1 INTRODUCTION

This course aims to provide the training and knowledge for seafarers who are required to take charge of a survival craft in emergency situations during and after launching, in accordance with Chapter III of the International Convention for Safety of Life at Sea (SOLAS), 1974, as Amended. SOLAS Chapter III includes requirements for life-saving appliances and arrangements, including requirements for life boats, rescue boats and life jackets according to type of ship.

This training also covers the requirements for knowledge, understanding and proficiency as set out in Chapter VI, Section A-VI/2, and Table A-VI/2-1 of the International Convention on the Standards of Training, Certification and Watchkeeping for Seafarers, 1978 (STCW 1978), as Amended.

At the end of the training, the trainee will be able to comply with the minimum standards of competence in survival craft and rescue boats other than rescue boats and operate life-saving appliances and to take charge of a survival craft engine and manage survivors and survival craft after abandoning ship. The trainee will also know the proper usage of the communication device, signaling apparatus, pyrotechnics and how to apply first aid to those who are in need during emergencies at sea.

2 SURVIVAL CRAFT AND RESCUE BOATS COMPOSITION, CHARACTERISTCS, AND FACILITIES

2.1 Lifeboats

A lifeboat is a small, rigid or inflatable boat carried for emergency evacuation in the event of a disaster aboard a ship.

General Requirements for Lifeboats / General Requirements

All lifeboats shall be properly constructed and shall be of such form and proportions that they have ample stability in a seaway and sufficient freeboard when loaded with their full complement of persons and equipment. All lifeboats shall have rigid hulls and shall be capable of maintaining positive stability when in an upright position in calm water and loaded with their full complement of persons and equipment and holed in any one location below the waterline, assuming no loss of buoyancy material and no other damage.

Each lifeboat shall be fitted with a certificate of approval, endorsed by the Administration, containing at least the following items:

1. Manufacturer's name and address;
2. Lifeboat model and serial number;
3. Month and year of manufacture;
4. Number of persons the lifeboat is approved to carry; and
5. Approval information including the Administration which approved it, and any operational restrictions.

The certifying organization shall provide the lifeboat with a certificate of approval which, in addition to the above items, specifies:

1. Number of the certificate of approval;
2. Material of hull construction, in such detail as to ensure that compatibility problems in repair should not occur;
3. Total mass fully equipped and fully manned;
4. Statement of approval.

All lifeboats shall be of sufficient strength to:

1. Enable them to be safely launched into the water when loaded with their full complement of persons and equipment;
2. Be capable of being launched and towed when the ship is making headway at a speed of 5 knots in calm water; and
3. Hulls and rigid covers shall be fire-retardant or non-combustible.

Seating shall be provided on thwarts, benches or fixed chairs which are constructed so as to be capable of supporting:

1. A static load equivalent to the number of persons each weighing 100 kg for which spaces are provided in compliance with the seating requirements;
2. A load of 100 kg in any single seat location when a lifeboat to be launched by falls is dropped into the water from a height of at least 3 m; and
3. A load of 100 kg in any single seat location when a free-fall lifeboat is launched from a height of at least 1.3 times its free-fall certification height.

Except for free-fall lifeboats, each lifeboat to be launched by falls shall be of sufficient strength to withstand a load, without residual deflection on removal of that load:

1. In the case of boats with metal hulls, 1.25 times the total mass of the lifeboat when loaded with its full complement of persons and equipment; or
2. In the case of other boats, twice the total mass of the lifeboat when loaded with its full complement of persons and equipment.

Except for free-fall lifeboats, each lifeboat to be launched by falls shall be of sufficient strength to withstand, when loaded with its full complement of persons and equipment and with, where applicable, skates or fenders in position, a lateral impact against the ship's side at an impact velocity of at least 3.5 m/s and also a drop into the water from a height of at least 3 m.

The vertical distance between the floor surface and the interior of the enclosure or canopy over 50% of the floor area shall be:

1. not less than 1.3 m for a lifeboat permitted to accommodate nine persons or less;
2. not less than 1.7 m for a lifeboat permitted to accommodate 24 persons or more; and
3. not less than the distance as determined by linear interpolation between 1.3 m and 1.7 m for a lifeboat permitted to accommodate between nine and 24 persons.

The number of persons which a lifeboat to be launched by falls shall be permitted to accommodate shall be equal to the lesser of:

1. The number of persons having an average mass of 75 kg, all wearing lifejackets, that can be seated in a normal position without interfering with the means of propulsion or the operation of any of the lifeboat's equipment; or
2. The number of spaces that can be provided on the seating arrangements. The shapes may be overlapped, provided footrests are fitted and there is sufficient room for legs and the vertical separation between the upper and lower seat is not less than 350 mm.

Particular characteristics of a lifeboat

Lifeboat buoyancy

All lifeboats shall have inherent buoyancy or shall be fitted with inherently buoyant material, which shall not be adversely affected by seawater, oil or oil products, sufficient to float the lifeboat with all its equipment on board when flooded and open to the sea. Additional inherently buoyant material, equal to 280 N of buoyant force per person shall be provided for the number of persons the lifeboat is permitted to accommodate. Buoyant material, unless in addition to that required above, shall not be installed external to the hull of the lifeboat.

Lifeboat freeboard and stability

All lifeboats shall be stable and have a positive GM value when loaded with 50% of the number of persons the lifeboat is permitted to accommodate in their normal positions to one side of the centerline.

Under the condition of loading described above:

1. Each lifeboat with side openings near the gunwale shall have a freeboard, measured from the waterline to the lowest opening through which the lifeboat may become flooded, of at least 1.5% of the lifeboat's length or 100 mm, whichever is the greater;
2. Each lifeboat without side openings near the gunwale shall not exceed an angle of heel of 20° and shall have a freeboard, measured from the waterline to the lowest opening through which the lifeboat may become flooded, of at least 1.5% of the lifeboat's length or 100 mm, whichever is the greater.

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 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 a 25-person life-raft 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.

Water-resistant instructions for starting and operating the engine shall be provided and mounted in a noticeable area near the engine starting controls.

Access into lifeboats

1. Every passenger ship lifeboat shall be so arranged that it can be rapidly boarded by its full complement of persons. Rapid disembarkation shall also be possible.
2. Every cargo ship lifeboat shall be so arranged that it can be boarded by its full complement of persons in not more than 3 min from the time the instruction to board is given. Rapid disembarkation shall also be possible.
3. Lifeboats shall have a boarding ladder that can be used at any boarding entrance of the lifeboat to enable persons in the water to board the lifeboat. The lowest step of the ladder shall be not less than 0.4 m below the lifeboat's light waterline.
4. The lifeboat shall be so arranged that helpless people can be brought on board either from the sea or on stretchers.
5. All surfaces on which persons might walk shall have a non-skid finish.

Lifeboat markings

1. The number of persons for which the lifeboat is approved shall be clearly marked on it in clear permanent characters.
2. 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.
3. 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 fittings

1. Falls – Ropes or lines used in hoisting and lowering the lifeboat when launching and hoisting. When floating blocks are fitted to emergency lifeboats, provision must be made to prevent the falls from cabling. A fall cables when it twists round and round. This was prevalent with manila rope falls, but was considerably reduced with the introduction of square laid rope. It may occur on occasion with wire rope falls, and happens when the weight of the boat is taken off the falls.

2. Fall Preventer Device – An essential marine safety equipment that can be used to minimize the possibility of an injury or fatality by providing a secondary alternate load path in the event of failure of the on-load hook or its release mechanism or of accidental release of the on-load hook.

3. Gripes – The function of the gripes is to hold the boat firmly down in the chocks, or in the case of gravity davits, firmly against the shoulder chocks on the davits.

   Gripes are required to be so fitted that they can be let go from inboard. The normal method of fitting is to have the gripe wires taken over fairleads on the gunwale and fastened on the outboard side to the deck or davit frame, a senhouse ship is attached to the inboard end of the gripes for letting go. A strong rope lashing is incorporated next to the senhouse slip to allow it to be cut in an emergency.

   Care must be taken as the boat is turned out that the thimble on the inboard end of the gripes, which must pass over the boat, does not foul up anything. It is the responsibility of the two men in the boat to clear the gripes to ensure that when a trigger is fitted, it does in fact fall.

"Latch-On Gripes" are an alternative method sometimes used with gravity davits. Latch-on gripes instead of going over the boat are led over stout bobbins on the stern and stern posts. All that is necessary is to let go the senhouse slips and then throw the gripe wires off the bobbins.

4. Limit Switch – The limit switch will stop the davits arm 12 inches before they reach the stowed-on position, then the davits should be hand cranked to their final position. If for some reason it is necessary to stop raising the lifeboat, the winch also has an emergency disconnect switch to stop the flow of power to the motor and this switch should always be in off position. Shipmasters must inspect limit switches every three months.

5. Skates – Skates are fitted to lifeboats so that they can be launched when the vessel has an adverse list. When the ship has been abandoned and the lifeboat is clear, the skates can be dropped overboard.

   Every lifeboat, except the emergency lifeboats on passenger ships, is fitted with two skates on the inboard side, for assisting the passage of the boat down the side of a ship with an adverse list. The skates are there to act as skids and help you slide or skate the boat down the side of the ship.

   When the boat is in the water, the skates cease to have any value and will greatly hamper the movement of the boat. Therefore, as soon as it may be convenient, unship them, and either stow them in the boat, or tow them (normally there is sufficient wood in the skates to keep them afloat). If the ship is abandoned prematurely, and the survivors return to it, the lifeboats must be recovered, and the skates replaced, so that they are once again ready for use. Only when the ship actually sinks should the skates be discarded.

6. Tricing pendants – Tricing pendants, also called tricing lines, are wires that bring the boat to the side of the ship. They hold the boat in position at the embarkation deck until the frapping lines are passed around the falls. The tricing pendants are then released. Raising the brake lever again permits the boats to continue down until it reached the water.

7. Winches – A device for reeling in or laying out a line. The handbrakes give control to the lowering speed. Motor or hand power can be used for hoisting. Winch hand cranks have coupling which automatically disengages the cranks of the metric motor to turn the winch. In order to reduce possibility of injury, the emergency disconnect switch should always be in off position when hand cranking. Lubrication requirements should always be followed to prevent accumulation of moisture.

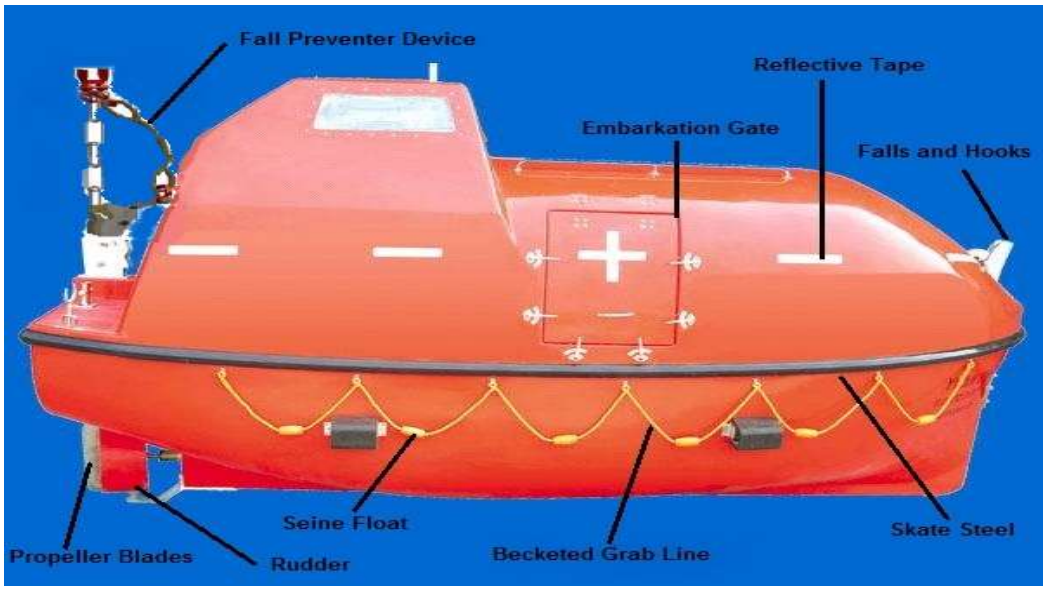
   One means of preventing this is to secure a length of light wire between the inboard cheeks of the two floating blocks. Another is to have a swivel on the bottom of each of the floating blocks. Where swivels are employed, they are to be kept well-oiled to prevent them from seizing up and so becoming useless.

As per LSA Code:

1. All lifeboats except free-fall lifeboats shall be provided with at least one drain valve fitted near the lowest point in the hull, which shall automatically open to drain water from the hull when the lifeboat is not waterborne and shall automatically close to prevent entry of water when the lifeboat is waterborne.
2. Each drain valve shall be provided with a cap or plug to close the valve, which shall be attached to the lifeboat by a lanyard, a chain, or other suitable means.
3. Drain valves shall be readily accessible from inside the lifeboat and their position shall be clearly indicated.
4. All lifeboats shall be provided with a rudder and tiller. The rudder shall be permanently attached to the lifeboat.
5. All lifeboats shall be fitted with sufficient watertight lockers or compartments to provide for the storage of the small items of equipment, water and provisions.

6. Every lifeboat to be launched by a fall or falls, except a free-fall lifeboat, shall be fitted with a release mechanism, which shall be so arranged that all hooks are released simultaneously, and release control shall be clearly marked in a color that contrasts with its surroundings.
7. 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.
8. Except for free-fall lifeboats, the painter securing device shall include a release device to enable the painter to be released from inside the lifeboat, with the ship making headway at speeds up to 5 knots in calm water.
9. Every lifeboat shall be so arranged that an adequate view forward, aft and to both sides is provided from the control and steering position for safe launching and maneuvering.

- **Parts of a lifeboat**



Propeller blades	– provides propulsion or speed to the lifeboat
Rudder	– maneuvers the boat while in the water
Buoyancy tank	– enables the lifeboat to stay afloat even when the boat is filled with water, passengers and crew
Lifeboat engine	– provides power to propel the lifeboat to its destination
Thwarts	– seats running from side to side in the lifeboat to provide rigidity of the lifeboat
Grab line	– safety ropes fitted around the lifeboat just above the waterline to help survivors in the water to cling it
Keel grab line	– provides grab handle for passengers / crew should the lifeboat capsize
Skate steel	– bumper like structure fitted to the hull of the lifeboat to protect the shell of the lifeboat from chaffing on the ship's side
Skates	– fitted to lifeboats so that they can be launched when the vessel has an adverse list
Embarkation Gate	– the access to the lifeboat at embarkation deck level
Seine float	– made of buoyant material attached to the bucketed line

- Lifeboat equipment

All items of lifeboat equipment shall be secured within the lifeboat by lashing, storage in lockers or compartments, storage in brackets or similar mounting arrangements or other suitable means. However, in the case of a lifeboat to be launched by falls, the boat hooks shall be kept from fending off purposes. The equipment shall be secured in such a manner as not to interfere with any abandonment procedures. All items of lifeboat equipment shall be as small and of as little mass as possible and shall be packed in a suitable and compact form.

1. Except for free-fall lifeboats, sufficient buoyant oars to make headway in calm seas. Thole pins, 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.
2. Two boat-hooks
3. A buoyant bailer and two buckets
4. A survival manual
5. An operational compass which is luminous or provided with suitable means of illumination. In a totally enclosed lifeboat, the compass shall be permanently fitted at the steering position; in any other lifeboat, it shall be provided with a binnacle, if necessary to protect it from the weather, and suitable mounting arrangements.
6. 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.
7. Two efficient painters of a length equal to not less than twice the distance from the stowage position of the lifeboat to the water line in the lightest sea going condition or 15m, whichever is the greater. On lifeboats to be launched by free fall launching, both painters shall be stowed near the bow ready for use. On other lifeboats, one painter attached to the release device shall be placed at the forward end of the lifeboat and the other shall be firmly secured at or near the bow of the lifeboat ready for use.
8. Two hatchets, one at each end of the lifeboat
9. Watertight receptacles containing a total of 3l of fresh water for each person the lifeboat is permitted to accommodate, of which either 1l per person may be replaced by a desalting apparatus capable of producing an equal amount of fresh water in two days or 2l per person may be replaced by a manually powered reverse osmosis desalinator capable of producing an equal amount of fresh water in two days.
10. A rustproof dipper with lanyard
11. A rust proof graduated drinking vessel
12. A food ration totaling not less than 10,000kj for each person the lifeboat is permitted to accommodate. These rations shall be kept in airtight packaging and be stowed in a watertight container.
13. Four rocket parachute flares
14. Six hand flares
15. Two buoyant smoke signals
16. One waterproof electric torch suitable for Morse signaling together with one spare set of batteries and one more spare of bulb in a waterproof container.
17. One daylight signaling mirror with instructions for its use for signaling to ships and aircraft
18. One copy of the lifesaving signals prescribed by regulation v/16 on a waterproof card or in a waterproof container
19. One whistle or equivalent signal
20. A first aid outfit in a waterproof case capable of being closed tightly after use

21. Anti-sea sickness medicine efficient for at least 48 hours and one sea sickness bag for each person
22. A jack-knife, to be kept attached to the boat by a lanyard
23. Three tin openers
24. Two buoyant rescue quoits, attached to not less than 30 m of buoyant line
25. If the lifeboat is not automatically self- bailing a manual pump suitable for effective bailing
26. One set of fishing tackle
27. Sufficient tools for minor adjustments to the engine and its accessories
28. Portable fire extinguishing equipment of an approved type suitable for extinguishing oil fires
29. A searchlight with a horizontal and vertical sector of at least 6 degrees and a measured luminous intensity of 2,500 cd which can work continuously for not less than 3hrs.
30. An efficient radar reflector, unless a survival craft radar transponder is stowed in the lifeboat
31. Thermal protective aids complying with the requirements, sufficient for 10% of the number of persons the lifeboat is permitted to accommodate or two, whichever is the greater

- Types of lifeboats

a. Partially enclosed lifeboats

Partially enclosed lifeboats shall be provided with ***permanently attached rigid covers*** extending over not less than 20% of the length of the lifeboat from the stem and not less than 20% of the lifeboat from the aftermost part of the lifeboat.

The lifeboat shall be fitted with a ***permanently attached foldable canopy***, which together with the rigid covers completely encloses the occupants of the lifeboat in a weatherproof shelter and protects from exposure. The lifeboat shall have entrances at both ends and on each side. Entrances in the rigid covers shall be weather tight when closed.

The canopy shall be arranged such that:

1. It is provided with adequate rigid sections or battens to permit erection of the canopy.
2. It can be easily erected by not more than two persons.
3. It is insulated to protect the occupants against heat and cold by means of not less than two layers of material separated by an air gap or other equally efficient means; means shall be provided to prevent accumulation of water in the air gap.
4. Its exterior is of highly visible color and its interior is of a color which does not cause discomfort to occupants.

5. Entrances in the canopy are provided with efficient adjustable closing arrangements which can be easily and quickly opened and closed from inside or outside so at to permit ventilation but exclude seawater, wind and cold; means shall be provided for holding the entrances securely in the open and closed position.
6. With the entrances closed, it admits the sufficient air for the occupants at all times.
7. It has means for collecting rainwater.
8. The occupants can escape in the event of the lifeboat capsizing.

The interior of the lifeboat shall be of a highly visible color. If a fixed two-way VHF radiotelephone apparatus is fitted in the lifeboat, it shall be installed in a cabin large enough to accommodate both the equipment and the person using it. No separate cabin is required if the construction of the lifeboat provides a sheltered space to the satisfaction of the Administration.

b. Totally enclosed lifeboat

Every totally enclosed lifeboat shall be provided with a ***rigid watertight enclosure***, which completely encloses the lifeboat. The enclosure shall be so arranged that:

1. It provides shelter for the occupants.
2. Access to the lifeboat is provided by hatches, which can be closed to make the lifeboat watertight.
3. Except for free-fall lifeboats, hatches are positioned so as to allow launching and recovery operations to be performed without any occupant having to leave the enclosure.
4. Access hatches are capable of being opened and closed from both inside and outside and are equipped with means to hold them securely in open positions.
5. Except for a free fall lifeboat, it is possible to row the lifeboat.
6. It is capable, when the lifeboat is in the capsized position with the hatches closed and without significant leakage, of supporting the entire mass of the lifeboat, including all equipment, machinery and its full complement of persons.
7. It includes windows or translucent panels, which admit sufficient daylight to the inside of the lifeboat with the hatches closed to make artificial light unnecessary.

8. Its exterior is of a highly visible color and its interior of a color, which does not cause discomfort to the occupants.
9. Handrails provide a secure handhold for persons moving about the exterior of the lifeboat, and aid embarkation and disembarkation.
10. Persons have access to their seats from an entrance without having to climb over thwarts or other obstructions.
11. During operation of the engine with the enclosure closed, the atmospheric pressure inside the lifeboat shall never be above or below the outside atmospheric pressure by more than 20 hPa.

c. Open lifeboat

This is the most elementary type of lifeboat, which is nothing but a hand-propelled boat with oars and sometimes has a small outboard engine fitted. This type has no permanent covering or shelter and it provides little protection from the environment.

d. Free-fall lifeboats

Free-fall lifeboats shall comply with the requirements of totally enclosed lifeboats described above. The carrying capacity of a free-fall lifeboat is the number of persons that can be provided with a seat without interfering with the means of propulsion or the operation of any of the lifeboat's equipment.

Each free-fall lifeboat shall make positive headway immediately after water entry and shall not come into contact with the ship after a free-fall launching against a trim of up to 10° and a list up to 20° either way from the certification height when fully equipped and loaded.

Each free-fall lifeboat shall be of sufficient strength to withstand, when loaded with its full complement of persons and equipment, a free-fall launch from a height of at least 1.3 times the free-fall certification height.

2.2 Life rafts

A life raft is a safety equipment that is used to provide emergency transportation to get people away from a sinking or endangered vessel. Life rafts are at least partially collapsible, in contrast with lifeboats, which are solid. Typically, life rafts are stored in their collapsed state, and they need to be regularly inspected to confirm that they are in good working order. When people get on board a ship, they should make a habit of determining where the life rafts are, and finding out if they have been assigned to a specific life raft or boat in the event of an emergency.

- Requirements for life rafts

Every liferaft shall be so constructed as to be capable of withstanding exposure for 30 days afloat in all sea conditions.

The liferaft shall be so constructed that when it is dropped into the water from a height of 18 m, the liferaft and its equipment will operate satisfactorily. 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 satisfactorily drop-tested from at least that height. The floating liferaft shall be capable of withstanding repeated jumps on to it from a height of at least 4.5 m above its floor both with and without the canopy erected.

The liferaft and its fittings shall be so constructed as to enable it 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.

The liferaft shall have a canopy to protect the occupants from exposure which is automatically set in place when the liferaft is launched and waterborne. No liferaft shall be approved which has a carrying capacity of less than six persons.

Unless the liferaft is to be launched by an approved launching appliance or is not required to be stowed in a position providing for easy side-to-side transfer, the total mass of the liferaft, its container and its equipment shall not be more than 185 kg.

The liferaft shall be fitted with an efficient painter of length equal to not less than 10 m plus the distance from the stowed position to the waterline in the lightest seagoing condition or 15 m whichever is the greater.

In addition to the above requirements, a liferaft for use with an approved launching appliance shall:

1. When the liferaft is loaded with its full complement of persons and equipment, be capable of withstanding a lateral impact against the ship's side at an impact velocity of not less than 3.5 m/s and also a drop into the water from a height of not less than 3m without damage that will affect its function; and

2. Be provided with means for bringing the liferaft alongside the embarkation deck and holding it securely during embarkation.

- **Particular characteristics of a life raft**

Access into rigid life raft

1 At least one entrance shall be fitted with a rigid boarding ramp to enable persons to board the liferaft from the sea. In the case of a davit-launched liferaft having more than one entrance, the boarding ramp shall be fitted at the entrance opposite to the bowsing and embarkation facilities.
2 Entrances not provided with a boarding ramp shall have a boarding ladder, the lowest step of which shall be situated not less than 0.4 m below the liferafts' light waterline.
3 There shall be means inside the liferaft to assist persons to pull themselves into the liferaft from the ladder.

Stability of rigid life raft

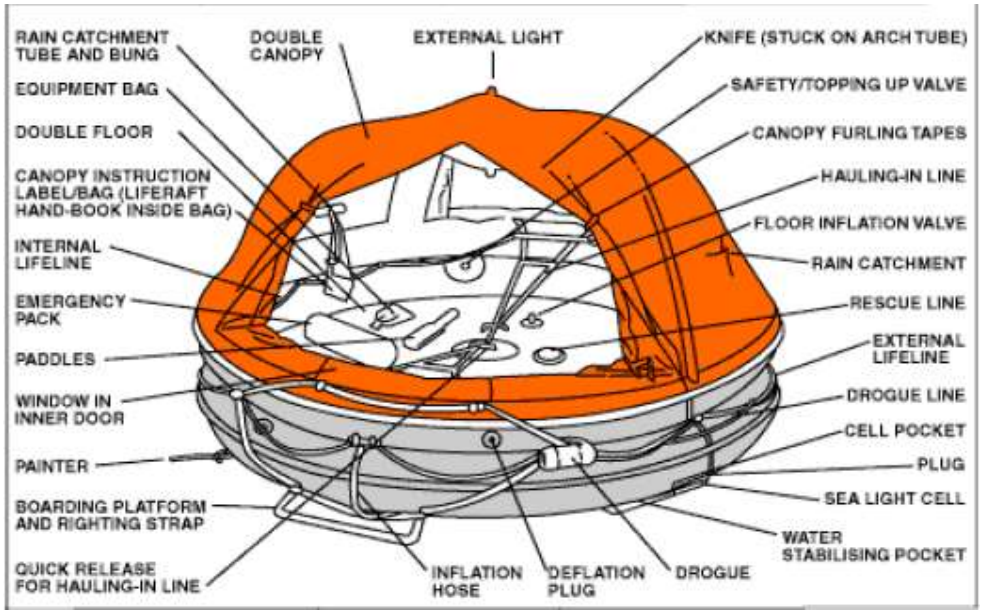
1 Unless the liferaft is capable of operating safely whichever way up it is floating, its strength and stability shall be such that it is either self-righting or can be readily righted in a seaway and in calm water by one person.

2 The stability of a liferaft when loaded with its full complement of persons and equipment shall be such that it can be towed at speed of up to 3 knots in calm water.

Markings on rigid life raft

The liferaft shall be marked with:
1 Name and port of registry of the ship to which it belongs;
2 Maker's name or trade-mark;
3 Serial number;
4 Name of approving authority;
5 Number of persons it is permitted to accommodate over each entrance in characters not less than 100 mm in height of a color contrasting with that of the liferaft;
6 SOLAS pack;
7 Type of emergency pack enclosed;
8 Length of painter;
9 Maximum permitted height of stowage above waterline (drop test height);
10 Launching instructions; and
11 Date when last serviced.

- Parts of a life raft



- Life raft equipment

The normal equipment of every liferaft shall consist of:

1. One buoyant rescue quoit, attached to not less than 30m of buoyant line
2. 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
3. One buoyant bailer for a liferaft which is permitted to accommodate not more than 12 persons; and two buoyant bailers, for a liferaft which is permitted to accommodate 13 persons or more
4. Two sea anchors with a shock resistant hawser and tripping line
5. Two buoyant paddles
6. Three tin openers and a pair of scissors. Safety knives containing special tin opener blades are satisfactory for this requirement.
7. One first aid outfit in a waterproof case capable of being closed tightly after use
8. One whistle or equivalent sound signal
9. Four rocket parachute flares
10. Six hand flares
11. Two buoyant smoke signals
12. One waterproof electric torch suitable for Morse signaling together with one spare set of batteries and one spare bulb in a waterproof container
13. An efficient radar reflector, unless a survival craft radar transponder is stowed in the liferaft
14. One daylight signaling mirror with instructions on its use for signaling to ships and aircraft
15. One copy of the lifesaving signals referred to in regulation V/16 on a waterproof card or in a waterproof container
16. One set of fishing tackle
17. A food ration totaling not less than 10,000 kj for each person the liferaft is permitted to accommodate. These rations should be palatable, edible throughout the recommended shelf life, and packed in a manner which can be readily divided and easily opened. The rations shall be kept in airtight packaging and be stowed in watertight container.

18. Watertight receptacles containing a total of 1.5l of fresh water for each person the liferaft is permitted to accommodate, of which either 0.5l per person may be replaced by desalting apparatus capable of producing an equal amount of fresh water in two days or 1l per person may be replaced by a manually powered reversed osmosis desalinator capable of producing an equal amount of fresh water in two days.
19. One rustproof graduated drinking vessel
20. Anti-sea sickness medicine sufficient for at least 48h and one seasickness bag for each person the liferaft is permitted to accommodate
21. Instructions on how to survive
22. Instructions for immediate action
23. Thermal protective aids complying with the requirements, sufficient for 10% of the number of persons the liferaft is permitted to accommodate or two, whichever is greater.

2.3 Rescue boats

A rescue boat is a craft which is used to attend a vessel in distress, or its survivors, to rescue crew and passengers. It can be hand pulled, sail powered or powered by an engine.

- Requirements of rescue boats

Rescue boats may be either of rigid or inflated construction or a combination of both and shall:

1. be not less than 3.8 m and not more than 8.5m in length; and
2. be capable of carrying at least five seated persons and a person lying on a stretcher.

Rescue boats shall be capable of maneuvering at a speed of at least 6 knots and maintaining that speed for a period of at least 4 hours. Rescue boats shall have sufficient mobility and maneuverability in a seaway to enable persons to be retrieved from the water, marshal liferafts and tow the largest liferaft carried on the ship when loaded with its full complement of persons and equipment or its equivalent at a speed of at least 2 knots. A rescue boat shall be fitted with an inboard engine or outboard motor. If it is fitted with an outboard motor, the rudder and tiller may form part of the engine.

Arrangements for towing shall be permanently fitted in rescue boats and shall be sufficiently strong to marshal or tow liferafts.

Inflated rescue boats shall be so constructed as to be capable of withstanding exposure:

1. when stowed on an open deck on a ship at sea; and
2. for 30 days afloat in all sea conditions.

The buoyancy of an inflated rescue boat shall be provided by either a single tube subdivided into at least five separate compartments of approximately equal volume or two separate tubes neither exceeding 60% of the total volume. In addition to complying with the requirements lifeboats, inflated rescue boats shall be marked with a serial number, the maker's name or trade mark and the date of manufacture. The inflated rescue boat shall be maintained at all times in a fully inflated condition.

- Particular characteristics of a rescue boat

Rescue boat buoyancy

The buoyancy of an inflated rescue boat shall be provided by either a single tube sub-divided into at least five separate compartments of approximately equal volume or two separate tubes either exceeding 60% of the total volume. The buoyancy tube shall be so arranged that in the event of any one of the compartments being damaged, the intact compartments shall be able to support the number of person which the rescue boat is permitted to accommodate, each having a mass of 75kg, when seated in their normal position with positive freeboard over the rescue boats entire periphery.

The buoyancy tubes forming the boundary of inflated rescue boat shall on inflation provide a volume of not less than 0.17 M^3 for each person the rescue boat is permitted to accommodate.

Each buoyancy compartment shall be fitted with a non-return valve for manual inflation and means for deflation. A safety relief valve shall also be fitted unless the administration is satisfied that such an appliance is unnecessary.

Markings of rescue boats

An inflated rescue boat must be fitted:

1 on the outside of the boat, arranged vertically with the lower edge at the waterline, with retro-reflective tapes, each tape being not less than 150 millimeters long and not less than 50 millimeters wide, spaced so that the distance between the center of a tape and the center of the tape next in line is not greater than 500 millimeters;
2 on the bow, with a vertical strip of retro-reflective tape 600 millimeters long and 50 millimeters wide and two horizontal strips of retro reflective tape 150 millimeters long and 50 millimeters wide, these strips being placed in the form of an arrowhead;
3 on the transom, above the water-line, with retro-reflective tapes, each tape being not less than 150 millimeters long and not less than 100 millimeters wide;
4 on each float, with retro-reflective tapes, each tape being not less than 150 millimeters long and not less than 50 millimeters wide, spaced so that the distance between the center of a tape and the center of the tape next in line is not less than 500 millimeters;
5 at the rear of each float, with a retro-reflective tape, being not less than 300 millimeters long and not less than 50 millimeters wide;
6 on each side of the bow cover, with retro-reflective tapes forming across, each tape being not less than 300 millimeters long and not less than 50 millimeters wide; and
7 on the underside of the boat, with retro-reflective tapes, each tape being not less than 300 millimeters long and not less than 50 millimeters wide, spaced so that the distance between the center of a tape and the center of the tape next in line is not less than 500 millimeters.

- Rescue boat equipment

All items of rescue boat equipment, with the exception of boat hooks which shall be kept free for fending off purposes, shall be secured within the rescue boat by lashings, storage in lockers or compartments, storage in brackets or similar mounting arrangements, or other suitable means. The equipment shall be secured in such a manner so as not to interfere with any launching or recovery procedures. All items of rescue boat equipment shall be as small and of as little mass as possible and shall be packed in suitable and compact form.

The normal equipment of every rescue boat shall consist of:

1. Sufficient buoyant oars or paddles to make headway in calm seas. Thole pins, crutches or equivalent arrangements shall be provided for each oar. Thole pins or crutches shall be attached to the boat by lanyards or chains;
2. A buoyant bailer
3. A binnacle containing an efficient compass, which is luminous or provided with suitable means of illumination
4. A sea anchor and tripping line, if fitted, with a hawser of adequate strength not less than 10m in length
5. A painter of sufficient length and strength attached to the release device complying with the requirements and placed at the forward end of the rescue boat
6. One buoyant line, not less than 50m in length, of sufficient strength to tow a liferaft
7. One waterproof electric torch suitable for Morse signaling together with one spare set of batteries and one spare bulb in a waterproof container
8. One whistle or equivalent sound signal
9. A first aid outfit in a waterproof case capable of being closed tightly after use.
10. Two buoyant rescue quoits attached to not less than 30m of buoyant line.
11. A searchlight with a horizontal and vertical sector of at least 6 degrees and a measured luminous intensity of 2500 cd which can work continuously for not less than 3h.
12. An efficient radar reflector
13. Thermal protective aids complying with the requirements, sufficient for 10% of the number of persons the rescue boat is permitted to accommodate or two, whichever is the greater
14. Portable fire extinguishing equipment of an approved type suitable for extinguishing oil fires

In addition to the equipment required, the normal equipment of every ***rigid rescue boat*** shall include:

1. A boat-hook
2. A bucket
3. A knife or hatchet

In addition to the equipment stated above, the normal equipment of every ***inflated rescue boat*** shall consist of:

1. A buoyant safety knife
2. Two sponges
3. An efficient manually operated bellows or pump
4. A repair kit in a suitable container for repairing punctures
5. A safety boat hook

3 TYPES OF DEVICE USED FOR LAUNCHING SURVIVAL CRAFT AND RESCUE BOATS

3.1 Lifeboats

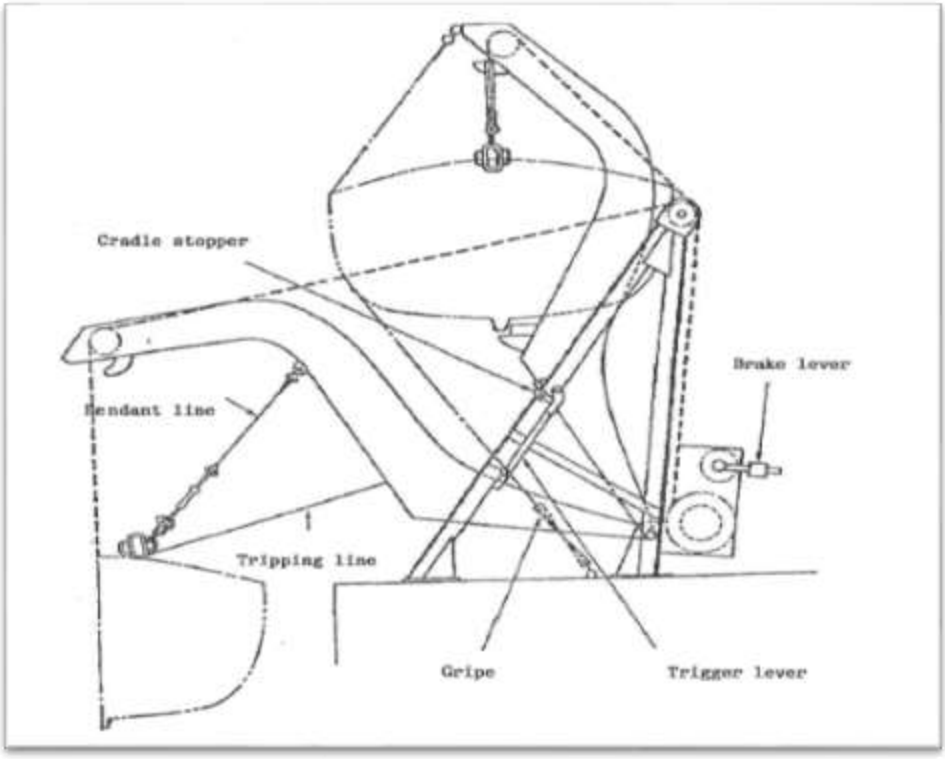
Boat davits – are large cranes that hold the lifeboat in position on the ship and lower the lifeboat into the water. They are also used to swing the boat to the lowering position and then after it has been hoisted to swing it back on board.

- Types of davits

Gravity davits – uses the weight of the boat to do the work required to launch the boat over the side of the ship. Gravity davits:

- may be on pivots;
- have a carriage mounted on roller track ways;
- fixed either to the deck or overhead; and
- boat is launched by lifting of a brake handle.

This type of davit is a "must" for the use of lifeboats weighing more than 2.25 tons. It consists of two arms mounted on rollers with travel down inclined tracks which allow the boat to be safely lowered even if the ship is listed 25 degrees either way. The falls are multi-strand steel wire ropes led to, and stowed on, the drum of the boat winch, which is also arranged that the two falls are kept separated and are paid out at the same rate. The winch has an automatic brake which controls the speed of lowering between 18 and 36 meters per minute.



Mechanical davits – The common mechanical davits are the quadrantal and sheath types. For both types, the davit arm is cranked outboard by screw, gears or other mechanical means.

a. Sheath screw davits – have two types: the straight boom sheath screw davit and the crescent sheath screw davit. The former carries the lifeboat on chocks between the davits and the latter cradles the lifeboat under the davits.

b. Quadrantal davits – The lifeboat is carried on chocks under the davits. The davit is pivoted near the foot so that it will turn in an arc at right angles to the vessel's side. The davit stands upright with the tops in towards each other so that the ends come directly above the hoisting hooks of the lifeboat.

c. The "Miranda" System – employ a different approach to the launching of a boat by means of gravity. The boat is contained in and attached to a cradle that is hoisted to the davit head by means of two single wire rope fails; there

are therefore no floating blocks. The boat is attached to the cradle by means of two short wire strops placed between the cradle head and the boat's lifting hooks. The painter which is attached to the lifeboat by means of a quick release system is also attached to the cradle and not to the ship.

d. Radial or roundbar davits – the heads of the davit arms are radial or round bars davits swing out in horizontal arcs in moving the boat from the inboard to the outboard position. The boat is swung aft until the bow clears the forward davit arms, then the boat is swung outboard and forward to the lowering position.

e. Luffing davits – Luffing davits, obsolete on vessels built after 1st July 1986, require the boat to be taken from inboard to outboard by the manual turning of a worn screw or telescopic screw. These davits are required to be capable of launching a boat against an advance list of 15 degrees and like gravity davits, are fitted in pairs. The boat normally rests in chocks at deck level and is firmly held down by means of deck gripes.

Normally, wipe rope falls and winches are fitted but under certain circumstances Manila ropes falls maybe used. Manila ropes falls attached to lifeboats 24 ft. (7.3 m) in length and over are required to be rove in a three-fold purchases, the hauling and standing parts of the fall being rove through the center sheaves, in order to balance the weight. Suitable bollards for making fast shall be provided.

f. Single arm davit – Single arm davits are mechanically controlled and are required to be fitted with wire falls and winch. They may be sited on the stern of small vessels attached to a lifeboat, Class C boat, inflatable boat or a rescue boat. Rigid boats will be secured at an approved position by approved fastenings. Single arm davits attached to boats are normally required to be able to launch the boat on one side of the ship only and are not required to launch the boat against an adverse list. Two men only are to be in the boat while it is being launched. Survivors join the boat when it is afloat.

Single arm davits may also be placed amid ships for the launching and recovery of inflatable boats and for the launching of liferafts. When intended for use with liferafts, the falls is required to have a tricing line attached for the purpose recovering the hook after a liferaft has been launched, without turning the davit inboard.

Single arm davits are also be fitted with a safety hook, which when the safety catch is released, will automatically release the liferaft as soon as it is waterborne. In lieu of a winch, some single arm davits intended of launching liferafts will be fitted with a spring motor for automatic recovery of the fall. Single arm davits intended for use with liferafts shall be capable of launching the liferaft when the ship is listed 20 degrees either way on vessels constructed after 1st July 1986, or 15 degrees on other vessels.

- Types of davit systems for free-fall lifeboats

Roller track system. It has its davit arms carried on rollers operating on a track beneath the launching ramp. When launching boat under controlled conditions, the rate of descent is controlled by centrifuge brakes on the winch to give a lowering rate of 15-18/min. When the davit arms assembly has reached the outboard end of the track, the roller continues to follow the curve thus swinging the lifeboat further outboard. Most of the installations sold to date are of this type because of the requirements of some authorities to launch a boat by means of a davit without the need of a power supply from the ship, unlike in an A-Frame type where a separate stored power unit must be installed.

A-Frame system. This has its davit arms piloted at the lower, outboard end of lunching ramping. A plate at the top end acting as boarding platform gives access to the lifeboat door. In a controlled launching of the lifeboat, hydraulic arms near the pivot point swing the davit arm assembly upwards and over the center to its fully extended position so that the lifeboat is well clear of the vessel stern.

3.2 Liferafts

- Throw-overboard type liferaft

How to launch the raft

- From the storage container, a line is secured to a fixed part of the installation or ship. This line is coiled up inside the raft and connected to a steel cylinder containing compressed gas (CO_2 and N_2).
- When the container is thrown overboard, the line will first act as a release-line for the gas-mixture and then as a painter, which prevents the raft from drifting away.
- In a painter, a so-called weak link is incorporated. If cutting the painter is forgotten, or in case of a hydrostatic release, the weak link will snap.
- After launching the container, one hauls in the slack of the painter and finally gives one or two strong pulls.
- This opens the valve of the gas cylinder. Then the raft will inflate automatically and force its way out of the container.

Where to launch the raft: Preferably launch raft on the lee side

Factors to consider

1. Is the installation or ship on fire?
2. Is there burning oil on the water?
3. Possible leeway?
4. Is there danger of the deck cargo going aboard, etc.?

In these situations, it could be necessary to launch the raft away from its stowing position. Untie the painter, carry the raft to the desired location and fasten the painter to a fixed point.

Check / secure the painter line

It should be perfectly clear why the painter must always be firmly attached to the ship. In stormy weather, the container or the inflated raft will be blown away very quickly.

Towing rafts

Towing the raft is possible. A towing patch is fitted to every life raft and this patch must always be used when tying two or more rafts together or when being towed. However, towing should be limited.

Boarding a raft

Board the raft from a ladder, scramble net, rope or from the sea. The most favorable situation is to board the raft dry.

Jumping into the raft may be possible, but not recommended. The container shells, which may be underneath the raft may cause serious injuries. On no account jump into the liferaft while another person is already inside.

- Davit-launched liferaft

Another way to launch a liferaft is by using a davit crane. These liferafts are especially designed for this purpose, but can also be thrown overboard.

Advantages

1. You board the liferaft on the embarkation deck.
2. The descent to sea-level is made in a controlled way.
3. Jumping, climbing or entering the water is unnecessary.

Disadvantages

1. More complicated launching method

Davit hook

1. Single arm davits supplied for the launching of liferafts are required to have a hook attached to the fall.
2. The hook will automatically release the raft when the raft is waterborne, provided that the safety catch has been taken off.
3. When the hook is hooked onto the liferaft, the operator closes a locking lever.
4. The hook cannot be closed without, at the same time, closing the lever and securing the safety catch.
5. When the liferaft has been hoisted and the weight of the raft is on the hook, a red lanyard attached to the locking lever on the hook may be pulled, taking off the safety catch.
6. The hook will not release until the weight of the raft becomes waterborne.

WARNING: A dangerous situation arises if the raft is obstructed by the ship's side during lowering, or when the wind lifts up the liferaft. Therefore, pulling the release lanyard should be delayed until the raft is within 1 meter from the water.

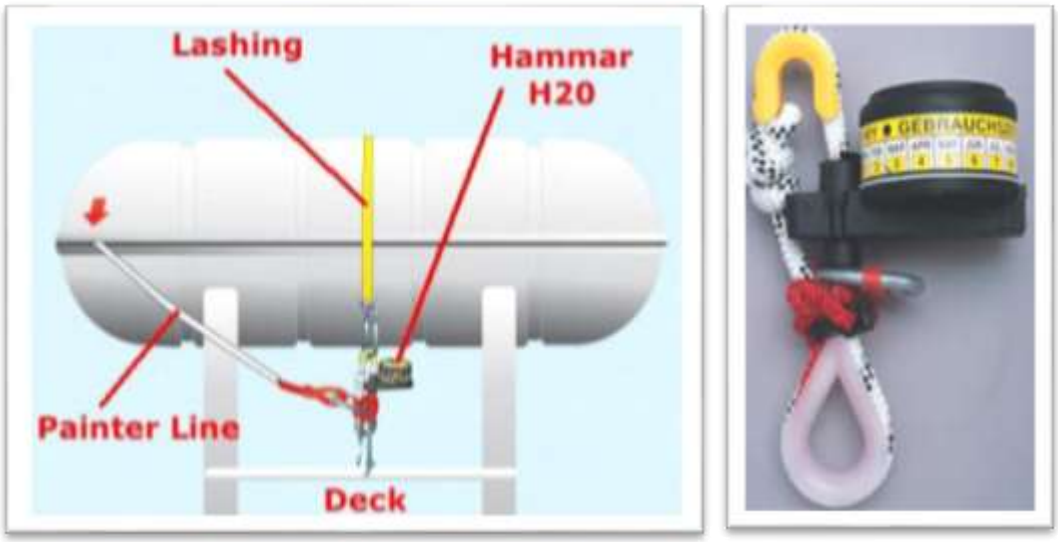
Launching equipment requirements for inflatable liferafts as per Code of Federal Regulations

1. Each inflatable liferaft not intended for davit launching must be capable of rapid deployment.
2. Each liferaft capable of being launched by a davit must have the following launching equipment at each launching station:
    a. A launching device must be approved and
    b. A mechanical disengaging apparatus approved.
3. The launching equipment must be operable, both from within the liferaft and from the deep water port.
4. Winch controls must be located so that the operator can observe the liferaft launching.
5. The launching equipment must be arranged so that a loaded liferaft does not have to be lifted before it is lowered.
6. Not more than two liferafts may be launched from the same set of launching equipment.

- Hydrostatic releasing gear

Hydrostatic releasing gear is a mechanism, which operates automatically when a ship sinks. When there is no allocated time for the crew to launch a liferaft due to the fast sinking of the ship, hydrostatic release gears are fitted.

Liferafts on ships or other mobile installations must be attached to a so-called hydrostatic release unit. Should a ship or installation sink ***within 4 meters*** underwater, water pressure automatically activates the sharp knife which cuts the white rope and releases the liferaft thus making liferaft float free, the painter line will be fully extended, which will initiate the inflation of the raft. A weak link ensures that the raft is not pulled down with the ship. It will break, the raft will surface and the survivors can climb in.



3.3 Rescue boats

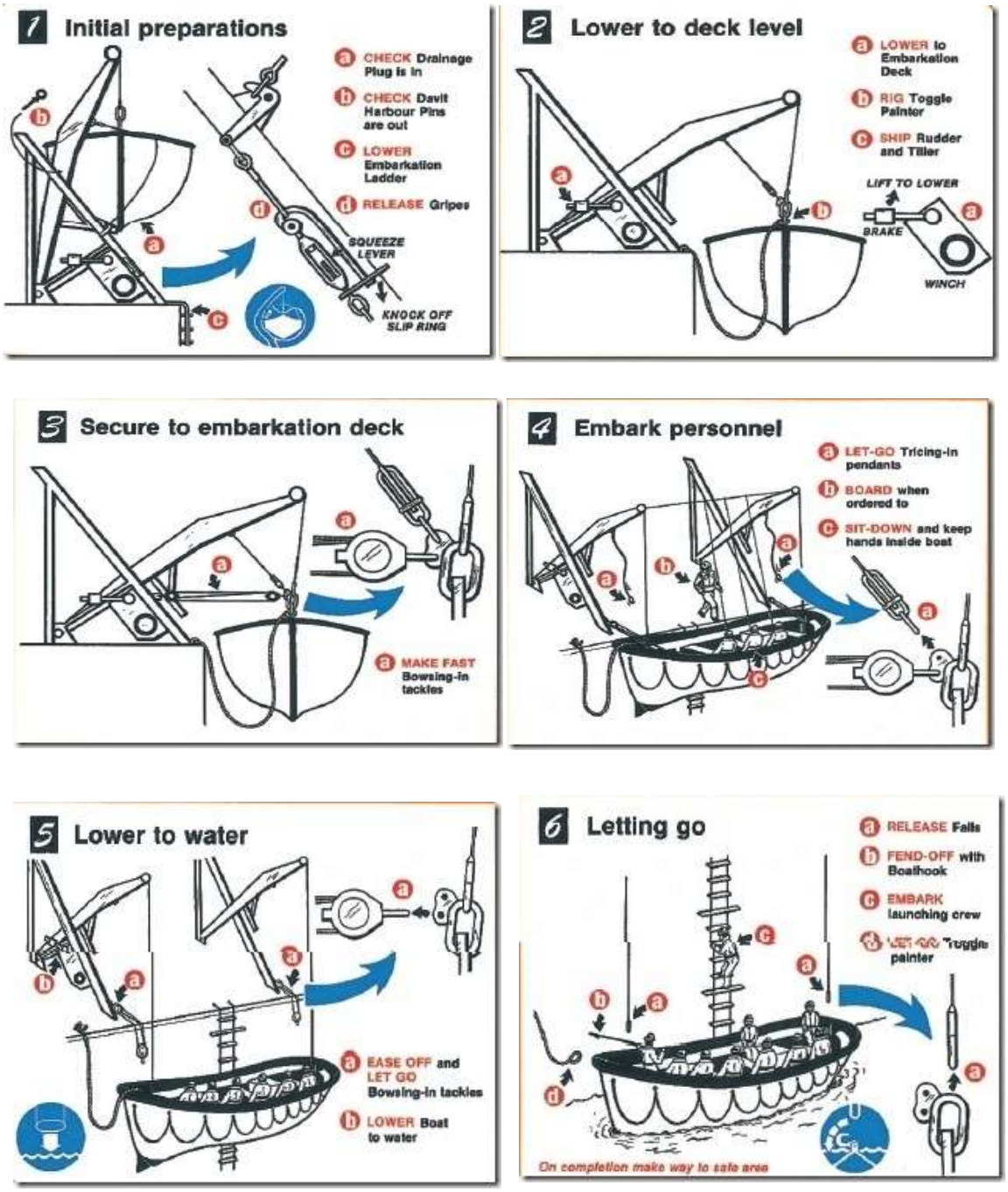
- **Code of Federal Regulations requirement**

1. Each davit for a rescue boat must be approved under approval of Code of Federal Regulations. If the launching arrangement uses a single fall, the davit may be of a type that is turned out manually, and the release mechanism may be an automatic disengaging apparatus approved under approval of CFR instead of a lifeboat release mechanism. Each rescue boat must be able to be boarded and launched directly from the stowed position with the number of persons assigned to crew the rescue boat on board. If the rescue boat is also a lifeboat and the other lifeboats are boarded and launched from an embarkation deck, the arrangements must be such that the rescue boat can also be boarded and launched from the embarkation deck.
2. Each rescue boat must be capable of being launched with the OSV making headway of 5 knots in calm water. A painter may be used to meet this requirement.
3. Each rescue boat embarkation and launching arrangement must permit the rescue boat to be boarded and launched in the shortest possible time.
4. Rapid recovery of the rescue boat must be possible when loaded with its full complement of persons and equipment.
5. Each rescue boat launching appliance must be fitted with a powered winch motor.
6. Each rescue boat launching appliance must be capable of hoisting the rescue boat when loaded with its full rescue boat complement of persons and equipment at a rate of not less than 0.3 meters per second (59 feet per minute).

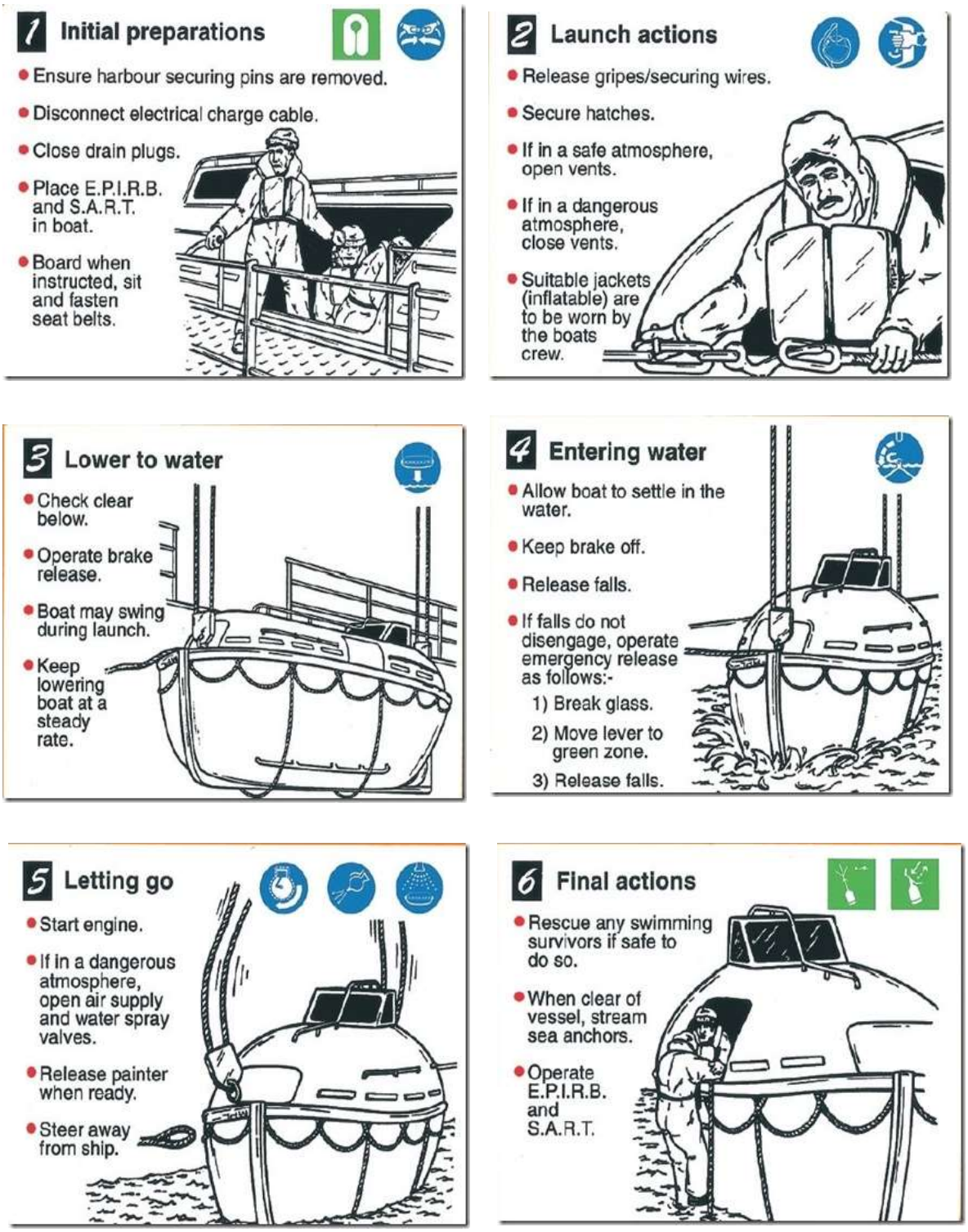
4 LAUNCHING SURVIVAL CRAFTS

4.1 Launching

- Procedure for launching an open lifeboat

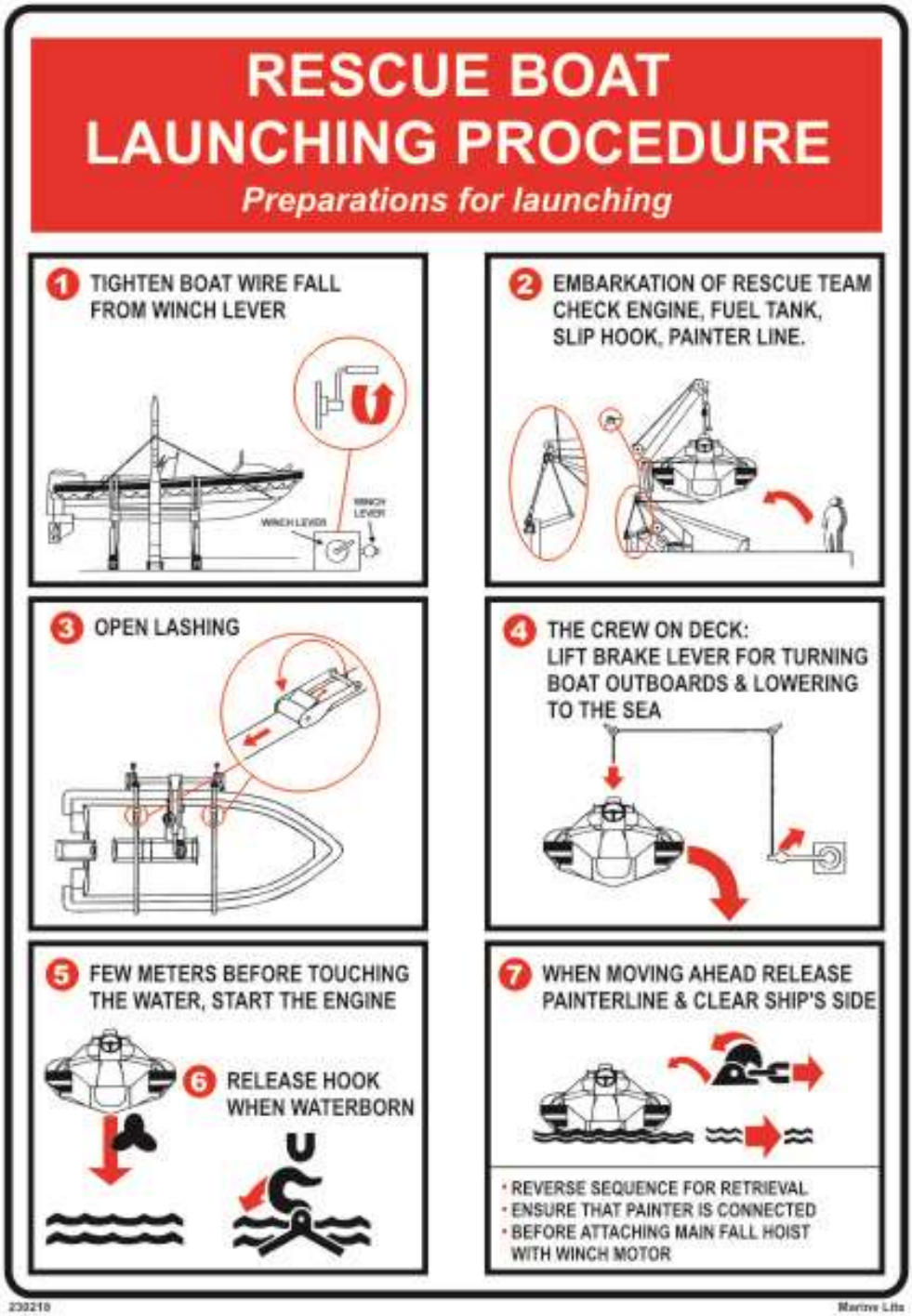


- Procedure for launching an enclosed life boat



- Procedure for launching a liferaft

- Procedure for launching a rescue boat



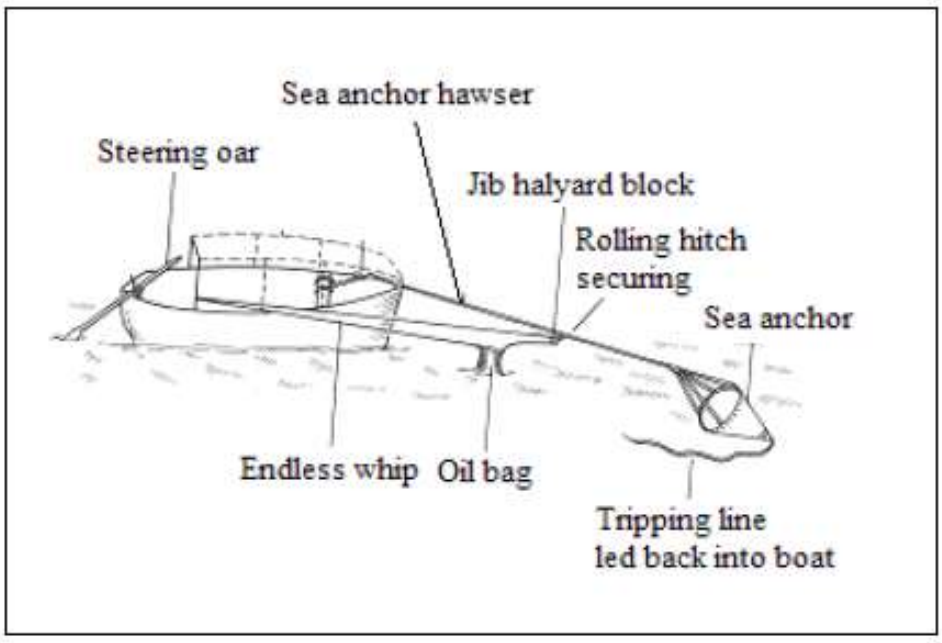
4.2 Clearing the ship's side

- Use of wave-quelling oil with small boats

When engaged in heavy seas, where excessive pitching is being experienced, the prudent use of oil on the surface of the water can effectively reduce the motion of the boat. One gallon of oil is provided as standard issue to all lifeboats. This oil is usually an animal or vegetable oil, rather than a mineral oil. Coxswain are advised that the use of oil in limited quantities should prevent waves from breaking over the craft and so reduce the violent movement on the craft. The oil will not reduce any swell effects.

It is normal practice to use the oil bag in conjunction with the sea anchor and heave the boat to, with the intention of riding the bad weather out. A small amount of oil is used at any one time, ideally spread ahead of the craft to form an advancing slick giving full benefit to the boat. In a towing operation the oil should similarly be spread from the fore part of the towing vessel. This will benefit the craft, the tug and the towed vessel.

Heavy oils tend to be better than lighter oils and prevent solid water landing on the top of the craft. The obvious danger is that the boat could be swamped or stove in with large waves. Comparing the pollution aspect of the use of oil with the safety of line, the priority must be in favor of safety of life at sea.



- Rescue boat embarkation, launching and recovery arrangement

1. The rescue boat embarkation and launching arrangements shall be such that the rescue boat can be boarded and launched in the shortest possible time.
2. If the rescue boat is one of the ship's survival craft, the embarkation arrangements and launching station shall comply with the requirements for survival craft muster and embarkation arrangements and launching stations.
3. Launching arrangements shall comply with survival craft launching and recovery arrangements. However, all rescue boats shall be capable of being launched, where necessary utilizing painters, with the ship making headway at speed up to 5 knots in calm water.

4. Rapid recovery of the rescue boat shall be possible when loaded with its full complement of persons and equipment. If the rescue boat is also a lifeboat, rapid recovery shall be possible when loaded with its lifeboat equipment and the approved rescue boat complement of at least six persons.

5 RECOVERING A SURVIVAL CRAFT

The primary occurrence of lifeboat accidents is during the recovery process. The recovery process is the most dangerous stage when using a lifeboat. The recovery process should be designed to be as safe as possible.

The three steps of the recovery process are outlined below together with the personnel involved. The table shows a comparison of using a single cable capsule or a twin-fall lifeboat which clearly shows the enhanced safety in recovery of a single cable capsule.

	(1) Getting in Position	(2) Hooking Up	(3) Beginning the Lift
Personnel	Helmsman	Hook Up Personnel	Helmsman
Single Cable	Good Maneuverability Easier and Safer to get in Position	One Person Good Access	Helmsman Can See the Hook Up
Twin-Fall	Poor Maneuverability Difficult to get in Position	Two People Poor Access	Helmsman Cannot See the Hook Up
Safer Solution	Single Cable	Single Cable	Single Cable

- Getting in position

The **helmsman** is the individual responsible for getting the lifeboat in position. With a single cable capsule he has good maneuverability and only has to be in the right location for one hook. With a twin-fall the maneuverability is far more restrictive and he has to get in the right location for two hooks. The helmsman's job of getting in position is far easier and safer with a single cable capsule.

- Hooking up

When hooking up the responsibility now moves from the helmsman to the **hook up personnel**. With the single cable capsule this is one individual who has good access which has been specifically designed to make this job as safe as possible.

With a twin-fall capsule this job needs to be performed by two individuals. The access to the hook up is usually far more awkward than in the cable capsule. Additionally it should be noted that involving two individuals doubles the danger of an incorrect hook up.

- Beginning the lift

When the lift begins control moves back to the **helmsman**. With a single cable hookup the helmsman can see the hook and he can see that a good hook up has been performed. He has line of sight visibility to the hook up person and to the hook to confirm that a good hook up has been made before beginning the lift.

With a twin-fall system the helmsman usually has limited visibility of the hook up personnel and cannot see the hooks to check the final hook up before the lift begins. More emphasis is placed on the hook up personnel with a twin-fall system as their task cannot be confirmed by the helmsman. Note also that these personnel are typically less trained than the helmsman.

6 ACTION TO BE TAKEN UPON LEAVING THE SHIP

6.1 Abandon Ship

- Preparations

There are a few important things to do, if time permits, before going over the side.

1. Try to find out the distance and direction of the nearest friendly land.
2. See to it that your life saving gear is in first class condition. The clothes you wear and the gear you take with you depends upon whether you are in a ***hot or cold climate***.

Abandoning the Ship in Cold Climate

Clothing:

1. Long woolen underwear and woolen socks to keep body warm
2. Wind proof jacket to protect shoulder and arms
3. Helmet or watch cap to keep head warm and water out
4. Garments that can be slipped off easily
5. Gloves to keep hands warm and to prevent burning them on lines

What to take:

1. Flashlight with a transparent rubber water sheath or pin on flashlight
2. Police whistle
3. Knife
4. A six-foot line tied under arm with a snap on free end to secure self to line one rescuing ship
5. Wallet and money belt

Actions before leaving the ship:

1. If possible, drink hot tea or coffee to ward off effect of cold water.
2. Test lifejacket valves and inflating tubes.
3. Stimulate circulation by deep and rapid breathing and by flexing arms and knees, to not over exert.

Abandoning ship in hot climate

1. Wear a shirt, trouser and tennis shoes to protect you from the effect of sun and salt water.
2. Take the same articles with you and follow the same routine before leaving ship as described for abandoning ship in cold climate.

- Getting over the side

1. Obey every command.
2. Wear your lifejacket and fasten it securely.
3. If possible, lower yourself by ladder or lines. If you jump, jump feet first, protecting your face with your hand.
4. Avoid debris in the water.
5. If possible, jump to windward from the lowest part of the ship or from an overhang structure.
6. If propellers are still turning, leave by the bow.
7. If the water is covered with burning oil, discard your life jacket and swim under water, swim windward.
8. To protect yourself from underwater explosion, swim away from the ship for at least one hundred (100) yards or swim aboard a boat raft or wreckage. If none of this are available; swim or lie flat on your back.

6.2 Actions to be taken when in the water

1. Tie raft and net together. It is easier for searchers to find a large group of survivors than two or three adrift separately.
2. Able-bodied men should stay out of crowded raft and hang on the side. Ropes on raft should be sufficiently loose to permit an easy grasp.
3. If the sea is rough, breathe as in swimming, inhaling through the mouth, exhaling through the nose as a wave washes over you.
4. Do not try to swim if raft or net is available. Save your strength.
5. Keep kicking your legs and moving all parts of your body to prevent numbness which will strike after 30 seconds of inactivity in cold water.
6. Beware of drowsiness, which often comes on between 15 to 45 minutes after you enter the water.
7. Shivering saps strength quickly. Deep rapid breathing and moving the arms and legs will usually stop it.
8. Non-swimmers are most likely to lose their heads. Encourage them and keep talking to them calmly and quietly.
9. Stay calm.

7 LAUNCHING AND RECOVERING RESCUE BOATS INTO A ROUGH SEA

- Procedure to Prepare and Safely Launch Boats into a Rough Sea

Deploy the sea anchor connected to the bow of the lifeboat, so that it stays afloat behind the sea anchor. The engine can be stopped while the lifeboat is slowly drifting. This will also keep the bow against the waves and swell. The sea anchor may also be deployed at the stern if it is well-shaped.

The sea anchor is equipped with a hewing line and a tripping line. The tripping line is used to retrieve the sea anchor.

8 DANGERS UPON USE OF ON-LOAD RELEASE DEVICES

Since the releasing gear actually launches the lifeboat into the water either intentionally or unintentionally, certain safety precautions must be observed. Regulations require:

1. The bend around the releasing gear from the keel to the side shall be painted white;
2. This bend of white should be approximately 12 inches wide depending on the internal arrangement of the lifeboat;
3. The lever shall be painted red and marked Danger – "Level Drops Boat".

Releasing Gear

Releasing gear is installed in the lifeboats to let go the falls. Without such gear, letting go the falls in a seaway could be a difficult and dangerous job.

The most widely used is the Rottmer gear which releases the falls of both ends of the boat at the same time. The man in charge orders the boat to be released. A lever is turned and this lever at both bow and shifting connection through universal joints to hook locks at both bow and stern ends of the boat. When the hook locks are opened, the hook releases the falls. Each Rottmer releasing hook is fitted with a preventive bar. These bars keep the falls from accidentally detaching in case the falls slacken when the boat is in the water. The Rottmer releasing gear is located in the bottom of the lifeboat and extends from bow to stern. It is a pipe with a universal coupling on each end a lever bolted near the middle. When this lever is turned 180 degrees, both releasing hooks open at the same time.
Hydrostatic releasing gear is a mechanism that operates automatically when a ship sinks. When there is no allocated time for the crew to launch a liferaft due to the fast sinking of the ship, hydrostatic release gears are fitted. At a depth of between 8 ft. (2.4 m) and 12 ft. (3.7 m) water pressure will automatically release the raft. The sinking ship pulls out the painter and so fires the gas bottle. A weak link parts and releases the raft from the ship. On large passenger ships an electrical release may be attached to a raft at the end of the ship, for use in emergency such as “MOB”.

9 MAINTENANCE PROCEDURES

9.1 Maintenance of falls

Falls used in launching shall be inspected periodically with special regard for areas passing through sheaves, and renewed when necessary due to deterioration of falls or at intervals of not more than 5 years, whichever is earlier.

9.2 Inspection of survival craft

- Weekly Inspection

The following test and inspection shall be carried out weekly and report of the inspection shall be entered in logbook.

1. All survival craft, rescue boats and launching appliance shall be visually inspected to ensure that they are ready for use. The inspection shall include, but is not limited to the condition of hooks, their attachment to the lifeboat and the on-load release gear being properly and completely reset.

2. All engines in lifeboats and rescue boat shall be run for a total period of not less than 3 minutes, provided the ambient temperature is above the minimum temperature required for starting and running the engine. During this period of time, it should be demonstrated that the gearbox and gearbox train are engaging satisfactorily. If the special characteristic of an outboard motor fitted to a rescue boat would not allow it to be run other than with its propeller submerged for a period of 3 minutes, a suitable water supply may be provided. In special cases, the administration waives its requirement for ships constructed before 1 July 1986.

3. Lifeboats, except free fall lifeboats, on cargo ships shall be moved from their stowed position, without any persons on board, to the extent necessary to demonstrate satisfactory operation of launching appliances, if weather and sea conditions allow.

- Monthly Inspection

1. Inspection of life saving appliances, including lifeboat equipment, shall be carried out monthly using the checklist required by the regulation to ensure that they are complete and in good order. A report of the inspection shall be entered in the log book.

9.3 Servicing of survival craft, rescue boats and launching devices

- Servicing of Inflatable liferafts and rescue boats

1. Inflatable liferafts and rescue boats shall be serviced at interval not exceeding 12 months, provided where in any case this is impracticable, the Administration may extend this period to 17 months.

2. It shall be serviced in an approved servicing station which is competent to service them, maintains proper servicing facilities and uses only properly trained personnel.

- Periodic servicing of hydrostatic release units

Hydrostatic release units, other than disposable hydrostatic release units shall be serviced:

1. At intervals not exceeding 12 months, provided where in any case this is impracticable, the Administration may extend this period to 17 months; and

2. At servicing station that is competent to service them, maintains proper servicing facilities and uses only properly trained personnel.

- Periodic servicing of launching appliances and on-load release gear

Launching appliance shall be:

1. Maintained in accordance with instruction for onboard maintenance as required by the regulation;

2. Subject to a thorough examination at the annual survey required by the regulation; and

3. Upon completion of the examination it is subject to a dynamic test of the winch brake at maximum lowering speed. The load to be applied shall be the mass of the survival craft or rescue boat without persons on board, except that, at intervals not exceeding five years, the test shall be carried out with a proof load equal to 1.1 times the weight of the survival craft or rescue boat and its full complement of persons and equipment.

10 OPERATING A SURVIVAL CRAFT ENGINE

10.1 Operating the engine

- Starting the engine

a. Preparation checklist before starting a lifeboat

1. Check the fuel oil level in the tank and refill if necessary.
2. Open the fuel cock.
3. Check the lube oil level in the crank case and clutch case. Refill up to the upper marking on the dipstick.
4. Turn the handle of the lube oil filter on the outlet side several times to the left or right
5. Open the Kingston cock.

6. Turn the starting handle by hand in order to lubricate each part.
7. Set the speed control lever to HIGH.
8. Turn the starting handle until you hear the sound of fuel being injected.

Note: Fuel is not injected if air is present anywhere in this system. Air enters the system when fuel runs out and when the fuel injection pump is stripped.

b. Starting a lifeboat

1. Set the speed control lever to HIGH.
2. Raise the decompression lever and turn the starting handle vigorously five or six times until the flywheel obtains momentum.
3. Release the decompression lever and further turning the starting handle firmly.
4. Warm up the engine at 600-700rpm speed without a load at least 10 minutes.

c. During operation

1. Check that the cooling water is coming out of the cooling water pipe outlet.
2. Check the Lubricating Oil pressure warning indicator to see that the oil signal is blue.

d. Stopping a lifeboat

1. Set the speed control lever to stop position.
2. Close the fuel cock.
3. Close the Kingston cock.
4. Stop the engine at the compression stroke by turning it until the starting handle resistance is felt. Do not use the decompression lever.

10.2 Maintaining a lifeboat engine

1. ***Engine and accessories*** – Water or an air-jock in the fuel system will prevent the engine from starting. Lack of oil will cause the engine to overheat. Dirt in the fuel will cause the engine to stop. Fresh water cooling system requires protection with anti-freeze when trading in cold areas.
2. ***Crankcase*** – Remove the oil cap and fill with lube oil up to the upper marking on the dipstick. When checking the oil level, insert the dipstick completely.
3. ***Clutch case*** – Remove the oil cap and fill with lube oil up to the upper marking on the dipstick. When checking the oil level, do not screw the lube oil dipstick on.
4. ***Lubrication on each part*** – Lubricate the starting chain and the starting shaft bearing with lube oil before operation.

- Air venting procedure

1. Loosen the plug of the fuel strainer and when bubble-free fuel comes out, securely tighten the plug.
2. Loosen the nipples at each end of the fuel injection pipe. Set the speed control level to HIGH.
3. Loosen the delivery valve holder (by about 2 turns) and when bubble-free fuel comes out, securely tighten the delivery valve holder, and then, after attaching the injection pipe, securely tighten the fuel pump side nipple.
4. Now turn the engine with the starting handle about 30 times. Fuel oil is circulated and comes out from the nipple on the injection valve side. When there is no more air bubble present in the oil, tighten the nipple. This indicates that the air has been completely vented.

Note: Start the engine every 10 days in order to check the engine condition or turn the starting handle by hand in order to lubricate each part, and also turn the starting handle until you hear the sound of fuel being injected.

- Boat crew, duties and responsibilities

1. *Boat coxswain* – a qualified coxswain familiar with his boat's physical characteristics. He must see to it that his boat is always clean and ready at any moment's use. He should know the boat's passenger capacity, keeping in mind that one (1) person is equivalent to a cargo of 165 lbs. He has full charge of his boat crew and passengers. When underway during inclement weather, he shall require all his boat crew and passengers to wear lifejackets. He shall enforce the "no smoking" regulation and require all passengers to sit down properly while underway. Safety and welfare of the personnel must be his primary concern.

2. *Boat engineer* – is responsible for the upkeep, maintenance and operation of the engine. He should be able to make minor repairs and spot trouble before it has a chance to cause damage.

3. *Bowman* – he acts as bow lookout and handles the bow lines and forward fender when coming alongside or getting underway. He is also responsible for the cleanliness of the boat. He should be qualified to relieve the coxswain, if necessary.

11 ACCESSORIES AND FIRE EXTINGUISHERS

11.1 Cooling water systems

- Seawater cooling system

Normally the engine is direct seawater-cooled. From the external strainer the cooling water is drawn through the lubricating oil cooler to the pump from where the water is fed through the cooling jackets up to the cylinder head and from there, via the water-cooled exhaust manifold and thermostat overboard, through the exhaust pipe. A thermostat is fitted in the water-cooled exhaust manifold. This ensures a constant cooling-water temperature between 50-75°C

- Freshwater cooling system

Alternatively, the engine can be delivered with freshwater cooling or it may be fitted with this later on. When using freshwater cooling it will be possible to reach a higher operating temperature of 70-95°C which will prolong the life of the engine. This cooling system is recommended for engines operating for more than 500 hours a year.

A pump circulates the freshwater in a closed system. This circulation pump is fitted on the back end of the engine. The fresh water circulates through the cooling jackets of the engine and through the heat exchanger fitted on the water-cooled exhaust manifold. The freshwater is cooled in the heat exchanger by seawater which is pumped through by a big impeller pump like the one used for direct seawater-cooling. The seawater leaves the heat exchanger via the exhaust system as in the case of seawater cooling.

- Frost precautions

To avoid damaging the engine, drain the cooling water during frosty periods. To protect the engine against damage caused by frost, proceed as follows:

1. Turn off the cock on the cooling water inlet skin fitting.
2. Drain the cooling water off the engine by removing the plug above the lubricating oil filter on starboard side and under the exhaust manifold, respectively.
3. Clean up the drain holes with a nail, a steel wire or the like, so that any remaining water may drain out.
4. Start the engine and let it run for 30 seconds to remove all the water from the engine and exhaust manifold.

11.2 Battery charging

Lifeboat engine has a battery starting system and is provided with an alternator for charging. Searchlight, fixed radio equipment and lifeboat distress light are supplied by the battery. Fixed radio equipment battery, if provided, can also be charged from the engine alternator. Onboard ship the lifeboat has a battery charging connection from the ship that also provides power to totally enclosed lifeboats for illumination during maintenance and inspections.

There should be a means provided for recharging all engine starting, radio and searchlight batteries. Radio batteries shall not be used to provide power for engine starting. Means shall also be provided for recharging lifeboat batteries from the ship's power supply voltage not exceeding 55V which can be disconnected at the lifeboat embarkation station.

11.3 Fire equipment

- List of fire equipment on a motor lifeboat
  - Portable fire extinguishers
  - Sand and a scoop
  - Drip tray and a fireproof scoop
  - 2 cocks on the fuel line
  - Drip tray and a fireproof engine cover

Note: Wood boats require a drip tray under the engine.

A portable fire-extinguishing equipment of an approved-type suitable for extinguishing oil fires is one of the normal equipment of every lifeboat, except otherwise stated.

The contents of portable fire extinguishers should be indicated by a colour code in compliance with the requirements of the competent authority. Each fire extinguisher should have a label affixed to it providing instructions to its use.

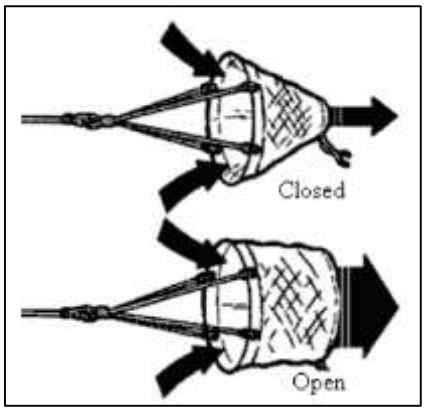
12 Handling survival craft and rescue boats in rough weather

12.1 Preparation for heavy weather

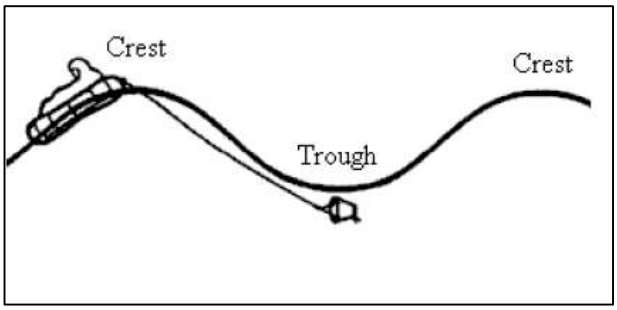
Time is a critical factor for reacting in a situation like rough weather. If a pre-warning is available with the ship, then staff can do the preparation; but if the warning period is short or if there is a sudden strike of rough waves and bad weather then handling of the ship depends on the knowledge, training, skills and, team efforts of ship's staff.

It is very important for a seafarer to know what to do in rough weather situation so that mistakes can be avoided and in minimal time during abandon ship.

- Using sea-anchor and oil bag



Throw out the sea anchor, or improvise a drag from the raft's case, bailing bucket, or a roll of clothing. A sea anchor helps you stay close to your ditching site, making it easier for searchers to find you if you have relayed your location. Without a sea anchor, your raft may drift over 160 kilometers in a day, making it much harder to find you. You can adjust the sea anchor to act as a drag to slow down the rate of travel with the current, or as a means to travel with the current.



You make this adjustment by opening or closing the sea anchor's apex.

When open, the sea anchor acts as a drag that keeps you in the general area. When closed, it forms a pocket for the current to strike and propels the raft in the current's direction. Additionally, adjust the sea anchor so that when the raft is on the wave's crest, the sea anchor is in the wave's trough.

When engaged in heavy seas where excessive pitching is being experienced, the prudent use of oil on the surface of the water can effectively reduce the motion of the boat. One gallon of oil is provided as standard issue to all lifeboats. This oil is usually an animal or vegetable oil, rather than a mineral oil. Coxswain are advised that the use of oil in limited quantities should prevent waves from breaking over the craft and so reduce the violent movement on the craft. The oil will not reduce any swell effects.

13 USE OF EQUIPMENT

13.1 Using Sea-anchor and Oil Bag

- Painter

The painter is used to steer the lifeboat away from the ship's side and to keep the lifeboat near the mother ship to pick up the remaining crew. It is made fast to the lifeboat usually on the second thwart by means of a strap eye and toggle. The other end is made fast to the main deck of the mother ship well forward on the outboard side of everything. It is released by pulling the toggle.

Painter requirements as per Code of Federal Regulation

The painter must:

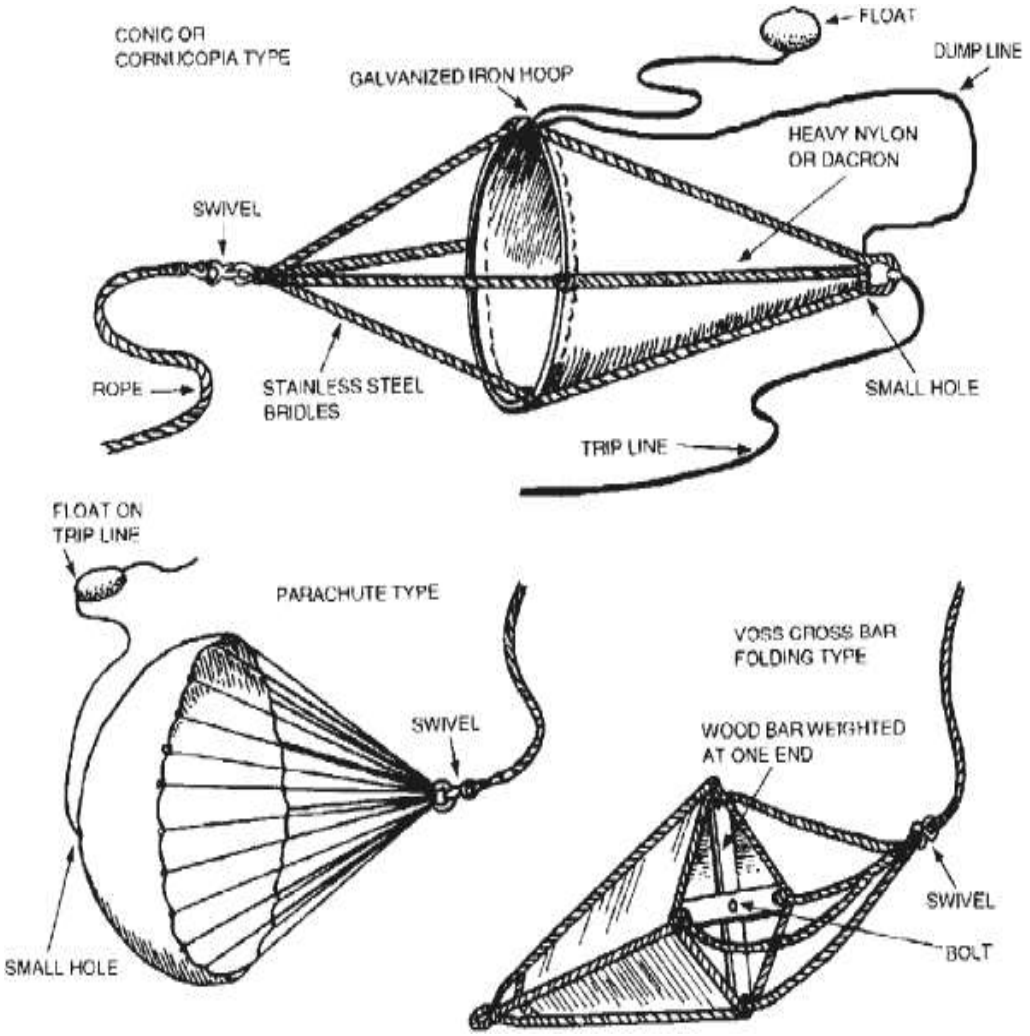
- be of at least 30.5 meters (100 feet) in length, but not less than three times the distance between the deck where the life float or buoyant apparatus it serves is stowed and the lightship waterline of the vessel;
- have a breaking strength of at least 680 kilograms (1,500 pounds), except that if the capacity of the life float or buoyant apparatus is 50 persons or more, the breaking strength must be at least 1,360 kilograms (3,000 pounds);

- be of a dark color if synthetic, or of a type certified to be resistant to deterioration from ultraviolet light; and
- stowed in such a way that it runs out freely when the life float or buoyant apparatus floats away from a sinking vessel.

- Sea anchor

The sea anchor (or drogue) is a conical bag made of canvas. A small hole in the bottom of the bag permits water to get out and thus prevents the bag from collapsing. A tripping line is provided to ease hauling in the bag.

One of the principal functions of a sea anchor is to provide stability in a rough sea. By trailing a sea anchor, you can minimize the possibility of capsizing in strong winds, or heavy seas since a raft floats on the water rather than in the water, it is susceptible to strong winds. Another important function of the sea anchor is its ability to slow down the drift of the raft (or lifeboat). This is important if you sent distress message with a position and you want to remain close to that area. Searchers will stay to look for wreckage and survivors at the last determined or confirmed position.



The principle involved in using a sea anchor is to create a "drag" effect that will do the following:

- Slow down the drift
- Give you direction and control
- Stabilize the raft
- Minimize capsizing

- Oil bag

In an open lifeboat where the effects of breaking seas are a cause for concern, the oil bag should be used. It can be secured to the bridle of the sea anchor, or near the end of the hawser. Preferably, the oil bag should be rigged on an endless whip arrangement, so that it can be replenished without having to heave in the sea anchor.

It is normal practice to use the oil bag in conjunction with the sea anchor and heave the boat to, with the intention of riding the bad weather out. A small amount of oil is used at any one time, ideally spread ahead of the craft to form an advancing slick giving full benefit to the boat. In a towing operation the oil should similarly be spread from the fore part of the towing vessel. This will benefit the craft, the tug and the towed vessel.

Heavy oils tend to be better than lighter oils and prevent solid water from landing on the top of the craft. The obvious danger is that the boat could be swamped or stove in with large waves. Comparing the pollution aspect of the use of oil with the safety of life, the priority must be in favor of safety of life at sea.

If the weather continues to deteriorate and the boat labors badly, take the jib halyard block off the mast head band and bend the two ends of the halyard together to make endless fall. Haul in about two fathoms (3.7m) of the sea anchor hawser and bend the jib halyard block onto the hawser, then pay out the hawser again.

Put a little oil in the oil bag, cork the bag and make it fast to the jib halyard. Haul the bag a little way out towards the sea anchor. The oil will seep out of the bag and help prevent the seas from breaking and the boat will be able to lie better to the sea anchor. The best position for the oil bag will have to be found by experiment. If the weather is very cold and the oil too thick to seep through the bag, prick the bag a few times with a sail needle or something similar.

14 FOOD AND WATER APPORTIONMENT IN SURVIVAL CRAFT

14.1 Initial Actions to Take when Aboard a Survival Craft

Ships may sink in less than 15 minutes. This affords little time to formulate a plan of action; careful planning is essential to be ready in an emergency. Here are some sound pointers for you to remember when abandoning a ship.

- Stay out of the water as long as possible. Try to minimize the shock of sudden cold immersion. A sudden plunge into cold water can cause rapid death, or uncontrollable rise in breathing rate may result in an intake of water into the lungs.
- Try to board a lifeboat, raft or other floating platform or object as soon as possible in order to shorten the immersion time. Remember that you lose body heat many times faster than in the air.
- If you manage to climb aboard a lifeboat, shielding can be accomplished with the aid of canvas cover, a tarpaulin, or an unused garment. Huddling close to the other occupants of the lifeboat or raft will conserve body heat.
- Keep a positive attitude of mind about your survival and rescue. This will improve your chances of extending your survival time until rescue comes. Your will to live do make a difference.

14.2 Apportionment of Food and Water

- Food and water rations

The lifeboat is provided with rations containing a MINIMUM of 3 liters of freshwater and 10,000 kilojoules (1/2 kilo) of vitamins and food for each person that the lifeboat is certified to carry. No food or water should be distributed in the first 24 hours EXCEPT for injured people who may be given water if they are unconscious.

Thereafter rations must be distributed three times daily:

Sunrise – Midday – Sunset

and at no other times except in the case of injured people. It is especially important to ensure that water rations are distributed fairly and therefore the graduated drinking vessels provided should be used. Water rations MUST be supplemented by rain water at every opportunity. The intake per person, except for injured persons should be ½ liter per day, which is the minimum amount of water the resting human body requires to survive. Food rations should be distributed fairly and so as to last as long as possible. The human body can survive for weeks without food provided it has an adequate supply of fresh water. A fishing kit is provided, but if fish or seabirds are caught DO NOT eat unless there is plentiful supply of fresh water. This is because of the high protein content in fish or sea birds which requires fresh water to help the digestion process.

Remember:

DO NOT DRINK SEA WATER
DO NOT DRINK URINE

15 MAXIMIZE DETECTABILITY AND LOCATION OF SURVIAL CRAFT

Watches or lookouts should begin immediately to maximize the chance of being detected or of sighting land. A watch keeper shall be in charge of the valuable stores on board. Watch for hands or arms trailing in the water and recognize the warning symptoms of exposure.

The object of a lookout is to sight land or a rescue vessel. However, it is important to discuss the ramifications of a false alarm. An accidental rising of hopes can dash the morale of a distressed and exhausted crew.

- Visual distress signals

Sooner or later, a ship will pass near the survival craft. That is why it is important to keep an intense lookout day and night in order to attract attention at the right time using the survival craft detection equipment.

In the daytime, you should use signaling mirror, whistle and buoyant smoke signals. At night, you should use the rocket parachute flares, the flashlight (which is suitable for Morse code signaling) and the whistle.

Any signal that is capable of attaining great heights (such as a rocket flare) is far more useful for alerting the attention of distant ships than most other types of visual signals. Your sighting distance on the ocean will be affected by the curvature of the earth, the distance between you and the viewer, and the height of your signal.

- Electronic distress equipment

Everybody should, in their own best interest, make sure that pre-designated crew when abandoning ship brings the communication equipment for the survival craft on board the lifeboat or raft.

The traditional communication equipment consists of a ***two-way VHF radiotelephone apparatus***. A two-way VHF radiotelephone apparatus is a lightweight, compact, waterproof and handy emergency radio equipment capable of use in both lifeboats and life rafts. It is so simple and easy to use that even unskilled person can use it an emergency.

At least three two-way VHF radiotelephone apparatus shall be provided on every passenger ship and on every cargo ship of 500 gross tonnage and upwards. At least two two-way VHF radio-telephone apparatus shall be provided on every cargo ship of 300 gross tonnage and upwards but less than 500 gross tonnage. Such apparatus shall conform to performance standards not inferior to those adopted by the organization. If a fixed two-way VHF radiotelephone apparatus is fitted in a survival craft, it shall conform to performance standards not inferior to those adopted by the Organization.

An approved two-way VHF radio-telephone apparatus for survival crafts shall be stowed in a protected and easily-accessible position ready to be removed to any survival craft in case of abandon ship. It shall be portable, watertight, capable of floating in sea water and capable of being dropped into the sea without damage.

Basic controls of a two-way VHF radio-telephone apparatus

The controls on a two-way VHF radio-telephone apparatus are very simple.
The basic controls consist of a volume control which often incorporates the on/off switch, a control for selecting the channel, and a squelch control.
The squelch control is used to suppress noise interference.

Other equipment that may aid detectability and location of survival craft are:

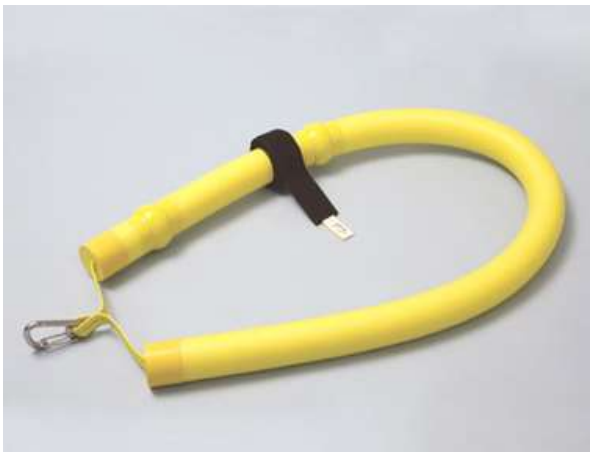
a. Emergency Position-Indicating Radio Beacon (EPIRB)
b. Search and Rescue Transponder
c. Radio reflector

These will be discussed further under Section 20 (Locating Devices Carried in Survival Craft) of this handout.

16 HELICOPTER RESCUE

16.1 Methods of Helicopter Rescue

1. Single lift – Using a rescue sling, approach the sling in a way that it is always between you and the hoist.



This is the most common method of helicopter rescue. The rescue sling is appropriate for quickly picking up persons, but it should not be used for injured persons.

The following should be observed when the single lift method is used:

a. When putting on the sling, ensure that the loop passes behind the back and under both armpits, just like putting on a coat.
b. Face the hook.
c. Clasp hands in front.
d. Do not sit on the sling.
e. Do not unhook the sling.

2. Double lift – In a double lift, the helicopter sends a rescuer down to put the sling around the person to be rescued. This method is suitable for rescue of incapacitated persons, but not badly injured to require a litter for rescue.

3. Basket lift – With this method, the person has to sit down, with arms and legs inside the basket. The head to be sent towards the knees, the hands around the knees. Keep still till the basket is onboard the helicopter.

4. Stretcher lift – This is used when rescuing badly injured persons. A tiller rope is often used for stretcher as well as for basket lifts in order to keep the stretcher or the basket clear of obstacles. The tiller rope must never be made fast onboard the ship.

16.2 Preparation before arrival of rescue services

- Group all survival craft together to make a bigger target for the rescue services.
- Should an aircraft or ship be sighted, ensure that survival routines are maintained right up until the moment of rescue. The rescue craft may have higher priorities.
- Signal the ship or aircraft and continue this until the rescue unit has clearly indicated that the signals have been received. Take a roll-call of all persons, with notes of injuries sustained and treatment given.
- If aerial or masts have been rigged, these should be taken down, particularly if helicopter are operating.

16.3 Helicopter hoisting operation

The hoisting operation is usually performed by means of a rescue lift attached to the strap from a height of about 30 meters. The strap or the sling is padded with buoyant material having a watertight coat. The sling can normally accommodate only one person at a time.

During the hoisting operation one person keeps an eye on the guiding line to reduce cable swing and prevent the strap/cable from getting caught. When the cable is lowered, the guiding line is let into the water again while you pull the strap down. If the guiding line is operated in the correct way, the time is saved and rescued action will be safer.

Lines from the helicopter must not be attached to the raft or the lifeboat. If this is done, or the strap is caught in an object so that the cable is overloaded, it will be "cut" and the rescue operation must be discontinued.

The use of the rescue strap requires you to know how to put it on to avoid injuries or falling out during hoisting. This is the general procedure:

1. Approach the strap or hold it between yourself and the lifting cable.
2. Put one arm through the loop formed by the strap and let it slip over your hand and your shoulder. It is important that you always put on the strap with one arm at a time so that the other one can be used to keep the lifejacket in place.
3. Pull the strap down so it goes across your back, under the arms and round the lifejacket. It will then be pushed against your neck and cause breathing difficulties.
4. Check that the lifting cable and the hook are in front of you. Seize the looking device to tighten the strap. Signal that you are ready.
5. The lift itself causes no discomfort as long as the strap has been correctly put on. Remain calm on the way up. Keep your elbows tight to your body and fold your hands across your stomach. You should not attempt to seize the door frame or lean against it either. The lift operator will get you safely into the helicopter.

The normal procedure is to send up persons who are injured first. If the injury is of a nature that prohibits the use of the rescue strap, it may be necessary to send up another person first to explain the situation. The helicopter may then lower a stretcher and a frogman. The patient must then be properly strapped to the stretcher. This method cannot be used if the injured person is in the water.

The following hoisting signals may be used :

DO NOT HOIST Arms extended horizontally, fingers clenched, thumbs down

HOIST Arms raised above the horizontal, thumbs up

Note : If a survivor has to give the hoisting signal himself, he should raise only one arm to prevent slipping out of the sling.

- Communicating with the helicopter

The success of any helicopter / ship operation depends on establishing and maintaining good communications. This applies not only to the communications between the helicopter and the ship, but also to messages passed between the ship operator, the ship's agent and the helicopter operator.

Communications during the operation itself must be directly between the helicopter and the ship and not relayed through any third party. The international language of shipping and aviation is English. To avoid any misunderstandings, especially if the language being used is foreign to any party involved, a standard message format must be used.

The following details should be provided by the ship to the helicopter:

a. Position of the ship
b. Course and speed to the rendezvous position

c. Local weather situation
d. Particulars on how to identify the ship from the air
e. Information on the facilities, which the ship can provide for landing and winching

17 EFFECTS OF HYPOTHERMIA AND ITS PREVENTION

Hypothermia is a condition in which core temperature drops below that required for normal metabolism and body functions which is defined as 35.0 °C (95.0 °F). Body temperature is usually maintained near a constant level of 36.5–37.5 °C (98–100 °F) through biologic homeostasis or thermoregulation. If exposed to cold and the internal mechanisms are unable to replenish the heat that is being lost a drop in core temperature occurs. As body temperature decreases characteristic symptoms occur such as shivering and mental confusion.

17.1 Signs and Symptoms of Hypothermia

The signs and symptoms vary depending on the degree of hypothermia and may be divided by the three stages of severity.

a. Mild

Symptoms of mild hypothermia may be vague with sympathetic nervous system excitation (shivering, hypertension, tachycardia, tachypnea, and vasoconstriction). These are all physiological responses to preserve heat. Cold diuresis, mental confusion, as well as hepatic dysfunction may also be present. Hyperglycemia may be present, as glucose consumption by cells and insulin secretion both decrease, and tissue sensitivity to insulin may be blunted. Sympathetic activation also releases glucose from the liver.

In many cases, however, especially in alcoholic patients, hypoglycemia appears to be a more common presentation. Hypoglycemia is also found in many hypothermic patients because hypothermia often is a result of hypoglycemia.

b. Moderate

Low body temperature results in shivering becoming more violent. Muscle mis-coordination becomes apparent. Movements are slow and labored, accompanied by a stumbling pace and mild confusion, although the victim may appear alert. Surface blood vessels contract further as the body focuses its remaining resources on keeping the vital organs warm. The victim becomes pale. Lips, ears, fingers and toes may become blue.

c. Severe

As the temperature decreases further physiological systems falter and heart rate, respiratory rate, and blood pressure all decreases. This results in an expected HR in the 30s with a temperature of 28 °C (82 °F).

Difficulty in speaking, sluggish thinking, and amnesia start to appear; inability to use hands and stumbling is also usually present. Cellular metabolic processes shut down. Below 30 °C (86 °F), the exposed skin becomes blue and puffy, muscle coordination becomes very poor, walking becomes almost impossible, and the person exhibits incoherent/irrational behavior including terminal burrowing or even a stupor. Pulse and respiration rates decrease significantly, but fast heart rates (ventricular tachycardia, atrial fibrillation) can occur. Major organs fail. Clinical death occurs. Because of decreased cellular activity in stage 3 hypothermia, the body will actually take longer to undergo brain death.

17.2 Ways to Prevent Hypothermia

1. Dress warmly: wear your Immersion suit if you have no choice but to be on water. Those suits are designed to keep you afloat and warm in cold waters.
2. Do not make too many movements on water. This will cause you to lose body heat and energy faster. As much as possible, keep larger part of your body afloat. Wear multiple layers. Multiple thin layers of clothing trap more warm air against your skin than a single thick layer.
3. Keep yourself dry as much as possible when boarding a survival craft. Water has 27 times the thermal conductivity of air, so you get cold much more quickly if you're wet.
4. Avoid wind chill. Even if the absolute temperature is not freezing, a breeze or wind can take body heat away much quicker than a still day. This can quickly lower your body temperature.
5. Try to avoid sitting in water. Sit in your lifejacket if there is nothing else available.
6. Squeeze as much water as you can out of sodden clothing, before replacing it, to reduce body heat loss through evaporation.
7. Huddling close to the other occupants of the survival craft will also conserve body heat but ensure craft stability is not compromised.
8. Know the signs of hypothermia. Quick action can mean the difference between life and death. Signs include lack of shivering, confusion, and sometimes not feeling cold anymore.
9. Get to safety. Remove the affected person immediately from the cold. If clothing is wet, remove it gently from the skin--there could be frostbite or damaged skin that could be distressed from rough handling. Get the individual to a health facility as soon as possible.
10. Do not heat the affected person quickly. Do not serve hot beverages and don’t place the person in hot water, this can cause thermal shock or even death. You can use lukewarm water.
11. Avoid frostbite. Frostbite is somewhat like hypothermia, except it is less serious. However, it can lead to it, and you must treat frostbite seriously. Signs are that your hand, feet, or face is turning red, then purple, then black. Slowly warm it up, but again, do not make a vast temperature change to the affected area.

17.3 Treating Hypothermia

Mild hypothermia may be treated if further heat loss is prevented. To prevent further loss of heat from evaporation or exposure to the wind, immediately wrap the survivor in blankets, keeping the body horizontal with the head slightly lower than the rest of the body.

Patients with moderate or severe hypothermia would require external rewarming, done as follows:

a. Place a waterproof sheet on a bunk, and lay the patient on a sheet
b. Cover him with two or three blankets

c. Put four towels (or other large pieces of cloth) into a bowl of hot water (about 40 Degrees Celcius), then put the dripping wet towels into four plastic bags
d. Put the plastic bags on the patient's armpits and each groin
e. After 10 minutes, replace with fresh wet hot towels
f. Continue until the patient's temperature is over 32 Degrees Celcius

18 RESCUE BOATS AND MOTOR LIFEBOATS FOR MARSHALLING LIFERAFTS AND RESCUE OF SURVIVORS IN THE SEA

- Towing operations

Rescue boats are expected to collect and marshal other survival craft. The towline should be of sufficient strength to achieve a successful tow to a comparatively safe area after a disaster.

When securing the towline, the length should be such that "snatching" of the line is avoided; this is especially important in choppy seas. The length of line and the speed of the towing operation should be established to prevent the towed vessel or craft from overrunning the towing craft.

Large alteration of the course should be avoided in favor of gradual turns, so avoiding excessive strain on the towline. A zig-zag course may prove more effective when it is desired to make headway into the weather, as opposed to a head-on approach.

The aim should be to establish an even tension on the towline throughout the operation. Should the line be allowed to become slack with the towed craft forward, a danger may arise that the towline could foul the propeller of the towing craft. The tension on the towline is directly affected by the weight aboard the craft being towed, also, the resistance and speed of the operation cause tensions to increase. The speed can easily be adjusted but the resistance experienced with a circular liferaft will be difficult to alleviate. In the case of a boat, removing the propeller should be considered for lengthy tow operation.

19 BEACHING A SURVIVAL CRAFT

Care must be exercised in approaching the land particularly where a swell or surf may be running or approaching a lee shore. Avoid rocky areas whenever possible. A gently shelving beach is preferable, although where a swell is running, breaking waves may extend well out to seaward of the beach. The rudder should be unshipped and the steering oar rigged. The boat should be maneuvered with the oars as an engine will be of little use in an area of broken water.

The beach is approached stern first, i.e., the boat heading out to sea, meeting the advancing waves head on. The crew will have to back water to row the boat shoreward. When the boat grounds, the steering oar is unshipped and the stroke oarsmen ordered out of the boat to hold the boat as best they can, whilst the remaining oarsmen keep backing water so that the boat is kept bows-on to the waves. Personnel, stores and useful survival equipment can be disembarked over the stern with the oarsmen disembarking last of all, in pairs, starting from aft. When a heavy swell is running, the boat is in great danger of broaching-to when beaching and therefore it may be more prudent, if possible, to wait until the swell subsides.

20 LOCATING DEVICES CARRIED IN SURVIVAL CRAFT

20.1 Electronic Distress Signal

a. Two-way VHF radiotelephone apparatus

In every lifeboat a VHF installation should be installed. VHF installations come in two types: the fixed installation and the portable sets.

Portable sets are used for communication on board the installation. The range and capacity of the batteries of these hand sets are limited. In case of emergency the handsets are used to communicate between muster points and control room/bridge. Of course, the handsets can be taken inside lifeboats and rafts for communication.

- Distress signal format

<AUTO ALARM>

Mayday (3 times) or SOS (3 times)
This is_____ call sign or name 3 times
Mayday this is_____ call sign_____
Position: Latitude _____
Longitude_____
Or bearing/distance from a navigational feature

Nature of distress_____
Assistance needed or required and
Any other information

Auto Alarm – the purpose is to alert receiving stations that an important message is to be broadcasted.
RT Auto Alarm – distinctive 2 tone signal
WT Auto Alarm – series of 12,4 seconds dashes

Silence Periods – no radio working is allowed during the silence periods except distress and emergency transmission.

b. Emergency Position-Indicating Radio Beacon (EPIRB)

The Emergency Position Indicating Radio Beacon (EPIRB) is one of the most important life-saving equipment on board ship. As its name implies, it is used for transmitting a distress alert and for guiding the rescuers to the position it indicates. An operating EPIRB means that somebody is in distress and immediate assistance is needed.

The early development of EPIRB was more for aircraft than for ships. The earliest EPIRB transmitted on the aircraft frequencies of 121.5MHz and/or 243MHz. They simply transmit a signal – usually alternating tones to be received on the emergency frequency on a normal aircraft radio – 121.5MHz being the civil emergency frequency and 243MHz for military equivalent.

It was later realized that an EPIRB could be used to raise the alarm in a distress situation. An additional higher frequency of 406MHz was later assigned for specialized EPIRB. This higher frequency could be made more stable which makes fixing position from the satellite much easier. The signal on this frequency incorporates a coded message to provide identification of the vessel to which the EPIRB is licensed.

The best EPIRB would be one that could transmit on both frequencies: 406MHz to give the satellite the best chance of getting a good fix on the EPIRB position and 121.5MHz for any searching aircraft to home on. A 406MHz MHz EPIRB transmits a short-coded message every 50 seconds when activated. Each half-second burst indicates the identity of the vessel to which the EPIRB is registered.

Another type of EPIRB is the INMARSAT EPIRB. It operates in one of the normal INMARSAT frequencies of 1.6GHz. It must either be programmed with its position or more normally, it contains an integrated GPS receiver.

- GMDSS requirements

Compulsory GMDSS vessels must carry an EPIRB as part of the equipment list. For vessels limited to area A1, this can be a VHF EPIRB. For vessels in any other areas, A2, A3, and A4, it must be an EPIRB which can work through one of the satellite systems. Both 406MHz and the INMARSAT EPIRBs are approved by GMDSS.

- Accidental operation

If an EPIRB is accidentally activated in the transmit mode, it should be turned off at once by removing the battery. Cancel the false alarm by calling the nearest Coast Station and also make a safety call on the VHF radio for the benefit of vessels in the vicinity. Failure to cancel the false alarm may cause fine or additional expenses to your vessel as payment for any rescue preparation and/or RCC's operational expenses.

- How an EPIRB saves lives

  - If the vessel sinks, the EPIRB will be automatically released from its bracket when subjected to water pressure at 2-4 meter depth, and then float up to the surface. It will be automatically activated and start to transmit vessel identity and positioning signals to the COSPAS/SARSAT satellites.
  - The satellite forwards the signal to a ground receiving station or local user terminal (LUT) where the position will be calculated and transferred to a Mission Control Center (MCC).
  - The necessary command will be sent to the nearest Rescue Control Center (RCC), which coordinates the rescue operation. Finally, the search and rescue forces (SAR) bring the distress to a satisfactory conclusion.
  - An approved EPIRB has 48 hours of continuous operation.

c. Search and Rescue Transponder (SART)

A Search and Rescue Transponder (SART) is an electronic unit which reacts to the emissions of X-band radars. It has a receiver which scans for VHF signals between 9.2GHz – the frequencies on which an X-band radar transmits its signal.

With the implementation of Global Maritime Distress Safety System (GMDSS), vessels up to 500 tons must carry at least one SART. Above 500 tons, they must carry at least two. Non-compulsory vessels are strongly advised to carry at least one to aid in any possible rescue.

- How does the SART work?

  – As soon as the SART detects a signal, it immediately transmits its own signal on the same frequency. This signal consists of a series of twelve pulses, and these are displayed on the screen of the radar as a series of twelve echoes with a gap of 0.6 miles between each of them.
  – The first dot is at the position of the SART, with the remainder radiating in a straight line towards the edge of the screen.
  – As the rescue vessel approaches the SART, the twelve dots each become short arcs. These arcs increase in size as the vessel gets closer, until the signal from the SART is permanently activated by the weakest side-lobes from the radar transmission. The signal from the SART becomes twelve concentric circles on the radar screen and this tells the would-be rescuers that they have more or less arrived.
  – When a SART is switched on, it will show a light to indicate that it is working. An approved SART should have sufficient power to operate in this stand-by mode for at least 96 hours. When it receives a signal from the X-band radar, and transmits its own signal, it will either flash this indicating light or in some cases, a second light or even a buzzer. This will serve to let the distressed persons know that approaching radar is activating the SART. If the survivors have handheld VHF with them, then this would be a good time to use it to try calling the approaching ship.

20.2 SOLAS requirement for radio equipment

1. A radio Installation that may be separate from or combined with DSC; portable lifeboat radio; VHF installation
2. A radar transponder (SART) capable of operating in the 9GHz band which shall be stowed in such a way that it can easily utilized
3. Emergency Position-Indicating Radio Beacon (EPIRB)

Communication systems for use in the Global System (terrestrial communication)

1. Long Range Service
   - HF (High Frequency 3-30 MHz)
     – Provides a long-range service in both the ship-to-shore and shore-to-ship directions
   - DSC
     – Forms the basis of distress alerting and safety communications
     – RT and NBDP can perform distress and safety communications following a DSC call

2. Medium Range Service
   - Provided on frequencies 2 MHz band
   - In the ship-to-shore, ship-to-ship will be used for distress alerts and safety calls
   - DSC2182 kHz will be used for distress and safety traffic by RT including SAR coordinating and on-scene

- 2174.5 kHz will be used for radio telex (NBDP) distress and safety traffic

3. Short Range Service
   - CHF provide short range service on the frequencies
   - 156.525 MHz (channel 70) for distress alerts and safety calls using DSC
   - 156.8 MHz (channel 16) for distress and safety traffic by RT including SAR coordinating and on-scene communication

GMDSS	- Global Maritime Distress Safety System
INMARSAT	- International Maritime Satellite Org. (Adopted 3Sept. '76)
RT	- Radio Telephony
WT	- Radio Telegraphy
DSC	- Digital Selective Calling
NBDP	- Narrow Band Direct Printing

21 PYROTHECHNIC DISTRESS SIGNALS

- **Rocket parachute flares:**

The rocket parachute flare shall:

1. Be contained in water-resistant cashing;
2. Have brief instructions or diagrams clearly illustrating the use of the rocket parachute flare printed on its casing;
3. Have integral means of ignition; and
4. Be so designed as not to cause discomfort to the person holding the casing when used in accordance with the manufacturer's operating instructions.

The rocket shall, when fired vertically, reach an altitude of not less than 300 m. At or near the top of its trajectory, the rocket shall eject a parachute flare, which shall:

1. burn with a bright red color;
2. burn uniformly with an average luminous intensity of not less than 30,000 cd;
3. have a burning period of not less than 40 s;
4. have a rate of descent of not more than 5 m/s; and
5. not damage its parachute or attachments while burning.

- Hand flares

The hand flare shall:

1. Be contained in a water-resistant casing;
2. Have brief instructions or diagrams clearly illustrating the use of the hand flare printed on its casing;
3. Have a self-contained means of ignition; and
4. Be so designed as not to cause discomfort to the person holding the casing and not endanger the survival craft by burning or glowing residues when used in accordance with the manufacturer's operating instructions.

- Buoyant smoke signals

The buoyant smoke signal shall:

1. Be contained in a water-resistant casing;
2. Not ignite explosively when used in accordance with the manufacturer's operating instructions; and
3. Have brief instructions or diagrams clearly illustrating the use of the buoyant smoke signal printed on its casing.

The buoyant smoke signal shall:

1. Emit smoke of a highly visible color at a uniform rate for a period of not less than 3 min when floating in calm water;
2. Not emit any flame during the entire smoke emission time;
3. Not be swamped in a seaway; and
4. Continue to emit smoke when submerged in water for a period of 10 s under 100 mm of water.

- Heliograph

A heliograph is a wireless solar telegraph that signals by flashes of sunlight (generally using Morse code) reflected by a mirror. The flashes are produced by momentarily pivoting the mirror, or by interrupting the beam with a shutter. The heliograph was a simple but effective instrument for instantaneous optical communication over long distances during the late 19th and early 20th century. Its main uses were military, survey and forest protection work. Heliographs were standard issue in the British and Australian armies until the 1960s, and were used by the Pakistani army as late as 1975.

- Distress Signals

1. The following signals, used or exhibited either together or separately, indicate distress and need of assistance:
   A. Gun or other explosive signal fired at intervals of about a minute
   B. A continuous sounding with any fog-signaling apparatus
   C. Rockets or shells, throwing red stars fired one at a time at short intervals
   D. A signal made by any signaling method consisting of the group:
      · · · - - - · · · (SOS) in the Morse code
   E. A signal sent by radiotelephony consisting of the spoken word "MAYDAY"
   F. The International Code Signal of distress indicated by N.C.
   G. A signal consisting of a square flag having above or below it a ball or anything resembling a ball
   H. Flames on the vessel (as from a burning tar barrel, oil barrel, etc.)
   I. A rocket parachute flare or a hand flare showing a red light
   J. A smoke signal giving off orange-colored smoke
   K. Slowly and repeatedly raising and lowering arms outstretched to each side
   L. A distress alert by means of digital selective calling (DSC) transmitted on:
      i. VHF channel 70; or
      ii. MF/HF on the frequencies 2187.5 kHZ, 8414.5 kHZ, 4207.5 kHZ, 6312 kHZ, 12577kHZ or 16804.5 kHZ
   M. A ship-to-shore distress alert transmitted by the ship's Inmarsat or other mobile satellite service provider ship earth station
   N. Signals transmitted by emergency position-indicating radio beacons
   O. Approved signals transmitted by radio communication systems, including survival craft radar transponders

2. The use or exhibition of any of the foregoing signals, except for the purpose of indicating distress and need of assistance and the use of other signals, which may be confused with any of the above signals, is prohibited.
3. Attention is drawn to the relevant sections of the International Code of Signals, the International Aeronautical and Maritime Search and Rescue Manual, Volume III and the following signals:
   A. A piece of orange-colored canvas with either a black square and circle or other appropriate symbol (for identification from the air)
   B. A dye marker

22 FIRST AID AND RESUSCITATION TECHNIQUES

22.1 General principles of first aid

First aid is the emergency treatment given to the ill or injured before professional medical services can be obtained. It is given to prevent death or further injury, to counteract shock, and to relieve pain. Certain conditions, such as severe bleeding or asphyxiation, require immediate treatment if the patient is to survive. In such cases, even a few seconds' delay might mean the difference between life and death. However, the treatment of most injuries or other medical emergencies may be safely postponed for the few minutes required to locate a crew-member skilled in first-aid, or to locate suitable medical supplies and equipment.

All crew-members should be prepared to administer first aid. They should have sufficient knowledge of first aid to be able to apply true emergency measures and decide when treatment can be safely delayed until more personnel arrive.

Those not properly trained must recognize their limitations. Procedures and techniques beyond the rescuer's ability should not be attempted. More harm than good might result.

- Priorities

On finding a casualty:

1. Look to your own safety; do not become the next casualty.
2. If necessary, remove the casualty from danger or remove danger from casualty (but see observation from below on a casualty in an enclosed space). If there is only one unconscious or bleeding casualty, give immediate treatment to that casualty only, and then send for help.

If there is more than one unconscious or bleeding casualty:

1. Send for help.
2. Then start giving appropriate treatment to the worst casualty in the following order of priority:
   - severe bleeding
   - stopped breathing/heart
   - unconsciousness

When to administer first aid:

1. To restore breathing and heartbeat
2. To control bleeding
3. To remove poisons
4. To prevent further injury to the patient

Never underestimate and do not treat as minor injuries:

1. Unconsciousness
2. Suspected internal bleeding
3. Stab or puncture wounds
4. Wound near joints
5. Possible fractures
6. Eye injuries

Never consider anyone to be dead, until you and others agree that:

1. No pulse can be felt, and no sounds are heard when the examiner's ear is put to the chest;
2. Breathing has stopped;
3. The eyes are glazed and sunken; and
4. There is progressive cooling of the body (This may not apply if the surrounding air temperature is close to normal body temperature.)

When properly given, first aid:

1. can reduce the effects of injuries and medical emergencies;
2. can keep a serious injured person alive; and
3. can mean a difference between a short and a long hospital care.

Note: In the excitement on an emergency it is important to stop for a moment to clear your head and think before you act when responding to an emergency situation on board, remain calm and apply the following Emergency Action Principle:

A. Survey the scene
B. Primary survey
C. Activate transfer facility
D. Secondary survey

- General principle of first aid aboard ship

1. Emergency evaluation of the patient
2. For limb injury, get the sound limb out first
3. Keep workers from crowding
4. Take patient's pulse
5. Position patient in the way that provides relief
6. Observe breathing and possible bleeding
7. Control severe bleeding
8. Don't move patient suspected of neck and spine injury
9. Wounds and burns must be covered
10. Prevent loss of body beat
11. Do not give alcoholic beverages

22.2 Use of first-aid kit

- First aid kit contents

Item	Number per package
Bandage compress 4 inches	1
Bandage compress 2 inches	1
Waterproof adhesive compress-1inch	16
Eye dressing packet 1/8 ounce ophthalmic ointment, adhesive strips, cotton pads	3
Bandage, gauze, compressed 2 inches x 8 yards	2
Tourniquet, forceps, scissors, safety pins	1,1,1,12
Wire splint	1
Ammonia Inhalers	10
Iodine Applicators(1/2 ml swab type)	10
Aspirin, Phenacetin, and caffeine compound (APC) 61/2 gr, tablets, vials of 20	2
Sterile petrolatum gauze, 3 inches X 18 inches	4

22.3 Resuscitation techniques

Mouth-to-Mouth Method

Work from the side of the casualty:

1. Lay casualty on his back.
2. Loosen clothing, particularly around his neck.
3. To open airway, hold the head in both hands, one hand pressing the head backwards and the other pushing the lower jaw upwards and forwards.
4. Seal the nostrils with your cheek or by pinching the nostrils.
5. Take deep breath, open your mouth wide, and seal your lips around the victim's mouth.
6. Blow directly into their lungs and watch for the chest to rise, then remove your mouth.
7. Watch chest fall while taking next breath.
8. Repeat process, the first six inflations being given as quickly as possible and thereafter at ten per minute.
9. Continue until casualty starts to breathe on their own or for at least 30 minutes if medical advice is not available.
10. If the mouth is badly injured for mouth to mouth, use the mouth to nose method.

It can happen that as soon as the airway is clear and the lungs inflated, the casualty will gasp and start to breathe spontaneously. If, or when, the patient is breathing, place in the coma or recovery position until fully recovered.

Mouth-to-Nose Method – This is similar to mouth-to-mouth method of resuscitation. Work from the side of the casualty with the head extended. Open your mouth wide, take a deep breath and seal the lips widely on the casualty's face around the nose. Make sure your lips do not obstruct their nostrils. Close the mouth by placing your thumb on the lower lip.

If the head is not sufficiently extended, the soft palate will allow inflation through the nose but may prevent expiration. If this happens, part the casualty's lips with your thumb after each inflation.

23 MANAGEMENT OF INJURED PERSONS

- Shock management

Shock is a depressed condition of the many body functions due to the failure of enough blood to circulate throughout the body following a serious injury.

Basic causes of shock

1. Pump failure; i.e.; the heart fails to act properly to pump
2. Fluid volume loss /hypovolemia, i.e., blood and fluid can be lost so that the fluid contained within the vascular system is insufficient to perfuse to all tissues and organ
3. Blood vessels dilate, i.e., the blood vessels dilate so that blood within them is insufficient to fill the system and provide efficient perfusion.

Factors that contribute to shock

- Pain
- Rough handling
- Improper transfer
- Continuous bleeding
- Exposure to extreme cold or excessive heat
- Fatigue

Dangers of shock

- Leads to death
- Predisposes body to infection
- Leads to loss of body parts

Signs and symptoms of shock

- Early stage
  1. Face is pale or cyanotic in color
  2. Skin is cold and clammy
  3. Breathing is irregular
  4. Pulse is rapid and weak
  5. Nausea and vomiting
  6. Weakness
  7. Thirst

- Late Stage
  1. If the condition deteriorates, victims may become apathetic or relatively unresponsive
  2. Eyes will be sunken with vacant expression
  3. Pupils are dilated
  4. Blood vessels may be congested, producing mottled appearance
  5. Blood pressure becomes very low level
  6. Unconsciousness may occur, body temperature falls

Treatment of shock

- DO NOT let the casualty move unnecessarily, eat, drink, or smoke.
- DO NOT leave the casualty unattended. Reassure the casualty constantly.
- Treat any cause of shock that can be remedied (such as external bleeding).
- Lay the casualty down, keeping the head low.
- Raise and support the casualty's legs (be careful if suspecting fracture).
- Loosen tight clothing, braces, straps or belts, in order to reduce constriction at the neck, chest and waist.
- Insulate the casualty from cold, both above and below. Contact the emergency service.
- Check and record breathing, pulse and level of response. Be prepared to resuscitate the casualty if necessary.
- Maintain body heat by insulating the victim from the surroundings and in some instances, applying external heat.
- If wet, remove all the victim's wet clothing as soon as possible and replace with dry clothing.
- Improvise a shelter to insulate the victim from the weather.
- Use warm liquids or foods, a pre-warmed sleeping bag, another person, warmed water in canteens, hot rocks wrapped in clothing, or fires on either side of the victim to provide external warmth.
- If the victim is conscious, slowly administer small doses of a warm salt or sugar solution, if available.

- If the victim is unconscious or has abdominal wounds, do not give fluids by mouth.
- Have the victim rest for at least 24 hours.
- If the victim is conscious, place him on a level surface with the lower extremities elevated 15 to 20 centimeters (6 to 8 inches).
- If the victim is unconscious, place him on his side or abdomen with his head turned to one side to prevent choking on vomit, blood, or other fluids.

Trendelenburg position - the body is laid flat on the back (supine position) with the feet higher than the head by 15-30 degrees. This is a standard position used in abdominal and gynecological surgery. It allows better access to the pelvic organs as gravity pulls the intestines away from the pelvis. It was named after the German surgeon Friedrich Trendelenburg. It is not recommended for the treatment of hypovolemic shock.

Other Uses of Trendelenburg position:

- The brain does not have any musculature structures to provide the necessary movements and pressures to return the blood to the heart. This loss of circulation in the brain due to the Trendelenburg position can actually be a detriment to the tissues instead. Gravity normally returns the blood to the heart from the brain.
- The Trendelenburg position is used in waterboarding to prevent water entering the lungs which allows the interrogator to bring the prisoner to a condition of extreme pain and loss of airway, thus leaving no hematomas or other physical signs of the inflicted pain and trauma.
- The Trendelenburg position is helpful in surgical reduction of an abdominal hernia
- The Trendelenburg position is also used when placing a Central Venous Line. The Trendelenburg position uses gravity to assist in the filling and distension of the upper central veins when placing a central line in the internal jugular or subclavian veins. It is also used in the placement of an external jugular peripheral line for the same reason. It plays no role in the placement of a femoral central venous line.
- The Trendelenburg position is also used in respiratory patients to create better perfusion.

Trendelenburg Position

- Bleeding Management

1. Bleeding can be controlled by pressure over the site of the bleeding. Any pressure will be suitable, even a hand, but a dressing or cloth is desirable. IF blood continues to soak through the dressing, do not remove the dressing, but place a further pad on top. A tourniquet MUST NOT be used under any circumstances.
2. An unconscious casualty should not look after in a coma or recovery position. Never leave a casualty unattended and checked frequently for any change in condition.
3. The first aid pack contains dressings, bandages and burn/wound creams. Instructions and guidance for the treatment of survivors are included.

- Open injuries

Occurs when there is a break in the surface of the skin or mucous membrane, exposing deeper tissue to contamination. Open injuries differ from closed injuries in that the protective layer of skin is damaged. This can produce more extensive bleeding.

There are five types of open soft-tissue wounds:

a. Abrasion – typically superficial and result from rubbing or scraping across a hard surface
b. Incision – smooth, clean-cut wounds as a result of a cut by sharp objects that tears the tissues
c. Laceration – injuries that have jagged, irregular edges caused by a blunt force that tears the tissue
d. Avulsion – injuries characterized by either complete separation of tissue or hanging as a flap; significant bleeding is common
e. Penetrating wound – often cause very little external bleeding but can damage structures deep within the body

Emergency medical care includes:

a. Apply direct pressure over the entire wound; elevate the injury above the level of the heart if no fracture is suspected
b. Maintain pressure with a roller bandage; if bleeding continues, apply a second dressing and roller bandage over the first
c. Apply pressure at the appropriate pressure point; continue to hold the direct pressure and elevation
d. Splint the extremity
e. Tourniquet

A tourniquet should be applied to control bleeding only when all other means have failed for its application can cause permanent damage to nerves, muscles, and blood vessels, resulting in the loss of an extremity. Remember: If a tourniquet is applied to save a life, immediate radio medical advice must be obtained.

- Fractures

A fracture is a broken bone. More precisely, it is a break in the continuity of the bone, often occurring as a result of an external force. The break can occur anywhere on the surface of the bone. The bone may be broken into two or more pieces or it may have a linear crack.

Careless handling of a patient may change a simple fracture into a compound one, by forcing jagged bone-ends through intact overlying skin. Compound fractures accompanied by serious bleeding are likely to give rise to shock.

You should suspect a fracture if one or more of the following signs is present in any patient who has a history of injury or reports pain:

- Deformity. The limb may appear to be shortened, rotated, or angulated at a point where there is no joint. Always use the opposite limb as a mirror of comparison.
- Tenderness. Point tenderness on palpation in the zone of injury is the most reliable indicator of an underlying fracture.
- Guarding. An inability to use the extremity is the patient's way of immobilizing it to minimize pain. The muscles around the fracture contract in an attempt to prevent any movement of the broken bone.
- Swelling. Rapid swelling usually indicates bleeding from a fracture site and is typically followed by severe pain.
- Bruising. Fractures are always associated with ecchymosis (discoloration) of the surrounding soft tissues.
- Crepitus. A grating or grinding sensation known as crepitus can be felt and sometimes even heard when the fractured bone ends rub together.
- False Motion. Motion at a point in the limb where there is no joint is a positive indication of a fracture.
- Exposed Fragments. In open fractures, bone ends may protrude through the skin or be visible within the wound.
- Pain. Pain along and bruising commonly occurs.
- Locked Joint. A joint that is locked into position makes any attempt to move the joint both difficult and painful.

Emergency medical care for Musculoskeletal Injuries:

Your first steps in providing care for any patient are the initial assessment and stabilizing the patient's ABCs. After you have done so, you can focus on specific injuries.

- Completely cover open wounds (for open fractures) with a dry, sterile dressing, and apply local pressure to control bleeding. If bleeding I well controlled, the area round it should be cleansed thoroughly with soap and water and then disinfected with 1% (10g/liter) cetrimide solution.
- Apply the appropriate splint and elevate the extremity. For any patient, be sure to position the injured limb slightly above the level of the heart. Care must be exercised in lifting up the affected part. Always assess the pulse, and motor, and sensory function before and after the application of splints.
- If swelling is present, apply cold packs to the area; however, avoid placing cold packs directly on the skin or other exposed tissues.
- Radio Medical Advice should be sought early in the case of a compound fracture or a severe type of fracture (skull, femur, pelvis, and spine) because it might be necessary to evacuate the patient from the ship.
- Unless there is an immediate danger of further injury, the patient should not be moved until bleeding is controlled and all fractures are immobilized by splinting.
- Prepare for transport, if necessary.