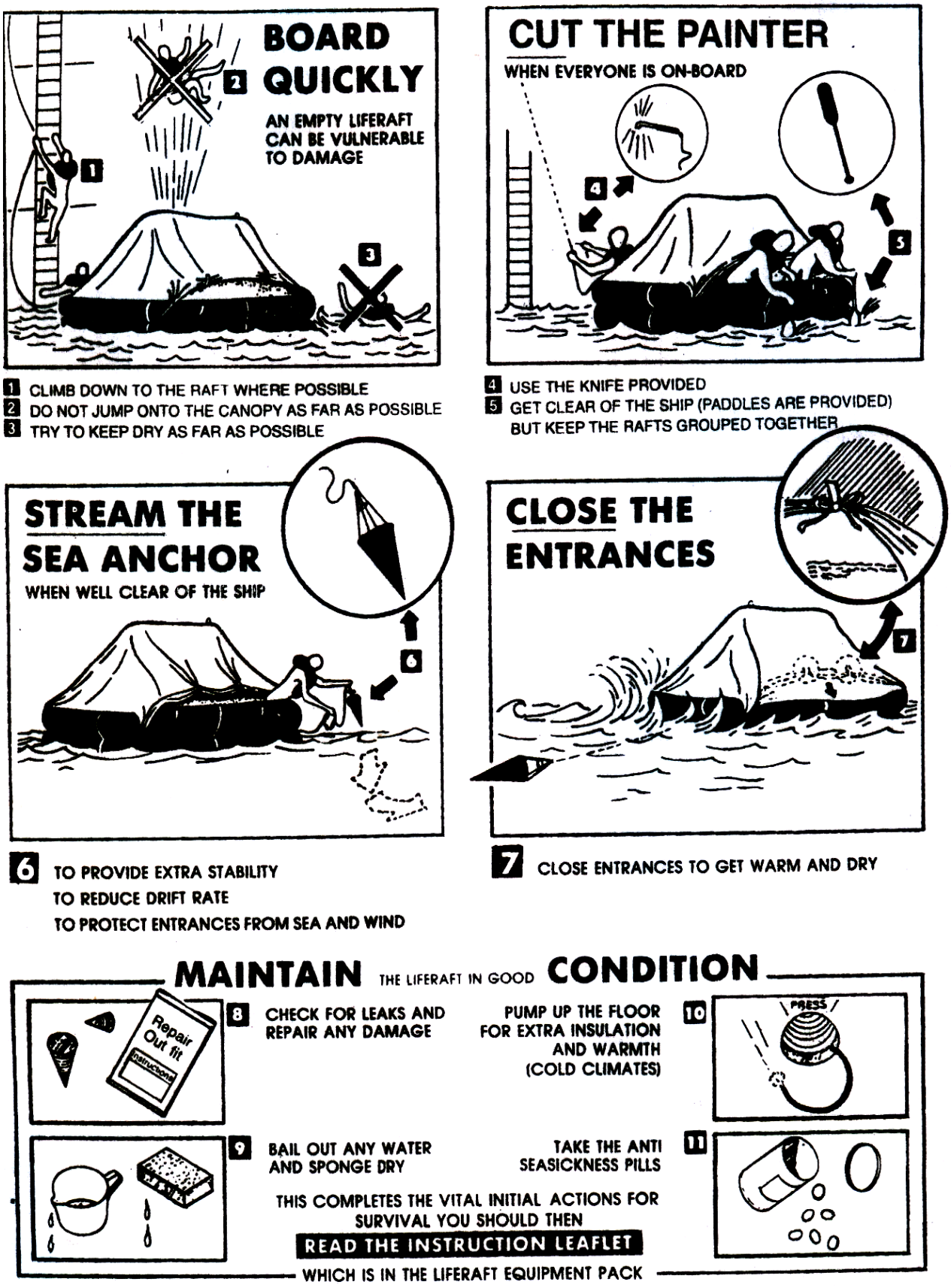


Fig 10 – Vital Actions after Launching

Float Free Arrangement for Life Raft

25. The float free arrangement for life rafts consists of the following :-

(a) Painter System

(b) Weak Link

(c) Hydrostatic Release Unit

26. **Painter System.** The life raft painter system provides a connection between the ship and the life raft and is so arranged as to ensure that the life raft when released and, in the case of an inflatable life raft, inflated is not dragged under by the sinking ship. The breaking strength of the painter system, with the exception of the weak link arrangement shall be not less than 10.0 KN for rafts carrying nine persons or more and not less than 7.5 KN for other liferafts.

27. **Weak Link.** The weak link forms the link between the painter system and the ship. It should be of sufficient strength to permit the inflation of the liferaft. It should have a breaking strain of 2.2 $\pm$ 0.4 kn.

28. **Hydrostatic Release Units.** It operates in such a manner as to allow the liferaft to be released from the ship when at a depth of 4m under water. It should not release the raft when seas wash over the unit and they should be fitted with drain to prevent water accumulation inside the hydrostatic chamber. Release unit should be constructed of compatible materials so as to prevent malfunction of the unit. Galvanising or other forms of metallic coating on parts of the hydrostatic release unit shall not be accepted. It should be permanently marked on the exterior with its type and serial number. Either a document or identification place stating the date of manufacture, type and serial number will be provided.

29 Any part connected to the painter system shall have strength of not less than that required for the painter.

30. The mariner should note that the where a survival craft requires a launching appliance and is also designed to float free, the float free release of the survival craft from its stowed position should be automatic.

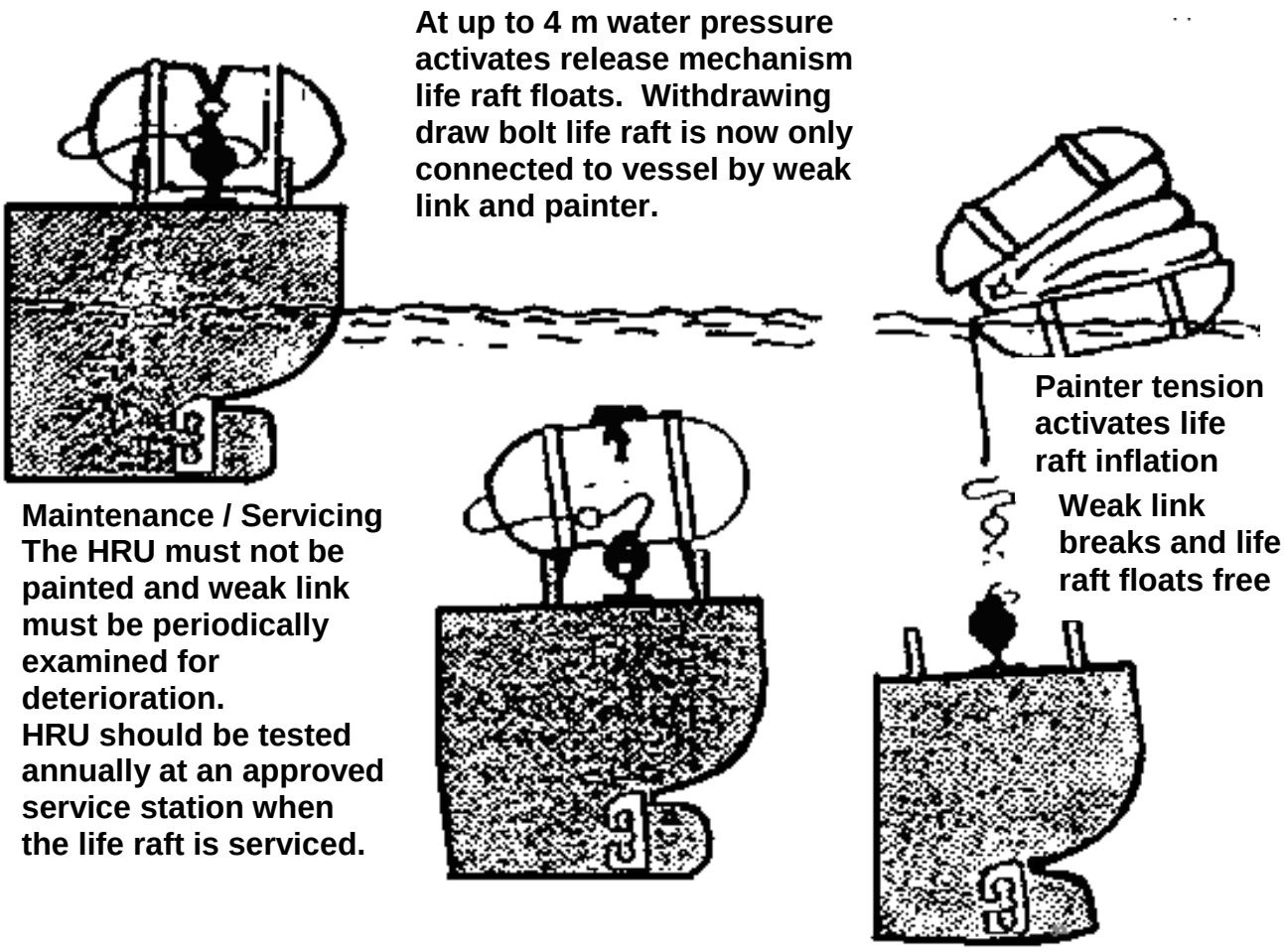


Fig 11 - Liferaft Operation : Method of Hydrostatic Release

Rigid Liferafts

31. All rigid liferafts shall comply with the general requirements specified by the regulations regarding liferafts. The buoyancy of the rigid liferafts shall be provided by approved inherently buoyant material placed as near as possible to the periphery of the liferaft. The buoyant material shall be fire retardant or be protected with fire retardant covering.

32. The floor of the raft shall prevent the ingress of water and shall effectively support the occupants out of the water and insulate them from the cold, the stability being such that it is capable of operating safely whichever way up it is floating. It must be either self-righting or readily righted in a seaway and in calm water by one person. Once loaded with its full complement of persons and equipment it must be possible to tow the raft in calm water at a speed of upto 3 knots.

Rescue Boats

33. **Number Carried.**

(a) **Passenger Vessels less than 500 tons gross:** At least one rescue boat.

(b) **Passenger Vessels of 500 tons gross or more:** At least one rescue boat on each side.

(c) **Cargo Vessels:** At least one rescue boat.

34. **General Requirements of Rescue Boats.** The requirements which allow a lifeboat to be classed as a rescue boats are :-

(a) Rescue boats may be of either rigid or inflated construction or a combination of both.

(b) Not less than 3.8 m and not more than 8.5 m in length. Capable of carrying at least five seated persons and a person lying down.

(c) Rescue boats which are a combination of rigid and inflated construction shall comply with the appropriate requirements of the regulations affecting rescue boats to the satisfaction of the Administration.

(d) Unless the rescue boat has adequate sheer, it shall be provided with a bow cover extending for not less than 15% of its length.

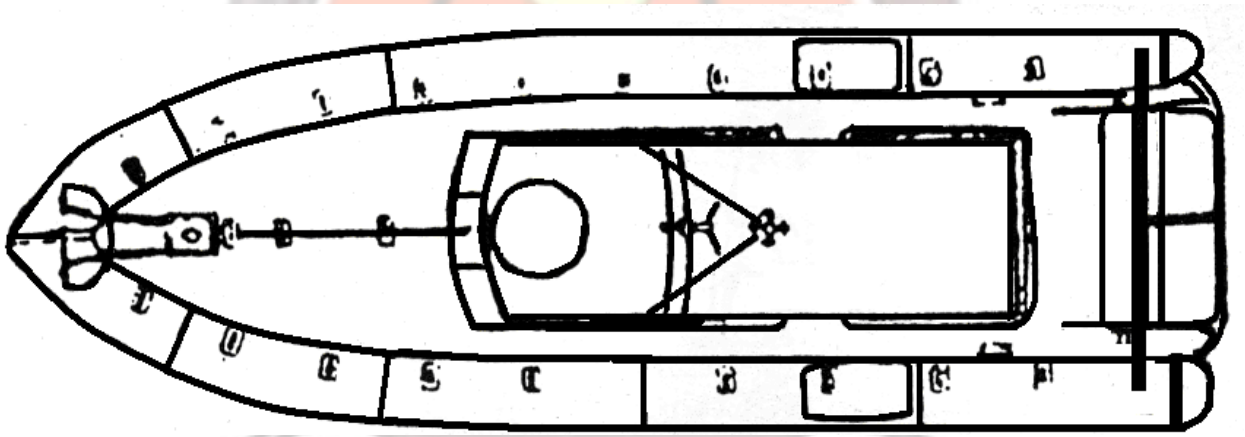


Fig 12 - Rescue Boat

(e) Rescue boats shall be capable of manoeuvring at speeds upto 6 knots and maintaining that speed for a period of at least 4 hours.

(f) Rescue boats shall have sufficient mobility and manoeuvrability in a seaway to enable persons to be retrieved from the water, marshal liferafts and tow the largest liferaft carried on the ship with its full complement of person and equipment or its equivalent at a speed of at least 2 knots.

(g) Arrangements for towing shall be permanently fitted in rescue boats and shall be sufficiently strong to marshal or tow liferafts as required above

(h) A rescue boat shall be fitted with an inboard engine or outboard motor. If it is fitted with an outboard motor, the rudder and the tiller may form part of the engine. Notwithstanding the regulation regarding the flash point of fuel of 43^{o}C or

less, outboard engines with an approved fuel system may be fitted in rescue boats provided the fuel tanks are specially protected against fire and explosion.

(j) The rescue boat shall be provided with weather tight stowage for small item of equipment.

CHAPTER - 5

PERSONAL LIFE SAVING APPLIANCES

Lifebuoys

1. **General Requirements.** Every lifebuoy shall :-

(a) Have an outer diameter of not more than 800mm and inner diameter of not less than 400mm.

(b) Be constructed of inherent buoyant material.

(c) Be capable of supporting at least 14.5 kg of iron in water for 24 hrs.

(d) Weigh not less than 2.5 kg.

(e) Not sustain burning, or continue melting after being totally enveloped in fire for 2secs.

(f) Be able to withstand a drop from its stowed position, or, from a height of 30m, whichever is greater.

(g) When fitted to operate quick release arrangement for self activated smoke signals and self igniting lights, have a mass sufficient to operate the quick release arrangement or 4kg, whichever is greater.

(h) Have a grab line not less than 9.5mm in diameter and not less than four times the outer diameter of the buoy in length. The grab line shall be secured at four equidistant points around the circumference of the buoy to form four loops.

2. **Distribution of Lifebuoys Over the Ship.** Lifebuoys are distributed over the ship as follows :-

(a) Lifebuoys shall be so distributed as to be readily available on both sides of the ship and as far as practicable on all open decks extending on the ship's side. At least one is to be placed in the vicinity of the stern.

(b) Lifebuoys should be stowed so as to be capable of being cast loose and not permanently secured in any way.

3. **Requirements for Additional Equipment Attached to Lifebuoys.**

(a) At least one lifebuoy on each side of the vessel should be fitted with a buoyant lifeline, equal in length to not less than twice the height at which it is stowed above the water-line in the highest seagoing condition or 30 meters, whichever is greater.

(b) Not less than one half of the total number of Lifebuoys shall be provided with self-igniting lights and not less than two of these shall also be provided with self activating smoke signals and be capable of quick release from the navigating bridge. These Lifebuoys should be equally distributed on either side of the ship and should not be the Lifebuoys previously stated with buoyant lines.

(c) Self-igniting lights on Lifebuoys of tankers shall be of an electric battery type.

(d) Each life buoy shall be marked in block capitals of the Roman alphabet with name and port of registry of the ship on which it is carried.

Life Jackets

4. **General Requirements.** Lifejackets shall :-

(a) Be so constructed that :-

(i) After demonstration, can be worn within 1 min without assistance.

(ii) Either capable of being worn inside out or clearly capable of being worn in only one way.

(iii) Be comfortable to wear

(iv) Allow the wearer to jump from a height of 4.5m into water without dislodging or damaging the life jacket

(b) Have sufficient buoyancy and stability in calm fresh water to :-

(i) Lift the mouth of an unconscious or exhausted person not less than 120mm clear of the water with the body inclined backwards at an angle of not less than 20^{o} and not more than 50^{o} from the vertical position.

(ii) Turn the body of an unconscious person in the water from any position to one where the mouth is clear of the water in not more than 5s.

(c) Have sufficient buoyancy, which is not reduced by more than 5% after 24hrs submersion in fresh water.

(d) Allow the person wearing it to swim a short distance and to board a survival craft.

(e) Be fitted with a whistle firmly secured by a cord.

Fig 13 - Correct Donning of Lifejacket

5. **Life Jackets on Board Passenger Ship.** A life jacket shall be provided for every person on board the ship and in addition :-

(a) A number of lifejackets suitable for children equal to at least 10 % of the number of passengers onboard shall be provided or such greater numbers as may be required to provide a life jacket for each child.

(b) Every passenger ship shall carry additional life jackets for not less than 5% of the total number of person on board these life jackets being stowed in conspicuous places on deck or at muster stations.

6. **Life Jackets on Board Cargo Ship.** A life jacket shall be provided for every person on board ship and in addition life jackets for 25% of the persons on board. Sufficient number of life jackets shall be carried for person on watch and for use at remotely located survival craft station.

7. **Lifejacket Buoyancy.**

(a) Lifejackets buoyancy may be achieved by packing with buoyant material.

(b) A lifejacket, which depends on inflation for buoyancy, shall have not less than two separate compartments and comply with regulations for fixed buoyancy type lifejackets.

8. **Lifejacket Lights.** Life jacket lights shall :-

(a) Have a luminous intensity of not less than 0.75 cd.

(b) Have a source of energy capable of providing a luminous intensity of 0.75 cd for a period of at least 8 hours.

(c) Be visible over as great a segment of the upper hemisphere as is practicable when attached to a lifejacket.

(d) If the light of the lifejacket is a flashing light it shall in addition :-

(i) Be provided with a manually operated switch.

(ii) Not be fitted with a lens or reflector to concentrate the beam.

(iii) Flash at a rate of not less than 50 flashes per minute with a luminous intensity of at least 0.75 cd.

Immersion Suits

9. **Construction.** The immersion suit shall be constructed with water proof materials such that :-

(a) It can be unpacked and donned without assistance within 2 minutes, taking into account any associated clothing and a lifejacket of the immersion suit is to be worn in conjunction with a lifejacket.

(b) It will not sustain burning or continue melting after being totally enveloped in a fire for a two seconds period.

(c) It will cover the whole body with the exception of the face. Hand shall also be covered unless permanently attached gloves are provided.

(d) Be provided with arrangements to minimise or reduce free air in the legs of the suit.

10. An immersion suit of an appropriate size complying with the regulation shall be provided for every person of the rescue boat.

11. On passenger and cargo ships with non-enclosed lifeboats at least three immersion suits shall be carried for each lifeboat.

Fig 14 - Immersion Suit

Thermal Protective Aids

12. **Purpose.** The main purpose of a thermal protective aid is to reduce both the convective and evaporative heat losses from the wearer's body.

13. **Requirements.**

(a) It should cover the whole body of a person wearing a life jacket with the exception of the face. Hands shall also be provided unless permanently attached gloves are provided.

(b) It should be capable of being unpacked and easily donned without assistance in a survival craft or rescue boat.

(c) It should permit the wearer to remove it in water in not more than 2 minutes if it impairs the ability to swim.

(d) The thermal protective aid shall function properly in air temperature from -30^0 C to +20^0 C.

14. **Numbers to be Carried.** A minimum of 2 in rescue boat or 10 % of total capacity of the boat which ever may be greater.

CHAPTER - 6

SURVIVAL AT SEA

1. Any person involved in an emergency should try to remain dry. It is known that the body loses its heat twenty six times faster when immersed in water than when kept in a dry environment. For this reason a waterproof suit must be considered extremely desirable for survival. However, for persons finding themselves in water, the following actions are recommended :-

(a) **Avoid Unnecessary Swimming.** This will only use up valuable energy and increase the body's heat loss to surrounding water.

(b) **Float on the Surface in a HELP Position.** With the knees clasped up against the chest. This position conserves body heat.

(c) Try to keep your morale up, and keep the will to survive.

(d) Avoid panic action.

(e) As soon as possible after the survival crafts are launched, tie all the survival crafts together and congregate in one place far away from the ship. The motor lifeboat may be used to escort survival and other crafts, and to search for survivors.

2. Once the above procedures are done, the survivors must stay in one place and protect themselves from the environment-that is heat and cold. Follow the survival at sea principles laid down for prolonging life under survival conditions.

Dangers to Survivors

3. **Effect of Temperature.**

(a) Heat Stroke. A serious condition where the body temperature rises above the normal to 40^0 C or more. It is caused by prolonged exposure to very hot or very humid conditions. The symptoms are a hot, dry skin, with a rapid pulse rate. The patient may appear flushed and could experience some confusion. Unconsciousness may follow.

(b) **Sun Stroke.** Sunstroke can occur when there is a hot sun with high temperature and the absence of wind. The patient gets a headache, dizziness and feels hot. Sunstroke may some times be fatal.

(c) **Cold and Hypothermia.** The majority of deaths are caused by hypothermia during and after the shipwrecks. It means loss of core body temperature. The symptoms of hypothermia include shivering, semi-consciousness, and loss of muscle control or fully unconscious collapse. The treatment is to cover the body by blankets or by thermal protective aids. Never massage, do not give liquid.

(d) **Effects of Seasickness.** The most seasoned seaman will get seasickness in survival crafts. This results in the loss of body fluids. There is no means to recover it back, as we do not have extra water in survival craft, so it is advisable that as soon as people board the survival craft, seasickness tablets should be given to every person.

(e) **Lack of Body Fluids.** Failure to maintain body fluids correctly can cause dehydration in the survival craft.

(f) **Drinking Seawater.** Avoid drinking seawater. It causes kidney malfunction and results in collapse at sea.

(g) **Fire or Oil on Water.** Most modern fire protected lifeboats protect the occupants from the effects of a continuous oil fire that envelop the boat for a period of not less than 8 minutes. Protection to the hull is normally provided by means of a water spray system.

(h) **Sharks.** As per the new requirements, survival craft must carry shark repellent. The shark repellent can be a chemical, which can be sprayed over the water, or it could be applied on the body.

4. **Clearing Away from the Ship.** Immediately after lowering and boarding the survival craft, measures should be taken to clear the vessel as quickly as possible. The danger of being struck from below by surfacing wreckage is greater than that from the suction caused by the ship sinking. Clearing away may be done by means of oars, paddles or being towed by motor boat. After clearing away, all craft must keep at a safe distance from the ship.

Immediate Action after Entering Survival Craft

5. **Lifeboat.**

(a) **Get Away from Sinking or Burning Ship.**

(i) Let go toggle painter.

(ii) Manoeuvre or drift to safe distance from ship.

(iii) Rig radar reflector.

(b) **Look for and Gather Survivors.**

(i) Manoeuvre and use buoyant lifelines to reach persons in water.

(ii) Use torch or search light at night.

(iii) Look for retro-reflective tapes on other life saving appliances and look for liferaft and life jacket lights.

(iv) Listen for whistles.

(c) **Join Other Survival Craft.**

(i) Use motor boats to retrieve drifting life rafts and secure them to other lifeboats and life rafts.

(ii) Use sea anchor.

(d) **Check Correct Functioning of the Lifeboat.** Check for damage, leaks, and build up of water.

(e) **Commence Measures for Protection and Survival.**

(i) Rig lifeboat exposure covers.

(ii) Give first aid to injure.

(iii) Take action against seasickness.

(f) **Read Survival Manual.**

6. **Inflatable Life Rafts.**

(a) **Get Away from Sinking or Burning Ship.**

(i) Hold on to or hook arms through hand lines inside raft (especially in rough weather).

(ii) Cut painter as far from raft as possible.

(iii) Manoeuvre or drift to as safe distance from ship.

(iv) Stream sea anchor or drogues.

(v) Rig radar reflector.

(b) **Look for and Gather Other Survivors.**

(i) Use rescue quoits and line to pull survivors to raft.

(ii) Use torch at night.

(iii) Look for retro reflective tapes on other appliances and look for lifejacket lights.

(iv) Listen for whistles.

(c) **Check Proper Functioning of the Life Raft.**

(i) Check for leaks and damages.

(ii) Plug leaks with leak stoppers from equipment bag.

(iii) Top up buoyancy chambers and if necessary with pump or bellows.

(d) **Join Other Rafts if Possible.** Secure rafts together with remains of painter allowing distance between rafts for movements in a seaway.

7. **Protective Measures.**

(a) **Heat Stroke.** To treat heat stroke, remove all the patients clothing and endeavour to keep the body cool. Wrap in a cold sheet and or sponge the body with cold water and keep cooling the body till the temperature starts to fall. Place the casualty in a recovery position and cover with a dry cloth or sheet.

(b) **Sun Stroke.** Is the common name for conditions that results from overheating the body. Sunstroke in a form of heat stroke caused by being exposed to the sun in tropical area for too long a time skin surface should be protected by suitable clothing.

(c) **Exposure.** Exposure is a cause of death, after abandoning the vessel; seaman should ensure that body heat is not lost by exposure. Person should take off protective clothing, even if wet, while the survival craft. No person should enter the water from the survival craft as this may lead to exposure.

8. **Effect of Seasickness.** Seasickness is the main cause of dehydration at sea in the survival craft. So it is important to issue seasickness tablets to every person soon after entering survival craft.

9. **Food and Water.** Do not issue any food or water for the first 24 hours except to a person, who is sick or injured, as there is amply moisture in body. After 24 hours, issue ½ litre of water per person per day. Effort should be made to preserve the moisture in the body by avoiding perspiration. It is possible to survive upto 14 days or more without water. Survival craft rations consist of non-thirst provoking food.

10. **Measures of Survival in Case of Burning Oil (Sea) Surface.**

(a) Evacuation, if by sea, will probably be by rigid survival craft. Fire on ships and platforms, which have spread beyond containment, will probably be accompanied by explosions of greater or lesser degree. The presence of burning oil surface of is a distinct possibility, and survival craft should be battened down and enclosed. A fire protected survival craft, when waterborne, shall be capable of protecting the number of persons it is permitted to accommodate when subjected to continuous oil fire that envelopes survival craft for a period of not less than 8 minutes.

(b) A survival craft with a water spray system shall comply the following :-

(i) Water for the system shall be drawn from the sea by self-priming motor pump. It shall turn on and turn off the flow of water over the outer hull.

(ii) The sea water intake shall be so arranged as to prevent the intake of flammable liquid from the sea surface.

(iii) The system shall be arranged for flushing with fresh water and allowing complete drainage.

11. **Means of Survival in Shark Infested Waters.** Survivors are advised as following :-

(a) Never swim or dive alone.

(b) Never swim or dive with an open wound, which attracts shark.

(c) Swim as smoothly as possible, because thrashing movements might attract the shark. The survivors are better protected if they can remain inside a plastic bag.

12. **Sea Anchor (Drogues).** Two sea anchors (drogues) are provided for each liferaft. Each should be fitted with a shock absorbent painter and designed with swivels at each end of the line to prevent fouling. The purpose of the drogue is to reduce the drift route of the life raft and to reduce the rise of life raft and avoid capsizing. Keeping this in mind, one of the sea anchor should be permanently secured so that it can be easily deployed following inflation of the life raft. It should be in such a manner that the life raft is oriented to the wind in a stable manner. It should always be employed when engaging in helicopter rescue operation or in beaching the life raft.

13. **Lookout.** A watch system should be organised, giving some duty to each occupant of a survival craft. Having something to do or to be responsible as it improves the morale of individual survivors and of the group in general. A constant lookout should be maintained to keep watch all round the horizon. The lookout must be instructed to listen as well as watch. They should be alert for signs of ships, aircraft, land, dangers and rain showers in the vicinity, which may provide an opportunity to supplement the water rate. On making any sighting the lookout should inform the person in charge of the craft before doing anything.

14. **Morale.** When survivors are in the survival craft the in charge should raise the morale of the persons who are in the survival craft by keeping the people and their mind busy by a good routine and discipline maintained at the outset of the situation. A watch system to be brought into operation. The survivors should communicate their location by using emergency transmitter. This should be activated as soon as practicable. The lookout should be aware of the position of pyrotechnics and how to use instructions being read well before they actually need to be used. Getting people to read the instructions on equipment and designating various job functions are the ways in which the hopes of the survivors are kept alive. Morale is maintained and will to survive is not lost.

15. **Survival in Water.** Any person involved in an emergency should strive to remain alive. It is known that the body loses its heat twenty six times higher when immersed in water than when kept in a dry environment. For this reason a waterproof suit must be considered extremely essential for survival. However, for persons finding themselves in water, the following actions are recommended:

(a) **Avoid Unnecessary Swimming.** This will only use up valuable energy and increase the body's heat loss to surrounding water.

(b) **Float on the Surface in a HELP.** (Heat Escape Lessening Posture)

position with the knees clasped up against the chest. This position conserves body heat.

(c) **Secure the Face Visor of your Lifejacket if Attached.** Failing this, protect your airways against breaking seas by using your hands to form a face bar.

(d) **If there is More than one Person, Group Together.** There is safety in number as you are making a larger target when grouped on the surface. If survivors form a circle group, free flowing water is restricted in the centre of the circle and the loss of heat is reduced. Casualties can also be kept warmer by being place in the middle of the circle and supported by the others. Lifelines fitted to certain suits can also be employed to link survivors together.

(e) **Keep your Morale up. Keep the will to Survive.**

(f) **Maintain as much of your Body out of the Water as Possible.** Throughout and avoid panic actions.

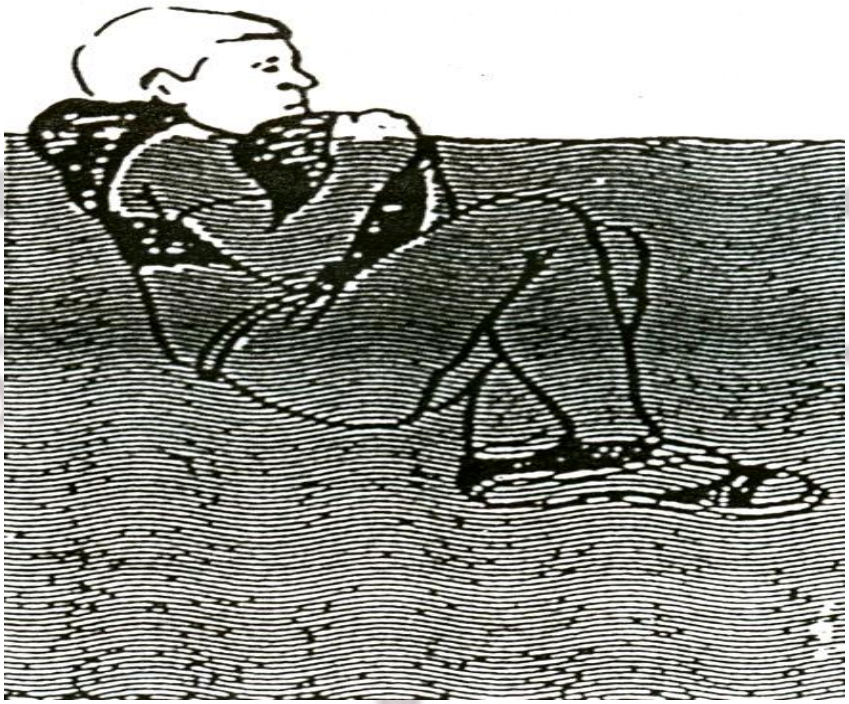


Fig 15 - HELP Posture

CHAPTER – 7

HELICOPTER ASSISTANCE

1. The primary role of the Search and Rescue (SAR) helicopter is to save lives of personnel in distress. Helicopters are equipped with a hydraulic rescue winch, which is controlled either by the pilot or a winch operator. The helicopter that is mostly used for helicopter rescue is the 'SEAKING'. It has a capacity of about 15/20 persons and has a flying time of about 500 miles (200 miles off shore, 200 miles to go back to base and 100 miles to search). Hence there should be no necessary delay at the scene of rescue. Explain to each one their duties prior to the Helicopter's arrival.

2. Helicopter rescue can be from a ship in distress, a lifeboat, a life raft and from the sea. Helicopter can also be used for various other services such as change of crew/passengers, supply of stores/provisions and supply of repair items. In such cases, proper and complete details must be communicated to the helicopter operator through the Agents, giving at least 24 hrs prior notice.

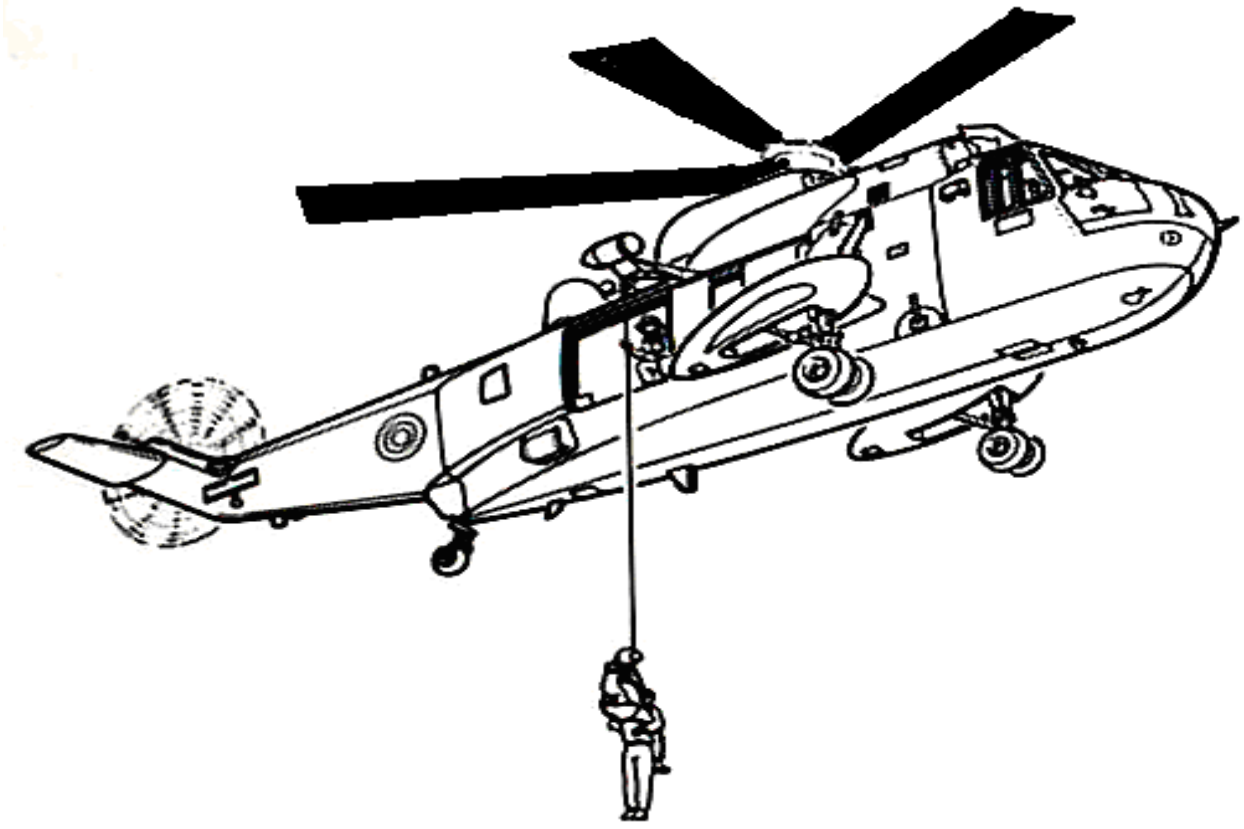


Fig 16 – Search and Rescue Helicopter

3. **Ship Board Safety Check List for Helicopter Operations.**

(a) Have all loose objects within and adjacent to the operating area been secured or removed?

(b) Have all aerials, standing or running gear above and in the vicinity of the operating area been lowered / secured?

(c) Has a pennant or windsock been hoisted where it can be clearly seen by

the helicopter pilot?

(d) Has the officer of the watch been consulted about the ship's readiness?

(e) Does the leader of the deck party have a portable radio Tran's receiver (walkie-talkie) for communicating with the bridge?

(f) Are fire pumps running- is there adequate pressure on deck?

(g) Are fire hoses ready (in the vicinity of the operating area?

(h) Are foam hoses, monitors and portable foam equipment ready?

(i) Has a rescue party been detailed?

(j) Are the following available and handy?
Large Axe; Crowbar; Wire Cutter; Red emergency signal torch; First Aid equipment; Stretcher

(k) Has the correct lighting (including special navigational lights) been switched on prior to night operations?

(l) Is the deck party ready, wearing brightly coloured tabards (waistcoats) and protective helmets, and are all passengers clear of the operating area.

(m) Has the hook handler been equipped with helmet, strong rubber gloves and rubber soled shoes?

(n) Is access to and egress from the operating area clear?

(o) **Landing On.**

(i) Is the operating area free of heavy spray of seas on deck?

(ii) Have side rails and, where necessary, awnings, stanchions and other obstructions been lowered or removed.

(iii) Where applicable, have portable pipes been removed and have the remaining apex ends been blanked off.

(iv) Are rope messengers to hand for securing the helicopter, if necessary (Note: only the helicopter pilot may decide whether or not to secure the helicopter)

(v) Have all personnel been warned to keep clear of rotors and exhausts.

(p) **Special Precautions for Tankers.**

(i) Ships not fitted with an inert gas system: has pressure been released from tanks with thirty (30) minutes of commencement of helicopter operations.

(ii) Ships fitted with an inert Gas System: has pressure in cargo tanks been reduced to slight positive pressure.

(iii) All tankers: have all tank openings been secured following venting operations.

(q) **Special Precautions for Bulk / Combination Carriers.** Has surface ventilation to dry bulk cargoes ceased, and have all hatch openings been fully battened down prior to helicopter operations.

(r) **Special Precautions for Gas Carriers.** Have all precautions have been taken to prevent vapour emission on deck.

(s) Upon Completion of Check off List an Entry is to be made in the Vessel's Logbook.

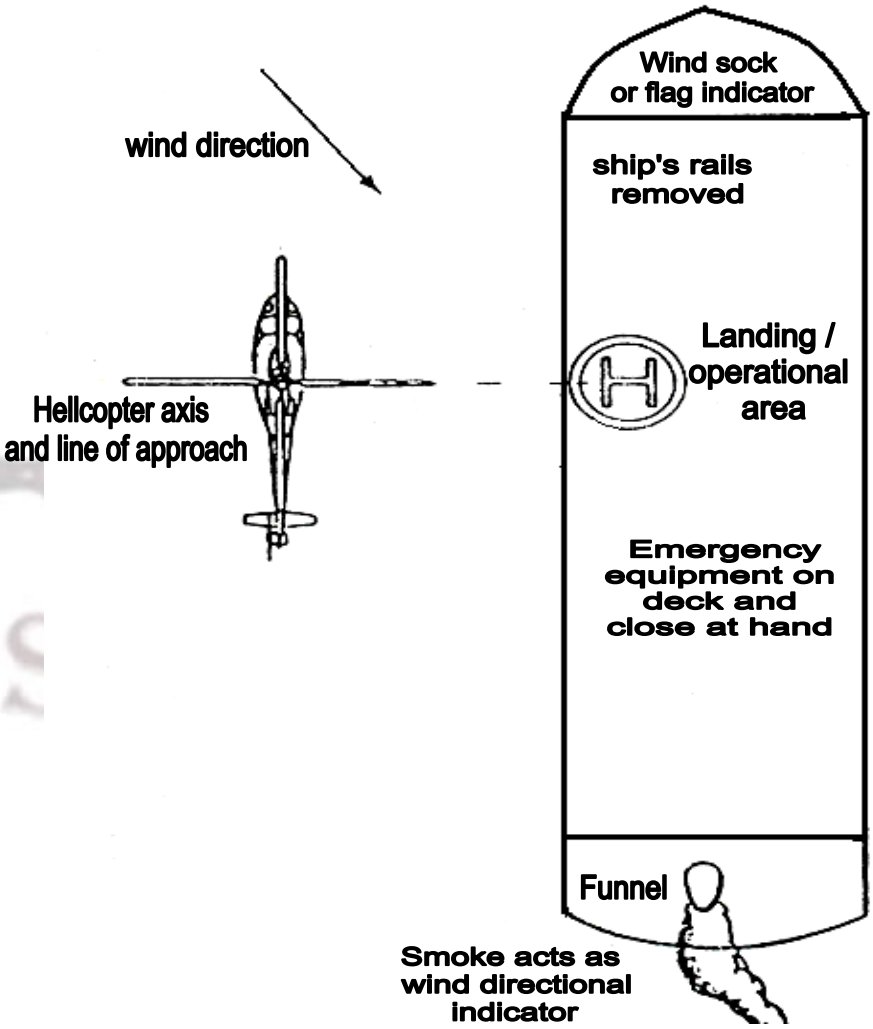


Fig 17 - Ship's Deck Plan of Helicopter Operation

Communicating with the Helicopter

4. **Visual Signals to Helicopter.** The officer in charge will be responsible for signalling the helicopter. The following visual signals should be used:

Forward. Signal given to helicopter pilot to indicate that vessel is ready and the helicopter may approach. (Arms repeated moved upward and backward,

beckoning onward).

Finishing Operations. Signal given to helicopter pilot to indicate operations finished. (Arms repeatedly crossed above the head).

5. **Communications Equipment.** The helicopter must be fitted with a marine VHF FM radio able to transmit and receive on at least channel 16 and two other simple working frequencies. Unless other arrangements have been agreed in advance, the ship should set watch on VHF Channel 16 for the arrival of the helicopter.

6. **Helo Operations Area.** To make for safe landing as winching operations, it is advisable that any part of the shipside rail within the manoeuvring zone is removed or collapsed without obstructing the clear zone. The section of the ship side rail should be at least as long as the diameter of the clear zone. Even if there is enough space on the ship to provide a landing area (either full or restricted), it is recommended that the area be positioned so that a large part of the manoeuvring zone is as close to the ships side as possible. All aerial awnings, stanchions and devices in the vicinity of the manoeuvring zone should be removed or lowered. The area of operation on deck is to be marked by letter 'H' in yellow or orange with circles of yellow / orange and black alternately.

7. **Hoist from a Rigid Survival Craft.**

(a) Lifting will be made by single or double lifts using the standard helicopter strop. Personnel will usually remain on the exterior of the craft and be lifted from outside the hull. Persons not being immediately transferred should remain inside the craft and provide body weight to ease stability problems. Coxswains of survival craft should turn their boat into the wind and endeavour to maintain a steady course at about 4 – 6 knots. The helicopter will hold station on the boat and match the speed on the surface craft. A frogman may land on the craft and instruct personnel regarding the evacuation.

(b) Coxswains should bear in mind that the down draught of the helicopter's rotor may affect the steerage and will most certainly generate spray from the surface. These will not only cause discomfort but may also impair visibility, especially on the glass surface of battened down hatches. If the weather is bad and several persons are being transferred a Hi-line operation will probably be used.

8. **Hoist from an Inflatable Life Raft.** Life rafts are severely affected by the down draught of helicopter rotors. Even with a sea anchor stressed considerable movement on the surface will be experienced. The possibility of the raft, capsizing is also a danger that cannot be discounted. Should the raft capsize, the frogman would cut open the floor to evacuate the occupants. The inflated canopy of the raft may hamper the lifting operation and on occasions it may be desirable to deflate the centre arches or pillars. Personnel would then occupy the upper part of the raft until whole operations are complete, and then cause re-inflation by means of bellows (assuming that the aircraft cannot lift all persons in one trip).

9. **Helicopter Rescue Strop.** The standard strop is made of flax webbing and is cushioned with rubber. It is attached to the winch hook by means of two 'D' rings, and a sliding toggle is provided to secure the strop around the body of the survivor. A handling loop is normally attached to the back of the strop. Harness is also used frequently.

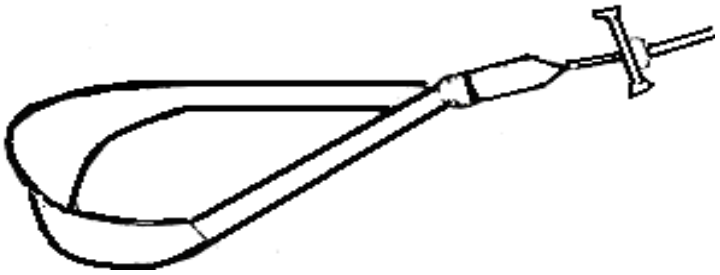


Fig 18 - The Rescue Strop

10. **<u>Helicopter Pick Up</u>.** The following procedure is to be observed in helicopter pick-up operation:-

(a) Place the head and both arms through the lifting strop.

(b) Ensure that the strop is seated firmly under the armpits. With the padded section of the strop positioned as high as possible across the back.

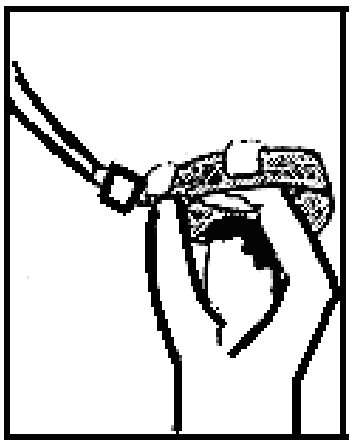
(c) Pull down the toggle to tighten the strop.

(d) Once secure inside the strop and ready to be hoisted give a 'thumbs up' signal to the winch man or observer of the helicopter.

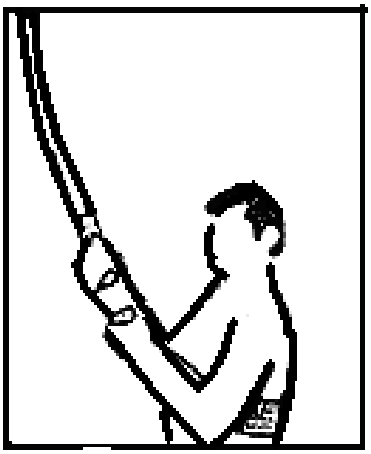
(e) Place both arms down by your sides.

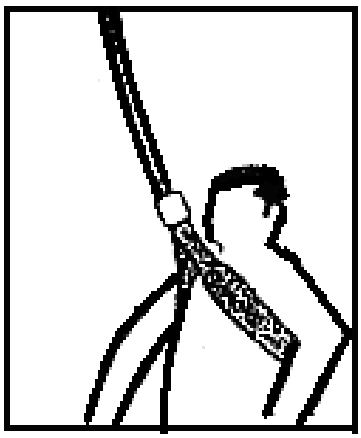
(f) When level with the helicopter access, wait until instructions are received from the helicopter crew.

Arms up through

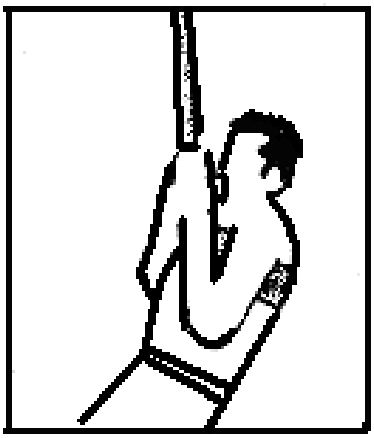


The strap up under the arms





The clamp is tightened



Arms down along your body or grip the clamp

<u>Fig 19 - Use of Rescue Strop</u>

11. **Rescue Net.** The rescue net has a conical shaped 'bird case' appearance and is open on one side when the net is trailing in the water. The survivor merely enters the opening, sits in the net and holds on.

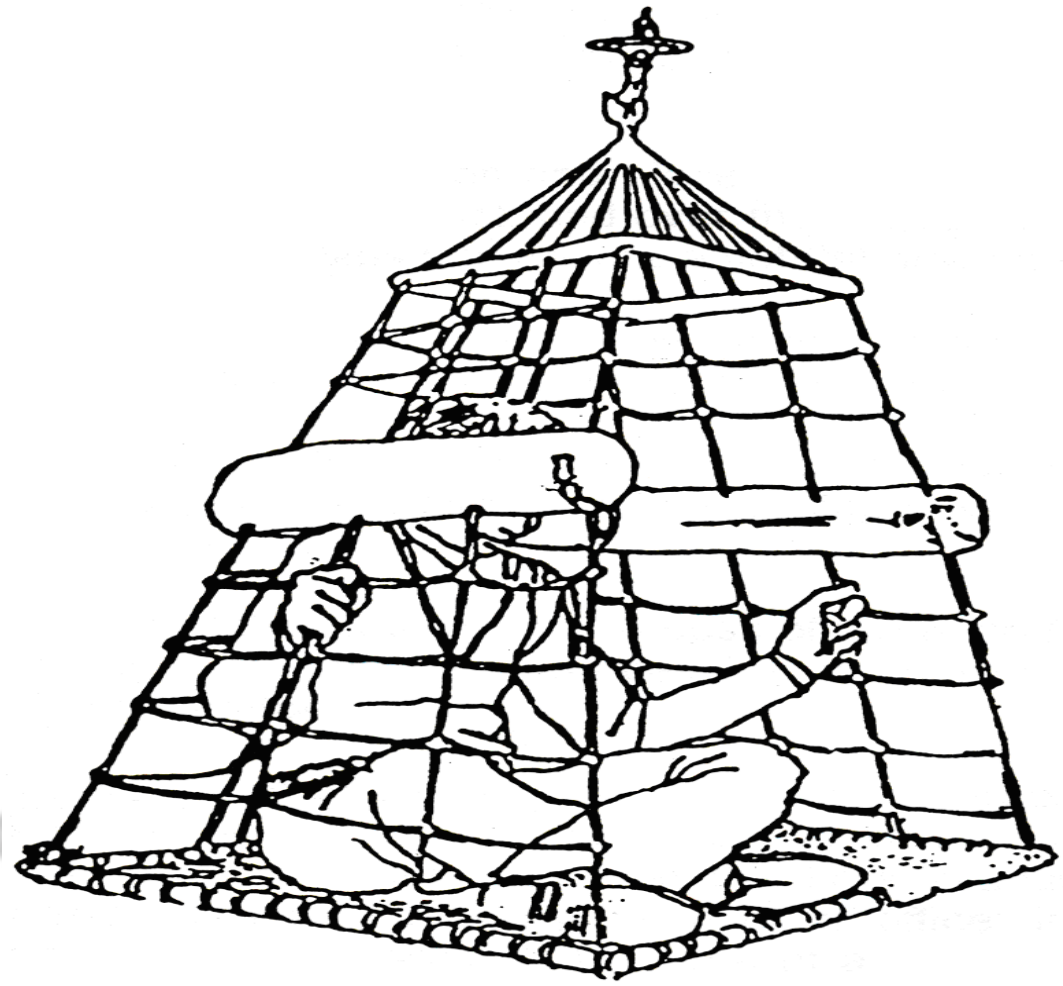


Fig 20 - Rescue Net

12. **The Neil Robertson Stretcher.** This stretcher is made of canvas and is stiffened with close fitting wooden slats. It is strapped around the body of a survivor to immobilise him and to support him for the lift. It is attached to the winch hook by means of a steel ring and 4-strap harness.

13. **General Precautions for Personnel During Winching Operations.** In the majority of cases where helicopter assistance is being given, a member of the aircrew will instruct and assist in the correct method of transfer. In the event of an aircraft being engaged and when the strop only is lowered, without a frogman or winch man, the following list of precautionary measures are advised :-

(a) Do not touch the strop, winch wire or any part of the lifting hoist until the static electricity has been removed from the wire. The pilot will first earth the wire by allowing it to enter the sea or touch the deck of the ship, to remove static.

(b) Keep the lifejacket on and place the strop over the upper part of the body; around the back and over the lifejacket. Draw down the toggle of the web straps and ensure a tight fit around your person.

(c) Place your arms at the side or follow the instructions of the landing officer.

(d) When ready to be winched up, extend your arms and give a thumbs-up signal to the aircraft, while looking towards the helicopter. Replace your arms at your side.

(e) Once winched towards the access of the aircraft, and alongside the doorway to the cabin, remain passive until instructed to move by the aircrew operator.

14. **Emergency Ditching Instructions.** In an in-flight emergency the pilot will attempt to prepare passengers for the possibility of the aircraft having to ditch. Obviously, circumstances may limit the time available for detailed explanations and any instructions by the pilot or officer in charge of the aircraft should be obeyed implicitly. The type of aircraft and the nature of the emergency will dictate the following sequence of events, as will the degree of composure and experience of passengers. On the assumption that all persons are wearing immersion suits and aviation life jackets, the instructions that will be given should include:-

(a) Place immersion suit hands over heads, and close all seals to the suit.

(b) Unpack the aviation lifejacket and place it over your head, but do not inflate the lifejacket.

(c) Tighten up the lap strap / seat belt.

(d) Arch the spine, gripping the underside of the legs, with feet braced firmly on the floor of the aircraft.

(e) Brace the body, especially the head, against impact prior to the ditching point.

CHAPTER - 8

EMERGENCY RADIO EQUIPMENT

Emergency Position Indicating Radio Beacon (EPIRB)

1. Accidents at sea air and even on land are part of our present-day life. In any emergency, time is precious. The quicker the search areas are identified the more likely a successful rescue. There are several ways that **SEARCH AND RESCUE** authorities are alerted to a vessel in trouble including marine radio distress calls, flares, etc but space-age-technology now takes most of the search out of search and rescue, using satellites and EPIRBs.

2. **An EPIRB is a compact, buoyant, self-contained radio transmitter. Activated, it continuously emits a distinctive radio signal for a minimum of 48 hours.**

COSPAS-SARSAT

3. The COSPAS-SARSAT International Satellites System for search and rescue consists of satellites in Polar orbits and a network of ground stations, which provides distress alert and location information to appropriate rescue authorities for maritime, aviation and land users in distress.

4. The USA, Canada and France jointly developed such a system called **SARSAT (Search And Rescue Satellite Aided Tracking)** in the seventies using the NOAA satellites. The then Soviet Union also developed a similar system known as **COSPAS (COsmicheskaya Sistyema Posika Avariynich Sudov Space System).** One of the characteristics of these satellites in low, polar orbit is that it will see the entire globe once every **twelve hours.** The joint **COSPAS-SARSAT** programme was formalised in November 1979. Inter-operability among the two systems was also established allowing all participating nations to use both the systems to detect and locate emergencies.

Functioning of the System

5. The ship/ aircraft carries an emergency transmitter (beacon), which could be activated either manually or automatically in case of a distress situation, such as accident, crash, sinking, fire, explosion, etc. This unit transmit signals (**as burst of signals burst of 0.5 seconds repeated after every 50 seconds)** that are detected by COSPAS-SARSAT orbiting satellites and are relayed to a ground receiving station termed as Local User Terminal (LUT), which processes the signals to determine the beacon location. Alerts are then relayed, together with the location data, via a Mission Control Centre (MCC), either to another MCC or to an appropriate RCC or Search & Rescue Authorities to initiate search and rescue operations.

6. The location of beacons is determined by Doppler Shift principle **using the relative motion between the satellite and the beacon.** The carrier frequency transmitted by the beacon is reasonably stable during the short period when the beacon is within a satellite's visibility. The internationally distress frequencies used are **121.5 MHz and the 406 MHz**.

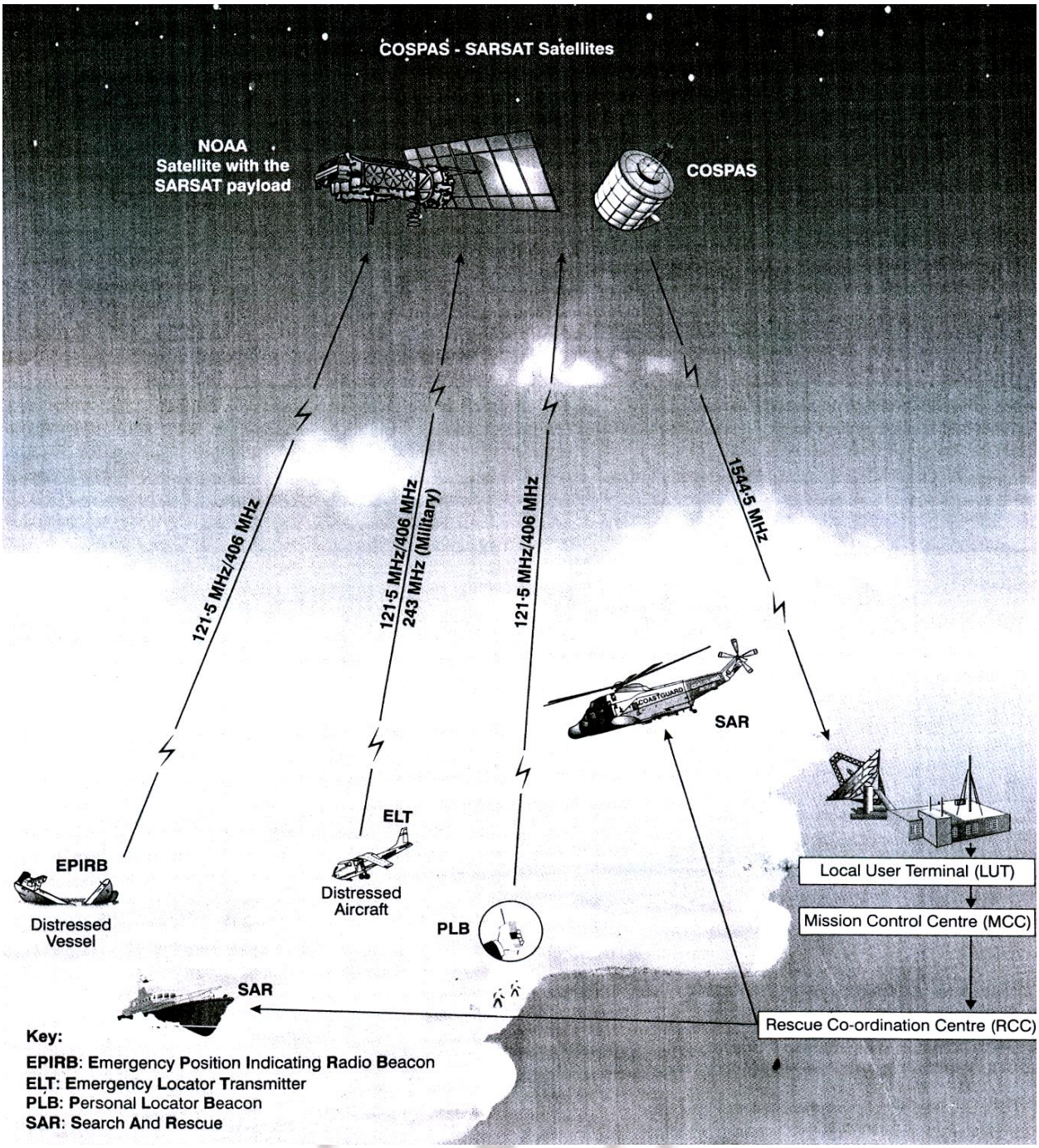


Fig 21 - Transmission of an EPIRB Signal

7. All EPIRBs should have arrangements for local manual activation or float-free and self-activation. Remote activation from the navigation bridge, while the EPIRB is installed in the float-free mounting may also be provided. The equipment mounting and releasing arrangements should be reliable, and should operate satisfactorily under the most extreme conditions likely to be met at sea. Manual distress alert initiation should require at least two independent actions.

8. All types of EPIRBs should also be equipped with a light of 0.75 candelas, flashing with a low duty-cycle ratio, which is automatically activated by the onset of darkness.

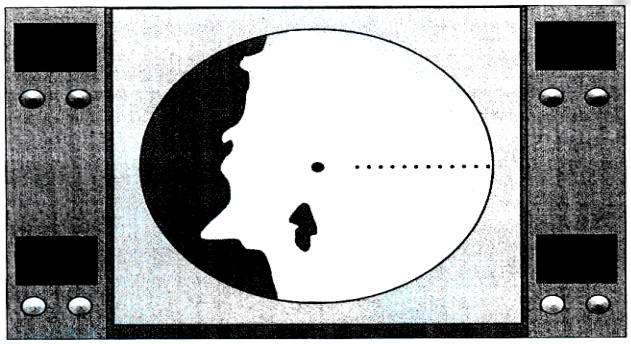
9. The output of COSPAS-SARSAT EPIRB is 5 Watts, & it should operate for 48 hrs.

10. **A 121.5 MHz signal also included on this beacon which serves primarily as a homing signal for SAR units. (Power output 75 mw)**

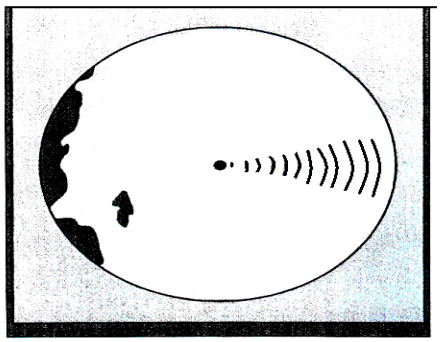
Search and Rescue Radar Transponder (SART)

11. **THE PURPOSE OF A SART IS TO HOME 'SAR' UNITS TO THE POSITION OF A PERSON OR VESSEL IN DISTRESS.**

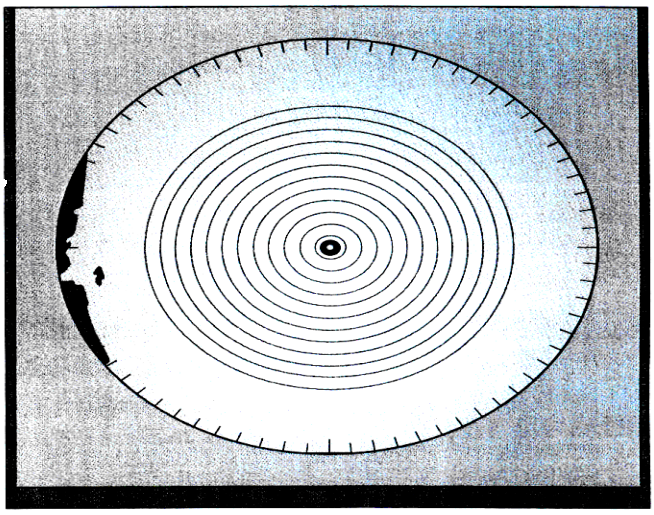
12. A search and rescue radar transponder (SART) is the main means for '**locating ships in distress or their survival craft.** The SART operates in the 9GHz frequency band (i.e. 9.2 to 9.5 GHz) and generates a series of response signals on being interrogated by any ordinary 9 GHz ship borne 3-cm X-band radar or suitable airborne radar. SARTs can be either portable for use on board ship or carrying to survival craft and/or permanently installed in the survival craft.



Radar Display showing the SART 12 dot blip code (bearing approximately 90°)



As the search craft approaches to within about 1n mile of the SART the 12 dots will change to wide arcs.



The wide arcs change into complete circles as the SART is closed

Using compatible radar, with output power at least 10kw on a search hieght of 3000 ft, detection ranges are up to 40n miles

With antenna height of 15 metres, detection ranges are up to at least 5 n miles

SURVIVAL CRAFT
IMO recommends SART mounted 1 metre above sea level

IMO SYMBOL FOR SART

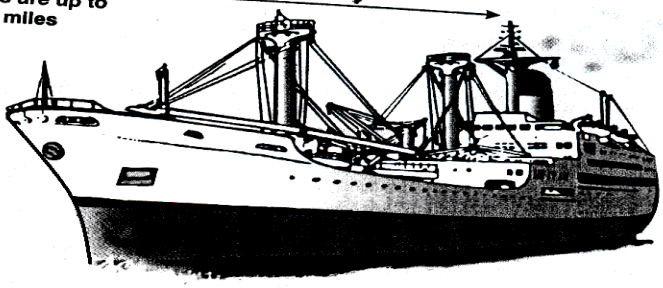


Fig 22 - Search and Rescue Radar Transponder (SART)

13. The SART is activated manually so that it will thereafter respond when **interrogated.**

14. When activated in a distress situation, a SART responds to radar interrogation by transmitting a signal which generates as a line of 12 blips code on a radar screen outward from the SART's position along its line of bearing. Displayed on the Radar-Plan Position Indicator (PPI), the spacing between each pair of dots will be **0.6 n.mile.** As the search craft approach as to within about 1n.mile of the SART, the blip dots will change into wide arcs, and even become complete circles as the SART is closed and become continually triggered. This is useful warning to the search craft to slow down. This distinctive and unique radar signal is easily recognised and is therefore much easier to spot than a signal echo such as from a radar reflector.

15. The SART also provides a visual or audible indication of its correct operation and will also inform survivors when it is interrogated by radar.

16. **<u>An audible beep will sound every 2 seconds when the SART is interrogated by a radar and every 12 seconds when no radar in sight.</u>**

17. The SART should have sufficient battery capacity to operate in the standby condition for 96 hours followed by a minimum 8 hours of transmission while being interrogated by radar.

18. Survivors are advised not to deploy a SART and a radar reflector on the same survival craft because the reflector may obscure the SART.

19. A well-mounted SART in moderate weather condition is capable of giving a detection range of 10n miles to a large ship's radar. A poorly mounted SART, perhaps operated inside a life raft or floating in the sea, may provide little better than visual search range to small fishing boat radar.

20. Line-of-sight problems are much less of a problem for airborne detection of SARTs at range up to 40n miles, given an initial search height of 3000 ft.

<u>Survival Craft Radio</u>

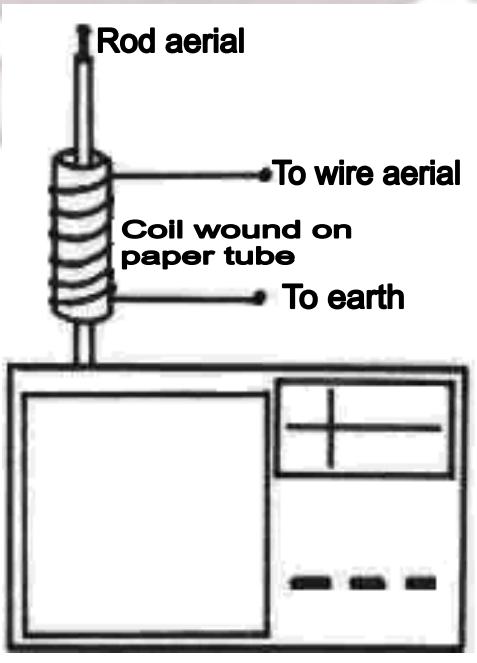


Fig 23 - Survival Craft Radio

21. GMDSS requirements call for ships to carry portable VHF hand-held radios. They operate in the maritime VHF band between 156 – 174 MHz. These are stored on the bridge. One of the crewmembers is delegated to bring the radios to the lifeboats during distress situation or while abandoning the vessel on authority of the Master.

22. The main use of the radio is to provide a means of communication between the lifeboats/life rafts and to liase with the Search and Rescue authority as they approach.

23. The VHF portable hand-held radio should, in addition to meeting the requirements of the Radio Regulations must comply with the following IMO performance standards :-

(a) Provide operation on VHF channel 16 and one other channel (Ch 06)

(b) Be capable of operation by an unskilled person.

(c) Be capable of operation by personnel wearing gloves.

(d) Be capable of single-handed operation, except for channel changing.

(e) Withstand drops on to a hard surface from a height of 1 meter.

(f) Be watertight to a depth of 1 meter for at least 5 minutes, and maintain water tightness when subjected to a thermal shock of 45 degrees C.

(g) Not be unduly affected by seawater or oil.

(h) Have no sharp projections, which could damage survival craft.

(i) Be of small size and compact.

(j) Be capable of operating in the ambient noise level likely to be encountered on board survival craft.

(k) Have provisions for attachment to the clothing of the user.

(l) Be either a highly visible or marked with a surrounding yellow/ orange marking strip.

(m) Be resistant to deterioration by prolonged exposure to sunlight.

Carriage Requirements

24. As per the SOLAS (Chapter III), all passenger ships and cargo ships of 500 G.T. and upwards shall have at least 3 Nos; Vessels between 300 to 500 GT are required to carry 2 Nos and Vessels below 300 GT are required to carry 1 no.

NOTE. *Output power of a survival craft radio (VHF) is 0.25 watts (low) AND 1 watt (high).*

Power / Energy Source

25. These VHF hand-held radios can be provided with a rechargeable battery supply of a **primary Lithium battery (mandatory).** The Primary battery should always be in

sealed condition and to be used only in case of an emergency.