SEAFARERS TRAINING CENTER INC

PROFICIENCY IN SURVIVAL CRAFTS AND RESCUE BOATS OTHER TAN FAST RESCUE BOATS

In compliance with the 1978 International Agreement on Standards of Training, Certification and Watch keeping for Seafarers Code (STCW as amended)

SCOPE

This course aims to provide the training for candidates to launch and take charge of a survival craft or rescue boats in emergency situations, in accordance with Section A-VI/2 of the STCW Code.

OBJECTIVE

This syllabus covers the requirements of the 1978 STCW and amended Convention Chapter VI, Section A-VI/2, Table A-VI/2-1. On meeting the minimum standard of competence in survival craft and rescue boats other than fast rescue boats, a trainee will be competent to operate life-saving appliances and take charge of a survival craft during or after launch. They will also be able to operate a survival craft engine and manage survivors and survival craft after abandoning ship. Trainees will know the correct use of all locating devices, including communication and signaling apparatus and pyrotechnics, how to apply first aid to survivors and the actions to take to preserve the lives of those in their charge.

ENTRY STANDARDS

For admission to the course, seafarers must be certified by a doctor to be in good health. They must also have complete the four courses covering the familiarization and basic safety training and instruction in accordance with Regulation VI/1 of STCW 1978 and amended.

COURSE CERTIFICATE

On successful completion of the course and demonstration of competence, a document may be issued certifying that the holder has met the standard of competence specified in Table A-VI/2-1 of STCW 1978 and amended.

A certificate may be issued only by centres approved by the Administration.

COURSE INTAKE LIMITATIONS

The maximum number of trainees attending each session will depend on the availability of instructors, equipment and facilities available for conducting the training. It should not exceed the number of persons which the survival craft to be used is permitted to carry, and should not, at any time, exceed that which will allow sufficient opportunity for each trainee to have adequate practical instruction in procedures for the proper use of systems and equipment.

STAFF REQUIREMENTS

The instructors shall have appropriate training in instructional techniques and training methods (STCW Code Section A-I/6, paragraphs 1-7).

TEACHING FACILITIES AND EQUIPMENT

Ordinary classroom facilities and an overhead projector are required for the lectures

TEACHING AIDS

– Instructor Manual.

BIBLIOGRAPHY

- **Master_Thesis_Report_Halt_Dreving[illegible]er_liten.pdf**
- **Technical Notices Consolidated Version 2016.pdf**
- **TSGB Solas Equipment Manual.pdf**

TIMETABLE
COURSE OUTLINE

Couse Outline	Approximate tine (hours)
Knowledge, understanding and proficiency	**Lectures, demonstration and practical exercises**
1. Introduction and Safety 1.1 Introduction 1.2 Safety guidance	**0.5**
2. General 2.1 Emergency situations 2.2 Training, drills and operational readiness 2.3 Actions to be taken when called to survival craft stations	**1.5**
3. Abandon Ship 3.1 Actions to be taken when required to abandon ship 3.2 Actions to be taken when in the water	**0.5**
4. Survival craft and rescue boats 4.1 Lifeboats 4.2 Liferafts 4.3 Rescue Boats	**0.75**
5. Launching arrangements 5.1 Boat davits 5.2 Liferaft davits 5.3 Rescue boats davits 5.4 Free-fall 5.5 Float-free arrangement 5.6 Marine evacuation system	**1.25**
6. Evacuation and recovery of survival craft and rescue boats 6.1 Launching 6.2 Clearing the ship's side 6.3 Marshalling Liferafts and rescuing survivors from the sea 6.4 Recovery of survival craft and rescue boats 6.5 Launching survival craft and rescue boats in rough sea 6.6 Recovery of rescue boats in rough sea	**1.25**

7. Actions to take when clear of the ship	**0.25**
8. Lifeboat engine and accessories 8.1 Starting the engine 8.2 Cooling systems 8.3 Battery charging 8.4 Fire extinguisher 8.5 Water spray system 8.6 Self-contained air support system	**1.5**
9. Rescue boat outboard engine	**1**
10. Handling survival craft and rescue boats in rough weather 10.1 Boats 10.2 Liferafts 10.3 Beaching	**0.75**
11. Action to take when aboard a survival craft 11.1 Initial actions 11.2 Routines for survival 11.3 Use of equipment 11.4 Apportionment of food and water 11.5 Actions to take to maximize detectability and location of survival craft	**1.5**
12. Methods of helicopter rescue 12.1 Communicating with the helicopter 12.2 Evacuation from ship and survival craft 12.3 Helicopter pick-up	**1.25**
13. Hypothermia	**1**
14. Radio equipment 14.1 Two-way VHF radiotelephone apparatus 14.2 Emergency position-indicating radio beacons (EPIRBs) 14.3 Search and rescue transponder beacons (SARTs) 14.4 Distress signals, signaling equipment and pyrotechnics	**1.5**
15. First aid 15.1 Resuscitation techniques 15.2 Use of first-aid kit	**2**
16. Drills in launching and recovery boats	**3**

17. Drills in launching Liferafts 17.1 Davit-launched liferafts 17.2 Throw-overboard liferafts 17.3 Boarding a liferaft from the water 17.4 Righting an inverted liferaft	**3**
18. Drills in launching and recovering rescue boats	**3**
19. Practical exercises and evaluation	**6**
Total	**31.5**

COURSE TIMETABLE

Day	Period 1	Period 2	Period 3	Period 4
1	Introduction and safety	Abandon ship Survival craft and rescue boats	Survival craft and rescue boats Launching arrangements	Evacuation and recovery of survival craft and rescue boats Actions to take when clear of the ship
2	Lifeboat	Rescue boat outboard engines Handling survival craft and rescue boats in rough water	Handling survival craft and rescue boats in rough water Actions to take when aboard a survival craft	Actions to take when aboard a survival craft Methods of helicopter rescue
3	Hypothermia Radio equipment	Radio equipment (continued)	First aid (continued)	Drills in launching and recovering boats
4	Drills in launching and recovering boats	Drills in lunching liferafts	Practical exercises and evaluation	Practical exercises and evaluation

1. Introduction and Safety

1.1 Introduction

This course prepares crew for the launching and handling of survival craft through a series of practical exercises using a range of open and enclosed lifeboats and inflatable rescue boats to build confidence, competence and knowledge of safety procedures.

Upon completion of the course, students should be able to demonstrate the capability to:

- Take charge of a survival craft or rescue boat during and after launch
- Operate a survival craft engine
- Manage survivors and survival craft after abandoning ship
- Use locating devices including communications, signaling apparatus and pyrotechnics
- Apply first aid to survivors.

1.2 Safety guidance

If we are in difficulties on board, there are some orders to attract attention of other crew members. This orders are STILL and CARRY ON.

On hearing the order "STILL" issued by the officer or crew member in charge of an operation, everything should be stopped and the other crew members should keep quiet and listen for further instructions. When ready to continue, the order "CARRY ON" should be given.

2. General

There is no decision as critical or serious onboard ship as determining whether or not the situation has deteriorated to the point where the crew should Abandon Ship. Only the Captain shall decide whether and when Abandon Ship procedures are to be undertaken. During extended open water passages the Abandon Ship Procedures will be reviewed prior to leaving the dock and again when underway.

2.1 Emergency situations

Whenever some incident of a serious or harmful nature happens all of a sudden, we classify it as an emergency. One of the most important factors in dealing with

an emergency situation is the presence of a solid action plan apart from a sharp mind and lack of fear. This is a general rule which is applicable to all situations whether on board a ship in the middle of the ocean.

This emergencies which may lead to abandoning ship as:

- Fire
- Collision
- Stranding
- Explosion
- Adverse reaction of dangerous good or hazardous bulk cargo
- Shifting of cargo
- Foundering

The emergencies that may require launching and operation of rescue boats as:

- Abandon ship, including marshaling of survival craft
- Man overboard
- Towing and rescue of survival craft from a shipwreck

Emergency Signal Alarm

The general emergency signal is a signal used on board ships in times of emergency.

The signal is composed of seven or more short blasts followed by one long blast on the ship's whistle and internal alarm system.

The signal alerts passengers of an emergency so that they will begin proper procedures in which all persons collect their life jackets and proceed to their assigned muster stations.

According to the occurring disaster, every crewmember must strictly follow the instructions as they appear on the boat muster or fire muster or as they are given by the master or the officer in charge.

Other alarms that are installed in the ship to give audio-visual warnings are as follows:

- **Fire Alarm**: A fire alarm is sounded as continuous ringing of ship's electrical bell or continuous sounding of ship's horn.
- **Man Overboard Alarm**: When a man falls overboard, the ship internal alarm bell sounds 3 long rings and ship whistle will blow 3 long blasts to notify the crew on board and the other ships in nearby vicinity.
- **Navigational Alarm**: In the navigation bridge, most of the navigational equipments and navigation lights are fitted with failure alarm. If any of these malfunctions, an alarm will be sounded in an alarm panel displaying which system is malfunctioning.
- **Machinery space Alarm**: The machinery in the engine room has various safety devices and alarms fitted for safe operation. If any one of these malfunctions, a common engine room alarm is operated and the problem can be seen in the engine control room control panel which will display the alarm.
- **Machinery Space CO_2 Alarm**: The machinery space is fitted with CO_2 fixed with fire extinguishing system whose audible and visual alarm is entirely different from machinery space alarm and other alarm for easy reorganization.
- **Cargo Space CO_2 Alarm**: The cargo spaces of the ship are also fitted with fixed fire fighting system which has a different alarm when operated.
- **Abandon Ship Alarm**: When the emergency situation on board ship goes out of hands and ship is no longer safe for crew on board ship. The master of the ship can give a verbal Abandon ship order, but this alarm is never given in ship's bell or whistle. The general alarm is sounded and everybody comes to the emergency muster station where the master or his substitute (chief Officer) gives a verbal order to abandon ship.
- **Ship Security Alarm System**: Most of the ocean going vessels are fitted with security alert alarm system, which is a silent alarm system sounded in a pirate attack emergency. This signal is connected with different coastal authorities all over the world via a global satellite system to inform about the piracy.

Different Alarm signals of the vessel are clearly described in the muster list along with the action to be carried out so that all the crew member can perform their duties within no time in actual emergency.

Muster List

A ship's crew must be prepared at all times to tackle and fight any kind of emergencies which can arise due to reasons such as rough weather, machinery malfunction, pirate attack, human error etc. Such emergencies can lead to a fire, collision, flooding, grounding, environmental pollution, and loss of life.

The Muster List consists of duties and responsibilities in case of such mishaps, designated and assigned to each person on the ship; in other words, it is a list of the functions each member of a ship crew is required to perform in case of emergency.

Owing to it being a document that specifies the job that every crew member is assigned with in case of an emergency, it must be displayed at every conspicuous location onboard. Some of the important areas where the muster list is posted are- Bridge, Engine room, accommodation alleyways etc. – areas where ship's crew spends the maximum of their time.

Clear instructions are provided for every person on board in the language or languages required by the ship's flag State and also in the English language. The list shall be ready before the ship proceeds to sea. The regulatory requirements for the Muster List are specified in SOLAS Chapter III, Reg. 8 and 37. The regulation applies to all ships.

Brief instruction is given in case the alarm for a particular emergency is sounded, which includes action to be taken by the crew onboard. Specific duties that are assigned to each person on board are mentioned very clearly in the list. Some of the essential duties specified in the list are:

- Closing of the watertight doors, skylights, portholes and other openings
- Carriage of equipment and readying the survival craft and other life-saving appliances
- Muster of the crew (and passengers, if applicable)
- Heads of emergency teams and fire teams to streamline the action against such emergencies
- The muster list shall also specify the apt substitute in case any person is injured or disabled

The common muster point is clearly described if any emergency alarm is sounded. Normally life boat deck area is made as a common muster point. However, the muster point could vary with the type of emergency that is at hand.

The muster list is posted to keep the crew aware of the different emergency situations and duties to be performed if such situations occur in reality. For this, regular training and drill must be conducted by the master of the ship to ensure that all crew members are familiar with life-saving and fire fighting appliances.

A Muster Card must be placed (by the Third Mate since he's in charge of the LSA and FFA) in every person's cabin that specifies the person's muster station and the exact task that is assigned to them in the case of a specific emergency. The alarm signals are also mentioned so that the person is not confused as to the nature of the emergency. Illustrations and instructions for life jackets may also be included.

2.2 Training, drills and operational readiness

Drills on board ships play an important role in preparing the crew for emergency situations. The ship's engine room is a hazardous place where a variety of accidents can take place. Engine room crew members are therefore required to carry out all important drills and training procedures on regular basis to ensure safety of the ship and its crew.

According to STCW 78/95 Convention every seafarer is obliged to have certified knowledge about safety precautions applied on board of the vessels. Besides, SOLAS 74/78 Convention indicates time intervals and content of drills that has to be conducted on board. The purpose of this paper is to present how different drills scenarios and conducting training alarms are affecting the crew and how they improve the process of preparing muster lists and muster station equipment and procedures. The paper is based on deck cadets onboard experience and training.

Drills and trainings on boards of the ships are the essential part of seafarers' professions. There are many regulations which describe the way and frequency of drill conducting. Regulations 25 and 26 from Chapter III Safety of Life at Sea 74 Convention specify muster lists and drills practice on board of passenger and cargo vessels. The most important and requiring much attention are: abandon

ship drill, firefighting drill and general emergency alarm drill. What is more, every ship has a contingency plan concerning a procedure practice for a variety of situations that may occur on board of this vessel.

Before the ship leaves port and at all times during the voyage, all life-saving appliances shall be in working order and ready for immediate use.

Regulation 30 Drills.
This regulation applies to all passenger ships. On passenger ships, an abandon ship drill and fire drill shall take place weekly. The entire crew need not be involved in every drill, but each crew member must participate in an abandon ship drill and a fire drill each month as required in regulation 19.3.2. Passengers shall be strongly encouraged to attend these drills.

Regulation 35 Training manual and on-board training aids.
This regulation applies to all ships. A training manual shall be provided in each crew mess room and recreation room or in each crew cabin.

The training manual, which may comprise several volumes, shall contain instructions and information, in easily understood terms illustrated wherever possible, on the life-saving appliances provided in the ship and on the best methods of survival. Any part of such information may be provided in the form of audio-visual aids in lieu of the manual.

The following shall be explained in detail:

- Donning of lifejackets, immersion suits and anti-exposure suits, as appropriate.
- Muster at the assigned stations.
- Boarding, launching, and clearing the survival craft and rescue boats, including, where applicable, use of marine evacuation systems.
- Method of launching from within the survival craft.
- Release from launching appliances.
- Methods and use of devices for protection in launching areas, where appropriate.
- Illumination in launching areas.

- Use of all survival equipment.
- Use of all detection equipment.
- With the assistance of illustrations, the use of radio life-saving appliances.
- Use of drogues.
- Use of engine and accessories.
- Recovery of survival craft and rescue boats including stowage and securing.
- Hazards of exposure and the need for warm clothing.
- Best use of the survival craft facilities in order to survive.
- Methods of retrieval, including the use of helicopter rescue gear (slings, baskets, stretchers), breeches-buoy and shore lifesaving.
- Apparatus and ship's line-throwing apparatus.
- All other functions contained in the muster list and emergency instructions.
- Instructions for emergency repair of the life-saving appliances.
- Every ship fitted with a marine evacuation system shall be provided with on-board training aids in the use of the system. The training manual shall be written in the working language of the ship.

2.3 Actions to be taken when called to survival craft stations

When called to a survival craft station the following personal life-saving appliances are useful:

- Lifejackets
- Lifebuoys
- Immersion suits
- Thermal protective aids
- Anti-exposure suits

Personal preparation depends on how much time you have before you must abandon the vessel.

The biggest hazard faced by crewmembers is loss of body heat or, hypothermia. To prevent hypothermia, put on as much clothing as you can. Make sure that your head, neck, hands and feet are covered. Wear many layers of clothing. The more layers you wear, the better protected you will be. Finish covering with wet weather gear and then put on the life jacket.

How individuals could prepare for abandoning ship

Remember to:

- Wear a lot of clothing and in many layers, as we have mentioned
- Wear soft-soled shoes to prevent damage to life raft
- Take anti-seasickness tablets. Vomiting causes loss of water. Seasickness makes a person more likely to get hypothermia
- Drink a reasonable amount of water. Too much may cause nausea, or vomiting
- Take your grab bag
- Button up your clothing and put on a life jacket
- At the time of abandoning ship, switch on the life jacket light if it is nighttime
- Avoid getting wet
- Avoid jumping into the water

Additional equipment for survival craft

If there is time between preparing and launching the survival craft, extra equipment should be taken into the survival craft. Some items are:

- Portable radio set (Broadcast type)
- Extra water in partly filled containers that will float and can be towed
- Sweet biscuits, tinned fruit and fruit juices, fresh and dried fruits
- Blankets and extra clothing
- Additional torches, batteries and bulbs
- Notebook and pencil
- Sun-screen cream
- Anti-seasickness tablets
- Light rope
- Oilskins
- Current chart of the area
- Portable VHF radio with Channel 16
- Hand bearing compass (possible position fixing if near coast line)
- Hand held GPS, spare batteries

Additional on preparation on personal equipment you also must think of the following steps before abandonment is necessary:

- Make sure that the person in command of each survival craft should check that all crew are present and that crew and passengers are suitable dressed and have correctly donned lifejackets.
- Preparations should be made for launching survival craft and/or deploying marine evacuation systems.
- Make sure that boats should only be lowered to embarkation deck level on instructions from the master himself. This will also apply on the marine evacuation systems.
- As a coxswain check that the persons assigned in the muster list should take two-way VHF radiotelephone apparatus, EPIRBs, SARTs and other items to their stations are aware from their tasks.

3. Abandon Ship

3.1 Actions to be taken when required to abandon ship

A ship should only be abandoned on the orders of the master or person in charge of the ship.

Additional items such as e.g. water, food, blankets which may be put into a lifeboat when time permits.
The supervision of boarding lifeboats and rescue boats is done by the coxswain according the fastest boarding procedure.

The supervision of boarding liferafts through marine evacuation systems is done by appointed crewmembers.

The supervision of boarding davit-launched liferafts is done by an appointed and qualified crewmember.

Hand-launched liferafts (throw overboard liferafts) should be boarded from the ship by means of ladders.

Jumping on to inflatable liferafts must be avoided at all times, this because of the danger.

If possible every effort should be made to keep dry when boarding survival crafts.

The person in charge should ensure that all of the boat's crew are present and all occupants are seated, with safety belts fastened where appropriate, before lowering.

The coxswain must check to be sure that hands and arms are clear of the boat's sides.

Before launching inboard engines of lifeboat and rescue boats should be started. Boats with external cooling systems (sea water) should never be started out of the water without touching the water.

The water spray and air support systems should be set to operate and the closure of hatches should be checked if launching into oil on the surface.

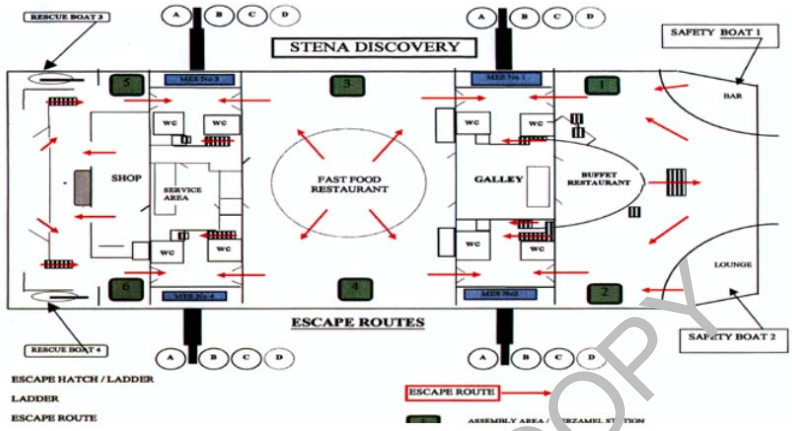
The coxswain must check to see if it is clear below before lowering a boat, throwing a raft overboard, or deploying a marine evacuation system.

The coxswain in charge must be able to have an alternative plan if it proves impossible to launch a survival craft or deploy a marine evacuation system.

3.2 Actions to be taken when in the water

Every crewmember should never enter the water without a lifejacket. If possible an immersion suit, thermal protective aid or anti-exposure suit can be worn if available.

Alternative every buoyant item can help a survivor in the water. A person in the water will cool and suffer from exposure very quickly, even in temperate areas, unless wearing an immersion suit, thermal protective aid or anti-exposure suit.
Every survivors in the water should swim to survival craft, buoyant wreckage or one another if within range, but otherwise avoid unnecessary exertion.



The lifejacket light and whistle must be used to track attention for rescue. Important is to know how to hold or connect to a lifeboat or liferaft.

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4. Survival craft and rescue boats

4.1 Lifeboats

Construction and outfit of the following lifeboats:

- Partially enclosed
- Totally enclosed
- Free-fall
- With a self-contained air support system
- Fire-protected

Different types of lifeboats:

- Open lifeboats.
- Partially enclosed lifeboats.
- Totally enclosed lifeboats.

Open lifeboats

Open lifeboats can be considered outdated. A new SOLAS regulation states that vessels were the keel is laid after 1986 must have totally enclosed lifeboats.

Partially enclosed lifeboats

This type of lifeboat is installed on ferry boats and passenger ships. The most important reason is of course that this type of boat can carry many passengers. That is why the boat has large entrances. Also the passengers are not trained so the crew must assist them.

Totally enclosed lifeboats

There are different types and sizes of totally enclosed lifeboats on the market such as:

- Whittaker from the United States
- Harding from Norway
- Watercraft from Great Britain
- Mulder and Rijke from the Netherlands
- Verhoef from the Netherlands (Specialized in Free Fall)
- Hatecke from Germany Harding

Harding Safety from Norway is also a leading company in making lifeboats for tankers and offshore units. The capacity of Harding boats is ranging from about 25 till 75 passengers. Harding Safety also manufactures free fall boats.

Watercraft Watercraft Int. Limited from England also build lifeboats ranging from 32 till 80 persons. One of the latest versions is the MK - V.

Different totally enclosed lifeboat have different ways to:

- Get into the boat and strap in.
- Prepare the boat (engine).
- Lower the boat.
- Release the falls.
- Maneuver the boat.

Every lifeboat shall be powered by a compression ignition engine. No engine shall be used for any lifeboat if its fuel has a flashpoint of 43C or less.

The engine shall be provided with either a manual starting system, or a power starting system with two independent rechargeable energy sources.

The engine shall be capable of operating for not less than 5 min after starting from cold with the lifeboat out of the water.

The exhaust pipe shall be so arranged as to prevent water from entering the engine in normal operation.

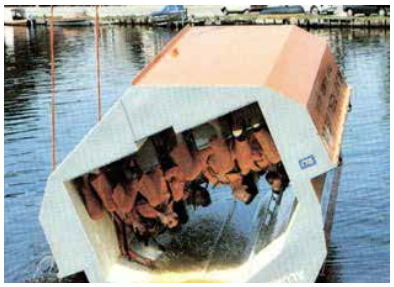
The speed of a lifeboat when proceeding ahead in calm water, when loaded with its full complement of persons and equipment and with all engine powered auxiliary equipment in operation, shall be at least 6 knots and 2 knots when towing a 25-persons liferaft loaded with its full complement of persons and equipment or its equivalent. Sufficient fuel, suitable for use throughout the temperature range expected in the area in which the ship operates, shall be provided to run the fully loaded lifeboat at 6 knots for a period of not less than 24 H.

Enclosure

- Protection against heat and cold.
- Access by watertight hatches.
- Launching and recovery can be done from inside.
- Opening and closing of the hatches must be possible from in and outside. Also to secure them in open position.
- Possible to row the craft (freefall excluded).
- In capsized position to withstand the total pressure.
- Sufficient daylight by windows.
- The exterior a highly visible colour and the interior a not discomfort colour.
- Handrails on the outside also around the hatches.
- Easy access to the seats.
- Protection against dangerous subatmospheric pressures caused by the engine.

Capsizing and re-righting (Cont. regulation 44)

- A safety belt for every person. (100 kg)
- Fully loaded the boat must be self-righting with the entrances closed and the persons in seatbelts.
- When the boat is damaged there must be an above water escape.
- During the capsize no water may enter the engine.



Lifeboat Capsize Test

Propulsion (Cont. regulation 44)

- The engine and transmission shall be controlled from the helmsman's position.
- Easily restarted after capsizing.
- Air cooled engines shall have a duct system to take in cooling air from, and exhaust it to the outside of the lifeboat.

Construction and fendering

- Protection against harmful accelerations.

Regulation 45

Lifeboats with a self-contained air support system. Safe and breathable air.

- For at least 10 min.
- During this period the inside pressure not less than the outside pressure.
- The overpressure not more than 20 mbar.
- Indicators to indicate the pressure all the time.

Regulation 46

Fire protected lifeboats.

- Fire protected for a period of not less than 10 min.
- Water spray system
  - Water for the system shall be drawn from the sea by a self-priming motor pump. (Or air supply) Controlling the water flow must be possible.
  - The seawater intake shall be so arranged as to prevent the intake of flammable liquids from the sea surface. 2.3 Possible to flush with fresh water.

Every new TEMPSC must be tested also called prototype test.

- Strength
- Material
- Stability
- Overload test
- Impact test
- Drop test
- Seating strength test
- Seating test

- Freeboard and stability
- Release mechanism test
- Buoyancy test
- Operational test
- Lifeboat light tests
- Self-righting
- Flooded capsizing test
- Engine inversion test
- Additional tests for lifeboats with self-contained air support system
- Additional test for fire protected lifeboats

Lifeboat markings

- The dimensions of the lifeboat and the number of persons which it is permitted to accommodate shall be marked on it in clear permanent characters.
- The name and port of registry of the ship to which the lifeboat belongs shall be marked on each side of the lifeboat's bow in block capitals of the Roman alphabet.
- Means of identifying the ship to which the lifeboat belongs and the number of the lifeboat shall be marked in such a way that they are visible from above.

Lifeboat equipment. (According to SOLAS handbook)

The equipment shall be secured in such a manner as not to interfere with any abandonment procedures.


Lifeboat equipment

All items shall be as little mass as possible.

- **Thole pins/crutches:** Thole pins or crutches or equivalent arrangements shall be provided for each oar provided. Thole pins or crutches shall be attached to the boat by lanyards or chains.
- **OARS:** There should be sufficient buoyant oars to make headway in calm seas.
- **BOAT-HOOKS:** Two buoyant boat hooks suitable to assist people in the sea.
- **A buoyant bailer and two buckets:** A bailer and two buckets attached to the boat by a lanyard.
- **Survival manual:** A handout containing useful information during the survival period.
- **Compass:** A suitably placed and luminous compass, fitted at the navigator's position.
- **Sea anchor:** For lack of space it should be of the folding type. A tripping line should be attached to the sea-anchor so that it can be hauled in easily. The sea anchor should be attached to the end of the towingline at least three or four times the length of the boat and have a breaking strength of about five tons.
- **Painter:** Two efficient painters of a length equal to not less than twice the distance from the stowage position of the lifeboat to the waterline in the lightest seagoing condition or 15 m, whichever is greater.
- **Hatchets:** Two hatchets, one at stern and one at the bow of the lifeboat.
- **Fresh drinking water:** Watertight receptacles containing a total of 3 Ltr. of fresh water for each person the lifeboat is permitted to accommodate, of which 1 Ltr. per person may be replaced by a de-salting apparatus capable of producing an equal amount of fresh water in two days.
- **Dipper:** A rustproof dipper with lanyard.
- **Drinking vessel:** A rustproof graduated drinking vessel.
- **Food:** A food ration totaling not less than 10.000 KJ for each person the lifeboat is permitted to accommodate: these rations shall be kept in airtight packaging and be stowed in a watertight container.
- **Rockets:** Four rocket parachute flares complying with the requirements of regulation 35.
- **Flares:** Six hand flares complying with the requirements of regulations 36.

- **Smoke signals:** Two buoyant smoke signals complying with the requirements of regulation 37.
- **Torch:** One waterproof electric torch suitable for Morse signaling. Together with one spare set of batteries and one spare bulb in a waterproof container.
- **Signaling mirror:** One daylight signaling mirror with instructions for its use for signaling to ships and aircraft.
- **Life-saving signals:** One copy of the lifesaving signals prescribed by regulation V/16 on a waterproof card or in a waterproof container.
- **Whistle:** One whistle or equivalent sound signal.
- **First-aid box:** A first aid outfit in a waterproof case capable of being closed tightly after use.
- **Anti-seasickness:** Six doses of anti-seasickness medicine and one seasickness bag for each person.
- **Knife:** A jack-knife to be kept attached to the boat by a lanyard.
- **Tin-openers:** Three tin-openers.
- **Rescue quoits:** Two buoyant rescue quoits, attached to not less than 30 m of buoyant line.
- **Manual pump:** One manual pump.
- **Fishing tackle:** One set of fishing tackle.
- **Tools:** Sufficient tools for minor adjustments to the engine and its accessories.

4.2Liferafts

There are two types of liferafts, the TOB Throw Over Board and the DLL Davit Launchable Liferaft. The TOB is relatively easy to use and always ready to use.

The TOB can be quickly launched and will provide relatively good protection. It also requires a minimum stowage space and don't require a launching facilities.

TBO Liferaft

The liferaft shall be packed in a container that is:

- Constructed as to withstand hard conditions encountered at sea.
- Sufficient inherent buoyancy, when packed with the liferaft and its equipment, to pull the painter from within and to operate the inflation mechanism, should the installation sink or capsize.
- As far as practicable watertight, except for drain holes in the container bottom.

Construction of liferafts

Every life raft is constructed to be capable of withstanding exposure for 30 days afloat in all sea conditions. The liferaft is constructed that when it is dropped into the water from a height of 18 m, the liferaft and its equipment will operate properly. If the liferaft is to be stowed at a height of more than 18 m above the waterline in the lightest seagoing condition, it shall be of a type which has been drop-tested from at least that height. The liferaft and its fittings are constructed to be towed at a speed of 3 knots in calm water when loaded with its full complement of persons and equipment and with one of its sea anchors streamed. Unless the liferaft is to be launched by an approved launching appliance the total mass of the life raft (including container and equipment) are not more than 185 kg. Inflatable life rafts are designed for 4 persons till 148 persons. The liferafts are packed in containers including the special designed emergency equipment.

Position of the liferafts

The liferaft including the emergency equipment is packed in a polyester container or rubber bag. It must be possible to evacuate the maximum amount of people at the muster point within a period of 10 minutes.

Design

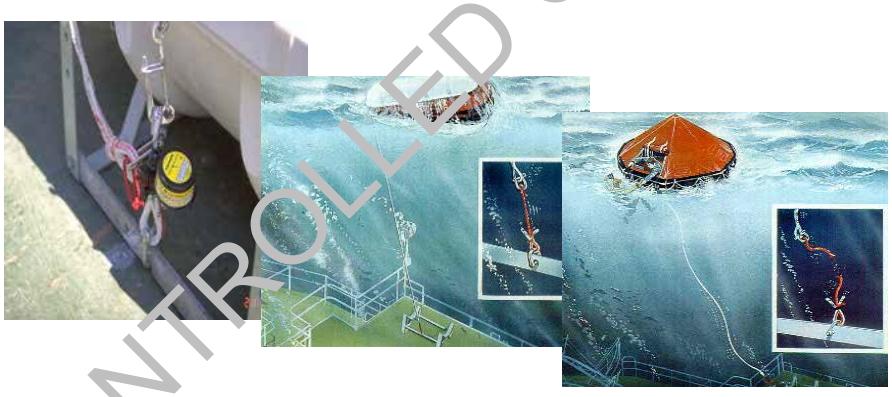
Rafts are made from heavy duty rubber on both sides. The topside is usually bright orange and the underside is black. All parts of the raft are glued. The quality demands are controlled by international and national authorities such as described in SOLAS convention and Lifesaving Appliances LSA code.

Components of the raft:

- Separate inflatable compartments.
- Inflatable canopy supports.
- Inflatable canopy.
- Inflatable floor.
- Sea water batteries.
- Stability bags.
- One or two entrances.
- Over pressure valves.
- Extra inflation valves.
- Automatic lights.
- Lifeline.
- Self-deployed sea anchor. Inflated liferaft.

Throw Over Board raft

A painterline runs from the raft container which is fixed to a Hydraulic Release Unit HRU. The painterline is stored in the container and is fixed by a steel cable with a steel cylinder of compressed gasses (CO2 and N2). When the raft is thrown overboard the painterline will activate the cylinder. The painterline is connected to the liferaft and prevent that the liferaft will drift away. The painterline is connected to the installation or HRU. Between the painterline and the HRU is a break line, if the installation should sink the break line will snap through by the upwards buoyancy. Then the liferaft will float to the surface. After launching the liferaft you should pull the painter out of the container, if there is any resistance you should tug sharply so that the pressure cylinder is activated, the raft will then inflate.



Where should the liferaft launched?

Important points:

- Is there a fire on board (smoke and heat)?
- Is the surface of the water burning?
- Can you reach the leeside?
- Is there debris where you wish to go overboard?

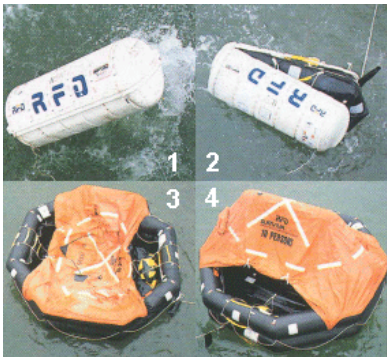
It could be necessary to launch the raft elsewhere in these situations. Untie the painter and carry the raft to another position, fasten the line and throw the raft overboard. Check the painter. It is of course of great importance that the painter remains in place until everyone is in the raft because the raft would otherwise drift too far away in a strong wind or current. It is possible to tow the raft with a specially attached towing piece. The strengthened towing piece should be used

to connect several rafts together. The speed of towing a raft should if possible be restricted to 2 knots. Before entering the raft you should remove sharp objects such as tools. Enter the raft by means of a (rope) ladder, scramble net, rope or from the water, try to ensure that you stay dry. You could jump into the raft from a not too great a height but it is not recommended, the shell of the container could cause injury. Never jump into the raft if other persons are already in the raft.

Launching TOB

Launch procedure for a throw able liferaft:

- Ensure that the painter is attached properly.
- Check whether it is clear overboard.
- Remove the sea lashing around the container and take the raft to the railing.
- Remove the railing if necessary.
- Throw the raft out.
- Pull the rest of the painterline sharply out of the container to activate the CO2 cylinder.
- The raft will inflate in ± 60 sec



Inflating liferaft

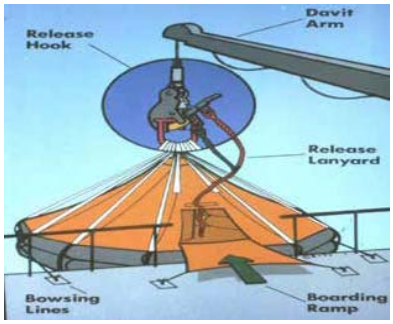
Davit Launchable Liferaft DLL

These liferafts have a special method of launching but can also be thrown overboard. The advantage is that you enter the raft dry and don't have to climb down. The disadvantage is that launching will take more time and you need to know how operate the DLL. The hook and davit with a single wire are special designed for the DLL. After launching the liferaft the hook that opens automatically when the raft makes contact with the water, as long as the safety pole is removed! The operator should lock the hook if it is fixed to the raft. When the raft nears the water (± 0.5 m.) the lock should be set to 'acute'. The hook will only open when the weight of the raft no longer hangs on the hook. Make sure the safety pole only opens at 0.5 m. from the water. Turning a raft.

If the raft is inflated upside-down or turns over, you must turn it back again.

- Climb the ladder on the side onto the raft where the CO2 cylinder can be found.
- Stand on the float and while holding the turning line gently lean backwards.
- If you are lying on your back with the (soft) raft on you, pull yourself from under the raft with the turning line.
- Then climb into the raft.

The last years we have seen a development that life rafts are self-righting.



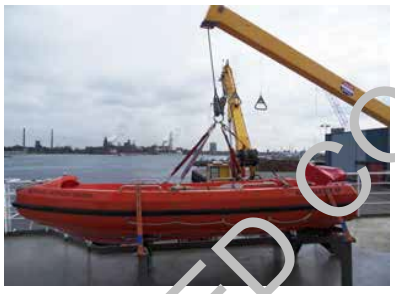
4.3 Rescue Boats

Construction and outfit of the following rescue boats:

- rigid boats
- inflatable boats - combination of rigid and inflatable boats

Particular characteristics and facilities of rescue boats Section III – Cargo ships (additional requirements).

Regulation 31.2 Rescue boats. Cargo ships shall carry at least one rescue boat complying with the requirements of section 5.1 of the Code. A lifeboat may be accepted as a rescue boat, provided that it and its launching and recovery arrangements also comply with the requirements for a rescue boat.



Life-saving appliance (LSA) Code, Chapter V - Rescue Boats.

- A lifeboat may be deployed as an RB, if both the boat and the launching device comply with the requirements laid down in the LSA code for testing.
- Requirements are also laid down here on floating equipment attached to FRBs, also in terms of sufficient protection against impact and forces.
- RBs must have an inflatable hull or a rigid hull, or a combination of both.
- Not shorter than 3.8 metres and not longer than 8.5 metres.
- The capacity must be such that at least 5 people can sit and 1 person can be laid on a stretcher. Not counting the gangway or the inflatable chambers.
- Boats consisting of a fixed hull in combination with floating chambers, also known as “Rigid” FRBs are also subject to the LSA code, if we look at the construction.
- Unless the boat has sufficient shear, the FRB must be fitted with a tube cover which is not less than 15% of the length of the boat.
- RB’s must be able to achieve a speed of 6 knots, and maintain that speed for a period of 4 hours.
- RB’s must be sufficiently maneuverable, even in rough seas, to be able to retrieve men overboard from the water, to marshal life rafts and to tow the largest life raft on board, at a speed of at least 2 knots.

- An RB may be equipped with an outboard or inboard motor, the rudder and the tiller may be part of the motor.
- RB's may be equipped with a petrol engine, but with an approved fuel system, with the tanks protected against fire and explosion.
- Possibilities for towing must be permanently fitted, for the marshalling or towing of rafts.
- Every RB must be self-bailing, or have a bailing pump system, to be able to bail effectively. This may also be automatic.
- RB's must be equipped with a water-tight compartment, in which small objects and the equipment can be stored.

5. Launching arrangements

5.1 Boat davits

For launching lifeboats, rescue boats and davit launchable liferafts the following arrangements are available:

- gravity davits
- luffing davits
- single-arm davits

A davit is any of various crane-like devices used on a ship for supporting, raising, and lowering boats, anchors, etc. The term sometimes refers to structural arms in other applications where a suspended load is supported in similar fashion to the naval application.

Davit systems are most often used to lower an emergency lifeboat to the embarkation level to be boarded. Davits can also be used as man-overboard safety devices to retrieve personnel from the water.

The lifeboat davit has falls (now made of wire, historically of manila rope) that are used to lower the lifeboat into the water. Davits can also refer to single mechanical arms with a winch for lowering and raising spare parts onto a vessel and for lowering any other equipment from the deck of a vessel or a pontoon to the water. The maintaining and operation of davits is all under jurisdiction of International Maritime Organization. The regulations are enforced by the country's own Coast Guard.

Lifeboat davit types

Davits are designed to fit into deck spaces that the naval architects deemed necessary:

- **Radial (obsolete)** - Hand powered davit. This type was used on the Lifeboats of the RMS Lusitania. Each arm must be rotated out manually; uses manila rope falls. Goose-neck shape to the arm that is swung out.
- **Mechanical (obsolete)** - This type is like the radial davit, but both arms are moved out at the same time using a screw system; uses manila rope falls. An example is the Welin Quadrant davit type used on RMS Titanic.
- **Gravity (industry standard)** - There are multiple forms; one man can operate; uses wire falls.

– **Roller** - Davit slides down a track, bringing the davit to the embarkation deck.

– **Single pivot** - One pivot point where the lifeboat is moved over the side of the craft.
– **Multi pivot** - Common on promenade decks of cruise ships. Useful where space is limited.

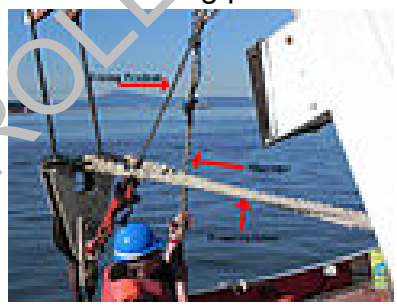
– **Free fall** - Lifeboat slides right off vessel. Lifeboat must be an enclosed type. Main type of Davit on merchant ships now. This type does not use falls.

– **Fixed** - Common on oil rigs. Lifeboat is hung above the water (at embarkation level) and lowered into the water.

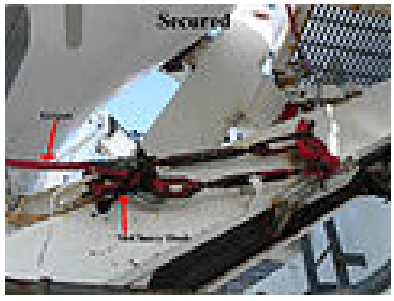
Basic Parts

– **Liferaft:** These can be Enclosed, partially enclosed, or open.

– **Frapping Lines:** These lines are used on all davits except the fixed and freefall davits. The frapping line are used to pull the lifeboat over to the embarkation deck along with the tracing pendent to be loaded.



– **Gripes:** Ropes used to hold the Lifeboat in the stored position while underway.



– **Tracing pendants:** Lines used to initially pull the lifeboat over to the embarkation deck so that the Frapping lines can be connected.

– **Falls:** The wires which lift or lower the lifeboat are known as falls.

Releasing mechanisms

There are 3 basic systems used to release the lifeboat from the davit. (Coast Guard Questions are for the Rottmer, On-Load releasing gear).

On-load: For this style of release mechanism, the lifeboat can be released at any point from the davit. This type of system allows a lifeboat to be released when it is not in the water, whether this is because of the emergency or an accident. Because of this, during an evacuation the release mechanism must be watched to make sure there is not an accidental activation.

Offload: This release mechanism requires the weight (load) of the lifeboat to not be on the hook when it is released. This includes the Titanic-era Monomony hook design that requires someone to remove the hook from the lifeboat by hand. But this type also includes the hydrostatic system many lifeboats use now. For this, a float is raised up and engages the release once the craft is in the water to the right depth.

Procedure

For all lifeboats using a roller gravity davit and Rottmer releasing gear, this is the procedure:

1. Make sure the Davit tracks are clear of debris.
2. Remove the lifeboat cover if applicable.
3. Put in the lifeboat plugs.
4. At this time the Rottmer releasing gear is checked to be secure.
5. Attach the sea painter to the bow of the ship.
6. Remove the gripes from the lifeboat.
7. Make sure the gripes preventing bar is free from the track.
8. Have the assigned brake man life the braking bar and lower the lifeboat to the embarkation deck.
9. Now that the Tracing pendants have pulled the lifeboat in close, attach the Frapping lines to the wire falls by passing them to a worker who is on the lifeboat.
10. Load the lifeboat. Load one person at a time and seat them so their weight is distributed between the two sides.
11. Have the brake man raise the lifeboat slightly so the workers can release the Tracing pendants.

12. Brake man lifts bar and lowers the vessel into the water.
13. Operate the Rottmer releasing gear and release the davit on the crest of a wave.
14. If ship is sinking, pull toggle pin to release the sea painter from the ship.

During this procedure, if the lifeboat has air-cooled engines start it at the beginning. If it has a water-cooled engine start the engine after the lifeboat is in the water.

5.2 Liferaft davits

The life raft on board ship are released or launched in to the water by three different methods:

- Auto release with Hydrostatic Release Unit (HRU).
- Manually launching.
- Launching by Davits.

Auto Release with Hydrostatic Release Unit (HRU):

The life raft HRU plays an important role when it comes to saving life during abandon ship situation. SOLAS 74 clearly specify the requirements for construction and positioning of the HRU at the life raft.

The Working of HRU:

- HRU acts as a connecting media between life raft container and ship deck, where it is stored.
- The HRU comes in action under the pressure of water exerted on HRU when the ship sinks below 4m of water level.
- The HRU consists of a sharp knife or chisel which is used to cut the strap lashed over the container carrying life raft, but it still holds the painter at the weak link.
- The HRU is connected to the container through a lashing arrangement which can be disengaged quickly by means of slip hook when launching the raft manually.
- The HRU is connected to a strong point on deck through a weak link.
- When vessel sinks, the HRU cuts the rope and the container floats to the surface of water.

- As vessel sinks further, the tension in the painter causes the life raft to inflate out of the container.
- The tension acting on the weak link will cause it to break making the life raft free from the ship.
- When vessel sinks, the HRU cuts the rope and the container floats to the surface of water.

Manual Launching Procedure of Life raft:

- Check that one end of the painter of the raft is well secured to a strong point on ship's deck or structure.
- Remove the lashing from the container of the raft and open the way to portable rail if available.
- Check the ship side where the raft to be launched is clear.
- Two people should lift the container from both sides horizontally and throw the container.
- Make sure the painter is still fixed at a strong point so that the raft should not be waved away by waters.
- Pull the painter with a hard jerk to fire the gas bottle to inflate the raft.
- The life raft will take 20-30 sec to inflate.
- Board the life raft one by one using ladder or rope.
- Avoid sharp objects like knives, shoes and other sharp objects etc which may damage the raft surface.
- When everybody is aboard, after a headcount, cut the painter with a sharp knife.

Launching Raft by Davit:

- Open the lashing and remove the raft container from HRU by opening the manual slip hook or bottle screw arrangement.
- Tie up the one end of the painter of raft into a strong point at deck.
- Keep the container in the open and attach the davit hook to the given eye in the canister/ container
- Take up the raft load by davit and keep the container hanging at embarkation deck area.
- Pull the painter and inflate the raft. Have a thorough check on the inflated raft.

- Start boarding the raft without the shoes and other sharp object.
- After the boarding is completed, check the bottom is clear and release the securing lines, if any.
- Someone inside the raft will detach the hook of the davit from the raft when the raft is just above the water.
- The davit operating person will board the raft either by jumping in to the sea, raft or by other boarding means if provided.
- Cut the painter and cast away the raft from ship.

5.3 Rescue boats davits

For launching lifeboats, rescue boats and davit launchable liferafts the following arrangements are available:

- gravity davits
- luffing davits
- single-arm davits

A davit is any of various crane-like devices used on a ship for supporting, raising, and lowering boats, anchors etc. The term sometimes refers to structural arms in other applications where a suspended load is supported in similar fashion to the naval application.

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- **Fixed** - Common on oil rigs. Lifeboat is hung above the water (at embarkation level) and lowered into the water.

Basic Parts

- **Liferaft:** These can be Enclosed, partially enclosed, or open.
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- **Gripes:** Ropes used to hold the Lifeboat in the stored position while underway.
- **Tracing pendants:** Lines used to initially pull the lifeboat over to the embarkation deck so that the Frapping lines can be connected.
- **Falls:** The wires which lift or lower the lifeboat are known as falls.

Releasing mechanisms

There are 3 basic systems used to release the lifeboat from the davit. (Coast Guard Questions are for the Rottmer, On-Load releasing gear).

On-load: For this style of release mechanism, the lifeboat can be released at any point from the davit. This type of system allows a lifeboat to be released when it is not in the water, whether this is because of the emergency or an accident. Because of this, during an evacuation the release mechanism must be watched to make sure there is not an accidental activation.

Offload: This release mechanism requires the weight (load) of the lifeboat to not be on the hook when it is released. This includes the Titanic-era Monomony hook design that requires someone to remove the hook from the lifeboat by hand. But this type also includes the hydrostatic system many lifeboats use now. For this, a float is raised up and engages the release once the craft is in the water to the right depth.

Procedure

For all lifeboats using a roller gravity davit and Rottmer releasing gear, this is the procedure:

15. Make sure the Davit tracks are clear of debris.
16. Remove the lifeboat cover if applicable.
17. Put in the lifeboat plugs.
18. At this time the Rottmer releasing gear is checked to be secure.
19. Attach the sea painter to the bow of the ship.
20. Remove the gripes from the lifeboat.
21. Make sure the gripes preventing bar is free from the track.
22. Have the assigned brake man life the braking bar and lower the lifeboat to the embarkation deck.
23. Now that the Tracing pendants have pulled the lifeboat in close, attach the Frapping lines to the wire falls by passing them to a worker who is on the lifeboat.
24. Load the lifeboat. Load one person at a time and seat them so their weight is distributed between the two sides.
25. Have the brake man raise the lifeboat slightly so the workers can release the Tracing pendants.

26. Brake man lifts bar and lowers the vessel into the water.
27. Operate the Rottmer releasing gear and release the davit on the crest of a wave.
28. If ship is sinking, pull toggle pin to release the sea painter from the ship.

During this procedure, if the lifeboat has air-cooled engines start it at the beginning. If it has a water-cooled engine start the engine after the lifeboat is in the water.

5.4 Free-fall

Life-saving appliance (LSA) Code, launching appliances for free-fall lifeboats:

- Every free-fall launching appliance shall comply with the applicable requirements of paragraph 6.1.1 and, in addition, shall comply with the requirements of the LSA code.
- The launching appliance shall be designed and installed so that it and the lifeboat it serves operate as a system to protect the occupants from harmful acceleration forces as required by paragraph 4.7.5, and to ensure effective clearing of the ship as required by paragraphs 4.7.3.1 and 4.7.3.2.
- The launching appliance shall be constructed so as to prevent sparking and incendiary friction during the launching of the lifeboat.
- The launching appliance shall be designed and arranged so that in its ready to launch position, the distance from the lowest point on the lifeboat it serves to the water surface with the ship in its lightest seagoing condition does not exceed the lifeboat's free-fall certification height, taking into consideration the requirements of paragraph 4.7.3.
- The launching appliance shall be arranged so as to preclude accidental release of the lifeboat in its unattended stowed position. If the means provided to secure the lifeboat cannot be released from inside the lifeboat, it shall be so arranged as to preclude boarding the lifeboat without first releasing it.
- The release mechanism shall be arranged so that at least two independent actions from inside the lifeboat are required in order to launch the lifeboat.
- Each launching appliance shall be provided with a secondary means to launch the lifeboat by falls. Such means shall comply with the requirements of paragraph 6.1.1 (except 6.1.1.3) and paragraph 6.1.2 (except 6.1.2.6). It

must be capable of launching the lifeboat against unfavourable conditions of a trim of up to only 2° and a list of up to only 5° either way and it need not comply with the speed requirements of paragraphs 6.1.2.8 and 6.1.2.9. If the secondary launching appliance is not dependent on gravity, stored mechanical power or other manual means, the launching appliance shall be connected both to the ship's main and emergency power supplies.

- The secondary means of launching shall be equipped with at least a single off-load capability to release the lifeboat.

Free Fall Launching appliances

5.5 Float-free arrangement

Float-free arrangements for liferafts with painterline. The liferaft painter system shall provide a connection between the ship and the liferaft and shall be so arranged as to ensure that the liferaft when released and, in the case of an inflatable liferaft, inflated is not dragged under by the sinking ship.

Weak link, if a weak link is used in the float-free arrangement, it shall:

- Not be broken by the force required to pull the painter from the liferaft container;
- If applicable, be of sufficient strength to permit the inflation of the liferaft; and
- Break under a strain of 2.2 +/– 0.4 kN.

Hydrostatic release units, if a hydrostatic release unit is used in the float-free arrangements, it shall:

- Be constructed of compatible materials so as to prevent malfunction of the unit. Galvanizing or other forms of metallic coating on parts of the hydrostatic release unit shall not be accepted.

- Automatically release the liferaft at a depth of not more than 4 m.
- Have drains to prevent the accumulation of water in the hydrostatic chamber when the unit is in its normal position.
- Be so constructed as to prevent release when seas wash over the unit.
- Be permanently marked on its exterior with its type and serial number.
- Be permanently marked on the unit or identification plate securely attached to the unit, with the date of manufacture, type and serial number and whether the unit is suitable for use with a liferaft with a capacity of more than 25 persons.
- Be such that each part connected to the painter system has a strength of not less than that required for the painter.
- If disposable, in lieu of the requirement in paragraph 4.1.6.3.6 be marked with a means of determining its date of expiry.
- Describes the working of a hydrostatic release unit for a liferaft securing strap.

On-board maintenance of hydrostatic release units: Periodic servicing of hydrostatic release units, hydrostatic release units, other than disposable hydrostatic release units, shall be serviced:

- At intervals not exceeding 12 months, provided where in any case this is impracticable, the Administration may extend this period to 17 months.
- At a servicing station which is competent to service them, maintains proper servicing facilities and uses only properly trained personnel.
- Disposable Hydrostatic Release Units must be visually checked on a regular basis (e.g. on not being painted).

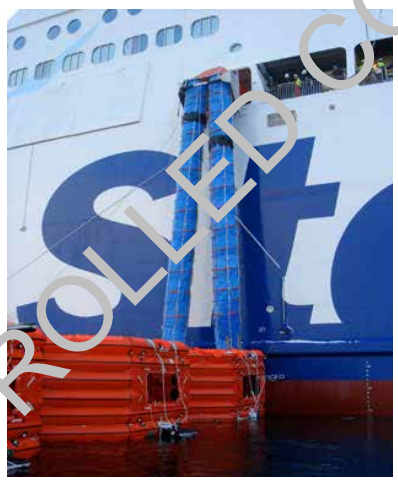
5.6 Marine evacuation system

Chapter III Life-saving appliances and arrangements Regulation 15 Stowage of marine evacuation systems:

- The ship's side shall not have any openings between the embarkation station of the marine evacuation system and the waterline in the lightest seagoing condition and means shall be provided to protect the system from any projections.
- Marine evacuation systems shall be in such positions as to ensure safe launching having particular regard to clearance from the propeller and

steeply overhanging portions of the hull and so that, as far as practicable, the system can be launched down the straight side of the ship.

- Each marine evacuation system shall be stowed so that neither the passage nor platform nor its stowage or operational arrangements will interfere with the operation of any other life-saving appliance at any other launching station.
- Where appropriate, the ship shall be so arranged that the marine evacuation systems in their stowed positions are protected from damage by heavy seas. MES.



Float-free arrangements for liferafts and MES stations.

Float-free arrangements for liferafts with painterline. The liferaft painter system shall provide a connection between the ship and the liferaft and shall be so arranged as to ensure that the liferaft when released and, in the case of an inflatable liferaft, inflated is not dragged under by the sinking ship. Weak link, if a weak link is used in the float-free arrangement, it shall:

- Not be broken by the force required to pull the painter from the liferaft container;
- If applicable, be of sufficient strength to permit the inflation of the liferaft; and
- Break under a strain of 2.2 +/– 0.4 kN.

6. Evacuation and recovery of survival craft and rescue boats

6.1 Launching

Launching a lifeboat in a safe atmosphere.

Lifeboats are allowed to board and lowered from embarkation deck, alternative lifeboats can also be lowered from stowed position to embarkation deck. IMO symbol embarkation ladder. IMO symbol lower lifeboat.

1. Check that it is clear below before lowering survival craft. Before launching the coxswain must check the area below must be clear of other lifesaving equipment and debris in the water.
2. Check painterline is deployed and secured. A requirement is that the painterline is already installed.
3. Check external power supply is disconnected.
4. Lower boarding ladder over the side.
5. Open hatches and prepare lifeboat inside.
6. Check if present that the dockingpins are removed.
7. By operating the pelican hook release the gripes around the lifeboat (sea fastenings around the lifeboat).
8. Operating the winch by lowering the lifeboat.

Gripes and dockingpins.

Gripes and dockingpins are used to keep the lifeboat and davit in stowed position. This to prevent unexpected releasing and keeping the tension of the falls.

Dockingpins

Power Supply

Pelican Hook

Gripe

Bowsing-in tackles

Some lifeboats cannot be lowered from their stowed position, in this case lifeboats will be first lowered to their embarkation deck by using bowsing in tackles. See the following procedure:

1. Check tracing gear.
2. Operate the winch from deck.
3. The winch must be operated with caution to bowse in the falls to reduce swinging while the boat is lowered to embarkation deck.
4. Make sure that the skids will stop the boat from swinging against the hull.
5. Install the bowsing gear and secure them.
6. Release the tracing gear and the boat is ready for boarding.
7. Lower the boat to water level and use the speed on the falls.
8. If the boat is lifted by its buoyancy or on the crest of a wave release the hooks from the falls.

Operating the winch

Bows in the falls

Install bowsing gears

Bowse in till steady alongside

Lowering the boat from the deck and from on board, according LSA code

The launching mechanism shall be so arranged that it may be actuated by one person from a position on the ship's deck and from a position within the survival craft or rescue boat. When launched by a person on the deck, the survival craft or rescue boat shall be visible to that person. The unhooking of falls or operation of disengaging gear.

Bowsing gear and tracing gear

Lowering the boat to sea level

Lowering the boat from on board

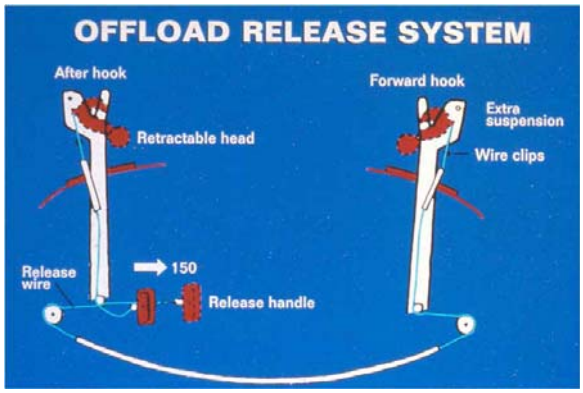
Life-saving appliance (LSA) Code, general requirements for lifeboats

Every lifeboat to be launched by a fall or falls, except a free-fall lifeboat, shall be fitted with a release mechanism complying with the following requirements:

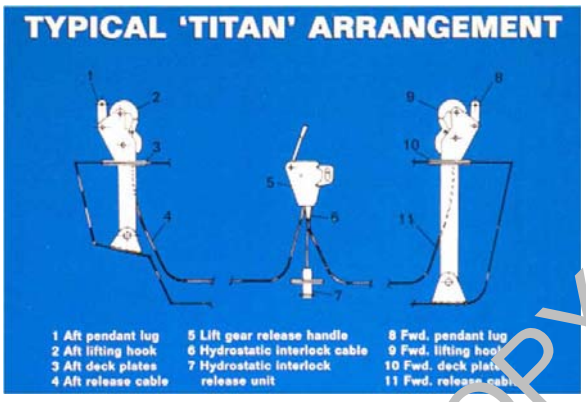
- The mechanism shall be so arranged that all hooks are released simultaneously.
- The mechanism shall have two release capabilities: normal (off-load) release capability and on-load release capability: normal (off-load) release capability shall release the lifeboat when it is waterborne or when there is no load on the hooks, and not require manual separation of the lifting ring or shackle from the jaw of the hook; and on-load release capability shall release the

lifeboat with a load on the hooks. This release shall be so arranged as to release the lifeboat under any conditions of loading from no load with the lifeboat waterborne to a load of 1.1 times the total mass of the lifeboat when loaded with its full complement of persons and equipment. This release capability shall be adequately protected against accidental or premature use. Adequate protection shall include special mechanical protection not normally required for off-load release, in addition to a danger sign. To prevent a premature on-load release, on-load operation of the release mechanism should require a deliberate and sustained action by the operator.

- To prevent an accidental release during recovery of the boat, unless the hook is completely reset, either the hook shall not be able to support any load, or the handle or safety pins shall not be able to be returned to the reset (closed) position without excessive force. Additional danger signs shall be posted at each hook station to alert crew members to the proper method of resetting.



Off load release system.



On load TOR release system

- The release mechanism shall be so designed and installed that crew members from inside the lifeboat can clearly determine when the system is ready for lifting by, directly observing that the movable hook portion or the hook portion that locks the movable hook portion in place is properly and completely reset at each hook; or observing a non-adjustable indicator that confirms that the mechanism that locks the movable hook portion in place is properly and completely reset at each hook; or easily operating a mechanical indicator that confirms that the mechanism that locks the movable hook in place is properly and completely reset at each hook.
- Clear operating instructions shall be provided with a suitably worded warning notice using colour coding, pictograms, and/or symbols as necessary for clarity. If colour coding is used, green shall indicate a properly reset hook and red shall indicate danger of improper or incorrect setting.
- The release control shall be clearly marked in a colour that contrasts with its surroundings.
- Means shall be provided for hanging-off the lifeboat to free the release mechanism for maintenance.
- The fixed structural connections of the release mechanism in the lifeboat shall be designed with a calculated factor of safety of 6 based on the ultimate strength of the materials used, and the mass of the lifeboat when loaded with its full complement of persons, fuel and equipment, assuming the mass of the lifeboat is equally distributed between the falls, except that the factor of safety for the hanging-off arrangement may be based upon the mass of the

lifeboat when loaded with its full complement of fuel and equipment plus 1,000 kg.

- Every lifeboat shall be fitted with a device to secure a painter near its bow. The device shall be such that the lifeboat does not exhibit unsafe or unstable characteristics when being towed by the ship making headway at speeds up to 5 knots in calm water. Except for freefall lifeboats, the painter securing device shall include a release device to anebal the painter to be released from inside the lifeboat, with the ship making headway at speeds up to 5 knots in calm water.

Distinguishes between normal release and on-load release and states when each would be used

In normal condition the off load system is easy to operate and can not create any danger. In severe weather conditions and rough seas the on load release system will prevent emergencies like capsizing or worse.

Explains the difficulties which could arise if the ship is still making headway

During launching a rescue boat the speed will be reduced and a leeward side must be created to launch the rescue boat.

Launching a Rescue boat

The ship will maneuver, and will have to reduce speed and attempt to come back onto the previous course, to approach the casualty directly. The man overboard team responds as follows:

- The crew members quickly change clothes.
- The boat is prepared for launch.
- The boat must be ready for use. Still check everything
- Start the engine before entering the water
- Check the radio link with bridge /control room.
- Ask for a “GO” signal from the responsible officer.

The crew members quickly change clothes.

If the MOB alarm is sounded, the duty crew will form the FRB team. Three or two trained people are required as standard on board an FRB. If there are any doubts for example about the weather, it is perhaps better not to launch. Rule number one remains think of your own safety. Some companies have in fact already drawn up standard rules for launching. These rules relate to the weather and wave height. This can be seen as a form of protection for the team. Some members find it difficult to refuse a call-out in spite of the risks to their own safety.

The crew must wear insulating suits. Specially designed survival suits, complying with the SOLAS requirements, are recommended. A lifejacket, preferably a fully automatic SOLAS approved lifejacket is also recommended. There are 150N jackets for use with medium protective clothing, such as a work overall. For heavy protective clothing, such as a dry suit, you can best use a 275 N lifejacket. Of course, you can also use a SOLAS approved block lifejacket. This system is less comfortable, but you are guaranteed that the lifejacket will keep you afloat, and it is self-righting in the event of unconsciousness. To protect the eyes, you could wear safety goggles. You can protect your hands with the gloves in the suit. Some companies have special helmets with built-in communication and face protection.

Following kitting up, the crew check one another. Above all concentrate on buckles, straps and the lifejacket. There should not be more than one fist's space in the lifejacket. If is it looser, the lifejacket will not work as well. The 'hood' of the jacket should be over the jacket itself. Otherwise it can no longer be worn following activation of the jacket. The zip of the dry suit must be closed, particularly in bad weather. The MOB team may only climb on the boat following this buddy check. The team will then carry out a final boat check, prior to launch.

The FRB is prepared for launch. The launching of an FRB boat depends on the launching installation used. The launching installation must comply with MSC./Circ. 809 and LSA Code. The systems have advantages and disadvantages over one another. SOLAS requirements: "SOLAS chapter III/26.3" lays down the requirements imposed on fast rescue boats and their launching device. Also see SOLAS chapert III, regulation 12 launching stations.

Below are a number of important points for launching

- The team must work well together.
- Always use a painter line on a ship.
- On an offshore installation, use control lines.
- Be conversant with the hook system in use.
- During the launch, always remain as low as possible in the boat, to prevent falling out.
- Possibly wear work gloves and helmets with chin straps.
- The engine should be running before the boat enters the water; if necessary, stop above water level.
- The boat should release whilst at the top of a wave.
- Do not forget the painter line and do not sail over it.

Rescue boat launching arrangement

The Rescue boat may be equipped with a lifting frame or a four-point hook. The hook may be an “ON-LOAD” or an “OFF LOAD” system. Also a combination of both systems is possible. If it is an on load system, it must be locked to prevent unauthorized use. The advantage of an on load system is of course that when any force is applied to the launching.

On load Schat Harding

Off and On load Neddeck

Retrieving the FRB

For retrieving the FRB, it may be necessary to first reset the hook; if the hook is on the boat, this will first have to be carried out on board. With a hook attached to the lifting cable, this must be carried out on deck. In the case of a ship, the painter line should be attached first. Then, the moving vessel will position the FRC beneath the hook. The hook should be located into the wind and against the current. With a water jet, the FRC is highly maneuverable. Also for retrieval, the same important points apply as above, but in reverse order. The launching and retrieval are always hazardous moments during the recovery/retrieving process.

It is also important, following an exercise or actual deployment that the FRC once again be made ready for use. Remember the following points:

- Top up the tank.
- Complete equipment, safely secured.
- Wash down with fresh water.

6.2 Clearing the ship's side

After launching and releasing the falls the next step is get clear of the ship's side in a lifeboat, is can be done by engine or alternative by oars.

Using the engine

1. Before launching check rudder position to clear the vessel.
2. After releasing the hooks pick up speed to take of the tension of the painter line.
3. If possible release the skids,
4. Release the painterline and steer clear of the painter line.
5. Pick up survivors and marshal, liferafts.
6. Proceed to a safer area.
7. Stay together and prepare sea anchor for deployment.

Using oars

If the engine is not working the boathooks can be used to clear the ship by pushing. If distance is obtained the oars can be used to reduce the tension on the painterline.

- The coxswain is in charge and will give orders to install the oars.
- The orders will be explained by the coxswain.

With use of the engine the painterline can be used to assist in clearing the ship's side by steering away with attached painterline. When enough distance the painterline can be released with fast release system.

Clearing the ship with liferaft

When clearing the vessel on the leeward side it is more difficult to move away from the drifting vessel, the dicision of launching a liferaft must be done with taking in mind the wind direction and best position to launch the liferaft. The lifeboat and rescue boats are in a position to pick up the liferafts and marshal them to a safe area.

6.3 Marshalling Liferafts and rescuing survivors from the sea

Marshalling of liferafts

The number of lifeboats and rescue boats that are carried on passenger ships shall be sufficient to ensure that in providing for abandonment by the total number of persons on board not more than six liferafts need be marshalled by each lifeboat or rescue boat.

The number of lifeboats and rescue boats that are carried on passenger ships engaged on short international voyages and complying with the special standards of subdivision prescribed by regulation II-1/6.5 shall be sufficient to ensure that in providing for abandonment by the total number of persons on board not more than nine liferafts need be marshalled by each lifeboat or rescue boat.

In other words marshalling of liferaft can be explained as:

- Each passenger vessel must have a lifeboat or rescue boat for each six liferafts when:
  - Each lifeboat and rescue boat is loaded with its full complement of persons; and
  - The minimum number of liferafts necessary to accommodate the remainder of the persons on board have been launched.
- A passenger vessel engaged on a short international voyage that also complies with the standards of subdivision requirements for vessels on short international voyages as described in chapter may have a lifeboat or rescue boat for each nine liferafts when:
  - Each lifeboat and rescue boat is loaded with its full complement of persons; and

- The minimum number of liferafts necessary to accommodate the remainder of the persons on board have been launched.

6.4 Recovery of survival craft and rescue boats

The tips below have been put together from years of helping people to skipper their boats with confidence. We have found time and again that when you apply these steps to all of your boat handling, you will be amazed how quickly you gain confidence and good techniques, even in tricky conditions.

Tip 1: Before driving anywhere, identify the blind spots from the helming position. If you are moored to a wharf or dock, take note of how the wharf looks from the helming position before you leave.

Tip 2: Practice stopping the boat and keeping her stationary for periods of up to 5 minutes. Holding an unmoored boat perfectly still takes practice and develops essential skills. I would not consider coaching anybody on a boat without practicing this first.

Tip 3: Either under sail or power, practice holding the boat at specific speeds (i.e. 3.4 knots or 1 knot). The ability to control your speed makes it much easier to feel confident in strong winds or tides in confined areas.

Tip 4: Turn your boat in tight circles. Most people cannot believe that their vessel, even when it is 50 or 60 feet, can be turned within its exact boat length with the correct techniques. Practice and see how you get on.

Tip 5: Count the seconds it takes for your boat to react after you go into either forward or reverse. It is often between 3 to 5 seconds and can be very alarming when there is a surprise delay whilst being blown sideways in a marina. With planning it is far less alarming.

Tip 6: Even if your wharf or mooring buoy has fixed mooring lines, approach ready to use lines that are on the boat. In strong winds this can provide far more flexibility. If you are using old tired ropes to hold your pride and joy, investing in new ones makes life much easier.

Tip 7: Make a plan, and tell the crew about it. Then ask them what their roles are to gauge their understanding. A fly-by of the marina, buoy or anchorage prior to carrying out the maneuver will make the briefing far easier. Things happen more quickly and smoothly with a plan, than if you drive straight in with no plan.

6.5 Launching survival craft and rescue boats in rough sea

Preparation:

- Some steadying method to be used so that the life boat does not land hard against the ship side.
- Prevent the fall blocks to hit ship crew or lifeboat.
- Boat crews must wear life jacket, helmet, and immersion suit in cold climate for rescuing operation.
- Sea quelling oil may be used to reduce the seas.
- Vessel to create a good lee. Wind to be on the opposite bow.
- Ship plugs.
- Lower lifeboat into the trough of a wave.
- On the next rising crest, release the hooks immediately and simultaneously.
- Cast off the painter once clear.
- Bear off the ship's side with tiller, oars or boat hook.
- Engine is started before the release of blocks and kept neutral.
- Once lifeboat is underway, tiller put against ship's side and with full throttle clear off the ship.

Precautions

- Rig fenders, mattresses or mooring ropes to prevent the boat from being staved during an adverse roll.
- A cargo net, slung between davits and trailing in the water for crew to hang on in case the boat capsize alongside. It should not hamper the operation of the boat.
- The painter is rigged and kept tight throughout so as to keep the boat in position between the falls.
- The falls are loosely tied with a line, led to the deck and manned. When the boat is unhooked, the line will steady the falls and prevent accidental contact with the boat crews.

- Once unhooked, the blocks should be taken up to avoid injuring the crews in lifeboat.

6.6 Recovery of rescue boats in rough sea

A painter is a rope that is attached to the bow of a dinghy, or other small boat, and used for tying up or towing.

Ideally, the length of the painter should be no longer than the length of the boat, especially on small craft, to prevent fouling the propeller of an outboard engine.

The disembarkation from rescue boats should be in an orderly manner, giving priority to injured persons, ladies and children.

The coxswain should be the last person to leave the survival craft or rescue boat and it would be his or her responsibility to check that the boat is secure. It would be prudent not to leave the survival craft or rescue boar unattended.

7. Actions to take when clear of the ship

- Distance from the sinking vessel.
- Survivors in the water.
- Use of safety equipment.
- Communication.
- Marshall.

Distance from the sinking vessel

If the vessel is drifting proceed with lifeboats and rafts to a safe area. The safe area is determined by wind direction and wind force. Normally a distance ranging from a ¼ till 1½ nautical mile is normally sufficient. Main objective is to stay close to vessel because of last position and visibility from air.

Survivors in the water

During an abandonment the coxswain will keep open communications with other life boats by means of VHF radio. If other survivors are in the water an attempt must be made to pick up the survivors.

Approaching survivors

1. Prepare pick up by asking the crew members in the lifeboat to assist.

2. Determine to open a hatch on one site.
3. Use equipment such as ladder, rescue line and boathook.
4. During approach keep the survivor(s) at the upwind side, to prevent drifting over the survivors.
5. Stop propeller to prevent injuries.
6. Get the survivors in backwards (panic) or use ladder.
7. Threat survivor injuries/hypothermia.

Use of safety equipment

It is important in the abandonment face to take with you the following safety equipment. At the station bill in most cases the duty officer on the bridge will take the SART's and EPIRB's to the lifeboat station. Of course if the float free EPIRB is floating in the vicinity of your lifeboat or raft an attempt should be made to retrieve the EPIRB and take it on board or connect it to the lifeboat or liferaft.

EPIRB

SART

Communication

Nowadays lifeboat can be equipped with a fixed two way VHF radio with DSC otherwise two portable two way VHF radio's must be available, in most cases ready for use on the bridge. The radios must comply with: RESOLUTION A.809 (19) adopted on 23 November 1995 PERFORMANCE STANDARDS FOR SURVIVAL CRAFT TWO-WAY VHF RADIOTELEPHONE APPARATUS.

The equipment should be portable and capable of being used for on-scene communication between survival craft, between survival craft and ship and between survival craft and rescue unit. It may also be used for on-board communications when capable of operating on appropriate frequencies.

The equipment should comprise at least:

- An integral transmitter/receiver including antenna and battery;
- An integral control unit including a press to transmit switch; and
- An internal microphone and loudspeaker.

The equipment should:

- Be capable of being operated by unskilled personnel;
- Be capable of being operated by personnel wearing gloves as specified for immersion suits in Fixed Regulation 33 of chapter III of 1974 SOLAS Convention;
- Be capable of single handed operation except for channel selection;
- Withstand drops on to a hard surface from a height of 1 m;
- Be watertight to a depth of 1 m for at least 5 min;
- Maintain water tightness when subjected to a thermal shock of 45°C under conditions of immersion;
- Not be unduly affected by seawater, or oil, or both;
- Have no sharp projections which could damage survival craft;
- Be of small size and light weight;
- Be capable of operating in the ambient noise level likely to be encountered on board ships or in survival craft;
- Have provisions for its attachment to the clothing of the user;
- Be resistant to deterioration by prolonged exposure to sunlight; and
- Be either of a highly visible yellow/orange colour or marked with a surrounding yellow/orange marking strip.

Portable VHF

Fixed VHF/DSC

Marshal

After an abandonment it is important to marshal the liferafts together at a safe area the lifeboat and/or rescue boats must be used for this purpose. Especially the liferafts being used during an abandonment with additional liferafts from a MES station. Also if a lifeboat has engine problems other lifeboats can tow away this lifeboat by making a towing connection.

Towing liferafts

Liferafts are floating behind the sea anchor so with making a connection make sure the sea anchor is retrieved from the sea. The point to make the connection is always on the bridle from the painter connection point. All other connecting point are not strong enough and will damage or capsize the raft.

Towing liferafts from MES station.

With additional liferafts from MES stations the rescue boats are vital to tow the liferafts to a safe area.

Life-saving appliance (LSA) Code

The speed of a lifeboat when proceeding ahead in calm water, when loaded with its full complement of persons and equipment and with all engine-powered auxiliary equipment in operation, shall be at least 6 knots and at least 2 knots when towing the largest liferaft carried on the ship loaded with its full complement of persons and equipment or its equivalent.

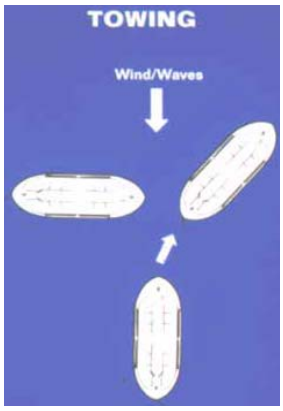
Towing point

Towing lifecrafts with rescue boat

Towing lifecrafts from MES station

Towing a lifeboat

1. Make VHF contact with the other lifeboat.
2. Prepare towing line use painter line.
3. Secure painter on a strong point for instance around the hook assembly.
4. Only send people out with immersion suit and lifejacket, use buddy line as securing point.
5. The lifeboat to tow is floating abeam on the wind direction.
6. Proceed against the wind and pass the bow to throw over the line.
7. Pick up speed slowly and wait till signal that the line is secured.
8. Use full length of the line.
9. Proceed to safe area.



Approach lifeboat for towing

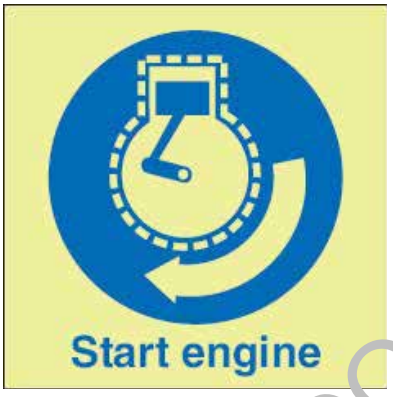
Hand over towing line

8. Lifeboat engine and accessories

8.1 Starting the engine

The coxswain must be able to do the final checks before starting the engine and operate the throttle and gear. Instructions are visible at the operating position and in the lifeboat manual. Normally the checks are and the coxswain must be able to:

- Check levels of fuel and lubricating oil.
- Checks that the gear lever is in neutral.
- Follows manufacturer's instructions and sets controls.
- Primes the fuel system, if necessary.
- Starts engine and adjusts the throttle.
- Checks oil pressure gauge and water cooling, if applicable
- Operates ahead and astern propulsion.
- Stops engine and turns off fuel.
- Now how to clean the fuel tank and renew fuel filters



IMO symbol start engine

Life-saving appliance (LSA) Code; Lifeboat propulsion

- Every lifeboat shall be powered by a compression ignition engine. No engine shall be used for any lifeboat if its fuel has a flashpoint of 43°C or less (closed cup test).
- The engine shall be provided with either a manual starting system, or a power starting system with two independent rechargeable energy sources. Any necessary starting aids shall also be provided. The engine starting systems and starting aids shall start the engine at an ambient temperature of –15°C within 2 min of commencing the start procedure unless, in the opinion of the Administration having regard to the particular voyages in which the ship carrying the lifeboat is constantly engaged, a different temperature is appropriate. The starting systems shall not be impeded by the engine casing, seating or other obstructions.
- The engine shall be capable of operating for not less than 5 min after starting from cold with the lifeboat out of the water.
- The engine shall be capable of operating when the lifeboat is flooded up to the centerline of the crankshaft.
- The propeller shafting shall be so arranged that the propeller can be disengaged from the engine. Provision shall be made for ahead and astern propulsion of the lifeboat.
- The exhaust pipe shall be so arranged as to prevent water from entering the engine in normal operation.

- All lifeboats shall be designed with due regard to the safety of persons in the water and to the possibility of damage to the propulsion system by floating debris.
- The speed of a lifeboat when proceeding ahead in calm water, when loaded with its full complement of persons and equipment and with all engine-powered auxiliary equipment in operation, shall be at least 6 knots and at least 2 knots when towing the largest liferaft carried on the ship loaded with its full complement of persons and equipment or its equivalent. Sufficient fuel, suitable for use throughout the temperature range expected in the area in which the ship operates, shall be provided to run the fully loaded lifeboat at 6 knots for a period of not less than 24 h.
- The lifeboat engine, transmission and engine accessories shall be enclosed in a fire-retardant casing or other suitable arrangements providing similar protection. Such arrangements shall also protect persons from coming into accidental contact with hot or moving parts and protect the engine from exposure to weather and sea. Adequate means shall be provided to reduce the engine noise so that a shouted order can be heard. Starter batteries shall be provided with casings which form a watertight enclosure around the bottom and sides of the batteries. The battery casings shall have a tight fitting top which provides for necessary gas venting.
- The lifeboat engine and accessories shall be designed to limit electromagnetic emissions so that engine operation does not interfere with the operation of radio life-saving appliances used in the lifeboat.
- Means shall be provided for recharging all engine starting, radio and searchlight batteries. Radio batteries shall not be used to provide power for engine starting. Means shall be provided for recharging lifeboat batteries from the ship's power supply at a supply voltage not exceeding 501 V which can be disconnected at the lifeboat embarkation station, or by means of a solar battery charger.
- Water-resistant instructions for starting and operating the engine shall be provided and mounted in a conspicuous place near the engine starting controls.

8.2 Cooling systems

The following cooling systems can be used:

- Air-cooled.
- Fresh-water-cooled.
- Seawater-cooled.
- Internal cooling with cooling liquid.

Fresh-water cooling systems require protection with antifreeze when trading to cold areas.

Cooling system free fall lifeboat

Air cooling

Is a method of dissipating heat. It works by expanding the surface area or increasing the flow of air over the object to be cooled, or both. An example of the former is to add cooling fins to the surface of the object, either by making them integral or by attaching them tightly to the object's surface (to ensure efficient heat transfer). In the case of the latter, it is done by using a fan blowing air into or onto the object one wants to cool. The addition of fins to a heat sink increases its total surface area, resulting in greater cooling effectiveness.

In all cases, the air has to be cooler than the object or surface from which it is expected to remove heat. This is due to the second law of thermodynamics, which states that heat will only move spontaneously from a hot reservoir (the heat sink) to a cold reservoir (the air).

Fresh Water Cooling System

"Fresh Water" cooling (also known as "Closed Cooling") is the marine version of the cooling system that you have in your car. Most marine engines started out

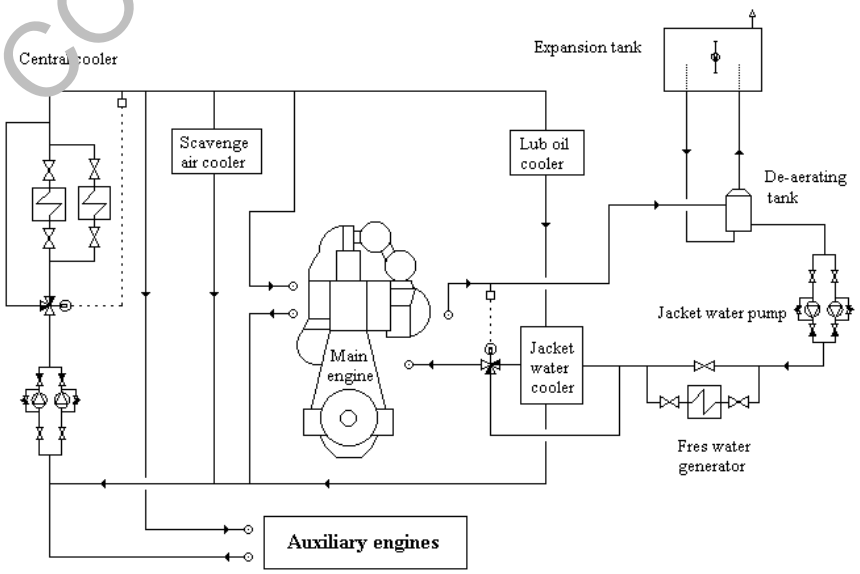
as a non-marine engine and were then designed to have a clean non-corrosive antifreeze coolant circulating between the engine and a "radiator". Normally air passes through the radiator and cools the engine coolant but in the marine version of this cooling system (fresh water cooling), the radiator is replaced with a "liquid to liquid" heat exchanger. Instead of air, sea water passes through one side of the heat exchanger and absorbs the heat from the engine coolant and is expelled out of the boat through the exhaust. On the other side of the heat exchanger the engine coolant is then circulated back into the engine. Many marine engines use the initially less expensive, "Raw Water" cooling system rather than "Fresh Water" Cooling. In this case, polluted corrosive seawater is pumped directly into the engine. The "Raw Water" eats away at the very base metal of a marine engine causing permanent damage.

Sea Water cooling system

Sea water is directly used in the machinery systems as a cooling media for heat exchangers.

Sea water circuit

The sea water is used as a cooling media in large seawater cooled heat exchangers to cool the fresh water of the closed circuit. They are the central coolers of the system and are normally installed in a duplex.



Internal combustion engine cooling

It uses either air or a liquid to remove the waste heat from an internal combustion engine. For small or special purpose engines, cooling using air from the atmosphere makes for a lightweight and relatively simple system. Watercraft can use water directly from the surrounding environment to cool their engines. For water-cooled engines on aircraft and surface vehicles, waste heat is transferred from a closed loop of water pumped through the engine to the surrounding atmosphere by a radiator.

Water has a higher heat capacity than air, and can thus move heat more quickly away from the engine, but a radiator and pumping system add weight, complexity, and cost. Higher-power engines generate more waste heat, but can move more weight, meaning they are generally water-cooled. Radial engines allow air to flow around each cylinder directly, giving them an advantage for air cooling over straight engines, flat engines, and V engines. Rotary engines have a similar configuration, but the cylinders also continually rotate, creating an air flow even when the vehicle is stationary.

8.3 Battery charging

All lifeboats equipped with a battery for starting have an external power supply with a transformator in the lifeboat. If the engine is running the equipment such as navigation lights, search light and fixed radio installation are working.

The lifeboat is equipped with a main switch and sometimes the possibility to switch between two batteries.

Power transformator in lifeboat

Main switch changing from batteries

8.4 Fire extinguisher

Life-saving appliance (LSA) Code

Lifeboats must be equipped with a portable fire-extinguishing equipment of an approved type suitable for extinguishing oil fires. Refer to the Revised Guidelines for Marine Portable Fire Extinguishers, adopted by the Organization by resolution A.602 (15).

IMPROVED GUIDELINES FOR MARINE PORTABLE FIRE EXTINGUISHERS

The size and type of extinguishers should be dependent upon the potential fire hazards in the protected spaces while avoiding a multiplicity of types. Care should also be taken to ensure that the quantity of extinguishing medium released in small spaces does not endanger personnel. For this reason in most lifeboats we find a 6 kg powder extinguisher for engine compartment fires for class A and B. Class A: Fires involving solid materials, usually of an organic nature, in which combustion normally takes place with the formation of glowing embers. Fires in ordinary combustible materials such as wood, cloth, paper, rubber and many plastics. Class B: Fires involving liquids or liquefiable solids. Fires in flammable liquids, oils, greases, tars, oil base paints, lacquers and flammable gases.

Symbol A class fires

Symbol B class fires

8.5Water spray system

Life-saving appliance (LSA) Code Fire-protected lifeboats

In addition to complying with the requirements, 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 envelops the lifeboat for a period of not less than 8 min.

Water spray system

A lifeboat which has a water spray fire-protection system shall comply with the following:

- Water for the system shall be drawn from the sea by a self-priming motor pump. It shall be possible to turn “on” and turn “off” the flow of water over the exterior of the lifeboat.
- The seawater intake shall be so arranged as to prevent the intake of flammable liquids from the sea surface.
- The system shall be arranged for flushing with fresh water and allowing complete drainage.

IMO symbol start water supply

Valve and pump

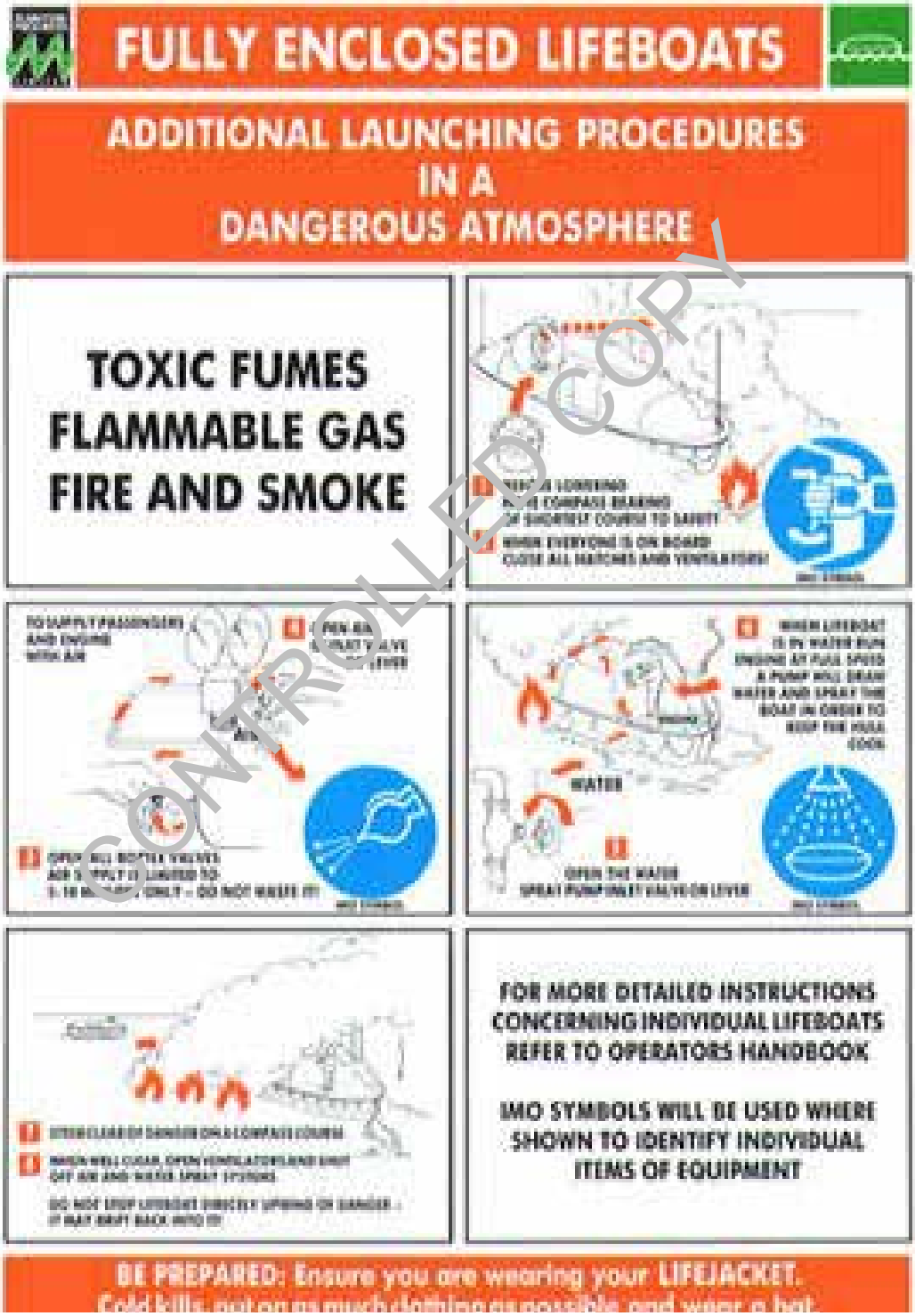
Lifeboat deluge system

8.6 Self-contained air support system

Lifeboats with a self-contained air support system Life-saving appliance (LSA) Code

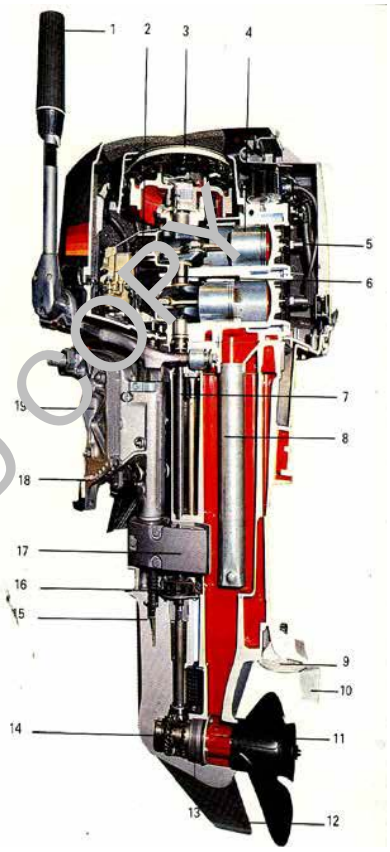
In addition to complying with the requirements a lifeboat with a self-contained air support system shall be so arranged that, when proceeding with all entrances and openings closed, the air in the lifeboat remains safe and breathable and the engine runs normally for a period of not less than 10 min. During this period the atmospheric pressure inside the lifeboat shall never fall below the outside atmospheric pressure nor shall it exceed it by more than 20 hPa. The system shall have visual indicators to indicate the pressure of the air supply at all times.

IMO symbol start air supply



9. Rescue boat outboard engine

A small outboard motor has the following appearance (only on small motors a tiller with rotary handle):



1. Tiller with throttle
2. Carburettor
3. Flywheel
4. Cylinder (x 2)
5. Sparkplug
6. Crankshaft
7. Drive shaft
8. Exhaust pipe
9. Cavitation plate
10. Trimming plate to counter wheel effect
11. Exhaust via hub
12. Propeller protection
13. Propeller seal
14. Reverse clutch
15. Operating rod reverse clutch
16. Cooling water pump
17. Bottom bearing
18. Holes and bolt for motor adjustment
19. Tilting device with lock.

Inspection and prestart checks

The inspection of the outboard motor consists of:

- Check whether the motor is correctly attached to the stern plate.
- Can the motor be tilted, and is it possible to lock the motor in this position.
- Check for any motor damage.
- Inspect the propeller.
- Remove the cover and inspect for damage and loose parts. Also check whether the motor is clean and that there are no salt deposits.
- Test the motor by starting according to the instructions:
  - Ensure water cooling by connecting a water hose to the motor.
  - Use the bellows to remove air from the fuel system.
  - Use the choke if the motor is cold. Do not flood the motor.

- Apply throttle in idle condition (propeller uncoupled), attach the kill cord.
- Start the motor by using the draw cord or with the electrical starter.

10. Handling survival craft and rescue boats in rough weather

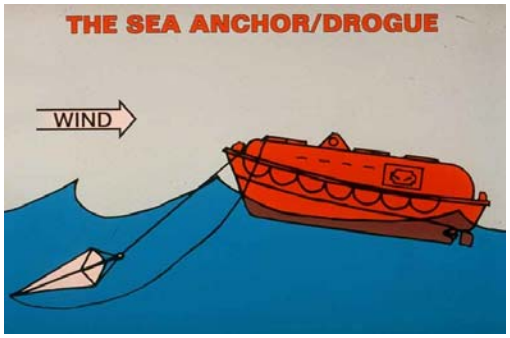
10.1 Boats

Lifeboats and sea anchor. Life-saving appliance (LSA) Code; Lifeboat equipment.

A sea-anchor of adequate size fitted with a shock-resistant hawser which provides a firm hand grip when wet. The strength of the sea-anchor, hawser and tripping line if fitted shall be adequate for all sea conditions.

Sea Anchor

A sea anchor must be deployed and connected to the bow of the lifeboat, the lifeboat will stay floating behind the sea anchor. The advantage is that the engine can be stopped and the lifeboat is slowly drifting. Also it will maintain the bow against the waves and swell. Otherwise the lifeboat will drift abeam on the waves and swell and sea sickness will start. If the stern of the lifeboats is well shaped also the sea anchor can be deployed at the stern.



The sea anchor in a lifeboat is equipped with a hewing (hawser) line and a tripping line. The tripping line is used if the sea anchor must be retrieved.

10.2 Liferafts

Liferafts and sea anchor. Life-saving appliance (LSA) Code; general requirements for liferafts / equipment.

Two sea-anchors each with a shock resistant hawser and tripping line if fitted, one being spare and the other permanently attached to the liferaft in such a way that when the liferaft inflates or is waterborne it will cause the liferaft to lie oriented to the wind in the most stable manner. The strength of each sea-anchor and its hawser and tripping line if fitted shall be adequate in all sea conditions. The sea-anchors shall have means to prevent twisting of the line and shall be of a type which is unlikely to turn inside out between its shroud lines. The sea-anchor permanently attached to davit-launched liferafts and liferafts fitted on passenger ships shall be arranged for manual deployment only. All other liferafts are to have the sea anchor deployed automatically when the liferaft inflates.

Liferaft with deployed sea anchor

Liferaft without deployed sea anchor

Important is to use the sea anchor to prevent that the winds will tip over the liferaft. Important is to retrieve the sea anchor during marshalling by lifeboat or rescue boat. Also the use of the sea anchor is gone if the rescue helicopter will produce a lot of downwash.

10.3 Beaching

Beaching with lifeboats

If land is in sight and an attempt is made to beach the lifeboat, rescue boat or liferaft the risks are in the surf, how to proceed:

1. Be aware of the location for beaching (e.g. rocks, cliffs, coral, etc.)

2. Before the surf bring bow from lifeboat or rescue boat against the surf.
3. Deploy sea anchor and with engine or oars try to keep the bow steady against the surf.
4. Rescue boat must tilt and stowed the outboard engine.
5. A life raft is beaching with the sea anchor deployed.
6. If you will feel the ground the embarkation can start.

Lifeboat with engine against the surf

11. Action to take when aboard a survival craft

11.1 Initial actions

Lists initial actions as:

- Survivors in water should be taken on board.
- Give first aid to injured, giving priority to resuscitation.
- All persons on board should be given anti- seasickness tablets.
- Survival craft should be secured together with the painter lines.
- Use of sea-anchors.

Lists immediate actions as:

- Stream the sea-anchor.
- Activate EPIRB.
- Erecting the canopy in half open lifeboats.
- Issuing anti-seasickness pills.
- Bail the liferaft dry.
- Treating the injured.
- Inflate the liferaft floor in cold conditions.
- Get radio equipment ready.

- Post lookouts.
- Ventilate a liferaft after it has been inflated before closing the openings.
- Read instructions on how to survive.

11.2 Routines for survival

- The person's in charge should do everything possible to maintain morale.
- Organizing survivors to undertake tasks for their safety and comfort helps to maintain morale.
- It is important of maintaining a constant lookout.
- Inform the lookouts how to use distress signals.
- Assign others for different tasks.
- Inform survivors of the dangers.

11.3 Use of equipment

The normal equipment of a rescue boat

According to Life-saving appliance (LSA) Code, chapter V, regulation 5.1.2. the equipment must meet the following requirements. All equipment except the boat hooks must be placed in storage areas or in special holders on the boat. The equipment may not get in the way of launching and retrieving the FRB. All items of equipment must be as small and light as possible.

The equipment consists of:

- Floating oars to allow rowing in calm water.
- A floating bailer
- A compass with illumination
- A sea anchor with a line of at least 10 meters.

- A painter of sufficient length, attached to an uncoupling system
- A floating line of no less than 50 meters, for towing rafts.
- A waterproof torch for issuing Morse signals, plus spare batteries and bulb
- A whistle or horn
- A waterproof First Aid kit.
- Two rescue lines with rings, line at least 30 meters in length.
- A search light capable of illuminating an object at night at a distance of 180 meters, over a width of 18 meters. The light must have an operating time of at least 6 hours, of which 3 hours uninterrupted
- A good radar reflector.
- TPA's (thermal protective aids) for 10% of the maximum number of occupants, or at least 2.
- Portable fire-extinguishing equipment of an approved type suitable for extinguishing oil fires.
- Hands-free and watertight VHF radio- communication set (MSC./Circ. 809)

Rescue Boat equipment

Special equipment of an inflated rescue boat:

- A floating safety knife
- Two sponges
- A hand pump
- A repair set for minor damage
- A safety boat hook.

Equipment of a liferaft; the normal equipment of every liferaft shall consist of:

- One buoyant rescue quoit, attached to not less than 30 m of buoyant line.

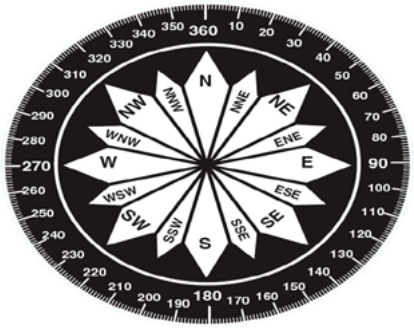
- One knife of the non-folding type having a buoyant handle and lanyard attached and stowed in a pocket on the exterior of the canopy near the point at which the painter is attached to the liferaft. In addition, a liferaft which is permitted to accommodate 13 persons or more shall be provided with a second knife which need not be of the non-folding type.
- For a liferaft which is permitted to accommodate not more than 12 persons, one buoyant bailer. For a liferaft which is permitted to accommodate 13 persons or more, two buoyant bailers.
- Two sponges.
- Two sea-anchors each with a shock resistant hawser and tripping line if fitted, one being spare and the other permanently attached to the liferaft in such a way that when the liferaft inflates or is waterborne it will cause the liferaft to lie oriented to the wind in the most stable manner.
- Two buoyant paddles.
- Three tin-openers and a pair of scissors. Safety knives containing special tin-opener blades are satisfactory for this requirement.
- One first-aid outfit in a waterproof case capable of being closed tightly after use.
- One whistle or equivalent sound signal.
- Four rocket parachute flares.
- Six hand flares.
- Two buoyant smoke signals.
- One waterproof electric torch suitable for Morse signaling together with one spare set of batteries and one spare bulb in a waterproof container. • An efficient radar reflector, unless a survival craft radar transponder is stowed in the liferaft.
- One daylight signaling mirror with instructions on its use for signaling to ships and aircraft.
- One copy of the life-saving signals referred to in Regulation V/16 on a waterproof card or in a waterproof container.
- One set of fishing tackle.
- One rustproof graduated drinking vessel.
- Anti-seasickness medicine sufficient for at least 48 h and one seasickness bag for each person the liferaft is permitted to accommodate.
- Instructions on how to survive.

- Instructions for immediate action.
- Thermal protective aids complying with the requirements of section 2.5 sufficient for 10% of the number of persons the liferaft is permitted to accommodate or two, whichever is the greater.

Markings on a boat compass card. Compass or magnetic compass.

The compass used is a standard, approved magnetic compass. A compass is a tool that gives us a reference direction. It works very simply by means of a magnetic indicator, which moves in liquid, with little resistance. The magnetic point will point north (Compass north). The rose consist of: 360 degrees = 32 directions. The main points are: North east, west and south. The intermediate directions are known as NNE, NE, ENE, etc. The compass does not identify true north, but compass north. This is known as compass error. This error can be determined, but in the FRB, a compass gives us a specific reference direction, and we are not required to navigate using the compass.

Compass rescue boat



Compass scale

11.4 Apportionment of food and water

The quantities of food and water carried in a lifeboat.

- **Food:** A food ration totaling not less than 10.000 KJ for each person the lifeboat is permitted to accommodate: these rations shall be kept in airtight packaging and be stowed in a watertight container.
- **Fresh drinking water:** Watertight receptacles containing a total of 3 Ltr. of fresh water for each person the lifeboat is permitted to accommodate, of which 1 Ltr. per person may be replaced by a de-salting apparatus capable of producing an equal amount of fresh water in two days.

Food rations

Water rations

The quantities of food and water carried in a liferaft.

- A food ration consisting of not less than 10,000 kJ (2,400 kcal) for each person the liferaft is permitted to accommodate. These rations shall be palatable, edible throughout the marked life, and packed in a manner which can be readily divided and easily opened, taking into account immersion suit gloved hands. The rations shall be packed in permanently sealed metal containers or vacuum packed in a flexible packaging material with a negligible vapour transmission rate (<0.1 g/m2 per 24 hours at 23ºC/85% relative humidity when tested to a standard acceptable to the Administration. Flexible packaging materials shall be further protected by outer packaging if needed to prevent physical damage to the food ration and other items as result of sharp edges. The packaging shall be clearly marked with date of packing and date of expiry, the production lot number, the content in the package and instructions for use. Food rations complying with the requirements of an international standard acceptable to the Organization1 are acceptable in compliance with these requirements.
- 1.5 l of fresh water for each person the liferaft is permitted to accommodate, of which either 0.5 l per person may be replaced by a de-salting apparatus capable of producing an equal amount of fresh water in 2 days or 1 l per person may be replaced by a manually powered reverse osmosis desalinator capable of producing an equal amount of fresh water in 2 days. The water shall satisfy suitable international requirements for chemical and microbiological content, and shall be packed in sealed watertight containers that are of corrosion resistant material or are treated to be corrosion resistant. Flexible packaging materials, if used, shall have a negligible vapour transmission rate (<0.1 g/m2 per 24 hours at 23ºC / 85%

relative humidity when tested to a standard acceptable to the Administration, except that individually packaged portions within a larger container need not meet this vapour transmission requirement. Each water container shall have a method of spill proof enclosure, except for individually packaged portions of less than 125 ml. Each container shall be clearly marked with date of packing and date of expiry, the production lot number, the quantity of water in the container, and instructions for consumption. The containers shall be easy to open, taking into account immersion suit gloved hands. Water for emergency drinking complying with the requirements of an international standard acceptable to the Organization2 is acceptable in compliance with these requirements.

How to ration and issue water and emergency food.

Man has several liters of water in his body, from which he can draw without serious symptoms. In a cold dilate the survivor will not feel real thirst in the first days after shipwreck. All the same, the following procedures should be followed:

- Do not drink on the first day
- Drink half a liter each day as a minimum.

On the first day after a shipwreck, the body will still have sufficient water, and the ingested water will only pass through the body. After the first day, the daily consumption of half a Liter will replace the basic loss by sweating and passing of urine. The water loss due to sweating is at a minimum of half a liter even in a cold climate. The minimal excretion of urine is around half a liter a day. By replacing half of this loss, survival time will be around 10-12 days on half a liter of drinking water a day. In the tropics water loss due to sweating will increase, and every effort should be taken to keep the raft as cold as possible. The roof or canopy should be sprayed with seawater in order to cool it, thus decreasing the temperature inside.

- Never drink seawater.
- Never dilute your fresh water with seawater.
- Seawater has a high content of salts, and some of these will promote urine excretion.
- Do not try to restrict your drinking water intake.

In the history of survival at sea there have been several cases where castaways have been found dead with their freshwater tanks half filled. You and your body need water to survive - take it.

Hunger

Man may die within a few days if he does not get water, but he will survive for weeks without food. The role of food in liferafts is therefore more a psychological factor. In the survival situation people should not be forced to eat if they do not feel like it. Foodstuffs wilh a high sugar content are the best, as the metabolism of sugar will yield some water, which will help the survivor to maintain a better water balance. In the survival situation the normal bowel function normally ceases.

Rescue survivors from a liferaft or boat

When a person has been in a liferaft for some days, and especially when the water intake has been low, his blood circulation suffers and he will therefore easily develop a shock condition. His condition is like the astronauts that have been in a weight situation for a longer period. If the survivor suddenly rises to his feet, his blood pressure will drop suddenly, and he will faint. It is important that survivors are helped and supported during rescue. As soon as possible they should be brought in the horizontal position in order to keep the blood pressure up. Drinks should be administered in small quantities. The first days after rescue food should be light until the bowel again functions normally.

11.5 Actions to take to maximize detectability and location of survival craft

Action to take to maximize detectability and location of survival craft and use the equipment that may aid detectability and location of survival crats such as:

- EPIRB
- SART
- Radar Reflector
- 2 way VHF radio

12. Methods of helicopter rescue

Helicopters. Rescue by helicopter can be effected from a shore base or offshore location. In the North Sea a field shuttle aircraft may be used for SAR by fitting a rescue winch and crewing aircraft with trained crews. SAR helicopters are available in the Brent, Forties, Ekofisk, Frigg and Statfjord fields. Norway, U.K. and Belgium use Sea King (Sikorsky S61) helicopters. It is a longer-range helicopter with a rescue winch and an all-weather capability. The endurance is 6 hours giving a range of some 600 nautical miles at a normal cruising speed of 100 knots. The helicopter can carry 19 survivors in a sitting position or 9 stretcher cases, and they have excellent communication-, navigation- and search and rescue equipment. Another helicopter in use by SAR is the Bell 412. Sometimes they are equipped with infra-red radar, night vision, searchlight etc. At each station one helicopter is available at 15 minutes readiness, plus another within 1 hour during daylight. The final stage of the rescue itself can prove hazardous if the person to be rescued is unfamiliar with techniques and procedures. In attempting to help he may actually hinder operations.

12.1 Communicating with the helicopter

Helicopters and planes can use VHF communication or signals to reply to lifeboats.

Signals used by aircraft engaged in search and rescue operations to direct ships towards an aircraft, ship or person in distress

PROCEDURES PERFORMED IN SEQUENCE BY AN AIRCRAFT			MEANING
1 CIRCLE the vessel at least once.	2 CROSS the vessel's projected course close AHEAD at a low altitude while ROCKING the wings. (See Note)	3 HEAD in the direction in which the vessel is to be directed.	The aircraft is directing a vessel towards an aircraft or vessel in distress. (Repetition of such signals shall have the same meaning)
CROSS the vessel's wake close ASTERN at low altitude while ROCKING the wings. (See Note) NOTE Opening and closing the throttle or changing the propeller pitch may also be practiced as an alternative means of attracting attention to that of rocking the wings. However, this form of sound signal may be less effective than the visual signal of rocking the wings owing to high noise level on board the vessel.			The assistance of the vessel is no longer required. (Repetition of such signals shall have the same meaning)

Air-to-surface visual signals

Reply from an aircraft observing the above signals from surface craft or survivors.					MEANING
Drop a message or	Rock the wings (during daylight) or	Flash the landing lights or navigation lights on and off twice (during hours of darkness) or	– or • – •	Use any other suitable signal	Message understood
Fly straight and level without rocking wings or	– • – • – •	Use any other suitable signal			Message not understood (repeat)

Air-to-surface visual signals

12.2 Evacuation from ship and survival craft

Evacuation from ship and survival craft.

If the survivors are transferred to a helicopter, the following points must be taken into account:

- Communication via channel 16/67.
- The helicopter will fly into the wind at a set speed (10-15 miles/hour).
- You will experience considerable downwash, which causes high winds, recognizable by a circle on the water surface.
- The Rescue boat must maintain speed and heading.
- The Coxswain should take up a fixed position in respect of the helicopter.
- The high line will be used to make contact with the lifeboat or rescue boat.
- The hoist then follows, preferably using a single or double sling.

High line

Rescue basket

Rescue single sling

Rescue sling

12.3 Helicopter pick-up

Some methods of lifting persons by means of a:

- Rescue sling
- Rescue basket
- Rescue net
- Rescue litter
- Rescue seat

Rescue Sling

For recovering a casualty without the rescuer having to enter the water, from a boat or a steep-sided canal/lake or where there is a large vertical-distance recovery. It can be operated by one person, has an effective reach of up to 4.5 meters, and yet weighs only 3 Kg.

Without this equipment, a casualty could be lost due to the freeboard, crew fatigue or the lack of crew numbers.

Rescue Basket

A helicopter rescue basket is a basket suspended below a helicopter in order to rescue people from a fire or other disaster site.

There are two main types of helicopter baskets. The smaller, more common type is used by rescuers to lift a person up from ground or water into the helicopter. An early type that could scoop an unconscious person from the sea was the Sproule Net, invented by Lt Cdr John Sproule, RN, in 1956 which was used by British helicopter rescue units until the late 1970s

The second type is a new invention. This is a basket able to fit five people or more. It allows a large group of people to be rescued from a fire or other emergency site, without needing to load them into the helicopter itself. It enables the helicopter to load a large group without landing. The helicopter hovers over the site and rests the basket on the ground or other surface. Evacuees board, then are transported to a safe area.

Rescue Litter

A litter is a stretcher or basket designed to be used where there are obstacles to movement or other hazards: for example, in confined spaces, on slopes, in wooded terrain. Typically it is shaped to accommodate an adult in a face up position and it is used in search and rescue operations. The person is strapped into the basket, making safe evacuation possible. The person generally is further protected by a cervical collar and sometimes a long spine board, so as to immobilize the person and prevent further injury.

A litter essentially is a stretcher with sides (or just a raised edge) and a removable head/torso cover. They are most notably remembered from Korea and Vietnam images of United States Air Force Para rescue airmen or more recent Coast Guard video clips of helicopters rescuing injured people from isolated areas. Some will also recall the images from the TV shows Emergency! & M*A*S*H of fixed stretchers on either side of medical evacuation helicopters.

Rescue Seat

The rescue seat is a buoyant aluminum device consisting of a hollow flotation chamber and a three-pronged seat, with prongs 120 degrees apart. Lead is inserted in the base of the assembly to minimize roll and to provide the proper degree of submergence of the seat in the water. A safety strap is provided to assist the survivor to remain in the seat during hoisting to the helicopter. The flotation chamber and hoist bracket of the seat are bright orange. The lower seat assembly is yellow for high visibility.

The helicopter rescue seat is intended for use in retrieving survivors and assisting the rescue swimmer in performing rescue operations when it is difficult to make a helicopter landing over land or water.

When conducting a rescue, the helicopter rescue seat is lowered on a hoist cable from a helicopter to the rescue swimmer and survivor. The rescue seat is designed to accommodate one person at a time.

13. Hypothermia

"Hypo" means low and "thermia" for heat, so hypothermia is standing for low (core) temperature. The body temperature usually varies between 36.9o and 37.4o C. Below 35o C we call it hypothermia. Three forms of hypothermia:

- Cronic
- Sub-acute
- Acute

Chronic

This form especially effects elderly people and/or alcoholics. As chronic hypothermia especially effects elderly and/or alcoholics it is not within the scope of this syllabus to discuss this form of hypothermia.

Sub-acute

Hypothermia caused by exposure for example to cold air. The simplest form of hypothermia in terms of protection and treatment. Heat loss because of exposure should not be overlooked. Hypothermia sets in, slowly but steadily. The casualty itself is not aware of the fact that he is affected by hypothermia. A dangerous situation can develop, since hypothermia can lead to loss of co-ordination between thinking and doing. Putting on enough clothing can easily prevent exposure. An important precaution in order to prevent this form of hypothermia is to make sure not to get exposed to the cold or limit this exposure.

Acute

Hypothermia caused by immersion in cold water. Acute hypothermia can be the result of immersion in cold water. In the North Sea the surface temperatures varies between 2o C to 6o C in wintertime and 15oC to 170 C during summer. The temperature of coastal waters strongly depends on the air temperature, but the North Sea is always cold to very cold.

The reaction of the human body to sudden exposure to cold water is:

- Quick breathing that can lead to hyperventilation
- Gasping for air
- Increasing blood pressure
- Increasing hart rate
- Disorientation
- Panic

Cold shock can lead to:

- Inhalation of seawater
- Reduce swimming capability
- Drowning, within first 2-3 minutes

To prevent cold shock:

- Wear protective clothing. Clothing serves a dual purpose. In clothing a considerable amount of air is trapped. This air helps you to stay afloat for a while. It also gives our body time to adjust to the cold water temperature.
- Whenever possible, do not jump in the water. Try to get into the water gradually.
- Use a life raft or lifeboat, or a personal escape system.

– Mental preparation. As soon as you enter the water your only concern is to control your breathing. This control can only be achieved by a positive mental attitude. BE PREPARED!

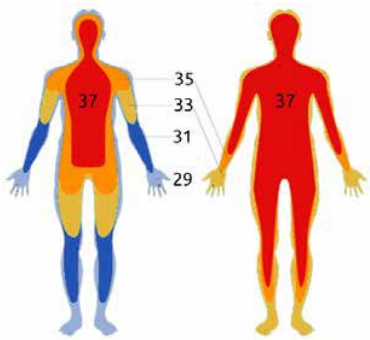
After the initial cold shock hypothermia will slowly but steadily set in. A number of factors will determine how quick someone will become hypothermic:

– Water temperature
– Air temperature
– State of the sea
– Age, size, body, sex and gender
– Layers of insulation
– Physical condition
– Mental condition

Prevention: If working on places where falling overboard is possible, make sure that you have a lifeline and life jacket.

Body heat loss

When a person is immersed in cold water the body cools down very fast. However it may take 10 to 15 minutes before the core temperature stars to drop. The greatest areas of heat loss are head and neck, chest, armpits and groin region.



To prevent hypothermia

Without a life raft or other floatation device a person in the water must swim to keep her/his head above water, especially with waves. In this situation there are two problems:

- Drowning
- Cooling down.

Swimming produces heat, but because the body is completely exposed to the cold water, heat loss will be larger than the heat production. Another important factor is that it is not possible to swim for a long time.

Conclusion: **Do not swim!**

Basic first aid in case of severe Hypothermia

First aid:

1. Lift the casualty horizontal
2. Don't move the casualty
3. Do not remove wet clothing
4. Put the casualty in a horizontal position with the feet raised
5. Put the casualty in warm blankets
6. Protect victim against the wind
7. Get professional help.

First aid for a hypothermic casualty in a life raft or lifeboat

In all lifeboats and liferafts we find an amount of Thermal Protective Aids TPA's depending on the capacity. This is 10% of the capacity. The TPA's will prevent more heat loss by the wind and the casualty warm up again due to his/her own body heat. The TPA's are not designed to use in the water.

Preventive equipment

Prevention and preparation is an important issue. If you have to work above or close to the water, use a lifejacket or work vest. If you have a MOB drill or real MOB situation use the correct protection.

14. Radio equipment

14.1 Two-way VHF radiotelephone apparatus

On board of survival crafts there are several means of communication. Probably the most effective and reliable is radio communication because it is possible to contact rescuers on a long distance. Not all the systems are permanently installed and should be brought to the lifeboats (and rafts) in case of an emergency the different systems presently in use are:

- VHF radio (Very High Frequency)
- EPIRB (Emergency Position Indicating Radio Beacon)
- SART (Search And Rescue Transponder)

Very high frequency radios

VHF installations come in two types, fixed and portable. Portable sets are used for communication on board the installation. The range and capacity of the batteries of these handsets are limited. In case of an emergency the handsets are used for communication between muster points and bridge, the handsets can be taken inside life boats- and rafts for communication.

The law requires the following channels to be installed:

- Channel 6 - Intershipl
- Channel 15 - Intership
- Channel 16 - Ship to ship
- Channel 17 - Intershipl
- Channel 67 - Search and rescue working
- Channel 70 - Digital Selective Calling DSC

The fixed installations are built into lifeboats and will generally have more channels to choose from, but will at least have the above mentioned. The range of a maritime VHF installation working on full power (25watt) will have maximum 30 –60 nautical miles, depending on weather conditions and antenna height.

In case of an emergency, channel 16 can be used to transmit a Mayday call; however this not anymore guarded for 24 hours. So use the digital selective calling frequencies instead. By a spoken message is case of an emergency we always use the Standard English Marine vocabulary. An emergency call will be send as:

- MAYDAY MAYDAY MAYDAY!
  This is: (name and call sign 3x)
- MAYDAY !
  This is: (name and call sign 1x) Our position is: (degrees/minutes or distance/bearing, name of installation or vessel)

Give necessary info:

- Nature of distress.
- What assistance is required.
- Amount of people involved.
- Other useful information.

DSC

With the implementation of the GMDSS convention we also changed from spoken emergency calls in DSC Digital Selective Calling. Sending in digital

language is clearer and will be less disturbed by bad radio signals. For DSC special frequencies are appointed for use.

14.2 Emergency position-indicating radio beacons (EPIRBs)

Emergency Position Indication Radio Beacons are required on ships and offshore installations. The beacons are self-powered by means of batteries and transmit signals to satellites. These satellites are from the Compass/Sarsat system, an international co-operative search and rescue effort. The system ensures a global coverage, 24 hours a day and contributes to help saving lives of seaman in distress. The E.P.I.R.B., once operated, automatically transmits a signal that is recognized by the satellite as an emergency call. The satellite will determine the position of the beacon and will then pass the information through to an earth station. From here the information is transferred to the Rescue Co-ordination Centre, nearest to the emergency position of the beacon. From this center the SAR operation starts or the information is relayed to another SAR center. Additionally the EPIRB's will send a signal out that can be picked up by SAR helicopters and also vessels equipped with the necessary homing devices. The homing devices will send the searching party straight to the person or persons in distress.

14.3 Search and rescue transponder beacons (SARTs)

The Search and Rescue Transmitter SART is a transmitter which can be used to take with you in the lifeboat or life raft. It can also be possible that the life boat is equipped with a SART. This is by the way not a requirement. The Search and Rescue Transmitter SART is a passive beacon until interrogated by radar frequency. It will then automatically transmit series of pulses, which are displayed on the radar screen of passing aircraft or vessels. The pulses are very obvious and therefore easy to recognize by the radar operator. Once recognized the navigator can plot the emergency position, the system is only for short range.

14.4 Distress signals, signaling equipment and pyrotechnics

Pyrotechnics are part of the signaling equipment found in the inventory of lifeboats, life rafts, ships, aero planes and helicopters. They may play a vital part in locating persons in distress. Warning: All pyrotechnics should be handled with care. They can be dangerous when safety is disregarded. Since there are many different types of pyrotechnics and various manufactures, always make sure to read the operating instructions first. In order to ensure a safe way of activating the signal, even by people who do not know how to read the instructions are also depicted in so-called pictograms.

Rocket/parachute flare

A flare is a good pyrotechnics to attract attention over great distance. Useable during day or night, not with fog and low clouds. The visibility in clear weather is ranging from 30 to 40 sea miles. When a parachute flare is activated, a rocket is fired to a height of approximately 300 meters.

When the flare is ignited a bright light burns for about 1 minute, the parachute keeps the flare in the air as long as possible. During the ascent of the rocket, the wind influences the tail in such a manner that the rocket turns into the wind. The flare will drift over your position when hanging on the parachute, giving an indication of your location.

Never use flares when helicopters are nearby! They may damage the aircraft and interfere with your own rescue!

Hand Flares

Hand flares are used to pinpoint your position. Effective both day and night, not with foggy weather. The visibility is around 6 sea miles in clear weather. Never look into the flare. The light may damage your eyes. These flares provide their own oxygen when burning which means that splashing waves will not extinguish the flare. They will continue burning even when held under water. These hand-held flares burn for about 1 minute.

Smoke signals

The use of the smoke signal is to pinpoint your position and to indicate the wind direction. Effective only in daytime, not with foggy weather. The visibility depends on the wind force.

Visual and audible distress signals

Signal mirror or heliograph; it is possible to attract attention over long distances, up to 20 miles by reflecting the sun rays to a ship, aero plane or coastline. The limitations are that the sun must be shining and it doesn't work 360 degrees around.

Signaling torch. (Flash light); very valuable source of light inside your life raft/life boat. It can also be used to attract attention at close range for instance to contact other life rafts or lifeboats. Morse code can also be sent. The torch is waterproof and spare batteries are provided as well.

Whistle; in the inventory we also find a whistle, just like the ones we have on our life jackets or survival suits. Not very effective, since the sound of waves and wind will in most cases overrule the whistle.

Radar reflector; this will provide in a better reflection on the radar screen of a searching vessel, airplane or helicopter. It is important that the radar reflector is installed in a correct way. (Not to be used together with SART)

15. First aid

15.1 Resuscitation techniques

Consciousness

Consciousness is an awareness of our surrounding. A disturbance of this awareness can vary from being confused to being in deep coma. Unconsciousness is the result of an interruption of the normal activity of the brain. This situation can be life-threatening because normal automatic defense systems of the brain can also be disturbed.

Determining the level of consciousness

Talk to a casualty. If there is reaction keep talking to a casualty to keep him awake and get as much information as possible before the level goes down.

- If there is no reaction on sound give a gentle shake at the shoulders.
- If there is reaction try to keep him awake and assemble information
- If there is no reaction take care of the airways and breathing because they are threatened due to the total relaxation of an unconscious casualty.
- Open the airways with the chin-lift

Checking the breathing

- Listen for sound
- Feel for airflow
- Look for movement of the chest Check the breathing for a minimum of 10 seconds to be sure not to miss it. If there is a good breathing, bring the casualty in the recovery position. If the breathing is insufficient or absent start CPR. Cardio Pulmonary Resuscitation (CPR).

CPR is a way of pumping sufficient oxygen to the brain to protect it for a longer time against damage due to lack of oxygen. CPR consist of giving a series of chest compressions alternated with inflation of air.

Symptoms

- Unconscious
- Pale/grey color
- No breathing

Actions

- Start with chest compressions (30x)
- Give mouth-to-mouth inflations (2x)
- Continue this in the following sequence 30-2-30- 2-30-2-30 etc.

15.2 Use of first-aid kit

Contents of first-aid kit

- 2 x Poly Burn Bags (12x16)
- 6 x Paratulle (10x10 singles)
- 4 x Paratulle (10x40)
- 64 x Paracetemol (2x32)
- 2 x Cetrimide Cream (50g)
- 20 x Plasters (2x10)
- 6 x Conforming Bandages (7x5x4x5cm)
- 4 x Triang Bandage (90x90x127cm)
- 2 x Medium Dressings (12x12cm)
- 2 x Large Dressings (18x18cm)
- 2 x Extra Large Dressings (18x28cm)
- 6 x Safety Pins 1 x 5” Scissors
- Instructions

Bleeding fractures burns shock

Burns can be caused by:

- Heat
- Cold
- Friction
- Radiation
- Chemicals
- Electricity

Scalds can be caused by:

- Hot liquids
- Steam

Classification of burns and scalds

- 1st degree
  - Red skin
  - Swelling
  - Pain

- 2nd degree
  - Blisters
  - Pain

- 3rd degree
  - Black skin (burns)
  - White/grey skin (scalds)
  - No pain

Actions

- Immediate cooling for at least 10 minutes with slowly running not to cold water.
- Chemical burns at least 30 minutes after removing contaminated clothes
- 2nd and 3rd degree burns should be covered sterile
- Alert medical attention

16. Drills in launching and recovery boats

Master of vessel is responsible for the safety of personnel involved in drills and is to familiarize himself and the vessel's crew with the following lifeboat related IMO guidelines and recommendations prior the actual drill.

Prior commencement of drill

1. The lifeboat lowering/free fall launching/rescue boat drill is to be supervised by a competent personnel.
2. The Master is to ensure that all safety measures and precautions are being observed in accordance with the vessel's safety management system (SMS) and lifeboat / rescue boat instruction manuals.
3. Safety briefing to all personnel involved shall be conducted prior to commencement of the drill.
4. The operation must be carried out during daylight hours only.
5. The operation shall not be carried out concurrently with any other activity such as bunkering, over side cargo operation, underwater diving, main engine immobilization etc.
6. Master of vessel shall Inform the Marine Safety Control Centre (MSCC) via VHF CH 07 or Tel 63252488/2489; 30 mins prior to commencement, upon completion and in the event of suspension of the operation.

Conducting the drill

1. There must be a safety boat in attendance if the lifeboat or rescue boat drill requires maneuvering in the water as part of the drill. Maneuvering of the lifeboat should be kept within the ship's length. The lifeboat / rescue boat is not permitted to loiter about at the anchorages. Note: The safety boat must be a suitable size harbour craft and should be able to hold and tow the lifeboat / rescue boat, if required. The ship's rescue boat or lifeboats are not permitted for use as a safety 0boat.)
2. The launch area must be clear of traffic before the lowering commence. The safety boat if provided, must warn all approaching traffic of the operation.
3. There shall be no person(s) in the lifeboat /rescue boat during its lowering, launching and recovery.
4. The drill shall abort immediately in the event of emergency, inclement weather condition or any likelihood of safety being compromised.

Application Procedures

- Free fall lifeboat launching and/or Lifeboat drills involving in-water maneuvering - Ship owners, masters or agents of vessels are required to obtain written approval from MPA's Marine Environment and Safety Department (MESD) at least three (3) working days prior the intended operation. Permission for free fall lifeboat launching is only granted to be carried out at Sudong Special Purpose and Raffles Reserve anchorages and subject to space availability. Such request may be transmitted by FAX no: 63252430 or via email: pms@mpa.gov.sg with the following information:
  - Name, IMO Number, Call sign, type and maximum height of vessel.
  - Proposed location and date of drill.
  - Harbour craft license number of safety boat.
  - Name of shipyard/berth and Terminal manager's approval if drills are being carried out alongside berth.
  - Ship specific Safe Operating Procedures (SOP) for the intended operation endorsed by Master or Vessel Managers.
  - Any other activity intended to be carried out at location.
- Lifeboat drills which do not require in-water maneuvering – Ship owners, masters or agents of vessels to obtain approval by calling Marine Safety Control Centre via VHF Channel 07 or Tel: 6325 2488/2489 by providing the following information :
  - Name, IMO Number or Call sign, type and maximum height of vessel.
  - Proposed location and date and time of drill.

17. Drills in launching Liferafts

17.1 Davit-launched liferafts

Davit-launched inflatable life raft is applicate in transferring the full-loaded liferaft by the davit which can be charged and loaded on deck. As the normal inflatable liferaft can only be embarked from the water after it floated by releasing the inflation valve during the throwing over period. However, this is hard to realize the lifesaving purpose if storm happens. Davit-launched liferaft is now widely used on passenger ships and cargo vessels due to its special effect.

Davit-launched liferaft is equipped with private free fall device and be lowered into water by steel ropes. It has the overall techniques and application performance like throwing-over board liferaft on the bases of adding a lifting point. In the emergency case or free-fall device failure, the davit-launched liferaft can also be throwing over-board. If the ship sinking, the hydrostatic release unit can make the liferaft separate quickly from the wreck and inflated automatically.

17.2 Throw-overboard liferafts

It is suitable for installing on ships on international voyages.

It meets the requirements of Regulations for the Statutory Surveys of Ships and Offshore Installations "Technical Regulations for the Statutory Surveys of Sea-going Ships Engaged on International Voyages (1999)" of P.R.C. and SOLAS 74/96Amendment, LSA, MSC.81 (70).

The throwing overboard inflatable liferaft can be inflated and opened automatically after throwing-over from the ship. If the ship sinking, the hydrostatic release unit can make the liferaft separate quickly from the wreck and float up from water to realize lifesaving purpose.

17.3 Boarding a liferaft from the water

Anyone with sea survival training will know that evacuating to a liferaft is a last resort measure and in most cases you should be 'stepping up' into a raft as your boat sinks below you. The obvious exception to this rule is when your vessel is on fire or you are obliged to use a liferaft to transfer from your own vessel.

The first thing you should be prepared for is the sheer weight of a liferaft. A six man liferaft is heavy and awkward to carry. Trying to unclip it from its mounting points and launch it over the side is easier said than done. It's probably and two or three person job in a big sea. Secondly, it's worth making sure that your liferaft is securely fastened to your boat (probably on a cleat) so that you don't lose it over the side whilst you watch it inflate and float away, or worse still, sink to the bottom of the ocean!

Most liferafts come in either a fiberglass or valise case which burst open as the liferaft inflates. Inflation occurs when the painter attached to the raft is pulled tight, triggering a cartridge of compressed gas.

It's worth planning your evacuation to a liferaft when you have time. Get together anything you might need for your trip including water, extra clothing, logbook, passports, wallets, phones, VHF Radio, charts, flares, tinned food (and a tin opener), cushions (to insulate the cold floor), sea sickness tablets, medication and anything else that might be useful. This may include extra clothing, TPAs, the boat's dinghy, paddles and anything else that might be useful including a handheld GPS or sextant and reduction tables.

It makes sense for all crew to be briefed at a muster point before evacuation and make sure you all drink what you can BEFORE you leave the boat and take sea sickness tablets. AFTER evacuation you will be abstaining from drinking water for a few hours, so as to acclimatize your body to rationing, so you may as well hydrate yourself properly from the plentiful supply of water on your vessel before you leave.

It is accepted practice to launch a liferaft from the windward aft quarter and the strongest, heaviest member of crew should go first to both stabilize the raft and help other crew into the raft afterwards. When in the raft, cut away the painter and deploy the drogue. You are then looking to reduce risk to yourselves, which means protect yourself against the elements, regulate and measure water intake so as to keep all crew sufficiently hydrated and keep your spirits up!

Knowing where you are, where you are drifting and how likely you are to be spotted by a passing vessel all helps morale enormously.

Boarding a liferaft

- Before boarding a life raft, ensure that no-one:
  - Has any sharp objects
  - Is wearing hard-soled shoes, which can damage the life raft.
- Check that everyone has put on their life jackets properly.
- Bring the life raft alongside the vessel.

- Board directly from the sinking vessel. Use the embarking ladder from the sinking vessel. It is not recommended that you jump into a raft**.** If you jump into the life raft, only do this when the raft is empty, and then only from a meter or so high. If there are people in it, jumping may injure them. The life raft can be boarded from the water if necessary. This may be necessary if the life raft cannot be brought alongside. It should be brought as close to the vessel as possible and survivors should enter the water at the lowest level. Swim across to the life raft by holding onto the painter. Always enter the water upstream of the raft so the swim will be with the stream or current. A fire hose, rope or ladder can be used for emergency boarding.
- Once everyone has boarded the life raft:
  - Cut the painter as far away from the raft as possible
  - Retrieve the balance of the line inboard for later use.

A knife is provided for that purpose close to the entrance point of the life raft. The position of knife and painter attachment point is clearly marked on the life raft in English and pictorially.

17.4 Righting an inverted life raft

There may be occasions when the life raft inflates upside down. This can happen in bad weather or strong winds.

If this happens, send a volunteer or a good swimmer wearing a lifejacket into the water to turn the life raft upright. Do this right away, because it may become difficult if the water fills in the canopy of the life raft, making it heavier.

Life rafts have the righting position marked clearly on the main buoyancy tubes.

To right the life raft:

- Turn the life raft until the gas bottles are downwind
- Get onto the inverted floor of the life raft, at the gas bottles
- Standing on top of the gas bottles, heave the raft over by pulling the righting strap
- Hold your arms folded above your head as the raft comes over, to form a pocket of air. Recover your breath before swimming out from under the raft

– When righting the life raft, make use of the direction of the wind

18. Drills in launching and recovering rescue boats

Every person involved in the operation of launching and recovery equipment and appliances of rescue boats should be required to demonstrate competence to undertake the tasks and responsibilities which should include but not be limited to:

– Assessment of the readiness of fast rescue boats, related launch equipment and launch appliance as fitted, for immediate launch and operation;
– Understand the operation of the winch, brakes, falls, painters, motion compensation and other equipment as fitted;
– Safety precautions during launching and recovery of a fast rescue boat; and
– Procedures for launching and recovery of fast rescue boat in varying conditions.

The level of knowledge of the tasks and responsibilities detailed above should be sufficient to enable the seafarer to perform launching and recovering duties in emergency situations.

Records should be kept on the ship to show which crew members are proficient in the launch and recovery of fast rescue boats.

Ongoing training for rescue boat launch and recovery teams and boat crews

Every person involved in the operation of launching and recovery equipment and appliances of rescue boats or is a member of a rescue boat team should participate in regular onboard training which would include, but not be limited to, drills when weather conditions permit such exercises to be carried out safely.

The factors listed below are to be taken into account when conducting drills:

- The frequency and regularity of training is important and as far as is reasonable and practicable, fast rescue boat systems and crews should be exercised weekly. The interval between a complete launch and recovery drill should not exceed 3 months.
- To achieve maximum effectiveness it is important that both the launch and recovery team, and the boat crew are aware of the limitations of the equipment as fitted and are confident in its use. This can only be achieved by ongoing training in varying conditions.
- So as not to expose the fast rescue boat crew to undue risk, the Masters/operators of ships, in conjunction with the trainers, should take the following into account while undertaking training in the launch and recovery of such craft:
  - Master and person in charge of the fast rescue boat should consult prior to any launch and give due consideration to:
    - Reliability, type and complexity of the fitted equipment;
    - The proven level of expertise of the fast rescue boat crew as demonstrated during exercises; and
    - Prevailing weather conditions.

Records should be kept on the ship with respect to fast rescue boat training on board including the dates and time of drills, operational status of the ship, sea and weather conditions also together with names and duties of those participating in the drill.