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CANADIAN FORCES CFCD 105 (B)

SEAMANSHIP RIGGING and PROCEDURES MANUAL

CFCD 105(B)

FLEET SEAMANSHIP, RIGGING AND PROCEDURES MANUAL

FOREWORD

2009

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CHAPTER 1
Introduction

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1.1 Aim

The aim of CFCD 105 - Seamanship Rigging and Procedures Manual is to provide fleet officers and seamen with the direction and guidance required to safely and professionally conduct all seamanship tasks associated with putting Canadian warships to sea.

1.2 Scope

CFCD 105 is a policy and procedural document for IRO/PRO/HFX/KIN/ORC class units in MARCOM. CFCD 105 is not limited to depictions of rigging arrangements and procedures for use, but also includes much general seamanship information and guidance. The primary reference from which the general seamanship material was compiled is the Royal Navy's *Admiralty Manual of Seamanship* (BR 67).

1.3 Format

CFCD 105 commences with a description of the seamanship organizations in place at all levels of the Canadian naval chain of command. General concepts, terminology, safety procedures, and generic equipment and rigging are introduced next. The rigging for, and conduct of, all major seamanship evolutions are then described, with specific guidance and details for each ship class being provided in chapter sub-sections. Specialist material is covered in the final chapters. The annexes comprise lists of current seamanship references and Class drawings.

1.4 Measurements

The majority of measurements in CFCD 105 are metric. The only significant exceptions are the imperial measurements used when referring to sizes of blocks and shackles e.g., 12" block secured with a 3/4" shackle. Lengths, diameters, circumferences, distances and weights are all metric.

1.5 Drawings

CFCD 105 includes several original drawings of the rigging arrangements for seamanship evolutions in all ship classes. In most cases, class drawings provided by DGMEPM//DMSS 4 and FMF(CB) have been used as the base from which this book's drawings were built. In the event that a discrepancy is noted between CFCD 105 and approved class drawings, the approved class drawings shall take precedence, and the Formation Seamanship Authority shall be advised.

1.6 Review and Amendments

Every effort was made to validate the material during the drafting process while always bearing safety and the junior seaman in mind. Undoubtedly, there will be requirements for amendment in the future stemming from regular fleet-wide review of the material, as well as the introduction of new equipment and procedures. For this purpose, all naval personnel involved in seamanship, especially ships' Deck Officers and Chief Bosn Mates, are strongly encouraged to submit recommendations and observations to the OPI through the chain of command whenever appropriate. In this way, CFCD 105 will continue to evolve and improve along with the Fleet.

CHAPTER 2

Seamanship Policy and Organization

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2.1 INTRODUCTION

A. It is important that all deck officers and boatswains possess a comprehensive understanding of the lines of communication and the means by which decisions affecting seamanship equipment and policy are made at all levels of the Canadian naval chain of command. In this way, personnel at all levels will be better able to effect changes when necessary.

b. It is particularly important for officers and senior NCOs to know where the interfaces between operational and technical staff occur so that initiatives, especially those pertaining to Unsatisfactory Condition Reports (UCR), Engineering Change Proposals (ECP), and maintenance can be moved efficiently through the staffing process. The key is effective communication, keeping staff at all points in the chain of command well informed.

2.2 NATIONAL DEFENCE HEADQUARTERS

The Canadian Forces are commanded by the Chief of the Defence Staff (CDS) from Headquarters in Ottawa (NDHQ). Among the many staff reporting to the Chief are two that are integrally involved in the conduct of seamanship. First is the Maritime staff, which defines the operational requirements for seamanship; and second is the Material staff, which is key to converting operational requirements into technical realities. Although these two groups of staff follow independent chains of command to the CDS, constant horizontal matrix-type staffing of common seamanship issues occurs. Critical to this process is the professionalism and co-operation of all involved.

2.3 CHIEF OF THE MARITIME STAFF

a. The Chief of the Maritime Staff (CMS), is the overall commander of the Navy. His staff is located at the National Headquarters in Ottawa, and is fully engaged with all issues pertaining to Canadian naval operations. The role of the CMS and his suppordinate staff are the Force Generation of elevant and combat capable Maritime forces. One of the Directors subordinate to the CMS is the Director Maritime Policy, Operations and Readiness (DMPOR).

b. One of DMPOR's areas of responsibility is seamanship. As such, he has on his staff DMPOR 4-4 (Seamanship), the key officer who is responsible for developing fleet-wide policy for seamanship. DMPOR 4-4 is assisted by a CPO2 Bosn (DMPOR 4-4-4) who provides operational expertise.,

c. The DMPOR 4 section liaises horizontally with their engineering counterparts in the ADM (Mat) organization concerning all technical issues affecting seamanship in the fleet, and with their DMPOR counterparts concerning all operational issues affecting seamanship. They also liaise vertically with the staffs of the Formation and Fleet Commanders, collating reports and recommendations on improving fleet seamanship practices, and then preparing new seamanship policies.

2.4 ADM (MAT)

a. The Associate Deputy Minister's (Material) staff includes the Director General Marine Engineering Personnel and Maintenance (DGMEPM). This naval engineer, is the technical authority on all issues relating to the review, approval and implementation of seamanship-related Engineering Changes (ECs), also known as configuration changes.

b. As a Director within the ADM (Mat) Group, DGMEPM does not have formal reporting responsibilities within the naval chain of command. However, constant liaison occurs between the DGMEPM staff, and the staffs of the Chief of Maritime Staff and the Formation Commanders. Seamanship operational deficiencies are raised and prioritized through the naval chain of command, and then forwarded to DGMEPM. Within DGMEPM are Class Desks which are staff offices organized to deal specifically with technical issues pertaining to either individual ship classes or equipment groups. Project teams are assigned to research and finalize the design of ECs, keeping technical imperatives and operational requirements in mind. Once complete, the EC is returned through the naval chain of command to the Formations, where its physical implementation on board individual ships is managed by the Fleet Maintenance Facilities.

2.5 FORMATION COMMANDER

a. The three formations are Maritime Forces Atlantic, Pacific and Naval Reserves. Seamanship issues requiring action were staffed by those officers responsible for Operational Readiness - N 34/J34 who report through their respective Chain of Command to CMS.

b. CST (A/P) have been appointed the Formation Seamanship Authorities (FSA). The FSA responsibilities range from developing operational criteria and policy for seamanship to reviewing seamanship-related Material Authorization Change Requests (MACR), ECPs and UCRs The Sea Training Commanders also co-chair the annual Seamanship SEG.

c. Also reporting to the Formation Commanders are the Commandants of the Naval Operations School in Halifax and the Fleet School in Esquimalt. Both schools include Seamanship Divisions that are responsible for the shore-based training of all Bosns, as well as the formal training of Deck Officers.. In addition, the Seamanship Divisions are responsible for instructing Naval Environmental courses (NETP), Naval Boarding Parties, Demolition Teams, and Small Arms. All course curricula are based on Qualification Standards and Plans (QSP) that reflect the Occupational Specifications that have been developed for each rank level. Close liaison between the schools and the FSAs ensures that training continues to meet ship requirements. A healthy dialogue in this regard, especially with respect to the introduction of new fleet seamanship practices, will prove invaluable to Boards which are convened to review Bosn course QSPs.

d. Also reporting to the Formation Commanders are the Commanding Officers of the Fleet Maintenance Facilities (FMFs) Cape Scott and Cape Breton. The FMFs are responsible for the critical functions of ship engineering support and maintenance. In terms of seamanship, this relates to second- and third-line maintenance of deck fittings, cranes and other seamanship equipment. Although the greater part of shore-based repair and maintenance supports marine and combat systems, seamanship remains a vital component of the FMF mandate. To that end, a CPO2 Bosn works at each FMF and champions seamanship issues. Close liaison with the FMFs ensures that technical support meets fleet seamanship requirements.

2.6 FLEET COMMANDER

The two Fleet Commanders (COMCANFLTLANT and COMCANFLTPAC) command all ships and submarines based in Halifax and Esquimalt. They report directly to the Formation Commanders on issues affecting the waterfront. Ships' Commanding Officers report to their Fleet Commander on shipboard matters, including those that pertain to seamanship. CST (A/P) also report to the Fleet Commanders so that Fleet Commanders are kept abreast of, and consulted on, all important seamanship developments.

2.7 THE SHIP

a. The composition of the Deck Department and its roles within the ship's Fighting and Functional Organizations are well defined in Ship's Standing Orders (SSOs).

b. The Deck Department is unique in that it relies on the participation of other departments through the Watch and Station Bill and Special Party Boards to conduct many of its key tasks. Examples of these include part ship hands, husbandry and maintenance. It is therefore very important for the Deck Officer (DECKO) and CBM to establish positive interdepartmental working relationships, keeping the XO and Coxn fully apprised of changing circumstances. Frequent planning meetings chaired by the XO provide a key forum for the DECKO and CBM to table any concerns and solicit the support of the other Department Heads and Departmental Chiefs in resolving ship related seamanship issues, and establishing Command priorities for the completion of tasks.

c. Of critical importance to the ship's overall effectiveness in completing seamanship tasks is a healthy working relationship between the Deck and Engineering Departments. This is necessary because the Engineering Department, and particularly the Hull Section, is responsible for administrating (via the FMFs) all second- and third-line maintenance and repair of deck equipment. All Maintenance Action Forms (MAFs), commonly referred to as work orders, are generated by the Engineering Department, normally through the Senior Hull Technician, to the Engineering Maintenance Coordinator and to the Engineering Officer. Care must be taken to ensure that MAFs relating to work on deck equipment are assigned a priority commensurate

with their importance. The same process applies to the staffing of UCRs and ECPs. Although UCRs and ECPs initiated by the Deck Department typically comprise only a fraction of the total leaving the ship, it behooves the DECKO and CBM to follow the staffing route closely, maintaining a tight relationship with their engineering colleagues. In addition, copies of all seamanship related UCRs and ECPs are to be forwarded to the FSAs so that trends can be monitored and operational priorities assigned.

d. DECKOs and CBMs must make every effort to avoid responding to seamanship problems in isolation, or to accept the status quo whenever there is a risk that safety of equipment and personnel may be compromised. It is vital that concerns be quickly passed to Command, so that an accurate determination of acceptable risk in relation to the ship's mission can be made. Similarly, it is very important that an active professional seamanship dialogue be developed between ships, in order to keep the Fleet Commander and FSA fully apprised of concerns and recommendations for improvement.

e. It is especially important for ships to resist any tendency to unilaterally implement rigging changes, no matter how expedient, unless exceptional circumstances arise such as those which might occur during hostilities, necessitating immediate change in order to fulfill mission objectives. Ships are to be in full compliance at all times with the baseline rigging and procedures promulgated in this publication.

2.8 THE STAFFING ROUTE – AN EXAMPLE

The following is a hypothetical scenario designed to demonstrate the staffing route for seamanship issues as described in the previous sections. A warship is in the process of coming to a single buoy when the picking-up rope suddenly parts. The CBM reports to the DECKO that the cause was a sharp edge on the forward edge of the bullring that cut the rope when it was under strain with a lead aft. They both agree that a UCR and ECP should be raised.

b. The UCR and ECP are drafted in the Deck Office and forwarded to the CO for approval via the DECKO, MSEO and XO. Essentially, the UCR describes the current design shortcoming of the bullring, while the ECP incorporates a recommended design change to eliminate the problem.

c. They are then submitted online to the Formation/Fleet Configuration Management Officers (CMO) and then it forwarded to the Formation Seamanship Authorities for comment.

d. The FSAs review the recommendations, and make comments with respect to safety issues associated with the bullring, and the overall effect that implementation of the EC will have on seamanship readiness. It is then returned to the CMOs for review.

e. The CMO forwards the UCR/ECP to the appropriate desk within the DGMEPM//DMSS organization. Horizontal liaison occurs between DMSS and various staff officers in order to

further refine the EC design and ensure that technical and operational authorities are working towards the same aim — in this case, an improved and safer bullring.

f. Once complete, direction to implement the EC is forwarded to all concerned i.e., the FSAs, CMOs, FMFs, and most importantly — the ships. The ships (through the MSEO) then liaise with the FMF to ensure that the bullring work is scheduled during the next available work period.

2.9 THE MARITIME COMMAND SEAMANSHIP SYSTEM EFFECTIVENESS GROUP (MS SEG)

a. **Introduction. IAW MACORD 224-01,** the MS SEG is a standing working group established to review, coordinate and guide action items from the Seamanship perspective for the fleet. It provides a forum for discussion of Seamanship matters and a focus for staff action. It also provides advice and recommendations through the MS SEG Chairman to the Surface Warfare Committee on seamanship matters. Although the MS SEG usually meets semi-annually, it must meet at least annually. To ensure the Fleet on both coasts have an equal opportunity to participate in meetings, a concerted effort is made to alternate meeting locations between east and west coasts venues.

b **Duties of the Seamanship SEG.** The SEG has the following responsibilities

1. identifying operational and tactical doctrine and procedures for Maritime Forces;

2. forwarding to the SWC, initiatives and developments for seamanship tactics and procedures including recommendations for the adoption of such tactics, exercise objectives, operational research (live/synthetic/modeling and simulation), and operational test and evaluations;

3. reviewing the effectiveness of all Maritime seamanship warfare systems, investigating any identified shortfalls, and recommending opportunities for further analysis i.e. OPTESTs, etc.;

4. following detailed analysis/scrutiny, reviewing, updating and prioritizing the Maritime Operational Deficiency List (MODL) and/or Maritime Tactical Development List (MTDL);

5. ensuring that Statement of Capability Deficiencies (SOCDs) are prepared to support new MODL items relative to surface and sub-surface warfare, including the progress of corrective actions; and

6. other duties assigned by the Chairman of the respective Committee.

c.. **Membership.** Membership of the Seamanship SEG is as follows:

CO STP/STA (Joint-Chairs)

DMPOR 4 Rep

Sea Training East/West Rep
Seamanship Division East/West Rep
MCDV Sea Training East/West Rep
DMRS 3-7
D Mar Pers (MOC Manager)
Secretary (to be supplied by STS)
Additional members as required for a particular situation

d. Conduct Of Work. A message/E-mail convening a MS SEG meeting is sent to the Fleet. members and all observers announcing the time and venue of the meeting and requests confirmation of attendance and agenda items. All members are expected to provide updates and a summary of actions taken to the chairperson prior to the meeting. The chairperson will forward a draft agenda to all members. The MS SEG will render a report of its proceedings (minutes) to the Surface Warfare Committee. The chairperson will forward copies of the minutes, including an executive summary or action/decision list, to all MS SEG members and observers.

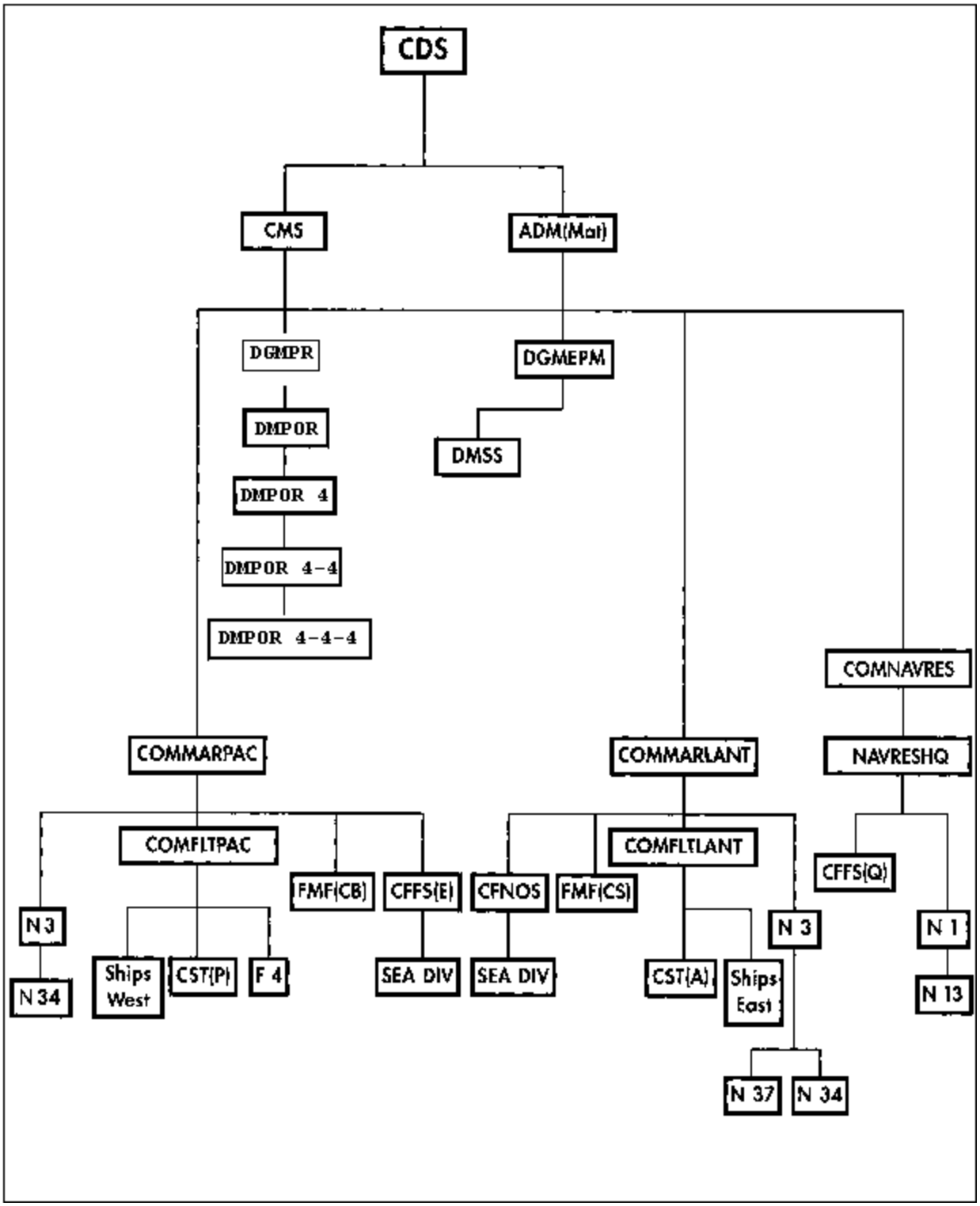

Figure 2.9.1 – Seamanship Organization Chart

CHAPTER 3

General Seamanship Terminology

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3.1 INTRODUCTION

Every profession and trade uses its own technical terms to describe the more specialized parts of its work. Nowhere is this more evident than in the language of the seaman. To learn seamanship, the seaman must first understand the general nautical terms and expressions which are explained in this chapter. The more technical terms are included in the chapters specific to the aspects of seamanship to which they apply.[1]

3.2 TERMS RELATING TO PARTS OF A SHIP

a. **Parts of the Hull**. From the German (hula), meaning a cloak or covering, the main body of a ship is called the hull. The hull is divided into three parts - the fore part, the midship part and the after part. The fore part begins with the stem, which is the foremost steel member forming the bow of the vessel (bow) and the after part ends in the stern (from stem to stern).

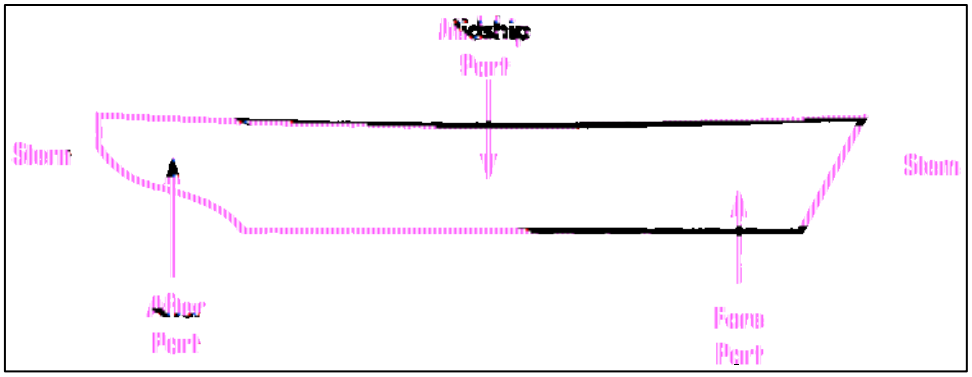


Figure 3.2-1 - Parts of the Hull

b. **Fore-and-Aft**. If you are standing anywhere inside the hull facing the stem you are facing forward. The reverse direction is aft. Any line which runs lengthways in the ship is said to run fore-and-aft and the line joining the middle of the stem to the middle of the stern is called the fore-and-aft centre line.

[1] Much of the material in this chapter has been taken directly from BR67 and has been modified for the Canadian Navy wherever appropriate.

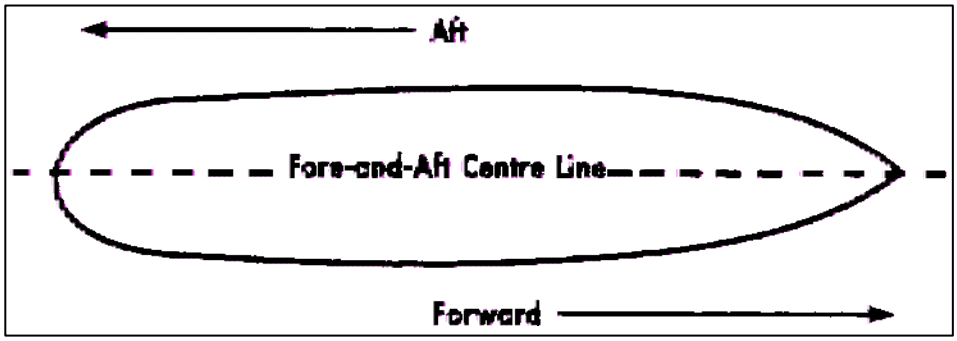


Figure 3.2-2 - Fore-and-Aft

c. **Port and Starboard**. Port and starboard are the terms used to divide a ship into left and right sides. When you are facing forward, starboard is on the right side and port is on the left side. It is customary to give stations or compartments odd numbers on the starboard side and even numbers on the port side. Starboard is generally accepted to have originated from steerboard, the board or oar which projected into the sea from the after right-hand side of a Viking long ship. Port derives from the custom of berthing the ship on the side opposite to the steerboard, and embarking stores via ports cut into the hull.

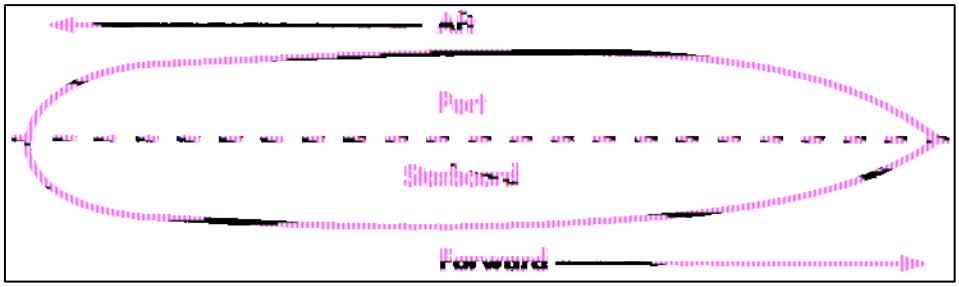


Figure 3.2-3 - Port and Starboard

d. **Hull Surfaces.** The sides of a hull can be described generally as starboard or port, meeting under the bottom of the ship at the **keel**. The curved surface of the fore part is called the bow (port or starboard) and the curved surface of the after part is called the quarter (port or starboard); the centre part is referred to as **midships**. When a ship is **afloat**, the **waterline** divides the sides into **ship's side** above the waterline, and **bottom** below it. These terms are used in a general sense, for example, when painting a ship's side or conducting diving operations. A more precise definition of an area can be achieved by referring to the side, the part and the waterline, for example, "the ship was holed on the starboard bow two metres below the waterline". The continuous horizontal surfaces of a ship are called **decks**. If exposed to the outside, they are called **weather decks**. Those that are not continuous are called **flats** or **platforms**.

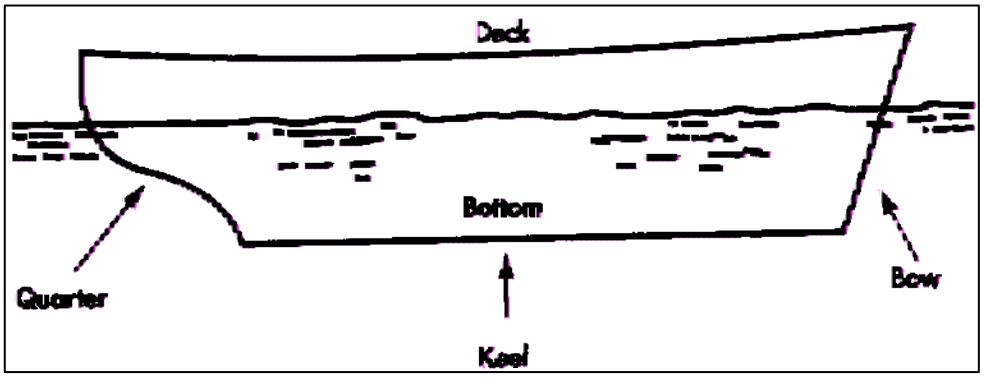


Figure 3.2-4 - Hull Surfaces

e. **Freeboard and Draught**. The height from the uppermost continuous deck or upper deck to the waterline is known as the freeboard. Depth of the keel below the waterline at any point along the hull is known as the draught. When we refer to a ship's draught, we usually mean its deepest draught.

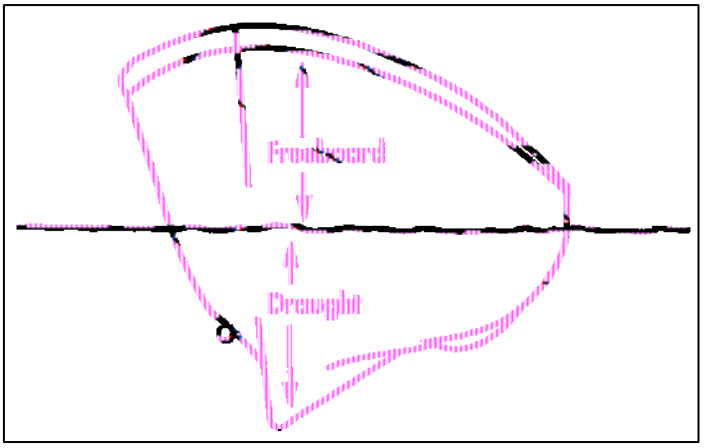


Figure 3.2-5 - Freeboard and Draught

f. **Beam, Camber and Bilge.** The length overall is the distance from the most forward point to the aftermost point. The greatest width of the hull is known as the beam. The curve given to the surface of a deck so that water will drain away to the ship's side is called the camber. The flat part of the hull's bottom is known as the bilge. The bilge may also refer to water, waste oil and any number of other liquids which collect at the bottom of the ship, or in the bilge. The bilge keel is a long projecting fin designed to decrease the rolling of the ship.

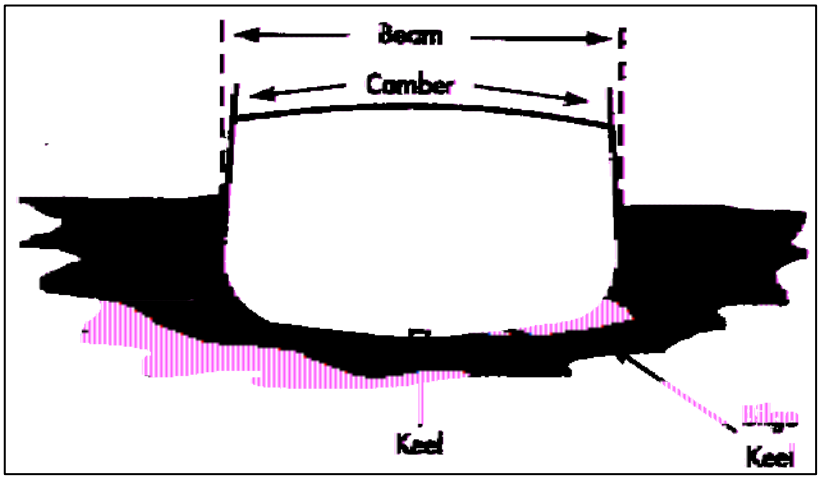


Figure 3.2-6 - Beam, Camber and Bilge

g. **Decks: A Brief History.** The arrangement of decks dates back several centuries. The ends of the upper deck were built up to form castles to house soldiers for defensive purposes. The lower portion of deck between the fore and after castles was known as the waist. The after part of the waist was known as the quarterdeck. The common tactic of boarding fell into disfavour with the advent of improved and longer range guns. Because of this, more space was required on the upper deck for guns. The castles were replaced with long, level deck housings with many guns each. The forward part of the ship retained the name forecastle, the pronunciation and spelling of which were eventually shortened to focsle and often abbreviated as FX. The aftercastle was eliminated and the quarterdeck became the after part of the upper deck and is still abbreviated as AX.

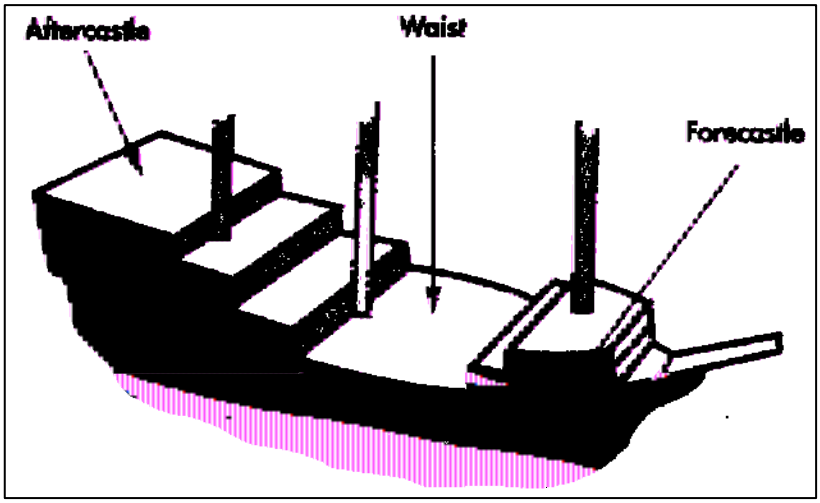


Figure 3.2-7 - Decks: A Brief History

h. **Contemporary Deck Naming.** The decks below the upper deck were named the main, lower, platform and orlop decks. Orlop is the name given to the lowest deck in a ship. It was the platform laid over the beams of a ship below the turn of the bilge. In modern warships, names have been retained as a quick reference (e.g. Sesame Street in the IROQUOIS Class, and Canadian city main street names in the HALIFAX Class) but the official and correct method of identifying decks is by number. Decks from the weather or uppermost continuous deck are numbered downwards in sequence (e.g., No. 1, 2, 3 deck). Decks above the weather deck are numbered upwards in sequence (e.g., No. 01, 02, 03).

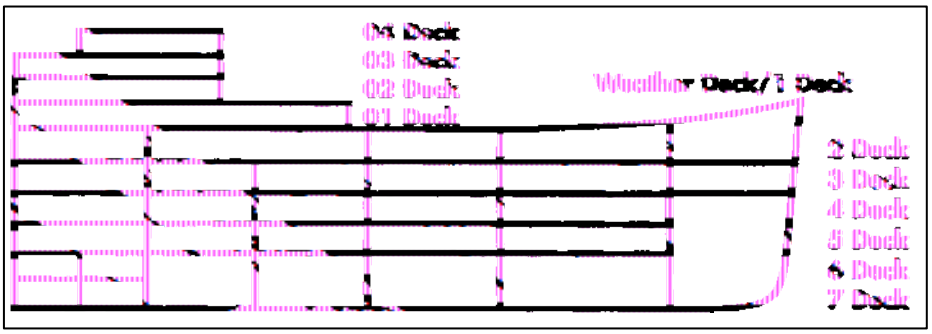


Figure 3.2-8 - Contemporary Deck Naming

i. **Parts of Decks.** Certain parts of any of these decks may also have special names. Below the upper deck a **flat** is a platform that does not run the length and breadth of a ship. A **lobby** is a space giving access to one or more compartments. These flats or lobbies may be named according to the principal adjacent compartments or equipment installed — for example, wardroom flat, Captain's lobby, capstan machinery flat — or they may be referred to by deck numbers and positions in the ship relative to the bow and the centre line.

j. **Weather Decks and Superstructure of a Ship.** The arrangement of the weather deck and superstructure of a ship is shown in Fig.3.2-9.

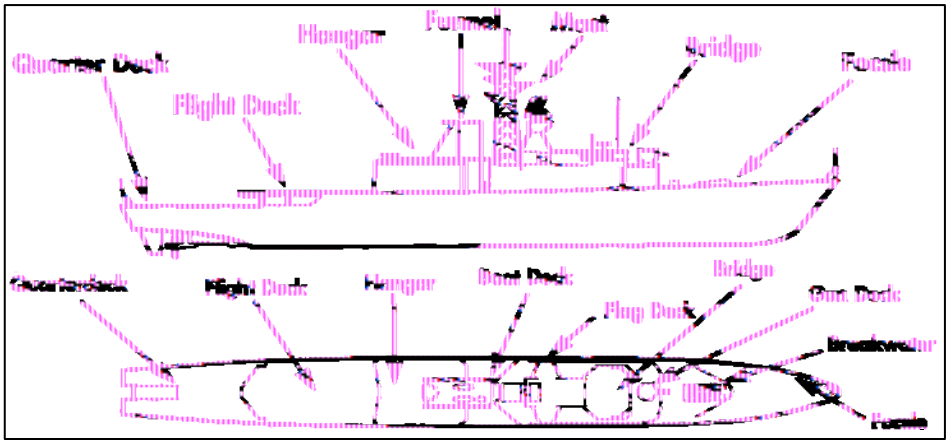


Figure 3.2-9 - Weather Decks and Superstructure of a Ship

k. **Machinery Placement.** In most cases, the main propulsion machinery and associated equipment are located amidships and low in the ship. This machinery is situated in individual water-tight compartments called engine rooms and auxiliary machinery rooms. Fuel and water are stored in tanks built into the lower parts of the hull.

3.3 TERMS DEFINING POSITION AND DIRECTION IN A SHIP

a. **General Position**

(**1**) A landsman lives in a house, therefore a seaman speaks of living in a ship not on a ship. If a seaman arrives by boat he goes up an articulating to accommodation or jumping ladder which is secured outboard , he comes over the side, and he is then on board. If the ship is lying against a dock wall it is alongside. The seaman crosses a brow from the dock to the ship and he is then on board and on deck.

(**2**) He then goes below by a ladder which gives access to the deck below through an opening in the deck called a hatch. He then reaches his living quarters which is in a space of the ship called a mess deck of which the walls are called bulkheads, the ceiling is called the deck head and the floor is the deck.

b. **Position Fore-and-Aft**. In a ship, the bow is forward and the stern is aft. Amidships describes the position roughly in the middle of the ship; it also describes any position on the fore-and-aft line. Midships is used also when defining an object. For example, a midship hatch could be either the one that is in the middle of the ship or, if there are two or more hatches, the one which is nearest the middle. Comparing positions of objects with one another, the hangar is abaft (aft of) the bridge, the bridge is abaft the focsle but forward of the hangar.

c. **Position Athwartships.** A position athwart or across the ship can be described relative to either the centre line or to the sides. The centre line divides the ship into port and starboard, while the ship's side gives an inboard and outboard position. For example, a ship is carrying three boats: one is swung outboard to port, the other two are stowed inboard to starboard. When comparing the position of the two boats stowed on the starboard side, the black boat can be described as lying inboard of the white boat, or the white boat outboard of the black.

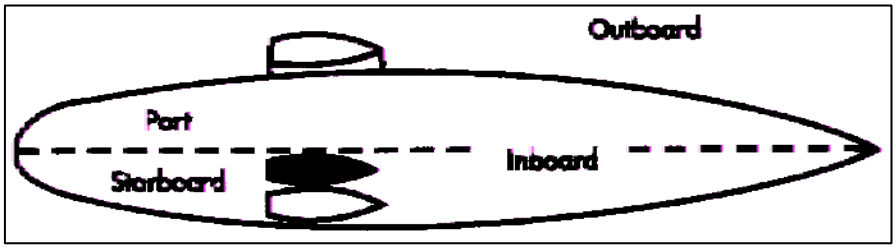


Figure 3.3-1 - Position Athwartships

The position of an object can be clearly described by combining the two methods.

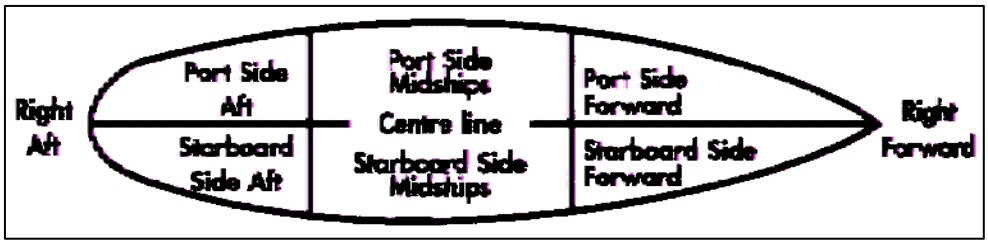


Figure 3.3-2 - How Positions Are Described

d **Movements of Objects On Board.** A seaman speaks of going forward, aft, below, up top (on deck) and aloft (i.e., anywhere in the rigging of a mast). He uses the same expression for shifting an object; thus he may shift something aft, or further forward, to port or starboard, or nearer to the ship's side.

3.4 TERMS DEFINING SHIPS IN MOTION

a. A vessel is under way when she is not anchored, secured to a buoy, made fast to the shore, nor aground. When actually moving through the water, a vessel is said to be making way.

b. When moving ahead, a vessel is said to be going ahead or making head-way. When moving astern, a vessel is said to be going astern, making sternway or making a stern board. A vessel gathers way when she begins to move through the water, and she has steerage way when her speed is sufficient for steering (i.e., the rudder is effective).

c. A vessel being blown sideways by the wind is said to be making leeway. When the wind is blowing from one side of the vessel, that side is called the weather or windward side. The other more sheltered side is called the lee side.

d. A ship is said to be adrift or not under command when broken away from her moorings and without means of propulsion.

3.5 TERMS DEFINING DIRECTION AND POSITION OUTSIDE A SHIP

a. **Relative Bearings.** Ahead, astern and abeam are relative bearings. In addition, when an object is midway between ahead and abeam it is said to bear on the bow, and when midway between abeam and astern it is said to bear on the quarter. The expressions fine and broad may also be used relative to ahead or astern; for example, an object may be fine on the port bow, broad on the starboard quarter (or abaft the starboard beam). These terms, however, are not exact and there is a more precise way of reporting relative bearings.

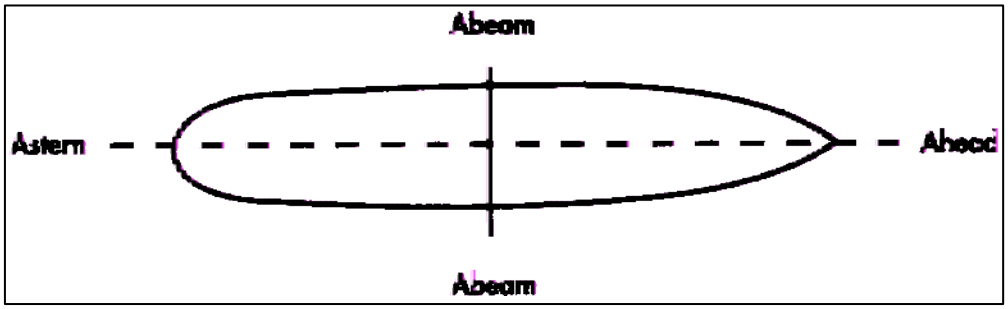


Figure 3.5-1 - Ahead, Astern and Abeam

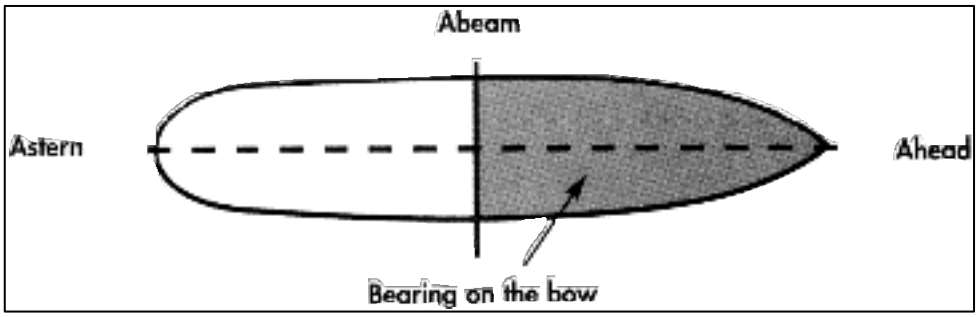


Figure 3.5-2 - Bearing on the Bow

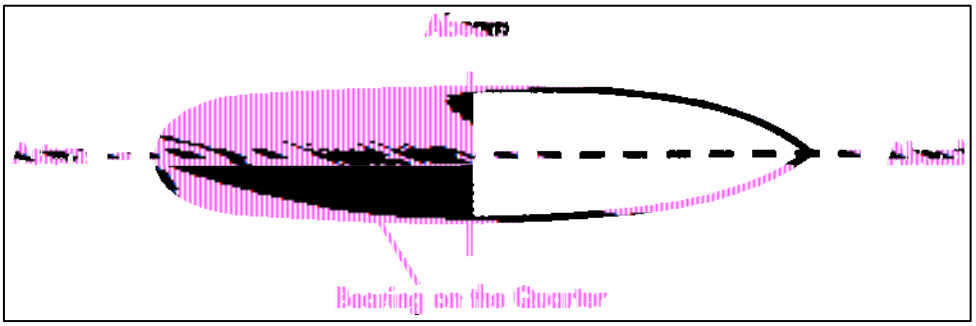


Figure 3.5-3 - Bearing on the Quarter

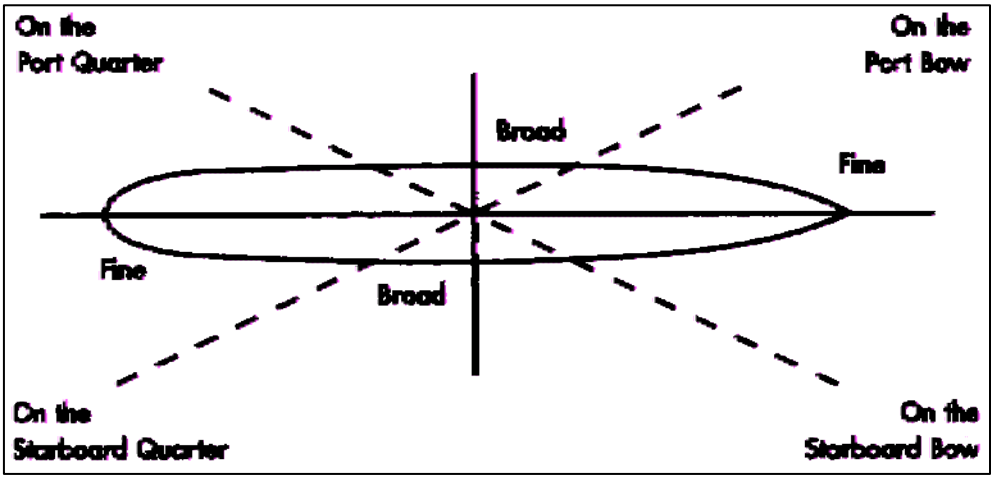


Figure 3.5-4 - Fine and Broad

b. **Directions in Degrees.** Reporting relative bearings by this method is based on the compass and uses an actual number of degrees. The system uses the ship's head as a reference of 0º. The ship's head, for the purposes of this system, is always 0º (dead ahead) regardless of the compass course being steered. The horizon is divided into degrees of arc, from 0º dead ahead to 180º astern. Those to port are called red while those to starboard are green. For example, an object 45º on the port bow is said to bear red four five.

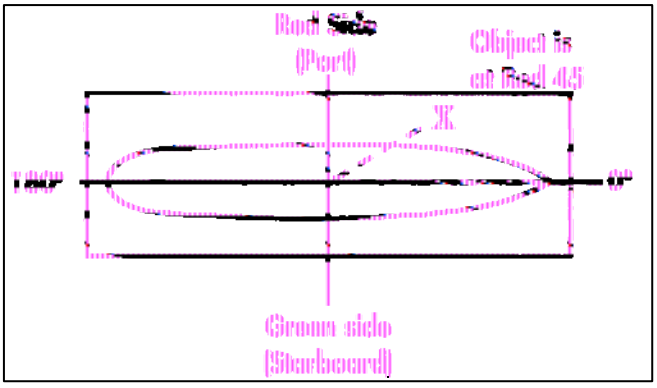


Figure 3.5-5 - Directions in Degrees

NOTE: *The word "degrees" is not used and numbers are given individually. As well, there are no preceding zeros.*

c. **Compass Bearings.** The bearing of an object from the ship may be given relative to true or magnetic North. If it is a gyro compass bearing, the horizon is divided into area of 0 to 359 degrees from true North. If it is a magnetic compass bearing, the horizon is divided into 359 degrees from magnetic North.

d. **Magnetic Compass.** The magnetic compass card is divided into 360 degrees from North (0º), through East (090º), South (180º), West (270º), and back to North. The card may be divided into 32 points of 11.25 degrees. The principal points of North, South, East and West are called cardinal points. The intercardinal points are North-East, South-East, South-West and North-West. The intermediate points are North-North-East, East-North-East, East-South-East, South-South-East, South-South-West, West-South-West, West-North-West and North- North-West. The remaining 16 points are known as by-points.

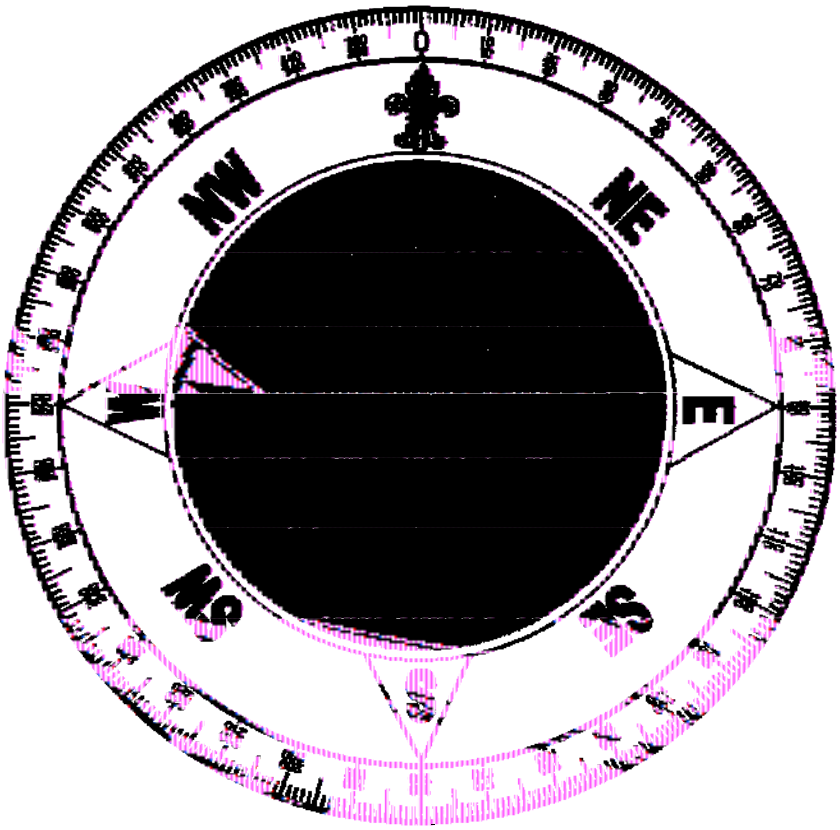


Figure 3.5-6 - Compass Card

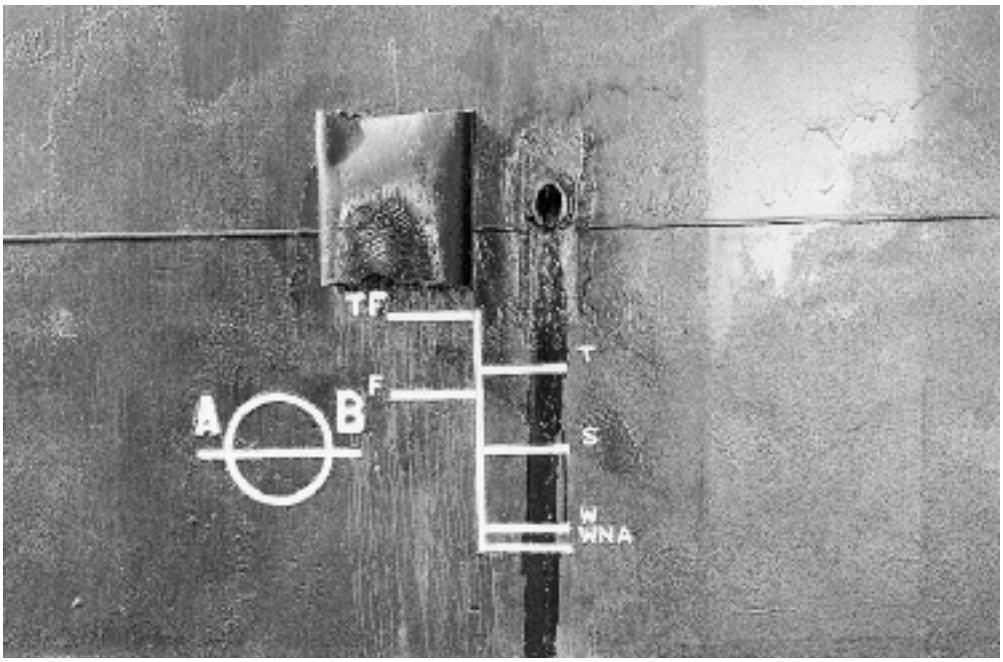
3.6 TERMS RELATING TO MEASUREMENT

a. **Draught Marks**

(**1**) Draught marks show the draught of the ship, measured in decimetres, and are usually positioned at the bows, stern and midships. The marks are Roman numerals, one decimetre high and one decimetre apart. Only even numbers are used. Above the waterline they are generally engraved on plates welded to the hull and below the waterline they are painted in a contrasting colour.

(**2**) When a ship is drawing 42 dm forward and 45 dm aft, the waterline touches the lower edge of the 42 mark at the bow and the upper edge of the 44 mark at the stern.

b. **Load Line Disc and Load Lines.** These marks on the sides of merchant ships indicate the greatest depth to which they may safely be loaded under various conditions in accordance with international regulations.



TF	Tropical fresh water	**WNA**	Winter, North Atlantic, for vessels under 100 metres in length
F	Fresh water		
T	Tropical sea water	**AB**	These letters indicate the registration society
S	Summer, sea water		
W	Winter, sea water		

Figure 3.6-1 - Load Line Disc and Load Lines

c. **Load Waterline.** Load waterline is a term chiefly used in HMC ships to denote the position of the waterline when the ship is fully loaded with crew, stores, water, fuel, etc. The ship is then said to be in the deep condition.

d. **Tonnage Measurements**. The tonnage of a ship can be expressed in terms of weight or volume. When expressed by weight, the unit of measurement is the tonne (one tonne equals 1000 kilograms), and when expressed by volume it is the ton of 2.83 cubic metres. This latter measurement is derived from the earlier "tun" which indicated the capacity of a wine cask.

e. **Displacement.** Displacement is the actual weight of the vessel measured by the weight in tonnes of water she displaces when loaded with fuel, water, stores and with the crew on board. It is seldom used for merchant ships because of the great difference in their displacement when fully and lightly loaded. It is, however, the usual method of describing the tonnage of warships. HMC ships displace the following:

Table 3.6.1 Displacement

CLASS	DISPLACEMENT (in Tons)
IROQUOIS	5155 light - 5106 loaded*
HALIFAX	4316 light - 4770 loaded
AOR 509/510	8380 light - 24700 loaded
KINGSTON	726 light - 932.61 loaded
VICTORIA	2030 surfaced - 2410 dived

*IROQUOIS Class ships are lighter in the loaded condition due to the water-compensated fuel system

3.7 DOCKS, SLIPS AND LAUNCHING

A ship is built on a slipway, which is a sloping platform erected on the foreshore of a deep river or estuary and extending well beyond and below the water's edge. The ship is launched in a cradle, which slides down the slipway until the ship becomes waterborne. With the trend toward modular construction of ships, as was the case with the HALIFAX Class, ships are not launched, but rather are floated up in dry dock once the modules have been connected.

The main structure of the hull up to the upper deck is completed before launching. In some cases, the main machinery and other large equipment may be installed and some parts of the bridge and other superstructures may be erected.

After launching, the ship is taken to a fitting-out berth in a basin where machinery not already fitted, internal fittings, armament, radar equipment, funnels, masts and external fittings are secured in

position and the rest of the super-structure is completed. Finally the ship is ready for equipment trials and to proceed to sea for sea trials.

Periodically during a ship's life, it is necessary to inspect her hull below the waterline to clean the bottom, change propellers, etc. For this, special docks or slips are built. The process is called docking followed by undocking.

a. **Dry Dock or Graving Dock**

(**1**) A dry or graving dock is an excavation faced with solid masonry, connected with a harbour, river or basin. The entrance is closed by a sliding caisson, a floating caisson, or dock gates. Water is admitted through valves (penstocks) until the level in the dock is the same as that outside. The entrance is then opened and the ship floated in. When the ship is inside, the entrance is closed and the water pumped out, thus leaving the ship resting on keel blocks, supported by breast shores (from the side of the dock to the ship's side), and bilge shores which give additional support. Side keel blocks and occasionally cradles are also used for heavier ships.

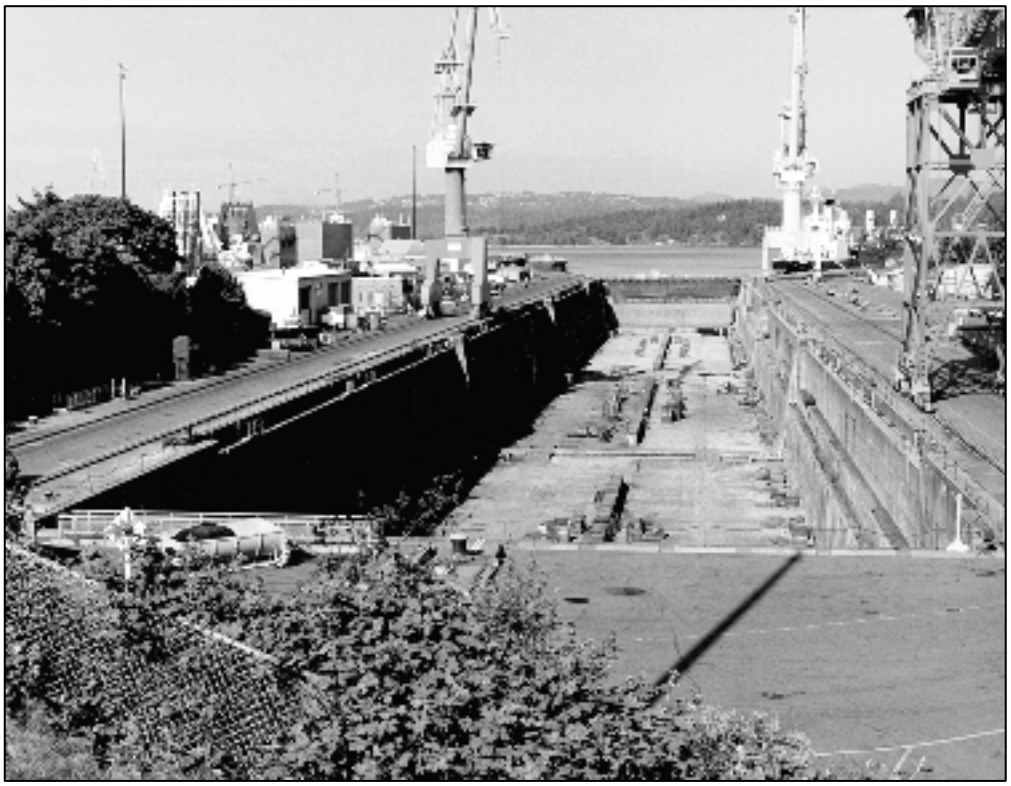


Figure 3.7-1 - Dry Dock at Esquimalt

Figure 3.7-2 - IROQUOIS Class Undergoing Docking Work

(**2**) Some small dry docks depend on the tide for flooding and draining. The vessel is floated in at high water, the gates are closed and, as the tide falls, the water is drained out through valves, which are shut when the dock is dry.

b. **Hydraulic Synchro Lift.** This is a platform, on which a craft is positioned, capable of being raised or lowered by hydraulic power. Its use is thus independent of the state of the tide and it permits work to progress continuously. These are now built to accommodate ships of up to 60 m in length.

Figure 3.7-3 - IROQUOIS Class Preparing to Be Lifted in Synchro Lift at Halifax Dockyard

Figure 3.7-4 - Hydraulic Synchro Lift After Ship Has Been Lifted

c. **Floating Dock.** A floating dock is a floating watertight structure which can be submerged sufficiently to receive a ship by flooding the pontoon tanks which form the bottom of the dock. When the ship has been floated into the dock and secured, the pontoon tanks are pumped out until the pontoon deck and the ship are dry. The ship rests on a line of blocks under the keel and in some cases blocks are positioned under the bilges. Because of the flexibility of a floating dock, it is essential that the ship be supported by breast shores between the ship and the dockside. This is necessary to prevent the sides of the dock deflecting inwards due to the weight of the ship resting on the blocks.

d. **Marine Railway.** A marine railway consists of a sloping runway of masonry or concrete, extending some distance below the low-water mark, on which rails are laid. A cradle, fitted with a wheeled carriage, is run out to receive the vessel when there is sufficient water. The vessel and cradle are hauled up the runway by winch or capstan until they are clear of the water.

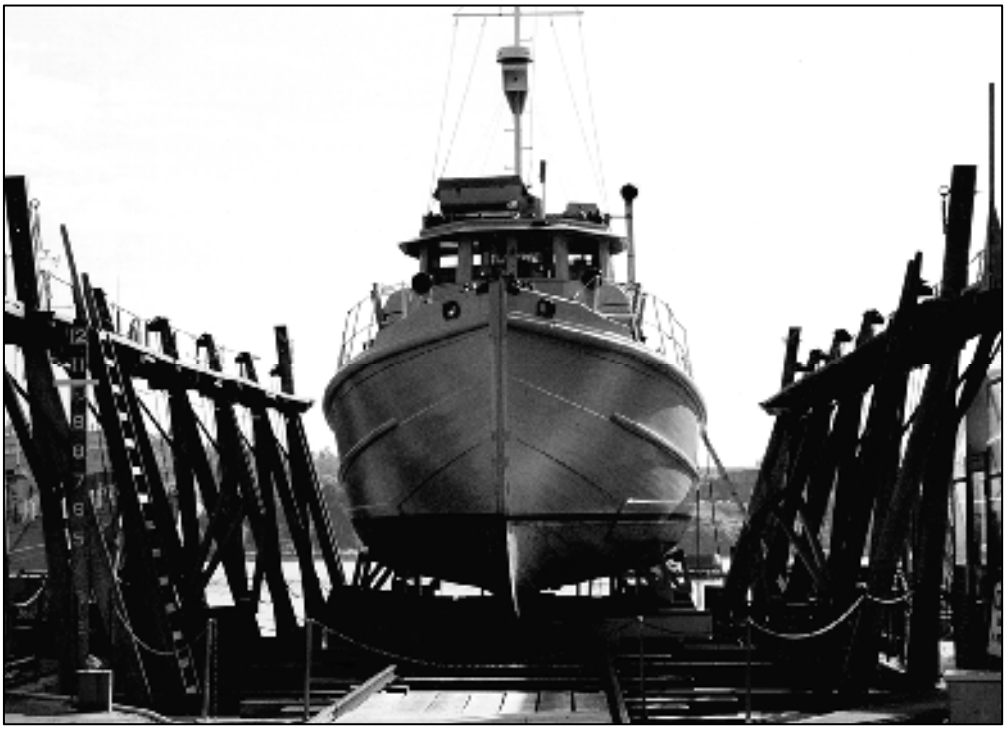


Figure 3.7-5 - Small Marine Railways in Esquimalt Dockyard

3.8 SEA MEASURES

a. **International Nautical Mile.** The International Nautical Mile is a standard fixed length of 1852 m.

b. **Sea Mile.** A sea mile is the distance equivalent to one minute of arc measured along the meridian at the latitude of measurement. Since the earth is flattened at the poles and not a true sphere, this distance is not a fixed length; it varies between approximately 1843 m at the equator and 1862 m at the North and South Poles. The sea mile is used for the scale of latitude on large-scale charts because distances are measured using the latitude graduation on the chart borders.

c. **Cable.** The cable is a unit for measuring short distances and equals one-tenth of a nautical mile, approximately 200 yards. This term was derived from the fact that the length of a ship's anchor cable was once 101 fathoms (606 feet). The length of a ship's anchor cable bears no relation to the cable measure (see Chapter Seven).

d. **Fathom.** The fathom was the traditional nautical linear measure for ropes, hawsers, depths of water and soundings. It is now superseded for all these purposes by the metre. The conversion is as follows:

1 fathom = 1.8288 metres
1 metre = 0.5468 fathoms

e. **Knot.** A knot is a unit of speed equal to one nautical mile per hour (1.852 kilometres per hour). For example, a ship may be steaming at 15 knots, meaning that she travels at a speed of 15 nautical miles per hour. (The expression 'knots per hour' is incorrect and should never be used to describe speed). The term is derived from a method of measuring speed in the days of sail, when a piece of wood attached to a line was thrown overboard. The number of equally spaced knots in the line that passed over the taffrail in a specified time gave the speed of the ship in knots.

3.9 GLOSSARY OF TERMS

Abaft	Further aft than; never use the term "aft of."
Access	Usually describes a door, hatch or other large opening, permitting entry into a compartment.
Articulating/ Accommodation Ladder	A portable set of steps fitted to a ship's side for the accommodation of people boarding from small boats or a pier.
(Harbour Position) A'Cockbill	When the anchor is clear of the hawse pipe, and hangs vertically by its ring. CPF veers 3 links.
Aft	In the direction of the stern.
Ahoy	A seaman's way of attracting attention.
Aloft	Above.
Anchor	A heavy, hook-shaped device fastened to the outboard end of a ship's chain cable. Together they are used to secure the ship to the sea bottom.
Angel Fairlead	Fairlead located on the top of the bull ring.
Athwart	Running from side to side.
Athwartships	Across the ship at right angles to the centre line.
Awash	Level with the surface of the sea.
Avast	An order to stop.
Back Up	To assist in holding.
Ballast	Any weight or weights used to change a ship's trim or to keep the ship from becoming "Top Heavy".
Ballast Tank	Watertight compartment to hold ballast.
Barge	A flag officer's boat.
Batten Down	To secure closed or shut.
Bear a Hand	An order to assist.
Below	Down; below a deck or decks.
Berth	A place to sleep or a ship to secure to.
Bilge	The inner "flat" part of the hull's bottom.
Bilge Keel	A long projecting fin designed to decrease the rolling of a ship. It is normally secured to the hull or the turn of the bilge.
Bilge Pump	Pump for removing bilge water.
Binnacle	A case or stand containing a ship's or boat's magnetic compass, adjusting magnets, and a lamp for use at night.
Bitt	A vertical post used for making fast lines; a bollard.
Bitter End	Inboard end of ship's cable.
Boat Deck	A deck on which boats are stowed.

Bollard	A single or double post for making fast lines (see bitt).
Boom	A long, heavy spar capable of being pivoted at one end, usually used for handling cargo.
Boot Topping	The black band around the waterline.
Bosn's Call	A whistle device used to pass orders.
Bow	The forward end of the ship.
Bravo Zulu	Well done.
Breakwater	A braced guard plate which prevents water from sweeping the decks.
Brightwork	Polished metal fittings such as brass tally plates.
Brow	A narrow platform placed between ship and shore for embarkation and disembarkation, sometimes called a gangway.
Buffer	Chief Boatswain's Mate.
Bulkhead	The term for a "wall" in a ship.
Bullring	The large fairlead at the bows.
Cable Holder	Designed solely for working cable; consists of a sprocket with lugs to carry links of cable; mounted on a vertical shaft. Usually combined with a capstan to work lines as well.
Cable Locker	A compartment in the forward portion of a ship in which anchor cable is stowed (chain locker).
Cant	To incline away from the upright.
Capsize	To overturn.
Capstan	Revolving drum, mounted on a vertical shaft, used for working lines.
Cast Off	To let go.
Centre Line	The middle line of the ship, extending from stem to stern.
Check Away	To ease out a rope or wire under control.
Chock	A block or wedge, so placed as to prevent or limit motion or to rest a boat on.
Cleat	A fitting having two arms to which ropes may be made fast.
Clam Shell	A very large oval-shaped porthole to enclose the Jungle Deck on AOR 509/510.
Coxswain	Designated Chief Senior or Petty Officer in a ship, responsible to the XO. He exercises command over all non-commissioned crew on board. One who has charge of a ship's boat and crew. Abbreviated: Coxn.
Crest	The highest point of a wave.

Deadweight	The total weight of fuel, water, stores, ammunition, crew and their effects, which a ship can carry.
Deck	The part of the ship corresponding to the floor of a building.
Dickie	The assistant to the Scratcher on a submarine
Dip	To lower temporarily; to pass under, as in dip a line.
Dog	A small bent metal fitting used in closing doors, hatch covers, manhole covers.
Dolphins	Mooring posts, usually composed of groups of piles driven into the bottom of a harbour.
Door	Allows horizontal access to spaces and passageways.
Double Bottom	Compartments at the bottom of a ship between inner and outer bottoms, used for ballast tanks, water, fuel oil, etc.
Draught	The vertical distance of the lowest point of the ship below the surface of the water when afloat.
Drag	To pull along the seabed.
Easy	Carefully or slowly.
Eyes of the Ship	The extreme forward end of the ship.
Even Keel	A ship is said to be on an even keel when the keel is level or parallel to the surface of the water
Fairlead	A fitting through which a rope or line may be led so as to change its direction without excessive friction.
Fair	Favourable or unobstructed.
Fake Out	To lay a wire or rope on the deck so that it is free for running.
Fathom	Nautical measure, 1.83 metres or 6 feet.
Fender	A portable device to protect a ship from damage when touching a pier or another ship. Most common are pneumatic fenders but they may be made of wood, rope, etc.
Flare	When the ship's sides curve outwards above the waterline commonly at the bow.
Flat	A small partial deck (built level) without curvature.
Forepeak	The compartment or tank at the bow of a ship.
Forward	In the direction of the focsle.
Foul	To entangle or obstruct.
Foundations	Supports for boilers, engines, and auxiliary machinery.
Freeboard	The vertical distance from upper watertight deck to waterline.
Furl	To fold or roll up an awning or sail.
Gaff	Pole.

Galley	Ship's kitchen.
Galvanizing	Coating metal parts with zinc for protection from rust.
Gangplank	A narrow platform placed between one ship and another for embarkation and disembarkation.
Gangway	The opening in the bulwarks or position in the ship's side by which the ship is entered or left. The term is also used to describe a passageway in a ship, and sometimes used to describe the platform.
Grapnel	A pronged hook for retrieving gear.
Grommet	A reinforcing eyelet of metal, rope or other material through which a rope, cord or fastening may be passed.
Gunwale	The junction of the upper deck and the hull at the top of the sheer strake.
Gypsy	Sprockets used for taking up chain cable in a windlass.
Handsomely	Slowly, carefully.
Hanging Judas	A fall, whip, or halyard hanging loose. Most commonly used to refer to the bridle hanging freely from the bullring when securing to a buoy.
Hatch	An opening in a deck for passage.
Haul Taut	To pull tight by hand.
Hawse Pipe	Casting, or castings, through deck and side of ship at bow for passage of anchor chain.
Hawser	A large rope used in towing and berthing.
Heel	The inclination of a vessel to one side.
Hull	The body of the ship which forms its outer watertight skin.
Inboard	Inside of the ship; toward or nearer the centre line.
Irish Pennants	Rope yarns or stray rope ends hanging.
Jack Staff	A flagstaff at the bow of a ship.
Jungle Deck	Tank deck on a replenishment ship.
Junk	Old rope.
Jury-Rig	Temporary, make-shift.
Keel	The principal fore-and-aft member of a ship's frame to which all weight is ultimately transmitted. The keel runs along the bottom connecting the stem and stern to which are attached the frames of the ship.
Knot	Measurement of speed (not distance) - one nautical mile per hour.
Ladder	Steps used on board ships in place of stairs.
Landfall	First sight of land after a sea passage.
Lee	Opposite side of the ship to that upon which the wind is blowing.

Length Over All	The length of a ship measured from the extreme forward end to the aftermost point of the stern.
Lie to	To be as stationary as possible in a gale.
Lighter	A vessel used for transporting cargo or stores to or from a ship.
Lines	The form of a ship as represented by its moulded surface.
List	To lean over to one side.
Mess	Communal or living areas.
Messmates	Those living together, comrades; “messmate before shipmate, shipmate before stranger”.
Midships	At or near the middle point of the ship’s length.
Mooring	Securing a ship in position by several lines or cables, so that she cannot move or swing.
Naval Pipe	A pipe for passage of anchor cable from deck to cable locker.
Overboard	Outside; over the side of a ship; into the water.
Palm	Device fitted to the hand to assist in sewing.
Piles	Baulks of steel-pointed timber or lengths of ferroconcrete which are driven into the harbour bottom and used as the foundations for the platforms of piers and jetties.
Porthole	A circular opening in the ship’s side.
Quarterdeck	The after part of the upper deck of the ship.
Range	To lay out rope or cable.
Refit	To repair.
Rigging	Ropes, wires, lashings, masts, boom’s tackles.
Roll	The motion of the ship from side to side, alternately raising and lowering each side of the deck.
Roundly	Rapidly or fast.
Rudder	A flat piece or structure attached upright to the sternpost which can be turned, causing the vessel’s head to turn in the same direction.
Rudder Stock	The shank of a rudder which extends through the hull upward to the steering motors.
Rudder Stop	Lug to limit the swing of the rudder.
Scotchman	Material used to prevent chafing.
Scran Locker	Stowage for kit left lying about.
Scratcher	Buffer on a submarine
Scruffy	Untidy, messy.
Sculling	To leave lying about or unattended.

Scupper	A hole or drain along the side of a ship's deck to allow water to run off.
Scuttle	A round port hole.
Sea Legs	The ability to maintain balance when a ship is rolling.
Secure	To make fast; to stop work.
Shepherd's Hook	A pole with a large hook for recovering boat's falls, wires, lines.
Shipshape	Neat and tidy.
Shot Mat	A heavy rope mat used to protect.
Slue	To cause to move sideways, as if some portion were pivoted.
Snub	To suddenly stop a rope or cable.
Snug	Properly secured; tight.
Staging Planks	Scaffolding on which to stand when working over the side or on the upper decks.
Stanchion	A supporting post.
Stay	A guy line.
Steering Gear	Apparatus for controlling the rudder.
Stem	The bow end of a ship.
Stern	The after or back end of a vessel.
Stow	To put away.
Strike	To haul down.
Tarpaulin	Waterproof covering.
Taut	Tight; to haul taut.
Teebar	A tool with a structural shape with cross section resembling the letter "T".
Template	A mould or pattern.
Tiffy (sickbay)	Slang for medical assistant carried on board Canadian ships.
Transom	The main frame at the stern of a ship.
Transverse	Athwartships; at right angles to the keel.
Trim	To shift ballast, cause a ship to change its position in the water over its length.
Veer	To pay out a line, wire or cable under power.
Walk Back	To pay out, by walking, keeping the line in hand.
Warp	A rope extending between ship and shore, for moving (warping) the ship without using her engines.
Warping Drum	A contoured barrel fitted horizontally on a windlass to work lines.
Waterline	Any one of certain lines of a ship parallel with (and at various heights above) the base line.

Watertight	So riveted, caulked, or welded as to prevent the passage of water.
Waterway	A narrow passage along the edge of a deck for drainage; a gutter.
Weather Deck	A deck exposed to the weather.
Weep	To leak slightly.
Winch	A small hoisting engine, used in pulling lines.
Winding	The action of turning a ship the other way round in her berth (turning end for end).
Windlass	A revolving drum, mounted on a horizontal shaft, used for heaving in cable; usually combined with a warping drum to work lines as well.

CHAPTER 4

General Shipboard Safety

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4.1 GENERAL

Naval operations are inherently dangerous. Lines under tension, heavy equipment and hazardous substances all pose threats to personnel. Safety is the responsibility of everyone — anyone observing an unsafe condition is to take action to correct it and, at the very least, report it to his/her supervisor. Most accidents can be attributed to inattention and carelessness. Personnel involved in any and all seamanship evolutions must avoid skylarking and must pay close attention to their surroundings. Each chapter in this manual stresses safety points specific to the evolution being described. This chapter also describes fundamental safety rules which apply in every situation.

4.2 SAFETY DURING EVOLUTIONS

The following is a list of safety points that should be covered in briefings given by the station supervisor prior to a seamanship evolution. The list is not comprehensive and should only be used as a guide. Although the list pertains to evolution safety, it can be applied to everyday work on board a ship. Sample safety briefings for specific evolutions are found in Chapters 6, 7, 8 and 9.

a. **Rigging**. Prior to commencing rigging for an evolution, the station supervisor will examine all equipment to ensure it is in good condition and proper working order, i.e. check lines for potential damage by corrosive material. The supervisor will then check that the station is rigged in accordance with the approved Class drawings, and the layouts promulgated in this publication.

b. **Dress**. The weather, sea state, wind and duration of the evolution should be taken into consideration when choosing the dress for an evolution. The OOW will make recommendations to the XO and Deck O on what personnel should wear. The dress for evolutions will be announced in the closing-up pipe, but a warning pipe should be made to allow personnel to prepare. Some general guidance on dress is detailed in the following table.

Table 1: Dress for Evolutions	
Steel-toed boots must be worn by all personnel. An appropriate flotation device must be worn by all personnel.	Dump workers, station supervisors and all other personnel working in the immediate vicinity of lines under strain and/or open guardrails shall wear Hazardous Duty life jackets and safety helmets
Safety helmets will be worn by personnel as required.	
All personnel must wear at least one full layer of clothing. There is no requirement for personnel working in a fuelling area to wear a second layer of clothing.	
All personnel in the vicinity and aft of the fuelling rig will wear safety goggles in order to protect their eyes in the event of a fuel spill. They will don the goggles prior to the probe being seated and will not remove them until the probe is clear of the station.	
A sharp knife is to be carried by all personnel.	
Gloves may be worn by line handlers at the discretion of the Station Supervisor. Normally, this would apply in cold winter conditions or when working with wire only.	

c. **Dump Areas and Guardrails**. It is often necessary to remove guardrails in order to conduct evolutions. When they are removed, a temporary guardrail must be rigged. Temporary guardrails consist of a length of line and chain strung across the gap. It can be lowered and raised quickly when required. When temporary guardrails are rigged, the station I/C must determine the requirement to wear safety harnesses with lifelines attached. Safety harnesses must be worn by dump and guardrail workers whenever guardrails are removed. Temporary guardrails are to be rigged prior to removing guardrails.

> **NOTE**: *Never lean on guardrails: it is unseamanlike and dangerous. When breaking guardrails or working around temporary guardrails, follow the two-man rule — never do the job by yourself.*

d. **Snap Back Zones**. Whenever a line comes under excess strain, the risk that it may part rises exponentially. When a line under strain parts, it snaps back to its normal unstrained condition. The speed at which it snaps depends on the construction of the rope. Ropes made of synthetic fibres, for example double-braided nylon, snap back at very dangerous speeds, presenting the risk of serious injury to anyone caught in its path. For this reason it is imperative that line handlers are ordered clear of snap back zones whenever excess strain comes on the line. Symptoms of excess strain are heat waves emanating from the line as the fibres begin to melt and visible smoke immediately prior to the line parting. The snap back zone is defined as an area 20 degrees from either side of potential snap points (Figure 4.2.1).

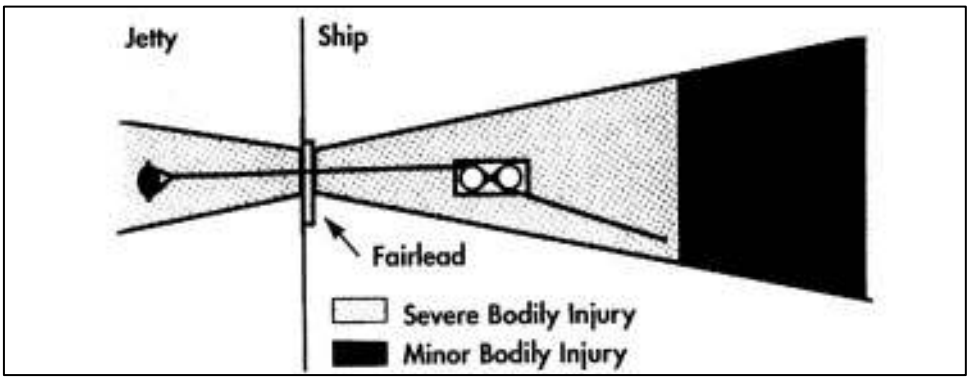


Figure 4.2-1 - Snap Back Zone

e. **Line Handling**

(**1**) Whenever handling lines, always heave in or pay out hand over hand.

(**2**) Never stand in a bight.

(**3**) Never wrap a line around your arm or waist.

(**4**) Fake or coil lines whenever receiving them so that they are free for running.

(**5**) Whenever possible, stand 2 m back from winches, capstans, bollards and/or blocks when handling lines.

(**6**) Be aware of the snap back zone when working with synthetic lines, and remain clear whenever possible.

(**7**) Never straddle lines.

f. **Loads**

(**1**) Do not stand between loads and the bulkhead.

(**2**) Do not stand between the rigging and bulkheads.

(**3**) Do not stand outboard of a load.

g. **Tensioned Rigs**

(**1**) Do not cross over or under rigging.

(**2**) Do not straddle or cross de-tensioned rigging.

(**3**) Do not turn your back to the rig.

h. **Winches/Capstans**. Riding turns are formed when a line on a winch or capstan drum crosses over itself. This creates a dangerous situation because the line jams and cannot be veered or heaved in.

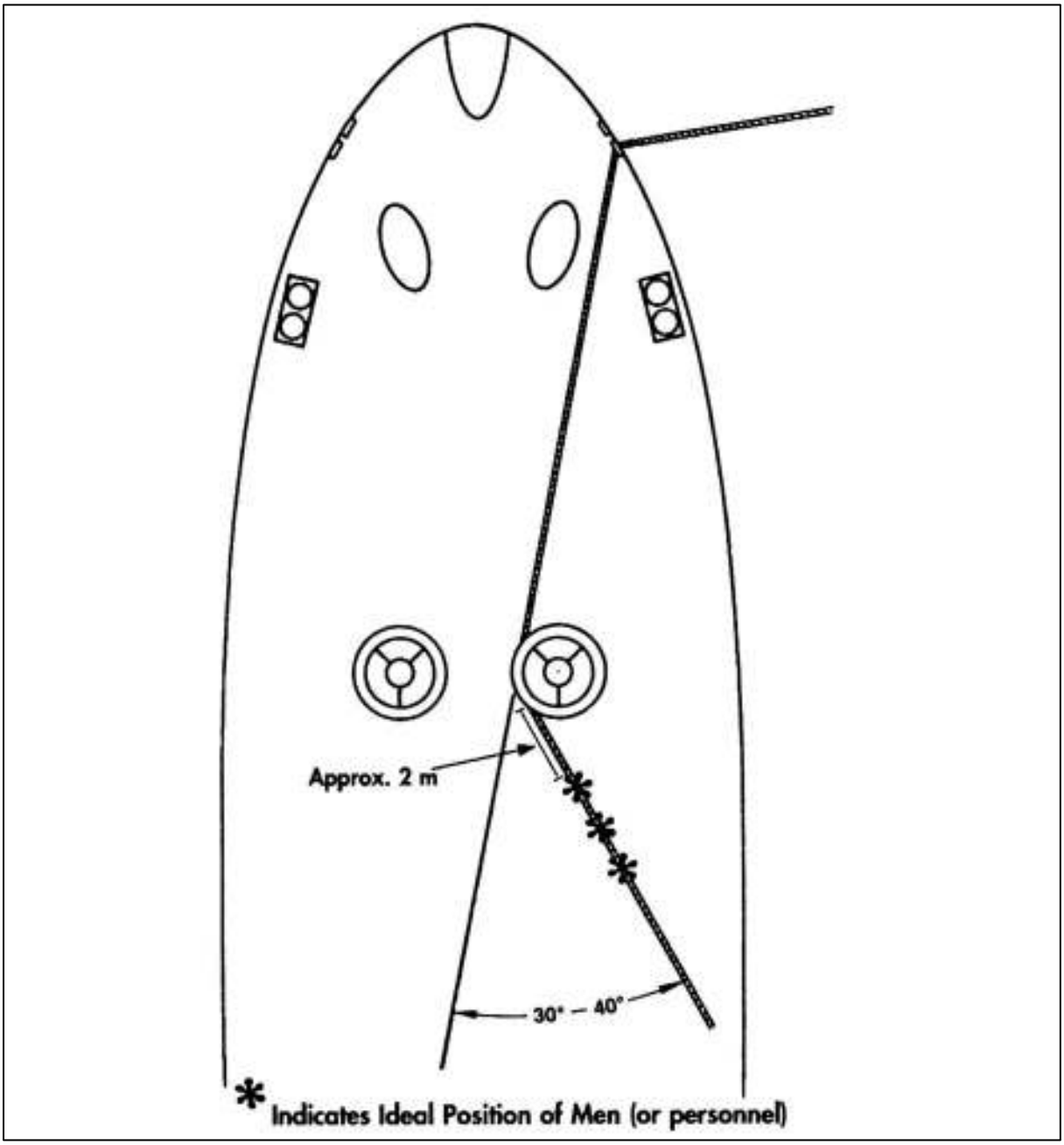


Figure 4.2-2 - Ideal Position when Working Capstans, Winches and Bollards

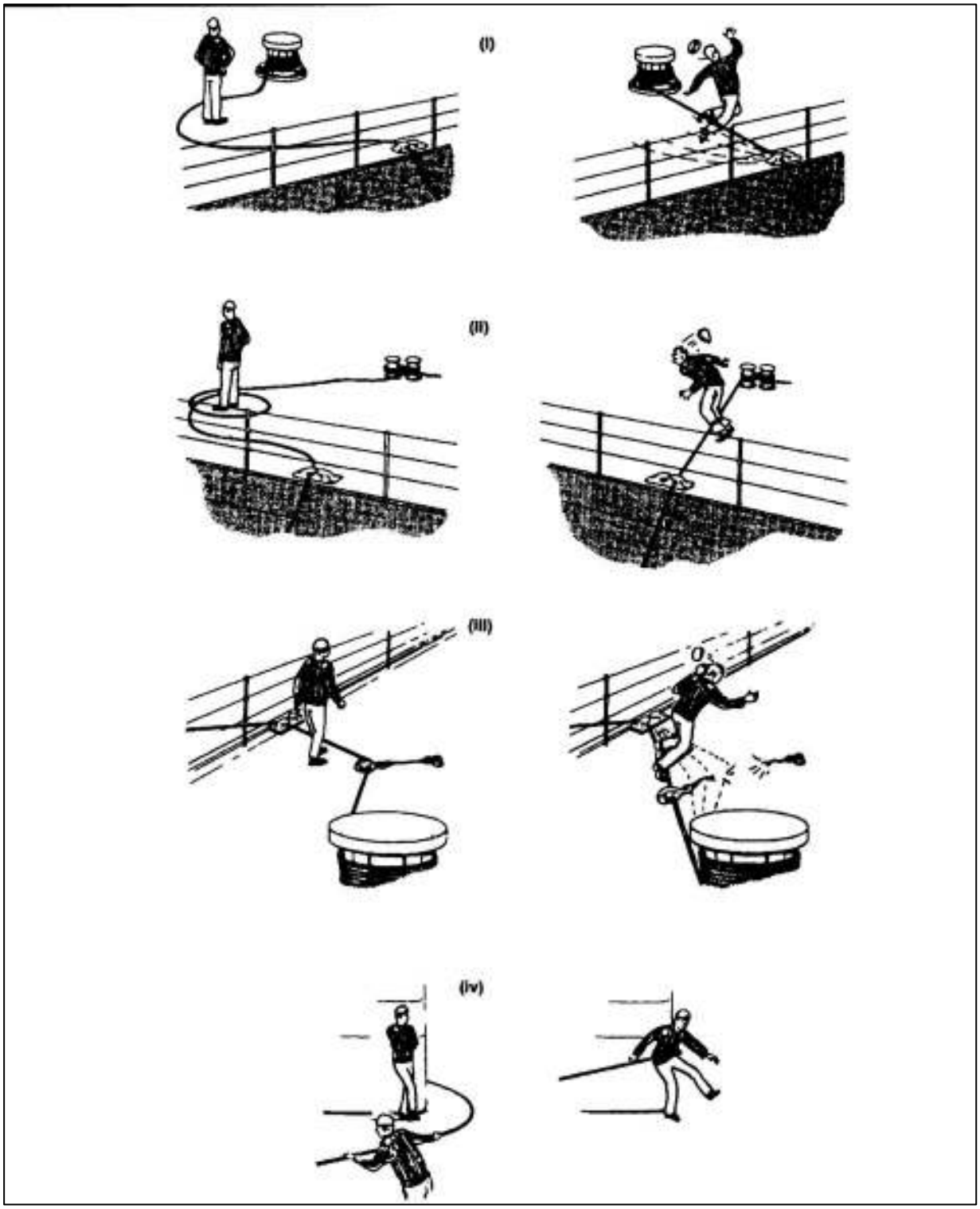


Figure 4.2-3 - Danger Zones when Working with Lines

4.3 Safety Equipment

4.3.1 Body Belt and Harnesses

a. The Body Belt with a lifeline attached is to be worn by personnel whenever they are working in an area near the guardrails or when guardrails are removed. The lanyard is to be rigged such that the person can go no further than the edge. The Body Belts are to be used judiciously; several personnel working in a dump area wearing the belts with lanyards can easily become entangled thus creating a dangerous situation.

b. The Full Body Harness is used to arrest a fall and are to be worn at all times when working aloft or over the side

Figure 4.3-1 – Full Body Harness

Figure 4.3-2 - Body Belt

c. A complete inspection of the belt or harness must be conducted prior to use, as described in the following table (Table 2).

Table 2: Body Belt and Full Body Harness Inspection
Belts and Rings. Beginning at one end, holding the body side of the belt toward you, grasp the belt with your hands placed 15 to 20 cm apart. Bend the belt in an inverted "U". The resulting tension makes damaged fibres or cuts easier to see. Follow this procedure the entire length of the belt/harness, watching for frayed edges, broken fibres, pulled stitches, cuts or chemical damage.
D-rings and D-ring metal pad (if any). Check for distortion, cracks, breaks, and rough or sharp edges. The D-ring bar should be at a 90 angle to the long axis of the belt and should pivot freely. The points of attachments for buckle and D-rings should be given special attention. Note any unusual wear, frayed, cut fibres, distortion of the buckles or D-rings. Rivets should be tight and immoveable. The body side rivet base and outside rivet burr should be flat against the material. Bent rivets will fail under stress. Inspect for frayed or broken strands. Broken webbing strands generally appear as tufts on the webbing surface. Any broken, cut or burned stitches will be readily seen.
Tongue or Belt Billet. These receive heavy wear from repeated buckling and unbuckling. Inspect for loose, distorted or broken grommets. Belts should not have extra punched holes.
Tongue Buckle. Buckle tongues should be free of distortion in shape and motion. They should overlap the buckle frame and move freely back and forth in their sockets. The roller should turn freely on the frame. Check for distortion or sharp edges. **Friction Buckle**. Inspect the buckle for distortion. The outer bars must be straight. Pay attention to corners and attachment points of the centre bar.
Lanyard Inspection. When inspecting lanyards, begin at one end and work to the opposite end. Slowly rotate the lanyard so that the entire circumference is checked. Spliced ends require particular attention. **Web Lanyard**. While bending webbing over a pipe, observe each side of the webbed lanyard. This will reveal any cuts or breaks. Swelling, discolouration, cracks, and charring are obvious signs of chemical or heat damage. Observe for any breaks in the stitching. **Rope Lanyard**. Rotating the rope lanyard while inspecting it from end to end will show any fuzzy, worn, broken or cut fibres. Areas weakened from extreme loads will appear as a noticeable change in original diameter. The rope diameter should be uniform throughout, following a short break-in period.
Snaps. Inspect snaps closely for hook and eye distortions, cracks, corrosion, or pitted surfaces. The safety latch should seat into the nose without binding and should not be distorted or obstructed. The safety latch spring should exert sufficient force to firmly close the latch.
Thimbles. The thimble must be firmly seated in the eye of the splice, and the splice should have no loose or cut strands. The edges of the thimble must be free of sharp edges, distortion, or cracks.

4.3.2 Cleaning of Body Belts and Full Body Harnesses

a. Basic care of all safety equipment will prolong its life. Proper stowage and maintenance after use are as important as cleaning the equipment of dirt, corrosives or contaminants. Storage areas should be clean, dry and free of exposure to fumes or corrosive elements.

b. Wipe off all surface dirt with a sponge dampened in plain water. Squeeze the sponge dry. Dip

the sponge in a mild solution of water and commercial soap or detergent. With a vigorous back and forth motion, work up a thick lather. Then wipe the belt dry with a clean cloth. Hang to dry but away from excessive heat. When hanging, hang from the D-ring.

4.3.3 Safety Helmets

a. Safety helmets, commonly referred to as hard hats, are worn by personnel employed in areas/environments where there is a danger of being struck on the head. The colour of the helmet is also used to identify key personnel during seamanship evolutions.

Table 3: Helmet Colour

Colour	Person
White	Safety Officer
Yellow	Station Supervisor
Green	Station Signalman
Red	Station Gunman
Blue	Station Worker
Orange	Storesman (Supply Dept.)
Grey	(Engineering Dept.)

b. The helmet consists of two parts: a tough, durable polyethylene shell and a suspended adjustable liner. The helmet has a slot on either side for accessories (goggles, defenders, etc.) and eyelets to attach a chinstrap.

c. The helmet should not be left under the direct rays of the sun or left exposed to severe cold when not in use. It should not be thrown around or altered in any way and should not be painted or affixed with decals as they hide cracks in the helmet. They should fit properly, be inspected periodically for scratches and cracks and be replaced every five years.

NOTE: *If a safety helmet is subjected to a hard impact, it should be discarded.*

4.3.4 Eye Protection

There are three basic types of eye protection: safety glasses, goggles and face shields. The correct type must be used, depending upon the hazard. Goggles and face shields offer good protection for

most hazards. Safety glasses do not offer any protection from chemical splashes; therefore, goggles are to be worn during fuelling operations. The vent type is designed to prevent fogging and is used during all seamanship evolutions.

4.3.5 Hearing Protection

Extended exposure to sound levels above 97 decibels can cause permanent hearing damage. Personnel are to use approved hearing protection ranging from earplugs to earmuffs when working with or around noisy equipment, e.g. grinding tools.

4.3.6 Hand Protection

There are a variety of gloves available to protect against various hazards, e.g. rubber gloves for working with paints and solvents, and leather gloves when working with ropes or power tools. The gloves being used must be matched to the hazard and inspected prior to use. Gloves must be used when working with wire and may be used when working with lines or hawsers, depending upon the weather.

4.3.7 Foot Protection

All seamen are issued steel-toed boots which are to be worn whenever there is danger of foot injury. The boots should be inspected periodically to ensure there is sufficient tread left to prevent slipping.

4.3.8 Respiratory Protection

There are a variety of respiratory hazards that sailors face, ranging from common dust to toxic paint fumes. IAW MARCORD 66-5 the appropriate mask, respirator or pressure breathing apparatus must be matched to the hazard.

4.4 WORKING ALOFT

Personnel often go aloft to work on equipment or to paint. Many dangers exist if established safety procedures are not followed. Some of the hazards are listed in the following table:

Table 4: Man Aloft Hazards	
Falling due to:	- ship's movement - radar antenna rotation - loose clothes catching - poor foothold on wet or greasy metal - being startled by unexpected noises
Radiation hazards from transmission equipment on board ship or adjacent ships.	
Risk to personnel below from falling tools and equipment.	
Exhaust gases from funnels.	

4.4.1 Procedure

a. Before going aloft, a Man Aloft Chit must be filled out by the person going aloft. These chits are maintained in the CSE office on each ship and are self-explanatory. They require the signatures of all key personnel involved, including the OOW/OOD, so that the safety of those personnel proceeding aloft is guaranteed.

b. The following actions should be followed before proceeding aloft to ensure that all precautions have been completed.

Table 5: Man Aloft Procedures
Have a completed and signed Man Aloft Chit.
Ensure all loose articles are removed from pockets.
Dress according to the weather.
Follow the buddy system — never go aloft alone or without someone observing from below.
Don all applicable safety equipment (hard hat, goggles, ear defenders).
Attach safety lanyards to all tools.
Inspect safety harness before donning.
Ensure flag "Kilo" is hoisted. Figure 4.4-2

NOTE: *If there is potential danger to personnel below from falling objects, then the area must be roped off.*

c. Upon completion of working aloft the OOD/OOW is to be informed. He/she will order flag "Kilo" hauled down. The Man Aloft Chit is to be returned to the CSE office.

4.5 PERSONNEL WORKING OVER THE SIDE

Table 6: Over the Side Procedures
Inform the OOD/OOW.
Check with the Duty Tech/EOOW to confirm that no hazard from overboard discharge exists.
Don all applicable safety equipment (life jacket, hard hat, goggles, ear defenders). Attach safety lanyards to all tools.
Ensure "Code Romeo Yankee/Flag "Kilo" are hoisted (Figure 4.5-2).

Figure 4.5-2 - Code Romeo Yankee

c. Upon completion of working over the side, the OOW/OOD is to be informed. He/she will order "Code Romeo Yankee" hauled down.

4.6 HEAVY WEATHER PRECAUTIONS

a. Before encountering heavy weather, the ship should rig rough weather lifelines. These are wire rope lines rigged across open areas of the upper decks to facilitate the safe movement of personnel who have to move about the upper deck in the execution of their duties. The wires (13 mm dia GFSWR 6 x19) are shackled either to the superstructure or to removable stanchions that are rigged in conjunction with the lifelines. To move along the lifeline, personnel use safety harness that clips on an off the lifeline as required.

b. If there is a requirement for personnel to work on the upper decks in rough weather, the following safety precautions must be followed (Table 7).

Table 7: Heavy Weather Precautions
Obtain permission from the OOW.
Keep the team as small as sensibly possible (no less than two).
Don positive buoyancy life jacket and safety harness (mandatory), safety goggles (as required).
Inform the OOW upon completion.

4.6.1 Upper Decks Out of Bounds

c. When the OOW places the upper decks out of bounds, a precautionary pipe will be made and the POOW shall ensure doors and hatches are dogged down and the Out of Bounds signs are posted on all exit routes leading to the upper deck. The POOW will then advise the OOW when the signs are posted. The pipe "Upper Decks are Out of Bounds" shall be made at each watch turnover. Signs shall be designed IAW para 4.6(d) to this article and placed IAW the table below.

Table: 8 Upper Deck EXIT Points Sign Location				
PROTECTEUR CLASS	**HALIFAX CLASS**	**IROQUOIS CLASS**	**KINGSTON CLASS**	**ORCA CLASS**
FWD BRIDGE WING DOORS	PORT AND STBD BRIDGE WING DOORS	#3 ROPE STORES TO AX	MCR FLATS TO 1 DK	IAW MOG 4 SOPS
BRIDGE FLATS TO STBD SIDE BRIDGE WING	PORT AND STBD BRIDGE PASSAGEWAY DOORS	AFT DECOMTAM STBD SIDE TO AX	HATCH 01 DK FROM 1 DK IN FRIDGE FLATS	
BRIDGE FLATS TO STBD AFT BRIDGE WING	ANCHOR CAPSTAN COMPARTMEN T TO FX	#3 ROPE STORES TO VDS WELL	CCR ON 01 DK TO BOAT DK	
WARDROOM FLATS TO RAS DECK AFT	1 MESS LOBBY TO FX	PAINT LOCKER TO AX	01 DK FROM CO FLATS TO 01 DK (BEHIND 40mm GUN)	
PAY OFFICE FLATS TO STBD SIDE TOP PART SHIP	FWD BREEZEWAY TO FX	PORT AND STBD 2 DK TO AFT BREEZEWAY	FWD BRIDGE DOORS	
FWD CLEANSING STATION IN SHIPS OFFICE FLATS	AFT BREEZEWAY TO TOP PART SHIP	FWD HANGAR DOORS TO BOAT DECK	AFTER BRIDGE DOORS	
FWD STBD SIDE	FWD HANGAR	AFT HANGAR DOORS TO		

DISPERSAL AREA TO STBD TOP PART SHIP	DOORS TO MISSILE DECK	FLIGHT DECK		
PORT AND STBD CARGO DOORS	PORT AND STBD HANGAR LOBBIES TO FLIGHT DECK	STBD TOP PART 1 DECK FLATS		
PROBE SHOP TO TOP PART SHIP	SOLID WASTE HANDLING LOBBY TO MISSILE DECK	BRIDGE WING DOORS		
AFT CLEANSING STATION TO LIBRARY FLATS	AX	PORT AND STBD EWER FLATS TO FLAG DECK		
COOKS OFFICE FLATS TO STBD BREEZEWAY		#1 SOLAR TO FX		
PORT HANGAR FWD TO BOAT DECK		FWD DECONTAM TO FX		
C&PO LOUNGE TO PORT BREEZEWAY		CABLE DK TO FX		
MS & BELOW LOUNGE TO STBD BREEZEWAY				
PORT SIDE HANGAR AFT TO FLIGHT DECK				
STBD SIDE HANGAR AFT TO FLIGHT DECK				
DECK OFFICE FLATS AFT TO AX				

d. Upper Decks are Out of Bounds signs shall be in both official languages and placed in accordance to the table to this article. The sign shall have a red background with white letters (40 mm in height) with 3/8" holes in each corner with bungee cord secured. The signs shall be positioned on the doors, hatches and ladders such that they inhibit egress.

UPPER DECK
OUT O UPPER DECK
OUT OF BOUNDS

LES PONTS SUPERIEUR
SONT HORS-LIMITE F BOUNDS

Figure 4.6-1 – Upper Deck Out of Bounds Sign

4.7 NON-IONIZING RADIO FREQUENCY RADIATION HAZARD (RADHAZ)

The emissions from ship's radars and radio transmitters can pose significant danger to personnel. With respect to seamanship, the risk occurs when equipment such as boat davits, cranes and kingposts become energized by transmissions coming from antennas in the immediate vicinity. In this case, simply touching them can cause severe burns. For example, in HALIFAX Class ships, the area used to launch the Zodiac is very close to the 35-ft. HF antennas. If the ship is transmitting at high power while Rescue Stations is piped, the crane operator risks being burned if he/she attempts to operate the crane prior to transmissions ceasing. Therefore the crane will not be operated until RADHAZ safe has been piped on the upper deck circuits. Each ship follows detailed instructions on out-of-bounds areas and on procedures to be followed. All personnel must understand the regulations involved in using the affected equipment. When in doubt, the subject matter experts to consult are the members of the CSE Department. Further guidance is given in MARCORD 43-02

4.8 HAZARDOUS MATERIAL (HAZMAT) AND WORKPLACE HAZARDOUS MATERIAL INFORMATION SYSTEM (WHMIS)

a. Ships carry many types of hazardous materials which are used by Boatswains, such as paints and cleaning solvents. All precautions should be taken to ensure hazardous material is handled and stored properly. In the event that a HAZMAT spill occurs, vacate and confine the compartment while concurrently raising the alarm. The emergency pipe will be ordered made by the OOW/OOD. The HAZMAT Clean-up Team, consisting of CSE personnel, will close up and conduct the cleanup.

b. HAZMAT considerations are coupled with the Workplace Hazardous Material Information System (WHMIS). Members of the ship's supply department are the onboard WHMIS experts, but all personnel should receive WHMIS training. Information is given to the ships by the product suppliers in the form of product labels and/or accompanying Material Safety Data Sheets (MSDS). The information is passed to the

ship's company through training, labels, and the MSDS. When in doubt about a product, clarification must be sought prior to use. Further guidance is given in MARCORD 66-5

4.9 SAFETY COMMITTEE

a. All ships are to have a safety committee charged with the onboard implementation of Command safety directives and the resolution of any current safety problems that affect, or may affect, the safety of the ship's company. The committee shall be chaired by the Safety Officer, with the membership including Heads of Departments or their representatives. The committee shall meet at least once every month.

b. The ship's safety organization is responsible for organizing safety education and training. The training shall be designed to suit the work environment and to familiarize personnel with potential hazards, special work requirements, safety rules and protective equipment requirements. It is important for all sailors to know that any safety concerns that they observe and report will be dealt with promptly by the Safety Committee.

4.10 SURVIVAL AT SEA

4.10.1 Life Rafts

a. Although the Canadian Shipping Act and SOLAS regulations, do not apply in respect of a vessel, facility or aircraft that belongs to the Canadian Forces or in respect of any other vessel, facility or aircraft that is under the command, control or direction of the Canadian Forces. All HMC Ships and Submarines, CF Auxiliary Vessels and all other Canadian naval vessels should attempt to follow the act and its subordinate safety regulations whenever practical and carry sufficient rafts and other rescue equipment. Therefore ships carry sufficient life rafts for the entire ship's company plus 10%.

b. The life rafts are located on the upper decks and are held in their cradles by hydrostatic release devices. These devices will release when immersed in 1.5 to 4.6 m of water. The life raft can also be released manually by slipping the senhouse slip and launching the life raft overboard. The life rafts are designed to hold 20 personnel, with provisions for three to four days. Life rafts must be landed annually for inspection. The ships staff are to conduct a visual check of the life rafts monthly to ensure that the containers are not cracked nor the seals broken, and that the life rafts are firmly secured in the cradles by the lanyards attached to the hydrostatic release devices.

Figure 4.10-1 - Life Raft Inflated

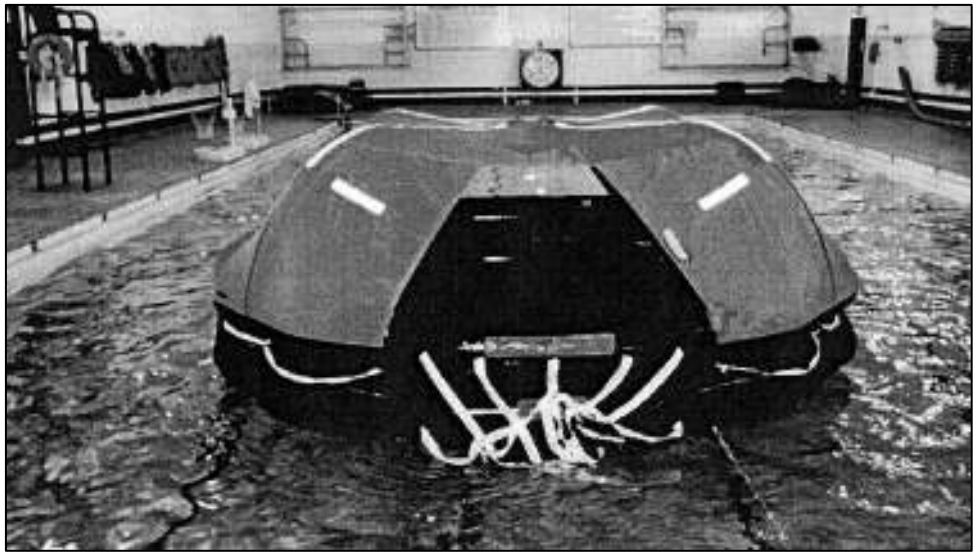


Figure 4.10-2 - Life Raft Survival Pack

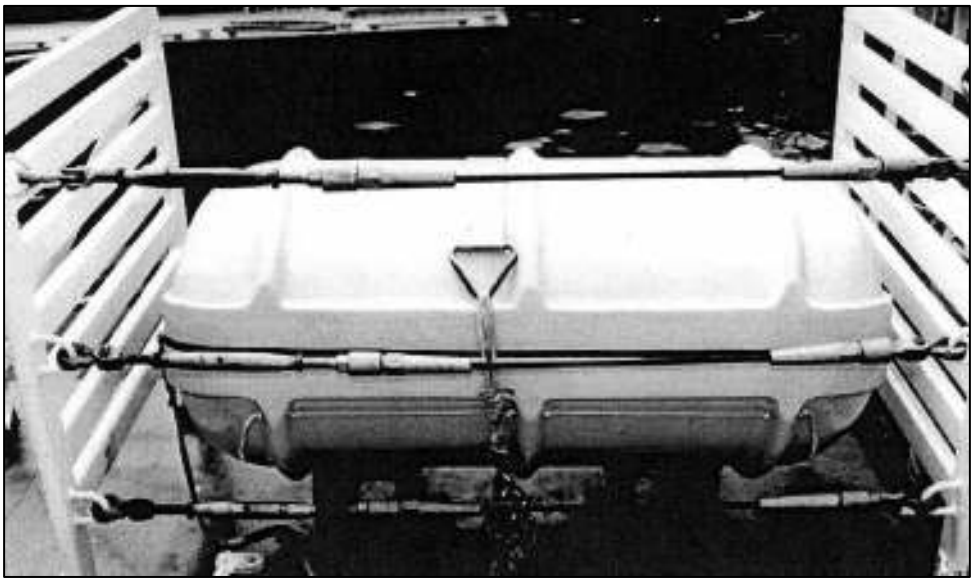


Figure 4.10-3 - Life Raft Container

Figure 4.10-4 - Hydrostatic Release Device

4.10.2 Life Jacket Container

Ships also carry life jacket containers which hold life preserver yokes (PFDs). Each life jacket container carries 40 life jackets.

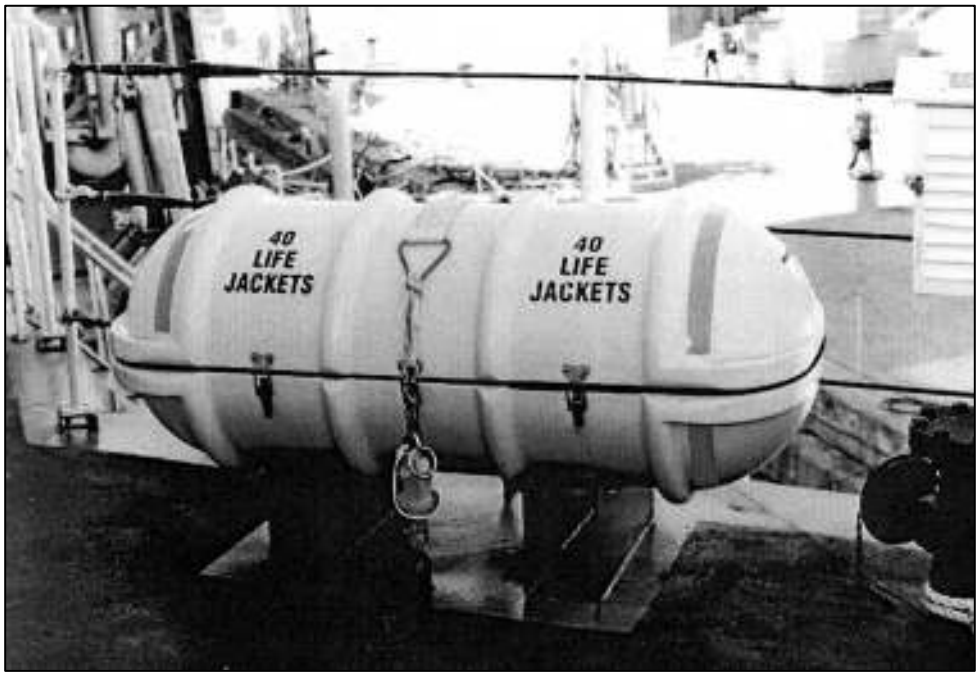


Figure 4.10-5 - Life Jacket Container

4.10.3 Flotation Devices – Definitions

There are a variety of flotation devices used in the Navy: the Mustang floater jacket/suit, the life preserver yoke (maritime pouch), the positive buoyancy life jacket and the hazardous duty life preserver. Whenever there is a danger of personnel falling into the water, one or a combination of flotation devices are to be worn. As with all other safety equipment, they must be worn properly and inspected prior to donning.

a. **Life Preserver:** A floatation device worn on the upper portion of the body that will turn an unconscious person upright onto their back within 5 seconds of entering the water. A life preserver may be inflatable or inherently buoyant.

b. **Personal Floatation Device (PFD):** Will maintain a person afloat in the attitude in which he/she entered the water. Every member of a ship's company is issued his/her own PFD. A PFD by definition is not a life preserver.

Figure 4.10-6 PFD

4.10.4 Life Preserver: Yoke, Maritime Pouch

This is a life preserver, containing 35 lbs of buoyancy; inflated manually by activating the CO_2 cylinder, with an oral inflation tube for increasing or decreasing air pressure. Accessories include skull cap, emergency light, sea-dye marker, whistle, hand-rescue loop, and buddy line. This Life Preserver is intended for general purpose use, and the PFD is worn, uninflated, over the head by line handlers.
his life preserver automatically inflates upon being immersed in water, has the capability of being manually inflated by activating the $C0_2$ cylinder, and has an oral inflation tube for increasing or decreasing air pressure. This Life Preserver may be worn alone or it can be zipped to the floater jacket. This is also a life preserver and contains 35 lbs of buoyancy used when working in exposed positions when the foam-filled positive buoyant PFD is too bulky to wear. Accessories are the same as maritime pouch.

Figure 4.10-7 - Hazardous Duty Life Jacket

4.10.8 Mustang Floater Jacket and Floater Suit

a. **Jacket, Buoyancy Aid (WX jacket or floater coat).** Black in colour, available in different sizes, provides hypothermic protection and contains 16 lbs of buoyancy. This is a PFD and not a life

preserver. It contains a special beavertail to protect the groin area from the effects of hypothermia. The life preserver, yoke hazardous duty, can be zipped to this jacket. Use is general purpose, used as protection during cold wet weather. Although rain resistant the jacket is not designed as a raincoat.

b. **Coveralls, Anti-Exposure.** Available in various sizes, flame orange colour, provides hypothermic protection and contains 15 lbs of buoyancy. This is a PFD and not a life preserver. Use is general purpose, used by boat crews and personnel during upper deck evolutions when the floater jacket does not provide adequate protection against hypothermia. The current issue has the following improvements: enhanced waterproofing, neoprene wrist closures, Tug-Tites at thighs and ankles that cinch easily around boots, ergonomic insulated hood easily folds into the collar, two chest pockets, new slash hand warmer pockets and extra large pockets at hips. HDLJ can be attached to the zipper.

Figure 4.10-8 - Floater Suit and Floater Jacket

4.10.9 Chemical Light/Personal Marker Light

a. Chemlites come in many shapes, sizes and colours and are used for many purposes at sea. They all have two chemicals inside a sealed plastic container. One of the chemicals is in a small glass vial. When the Chemlite is squeezed or bent, the vial breaks, allowing the two chemicals to mix, producing light. The duration and intensity of the light is dependent on the type of Chemlite.

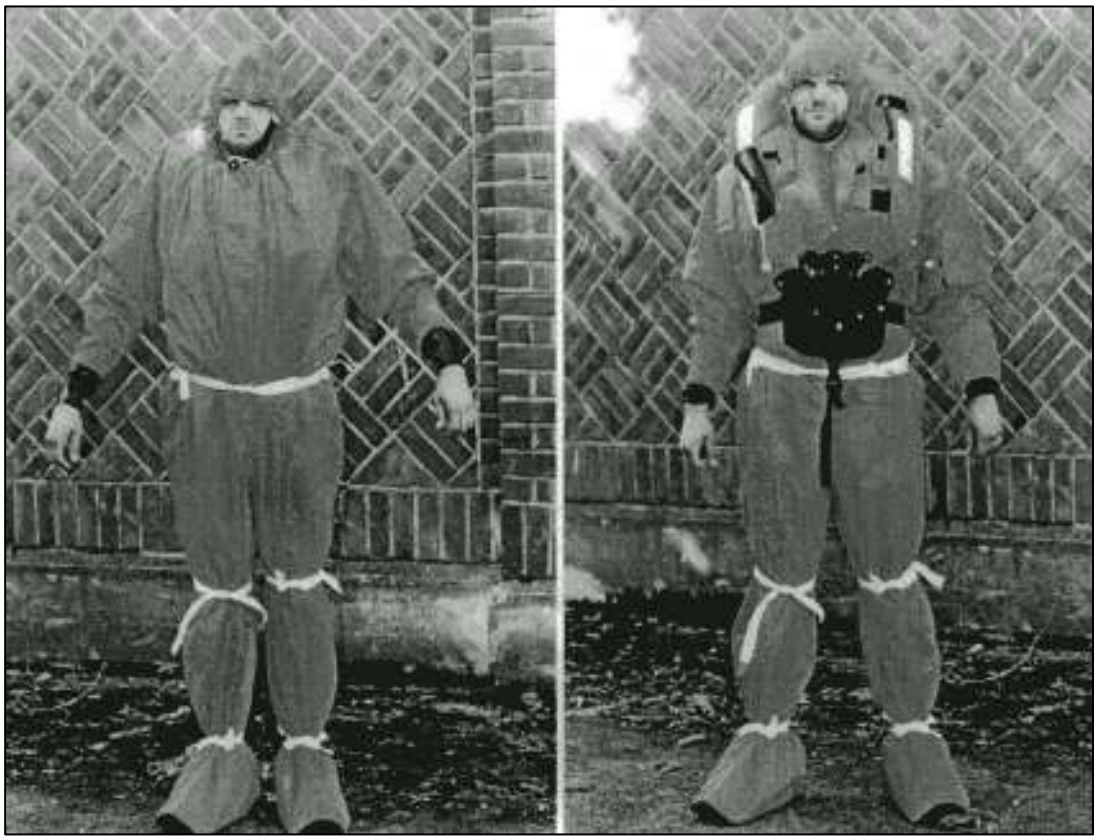
b. Personal Light Markers are green Chemlites that have a metal clip and a cover. When activated they will last 8 to 12 hours. All personnel should have a Personal Light Marker attached to their outer clothing when conducting upper deck evolutions. The Chemlite is activated by removing the cover and squeezing the handle (which breaks the vial and allows the two chemicals to

mix). This can be done with one hand if required. It is not mandatory to activate the PML during seamanship evolutions.

Figure 4.10-10 - Personal Marker Light

4.10.9 Ship Abandonment Suit (SAS)

The Ship Abandonment Suit is a one piece/one size suit designed to significantly delay the onset of hypothermia, or other exposure hazards, in the event that the ship must be abandoned. One is issued to each person in the ship's company. The SAS is to be donned prior to entering the water and may be worn under or over the PFD.



PFD Underneath **PFD Over Top**

Figure 4.10-10 - Ship Abandonment Suit (SAS)

NOTE: *All shipboard personnel are to receive regular refresher training from IAW CFCD 102 on use of the survival-at-sea equipment described in this chapter.*

CHAPTER 5

Rigging and Deck Gear

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5.0 INTRODUCTION

This chapter discusses the rigging used in the Canadian Navy. Each section covers the minimum care and maintenance required for the equipment. Testing of all rigging is to be carried out every two years. Rigging used for lifesaving and personnel transfer is to be tested annually. Rigging that has been exposed to excessive strain or shock-loading is to be tested as soon as possible. It is the responsibility of the ship to liaise with Fleet Maintenance Facilities (FMF) to ensure testing is done within the time requirements.

5.1 INTRODUCTION TO TYPES OF ROPE

Most ropes can be described as belonging to one of three main types:

(**1**) Natural Fibre Cordage (NFC);
(**2**) Man-Made Fibre Cordage (MMFC); and
(**3**) Steel Wire Rope (SWR).

In the Canadian Navy, rope is described in terms of its diameter measured in millimetres (mm), the type of construction, and the material from which it is made (e.g., a 36 mm braided polyester).

5.2 CONSTRUCTION, CHARACTERISTICS AND DETAILS OF SUPPLY OF NATURAL FIBRE CORDAGE

Use of natural fibre cordage in the Canadian Navy has dwindled in recent years, primarily because man-made fibre cordage is stronger, harder wearing, more cost-effective, and in most circumstances, more functional than natural fibre cordage. However, natural fiber cordage is still required for certain tasks, and this requirement is likely to continue for the foreseeable future.

5.2.1 Construction

a. Natural fiber ropes are made from fibers of varying lengths depending upon their source. The first process is to comb out these fibers into a long even ribbon as shown in Fig 5.2-1.

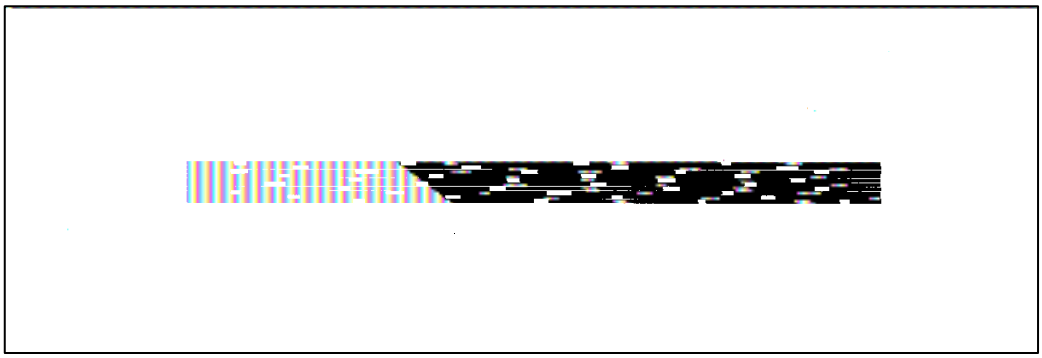


Figure 5.2-1 - Fibers of a Rope

b. The ribbons are then twisted up into yarns, and according to the twist given, it binds the fibers firmly together so that they hold, by friction, when the yarn is subjected to strain. This process is known as spinning, and the yarns are said to be spun left-handed or right-handed according to the direction of the twist.

c. Next, a certain number of yarns are twisted together to form strands. The number and size of yarn to make each strand depends on the size of the rope it is intended to make. This stage is known as twisting the strands and, again, the twist can be left-handed or right-handed.

d. Three or four strands are now made up into a left-handed or right-handed rope. This process is called laying or closing, and is always carried out in the direction opposite to that used in the previous stage of twisting the strands. It is distinct from the simple spin or twist and is two-fold in that:

(**1**) the strands are twisted up together to form the rope, and at the same time;
(**2**) the strands are rotated individually in the direction of the original twist.

Were this not done, laying the strands up together would tend to untwist the yarns in each strand.

e. As the rope is laid up, its length contracts like a coiled spring, giving it a certain elasticity. The harder the twist given to the strands in laying, the shorter will be the resultant rope. Thus, a rope is said to be hard-laid, ordinary-laid or soft-laid rope. In practice, three strands of 275 m in length lay up into a rope of about 220 m in length. Three strands so laid up constitute a hawser-laid rope (Fig 5.2-2). Right-handed hawser-laid rope is the only type of natural fiber cordage now used in the Canadian Navy.

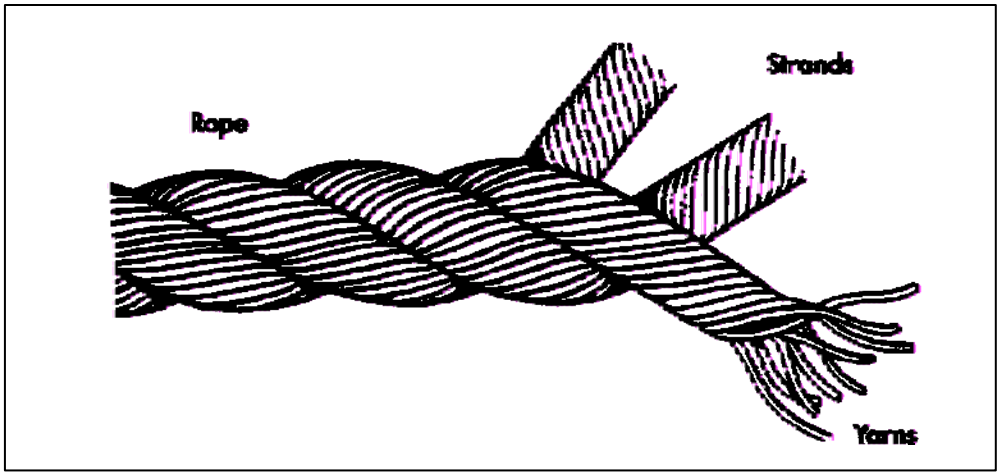


Figure 5.2-2 - Rope Construction

5.2.2 General Characteristics

a. The strands tend to unlay unless the end of the rope is whipped (i.e., firmly bound) with twine.

b. The rope will stretch under load and will not completely recover when the load is removed.

c. The rope acquires a permanent and irreversible set; the higher the load in relation to the breaking strength, the greater the set. The set may be observed by the extension in length and reduction in diameter when the rope is slack and will eventually render the rope unfit for service. The older and more worn the rope, the less elasticity it will possess and the weaker it will become.

d. Rope under load will tend to twist in the opposite direction to that of its lay and thereby tend to unlay itself, but it should regain its normal form when slack.

e. When wet, NFC will usually shrink in length in proportion to the amount by which it swells in diameter, but it will recover its original length when dry and after use.

f. Rope which is continually subjected to heat and damp will lose its elasticity and strength sooner than rope used under normal conditions of temperature and humidity.

5.2.3 Materials Used

Manila is the only natural fiber rope used by the Canadian Navy. The fibers of the rope are treated with a rot-resistant solution during the first stage of rope making when the fibers are combed into ribbons. Manila rope is made from the leaf fiber of the **abaca** plant, which is grown in the Philippine Islands and shipped from the port of Manila (hence its name), as well as from Sumatra and Borneo. When new and untreated, it is deep golden-brown in colour. The rope is flexible, durable and strong when compared with other natural fiber ropes. It is impervious to salt water and stands up well to

wear and tear. Its advantages over man-made fiber cordage are that it stretches less, will surge more readily around a winch or capstan, and does not fuse when heated. It is used primarily for lashing when securing for sea and as the easing out pendant when performing replenishment operations.

5.2.4 Strength

A method of finding the approximate Breaking Strength (BS) of manila cordage is to divide the square of the diameter of the cordage in mm by 200, the answer being in tonnes. This allows for a good margin of safety. To estimate the strength of a rope, which is well worn, but in good condition, apply the formula as for new rope, using the actual and not the nominal diameter. However, the only really reliable method by which the strength of a rope may be determined is to test a sample of the worst part of the rope to destruction.

Example: 25 mm line BS = 25 x 25 ÷ 200 = 3.125 tonnes

5.2.5 Care and Maintenance of Natural Fiber Cordage

a. Natural Fiber Cordage (NFC) does not have a permanent elasticity limit. The life of a rope depends on the frequency with which it is used under strain, since the fibers tend to slip a small amount under each load in spite of the twist given during manufacture.

b. NFC should not be stowed away while it is wet; if this is unavoidable, the rope must be brought out and dried at the first opportunity.

c. Although any rope in good condition can be confidently expected to bear its full working load with ease, allowance for wear must be made in assessing the full strength of used rope, particularly when it has been subjected to hard conditions.

d. Before estimating the strength of such a rope it should be examined for damage, chafe, rot and fatigue. Serious damage can be seen when the strands are distorted and bear unequal strain, or when the rope becomes opened.

e. Rot can be detected by the smell of the rope and by opening out the strands and examining their inner surfaces. Should they be healthy and strong, all is well; if they are powdery, discoloured, weak or can be plucked out, rot exists and the rope should be condemned.

f. Rope may also be subject to chemical attack. Many rust-removal compounds are based on phosphoric acid, which has a disastrous effect on natural fiber and, for this reason, cordage should always be protected from contamination.

NOTE: *If doubt exists as to the serviceability of a rope, the rope should be condemned.*

5.3 CONSTRUCTION, CHARACTERISTICS AND DETAILS OF SUPPLY OF MAN-MADE FIBER CORDAGE (MMFC)

a. In 1939 a new man-made yarn known as nylon became available to the cordage industry. From the outset it was evident that this synthetic fiber possessed such remarkable qualities that a great advance had been made in the cordage industry. The technical name for nylon is polyamide. Both names are interchangeable but the former is preferred in the Canadian Navy to distinguish it from other synthetic materials that were subsequently developed and are used for cordage manufacture. These latter materials are polyester and polypropylene. The most recently developed, Kevlar, is a derivative of nylon.

b. The various man-made fiber ropes have different characteristics, which make them specially suited for specific tasks. For example, nylon has greater elasticity than polyester and is therefore suitable for use as towing hawsers. Polyester, because of its relatively low elasticity and excellent weather and abrasion resistance, is suitable for berthing ropes, replenishment lines and halyards. Staple spun polypropylene is appropriate when light, floating, easily handled ropes such as towing hawser messengers and swimmer recovery lines are required. Kevlar is at present used only for berthing lines. Cordage made from man-made fiber is naturally rot-proof and almost impervious to water.

c. Unless specially treated, man-made fiber cordage, except for Kevlar, will stretch far more than natural fiber cordage. This stretch ranges from 25-30 percent for polypropylene to 45-50 percent for nylon at breaking load. All man-made fiber ropes can be considered non-flammable in that they do not readily ignite or burn with a flame. In the molten state, these materials will burn but only at a temperature approximately twice that of their melting point.

5.3.1 Construction

Nylon, polyester and polypropylene all fall into the polymer group. Nylon is produced from coal where as the remainder is produced from oil. Most man-made fibers are made from either continuous filaments, or yarns of staple fibers. However, polypropylene ropes can be manufactured from multi-filament, monofilament, staple or film-fiber. Details are as follows:

a. **Staple.** These fibers vary in length, which is determined by the processing machine on which they are to be used. For rope making, the staple length varies between 150 mm and 1300 mm. Although weaker than continuous filament cordage of equivalent size and material, staple spun cordage is ideal in applications where a good grip is required.

b. **Multi-filament.** These yarns are composed of a number of very fine filaments of circular cross section twisted together, each filament being continuous throughout the yarn length.

c. **Monofilament.** These are usually circular in cross section and are continuous throughout their

length. Micrometer-type gauges are used to measure their diameter, which, for rope making, can range from 0.125 mm upwards.

d. **Film-fiber.** Film-fiber is composed of fibrils produced by longitudinal splitting when an extruded tape or ribbon is twisted into a yarn.

e. **Hawser-laid.** Hawser-laid, man-made fiber ropes are manufactured in the same manner as natural fiber ropes; that is, three strands laid up with a right-hand twist (Fig 5.2-2). Each strand is composed of a sufficient number of uniform filaments of specified polymer to give the rope the required strength. A higher twist is imparted to the man-made strands than to those of natural fiber, and the ropes are subjected to a form of heat treatment to stabilize the lay and thereby reduce the tendency of the strands to separate in service. It is important that the twist and balance of the lay should be undisturbed, especially when being spliced.

f. **Braided Rope.** This rope, known commercially as core/cover rope, is constructed by crossing and recrossing the yarns or strands in 'maypole' fashion such that each yarn or strand passes alternatively over and under one or more of the others to form a circular tubular sheath, which contains a core. All braided ropes in the Canadian Navy fall into this category: a braided sheath around a braided core (Fig 5.3-1).

Braided construction gives certain advantages over hawser-laid ropes. They have good flexibility and are easy to handle when wet or dry, new or worn, are non-rotating and will not kink. They provide more grip on capstans or warping drums because of the greater contact area.

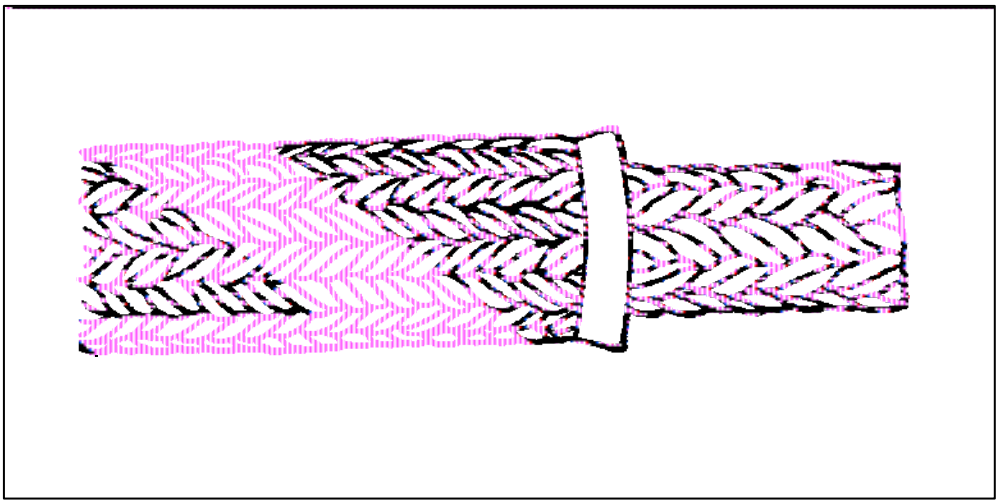


Figure 5-3.1 - A Braided Rope with Braided Core

5.3.2 Characteristics

a. **Nylon.** This multi-filament cordage is approximately two and a half times as strong as manila of equivalent size. It stretches by almost half its length before parting, but gives little, if any, warning that it is about to reach the limit of its stretch. Used within its safe working load, it will stretch approximately 25 percent of its length and still retain recovery. It does not float and it loses approximately 10 percent of its strength when wet. The melting point is 240-260 degrees C and it is virtually unaffected by temperatures of -80 degrees C. Nylon has good weather and abrasion resistance and a high resistance to alkalis, but low resistance to certain acids. For example, strong sulphuric acid will dissolve the fibers. The energy absorption qualities are excellent and are retained to a significant degree during repeat loading.

b. **Polyester.** This multi-filament cordage is nearly twice as strong as manila of equivalent size. It stretches approximately 35 percent before parting. Used within its safe working load, it will stretch 14 percent of its length and still retain excellent recovery. The strength is virtually unchanged when wet, it does not float, the melting point is 240-260 degrees C and it is virtually unaffected by temperatures of -80 degrees C. Polyester has excellent weather and abrasion resistance and high resistance to acids but not to alkalis.

c. **Polypropylene.** This cordage is nearly twice as strong as manila of equivalent size and is the lightest in weight of the man-made fibers. It stretches up to 44 percent before parting. Used within its safe working load, it will stretch 17 percent of its length. It retains its strength when wet and has low water absorption. It will float indefinitely in water. The melting point is 160-170 degrees C. Polypropylene has high resistance to acids and alkalis. Multi-filament and monofilament Polypropylene is not normally used for load-bearing ropes.

5.3.3 Identification

All cordage supplied to the Canadian Navy comes with a test certificate and a certificate of conformity, on which are listed the date of manufacture, the standard to which the rope has been manufactured, and the guaranteed minimum breaking strength of the rope when new. To prevent confusion, particularly between nylon and polyester ropes whose external appearance is identical, where possible identification yarns are incorporated in man-made fiber ropes. However, with certain smaller ropes it is not possible for the manufacturer to include an identification mark, and so no common standard of identification exists. Therefore, the test certificate and certificate of conformity supplied with the rope should be regarded as the only reliable guide to the breaking strength of the rope. There is one test to determine the difference between nylon and polyester line. If the end of the line is burned and produces soot, the line is polyester. If the line does not produce soot, it is nylon.

5.3.4 Strength

The rule-of-thumb method of calculating the breaking strain of man-made fiber rope is to divide the square of the diameter by a known factor. Table 5.3-1 gives the approximate strength of new cordage according to its diameter (d) in mm. However, it is emphasized that the test certificate supplied with the rope is the only accurate guide to the breaking strength.

Table 5.3-1: Calculation for Approximate Breaking Strength of MMFC

Cordage	Formula for Calculating Breaking Strength
Nylon (under 32 mm)	$d^2/50$ tonnes
Nylon (32 mm and over)	$d^2/60$ tonnes
Polyester (under 32 mm)	$d^2/64$ tonnes
Polyester (32 mm and over)	$d^2/66$ tonnes
Polypropylene	$d^2/77$ tonnes

5.3.5 Uses

The principal service uses of man-made fiber ropes are as follows:

a. **Nylon.** Because of its elastic properties, it is used for towing hawsers, berthing lines, and light and heavy messengers during replenishment operations.

b. **Polyester.** Because of its low stretch, high strength and excellent weather and abrasion resistance, it also can be used for light and heavy messengers.

c. **Polypropylene.** Being a floating rope, it is used in its staple form for towing and light jackstay messengers. It is also used for boat ropes and as the recovery line for the rescue swimmer.

5.3.6 Care and Maintenance of Man-Made Fiber Rope

a. All ropes experience deterioration from unnecessary exposure to sunlight.

b. Avoid contamination by chemicals or fumes. If contaminated, wash with cold running water. Remove oil and grease with a mild soap solution.

c. Ropes must be stowed in bins or on raised boards to allow free circulation of air.

d. Ropes must not be stowed where there is excessive heat. Excessive cold makes the rope brittle.

e. Avoid unnecessary chaffing when possible by protecting the parts concerned with anti-chaffing material.

f. Normal wear is unavoidable and, if not excessive, is harmless. Replace lines if approximately 20 percent wear is evident.

5.4 HANDLING OF NATURAL AND MAN-MADE FIBER CORDAGE

5.4.1 Elementary Rules

The lessons which a seaman must learn before he handles a rope are explained below:

a. **The Seaman's Knife.** The seaman should regard his knife as his best friend. It should be worn on a belt around the waist. The seaman's knife is a tool not a weapon. The end of the blade should be rounded, not pointed, and the blade should be sufficiently deep and thick to cut without bending. The edge of the blade should be sharpened like a chisel to avoid wearing away the thickness and strength of the blade. Folding knives should be kept lightly oiled with special attention to the hinge.

b. **Rope Ends.** Before a rope is cut, a whipping should be applied to either side of the point at which the cut is to be made to prevent the rope from unlaying. The different methods of whipping are described later in this chapter.

c. **Coiling Down Ropes.** A heaving line, or any line or rope which is being hauled in, should be coiled either in hand or on deck as it is hauled inboard. This is an elementary precaution to ensure that the line or rope is immediately ready for further use.

5.4.2 Special Precautions when Handling Man-Made Fiber Cordage

Although the rules for handling natural fiber cordage and man-made fiber cordage are generally similar, the properties and characteristics of man-made fiber necessitate greater care in its handling. Many of the advantages of using man-made fiber ropes can become serious liabilities if the seaman is not familiar with certain characteristics of these ropes. When a man-made fiber rope parts, it immediately tends to regain its original length. Nylon when stretched over 40 percent is liable to part suddenly without audible warning. It then whips back along the line of tension and can kill or seriously injure anyone in its path. In the Navy, it is referred to as bolt. The following rules must be observed when handling man-made fiber ropes:

a. Men backing up a man-made fiber rope under tension on a capstan drum or any other holding surface must stand well back and out of the line of recoil of the rope.

b. When a man-made fiber rope is turned up on any holding surface and is in tension, a certain amount of heat is generated by friction between the rope and the holding surface. Should this heat approach the melting point of the fibers of the rope, the outer fiber will melt and create a lubricant, whereupon the rope in tension may surge violently. Therefore, it is essential that men

backing up a man-made fiber rope in tension on a capstan drum, bollards or any holding surface stand well back. The minimum distance between the first man backing-up the rope in tension and the holding surface should be 2 m. Should the rope surge violently, this distance of 2 m means that the first man backing up will have some warning before he is drawn dangerously close to the holding surface.

c. Ropes that have been subject to stretching, e.g., towing hawsers, should be given time to recover to achieve their natural length if they are to be reeled up. Recovery time may be as long as six hours for a towing hawser that has been under heavy load for long periods.

d. Do not pass man-made fiber and steel wire ropes through the same fairlead. The stretch is incompatible and the resultant chaffing of the man-made fiber will seriously weaken it.

5.4.3 Handling all Cordage

From the precautions listed above for the safe handling of man-made fiber cordage, the following detailed advice should always be practiced when handling any ropes or lines:

a. Avoid bad leads and sharp edges. Ensure thimbles or such fittings do not chafe or cut a rope.

b. As a general rule, rope should be veered rather than surged on a capstan or winch drum because surging induces friction and damages the surface of the rope. A rope should never be surged on a capstan or a drum that is rotating in the same direction (turning to veer). This is a dangerous practice and applies to steel wire rope as well as fiber rope.

c. Three turns are usually sufficient when hawsers are being hove in on capstans or drum ends. However, for heavy loading it may be necessary to take an extra one or two turns, giving due regard to the size and strength of the rope and equipment involved.

d. If surging around bollards is necessary, it should be done before the strain on the rope is heavy. Great care must be taken when easing out a rope around bollards if it is heavily loaded.

5.5 PREPARING NATURAL FIBER AND MAN-MADE FIBER ROPES FOR USE

5.5.1 Coiling and Uncoiling

a. A rope laid out straight will have no tendency to twist or turn either way, whether its lay is left- or right-handed. From this position, it can be stowed on a reel or coiled down.

b. When stowed on a reel or hauled off a reel, a rope will not develop any twists or turns in its length. However, when coiling down a rope, the part of the rope remaining uncoiled will be given one twist or turn as each loop in the coil is formed.

c. When coiling down a rope, the end should be kept free to allow the uncoiled length to rotate and thus keep it free from becoming snarled up with kinks or turns.

d. Similarly, a rope which is run off a coil will acquire a twist or turn for every loop in the coil, but if the end is kept free, the rope will usually free itself of these turns when hauled out straight.

e. One method of avoiding these turns, should the end of the rope not be free, is to turn the coil around while coiling down the rope, thus turning the coil into a reel.

f. Another method, as when coiling direct from a reel, is to allow as long a length as possible between reel and coil; this length will absorb the turns until the end of the rope is free from the reel, and so can be freed of its turns.

g. Similarly, when coiling down a rope which is led through a block, the coil should not be made too near the block; otherwise a slight check may cause a kink to develop in the rope as it is running through and thus choke the luff (Fig 5.5-1).

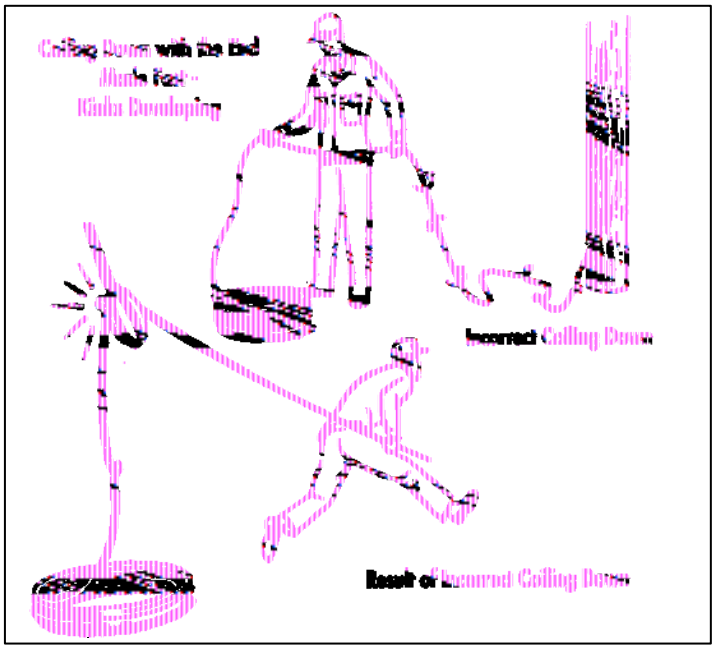


Figure 5.5-1 - Mistakes in Coiling Down

5.5.2 Coiling Down

Cordage is very resilient and will absorb a number of turns in its length without becoming snarled if the length is sufficient and the turns correspond with the lay of the rope; however, if the turns are against the lay, it will quickly become snarled. For this reason, rope of right-hand lay is always coiled down right-handed, and rope of left-hand lay is always coiled down left-handed.

5.5.3 To Coil a Rope for Running

Lay the rope as straight as possible along the deck. Begin coiling it down close to where the standing part is made fast, and lay each loop flat upon the other below it until the bare end is reached. The size of the loops should be as large as stowage space permits. The running part is now underneath the coil, so when the coil is turned over, the rope should then run out freely when required. Remember that the running part or end part should always be on top of any coil.

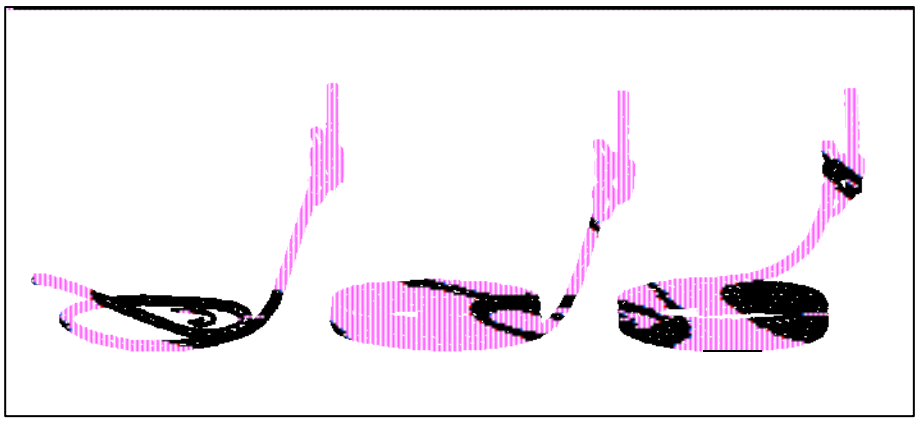


Figure 5.5-2 - To Coil a Rope

5.5.4 To Coil a Small Line in the Right Hand

When coiling in the right hand, the rope should be held with the right thumb pointing towards the end. The coil will then form correctly.

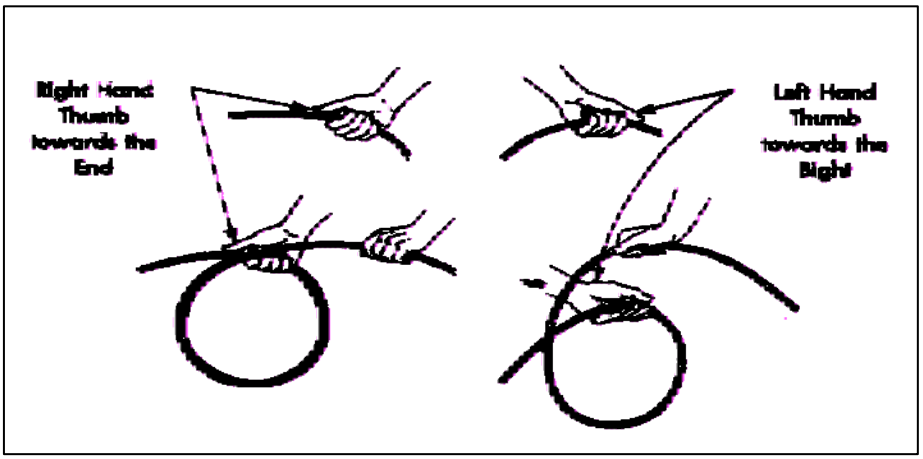


Figure 5.5-3 - Coiling a Line (right hand only)

5.5.5 To Thorough Foot a Rope

This is a method of joining two ropes by their soft eyes (Fig 5.5-4). The eye of Rope A is passed through the eye of Rope B, and the bight of B is then hauled through the eye of A, thus joining the ropes by their eyes. This method is not used for joining two ropes temporarily because it may take some time to unhitch them.

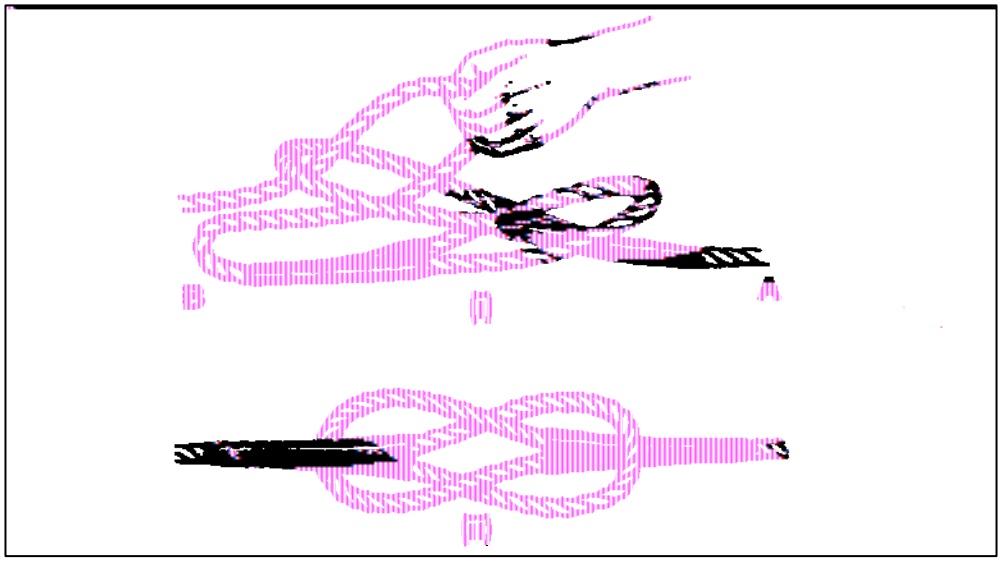


Figure 5.5-4 - Thorough Footing

5.5.6 To Fake Down a Rope

A rope that may have to be paid out quickly should be faked down in as long fakes as space allows. When faked, a rope does not acquire as many turns as when coiled, and it will therefore run out with less chance of becoming snarled. Care should be taken that each bight at the end of a fake is laid under that immediately preceding it to ensure a clear run.

Figure 5.5-5 - Faking Down a Rope

5.5.7 To Cheese Down a Rope

When a neat stow is required for a short end of rope, it may be cheesed down. This method should never be used when the rope will be required to be rove quickly through a block.

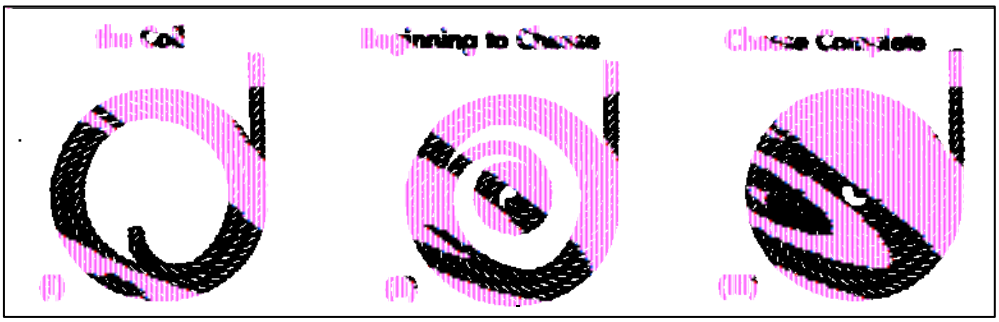


Figure 5.5-6 - Cheesing Down a Rope

5.5.8 To Turn Up a Rope to a Cleat

Take initial turns as shown in Fig 5.5-7. Continue with figure-of-eight turns around the horns of the cleat as many times as required. It will be seen that when the figure-of-eight turns are removed, the rope is ready to be checked under control. A rope turned up to a cleat must be ready for casting off at a moment's notice; therefore, the turns should not be completed with a half hitch because this may jam them. Cleats are not suitable for turning up wire rope.

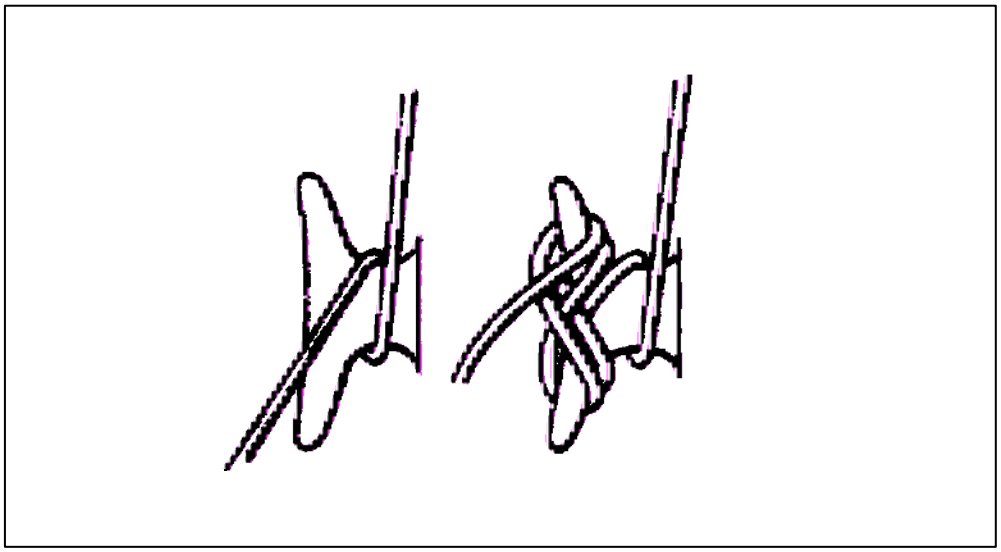


Figure 5.5-7 - Turning Up a Rope to a Cleat

5.5.9 To Hang a Coil on a Cleat

Whenever possible, a coil of rope should be hung up clear of the deck so as to keep the deck clear and the rope dry.

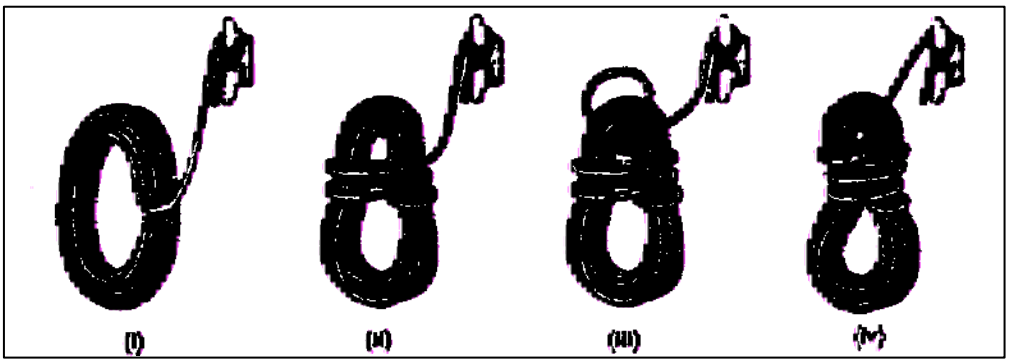


Figure 5.5-8 - Hanging a Large Coil on a Cleat

5.5.10 Handling New Cordage

a. **Opening a New Coil.** A length of rope is supplied to a ship in a compact, machine-wound coil bound with yarns or strands.

(**1**) To open up a new coil of rope of less than 48 mm diameter, roll it over until the outside end of the rope is at the top and pointing directly at you. Then turn the coil over towards the left and lay it flat on its side. The lashings are now cut and the inner end of the rope is pulled out from the centre. The rope will then leave the coil correctly and can be coiled down.

(**2**) With rope of 48 mm diameter or larger, the twisting involved in the preceding method is not acceptable and the coil must be unreeled in the opposite way to that in which it was made up. The coil should be placed on a turntable or slung so that it can be revolved. Cut the lashings and haul the rope off from the outside. If this method is not possible, stand the coil on its end and lap the rope off the top of the coil turn by turn. As each turn is removed, revolve the end of the rope to take out twists.

b. **Cutting off a Length of Rope from a New Coil.** The required amount of rope is hauled from the coil as previously described, and then the rope is whipped or taped at each side of the position at which it is to be cut.

5.5.11 Storage of Cordage

Coils of new rope should be stowed clear of the deck, in a cool, well-ventilated, dry place, to allow the air to circulate freely around them. Used rope should be hung in loose coils if this is practical. No cordage should be stowed in contact with bare steelwork. If cordage has to be stowed in the open, it

should be protected from sunlight because man-made fibers are susceptible to deterioration caused by the sun's rays.

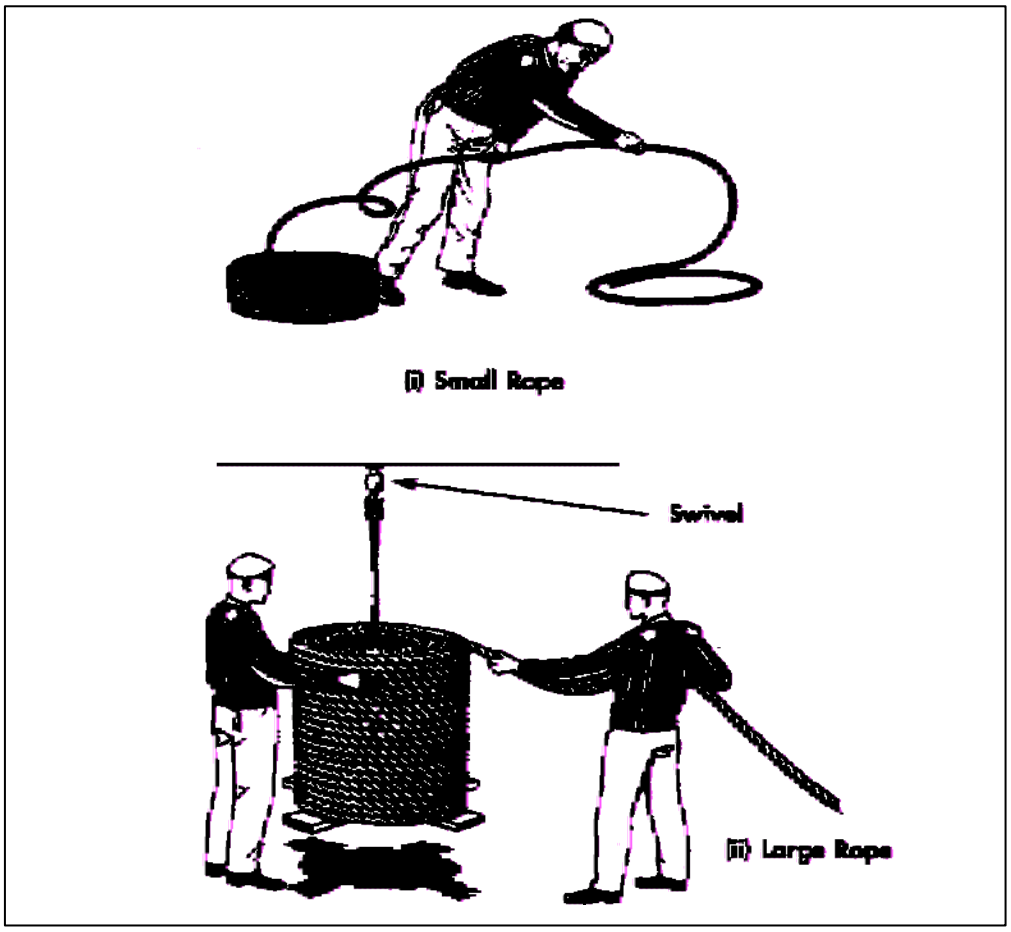


Figure 5.5-9 - Opening a New Coil

5.6 TWINES, LINES AND SPUNYARN

The following twines, lines and spunyarn are used in the Canadian Navy:

a. **Sailmakers (whipping twine).** Used primarily for applying whippings to ends of lines. It can be unwaxed or waxed and can also be used for sewing heavy canvas.

b. **Tarred Marlin.** Used primarily for mousing hooks and shackles or as a temporary whipping on wire rope when splicing.

c. **Sash Cord.** Used for making up heaving lines.

d. **Gunline.** Used with line-throwing guns or as a bolo line to establish contact between ships or the jetty over long distances.

5.7 BENDS AND HITCHES

Strictly speaking, a bend is a method of temporarily joining two ropes. A hitch is a method of temporarily joining a rope to a structure or ring. A knot is the intertwining of strands or smaller parts of rope(s) to prevent a rope from unreeling or to provide a handhold, a weight or a stopper on any part of a rope. These definitions have become blurred with time and all three terms are now virtually synonymous. Commonly used bends and hitches are described below.

5.7.1 Strength of Knotted Ropes

All knots, bends and hitches reduce the strength of a rope in that portion where the knot, bend or hitch is made. This reduction varies from 40 to 60 percent and should be kept in mind when putting a load on a knotted rope.

5.7.2 Terms Used

The following terms are used when describing the formation of the various bends and hitches:

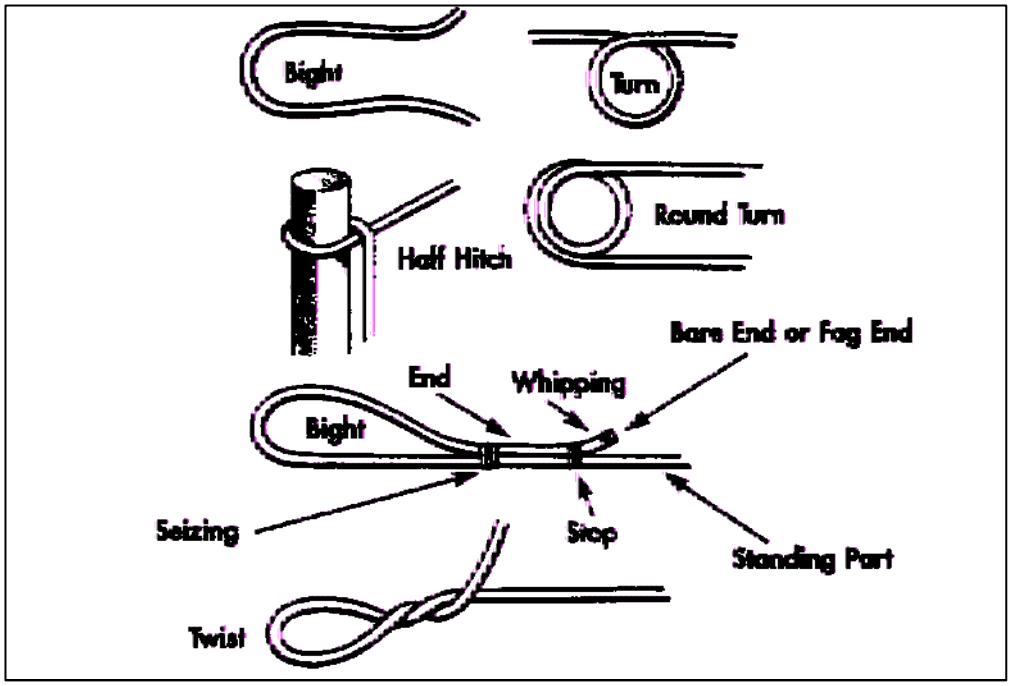


Figure 5.7-1 - Rope Terminology

a. **Bight.** The middle part of a length of rope. This term also refers to a loop of rope. To make a bight is to form a loop.

b. **End.** The short length at the end of a rope, which may be formed into an eye, or used for making a bend or a hitch with which to secure it. The end of a rope is also that length of rope left over after making such an eye, bend or hitch. The bitter end is the extreme end of a length of rope.

c. **Standing Part.** The part of the bight of a rope that is nearest the eye, bend or hitch, in contrast to the end.

d. **Stopper.** A light fastening for temporarily holding in place a rope or any other object. It is not meant to bear any strain other than that required to keep the rope or other object in place.

e. **Seizing.** A seizing is used to fasten two ropes or two parts of the same rope securely together in order to prevent them from moving in relation to each other.

f. **Whipping.** The binding around the bitter end of a rope to prevent the strands from unlaying.

5.7.3 Elements of Bends and Hitches

Most bends and hitches consist of a combination of two or more of the elements.

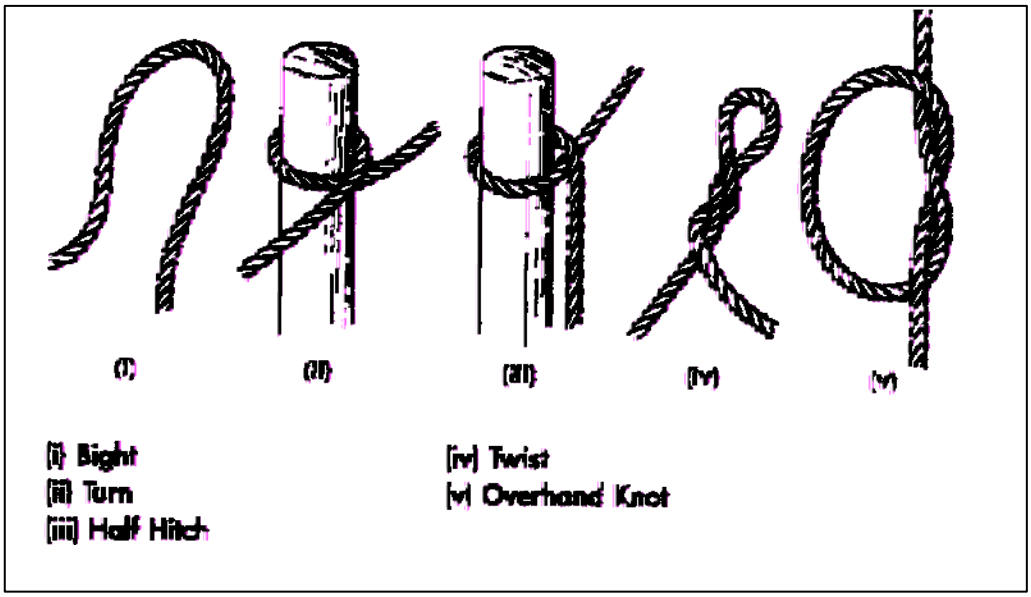


Figure 5.7-2 - Elements of Bends and Hitches

5.7.4 Reef Knot (Square Knot)

The reef knot consists of two overhand knots made consecutively and is used as a common tie for bending together two ropes of approximately equal size. It is not likely to come undone when there is no strain on the knot, but it is not reliable if the ropes are of unequal size or very slippery, unless the ends are seized back to their standing part. To form a reef knot, care must be taken to cross the ends opposite ways each time they are knotted (i.e., right over left, then left over right, or vice versa). Otherwise, the result will be a granny knot that will either slip or jam, depending upon whether it is made with or against the lay of the rope. A granny knot is also very likely to come undone when there is no strain on the knot.

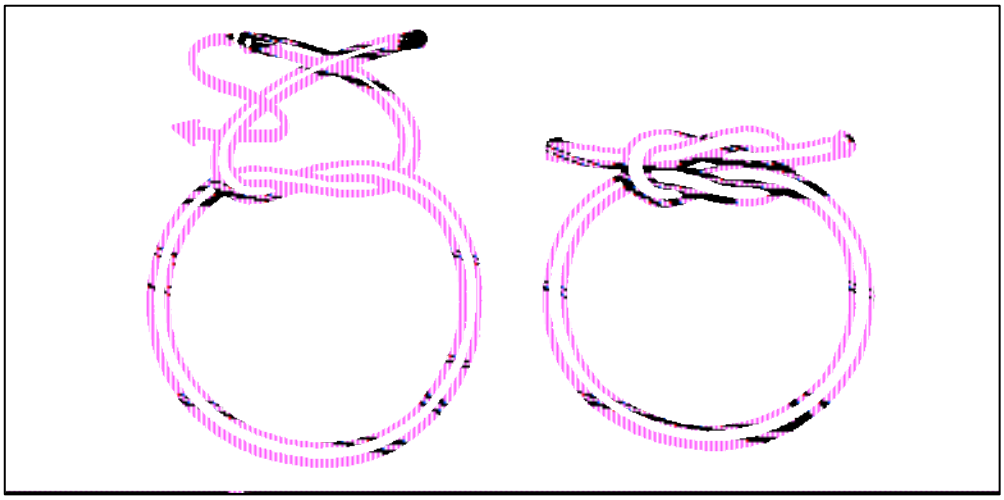


Figure 5.7-3 - Reef Knot

5.7.5 Figure-of-Eight Knot

This knot is used to prevent a rope from unreeving through a block or passing through a small fairlead.

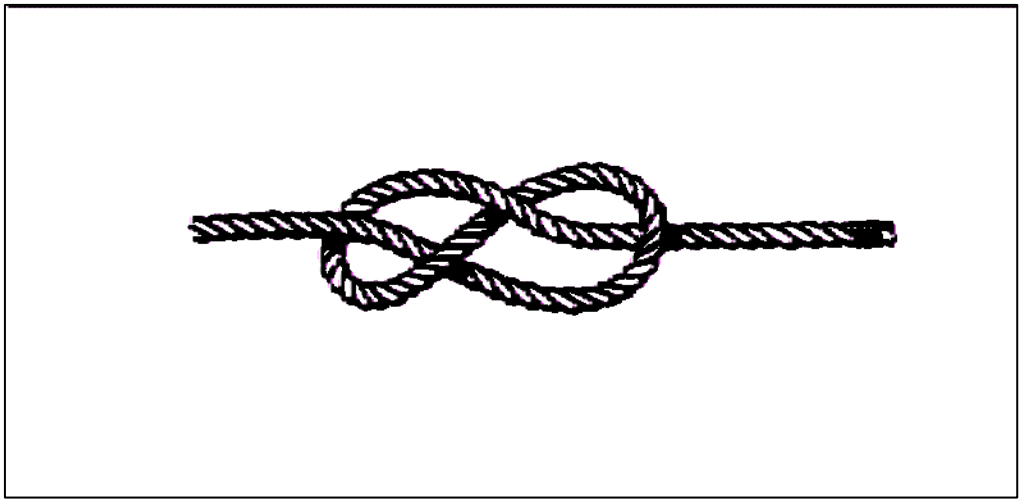


Figure 5.7-4 - Figure-of-Eight Knot

5.7.6 Marling Hitch

This hitch is used for lashing long bundles such as awnings. It will be seen from the illustration that in each hitch, the end is passed down through the bight, thus jamming that part against the bundle and enabling the lashing to be hauled taut. The operation of binding together ropes or yarns by a succession of closely spaced marling hitches is known as marling down. Marling is usually begun with a timber hitch if no eye is spliced into the end of the lashing.

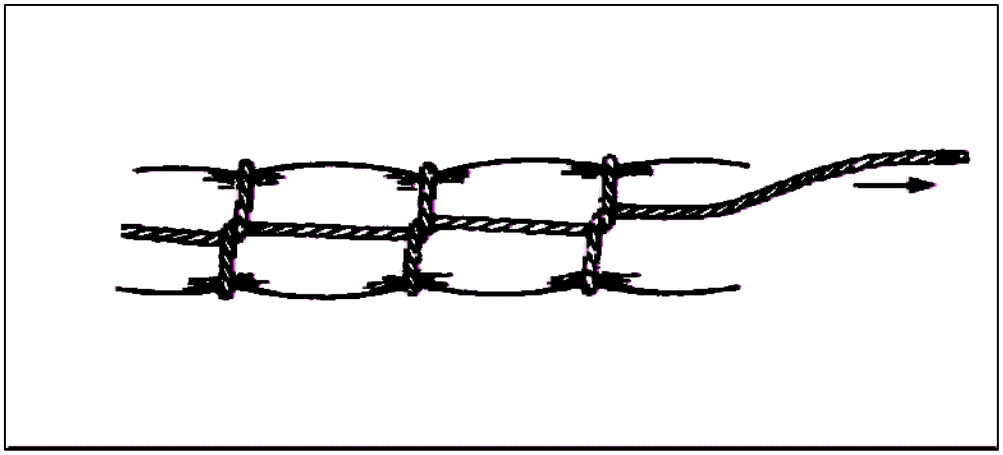


Figure 5.7-5 - Marling Hitch

5.7.7 Timber Hitch and Half Hitch

This hitch is used to tow, hoist or lower a spar. If the spar is tapered, it should be towed or hoisted thick end first, with the timber hitch at the thin end and the half hitch at the thick end.

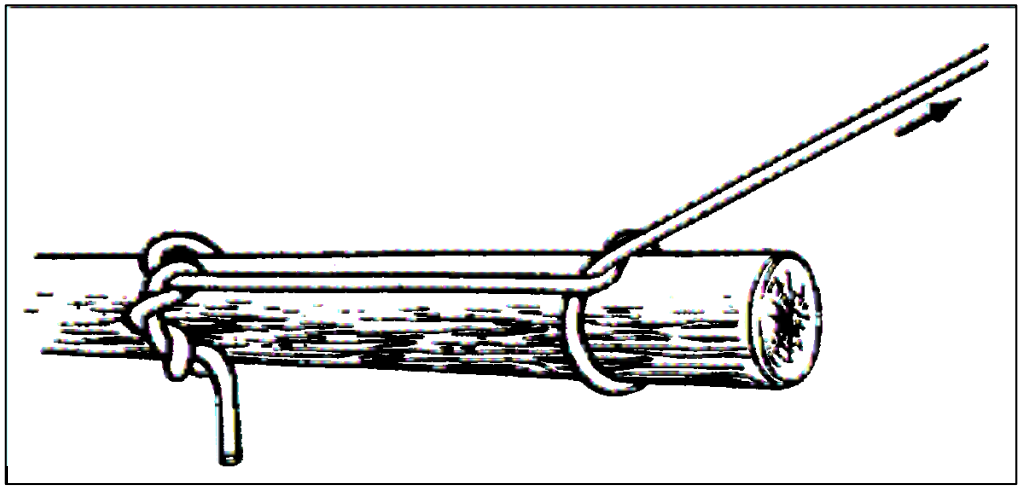


Figure 5.7-6 - Timber Hitch and Half Hitch

5.7.8 Clove Hitch

A Clove Hitch is used to secure a rope to a spar, rail or similar fitting, as well as for many other purposes. It will slip along the spar or rail if subjected to a sideways pull. It can be made with the end or with the bight of a rope, as illustrated in Fig 5.7-7.

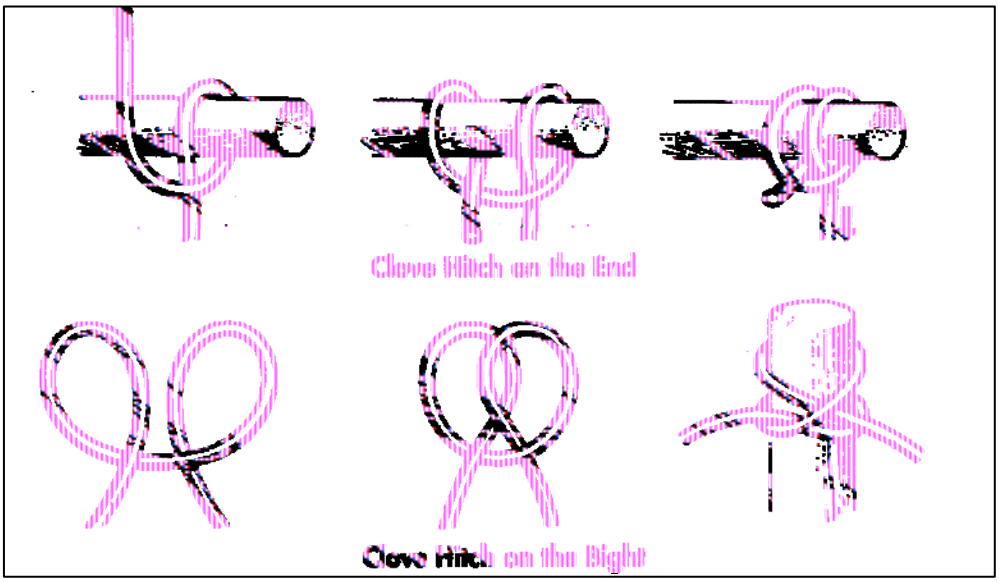


Figure 5.7-7 - Clove Hitch

5.7.9 Rolling Hitch

This hitch is also used for securing a rope to a spar, rail or similar fitting when the pull is expected to be from one side or the other, and to another rope under strain. It is made by passing the end twice around the spar or rope, each turn crossing the standing part. A half hitch on the opposite side completes the hitch. Always pass the two turns on the side from which the pull is expected.

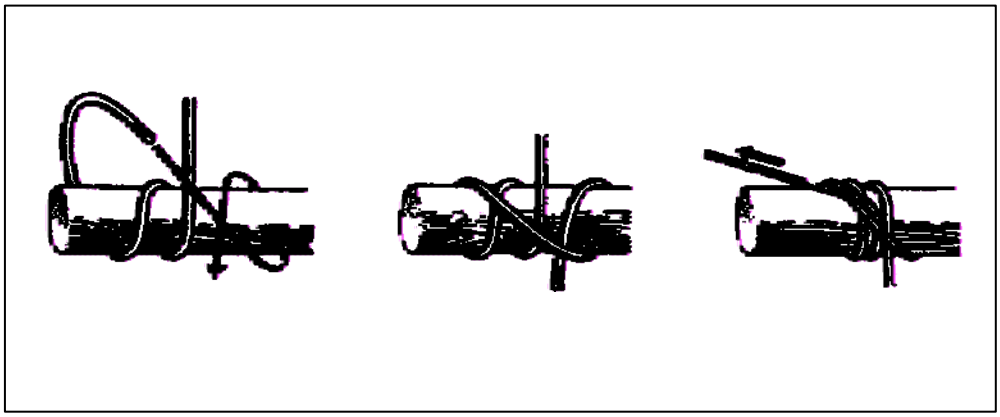


Figure 5.7-8 - Rolling Hitch

5.7.10 Round Turn and Two Half Hitches

This combination is used to secure a line to a spar, ring or shackle. It will never jam and can be cast off quickly. The end should be stopped to the standing part.

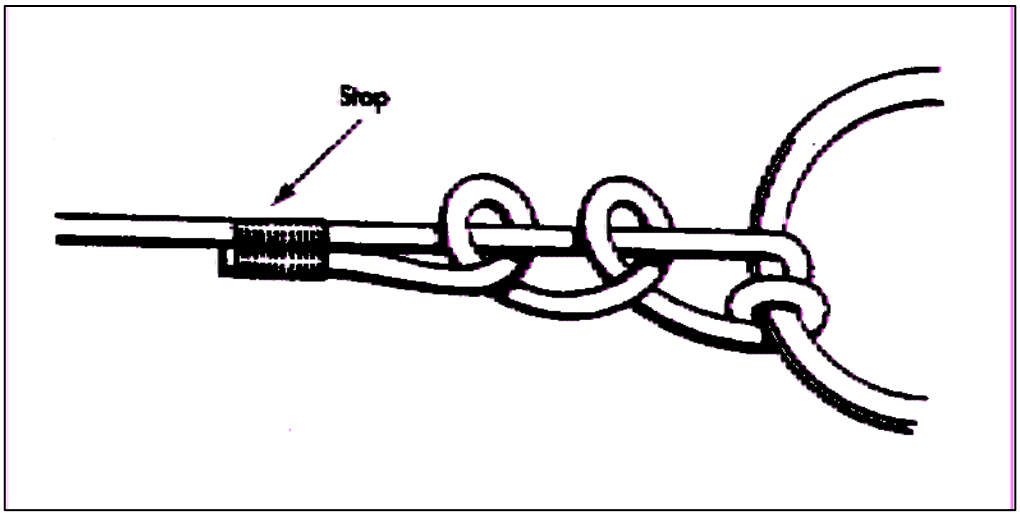
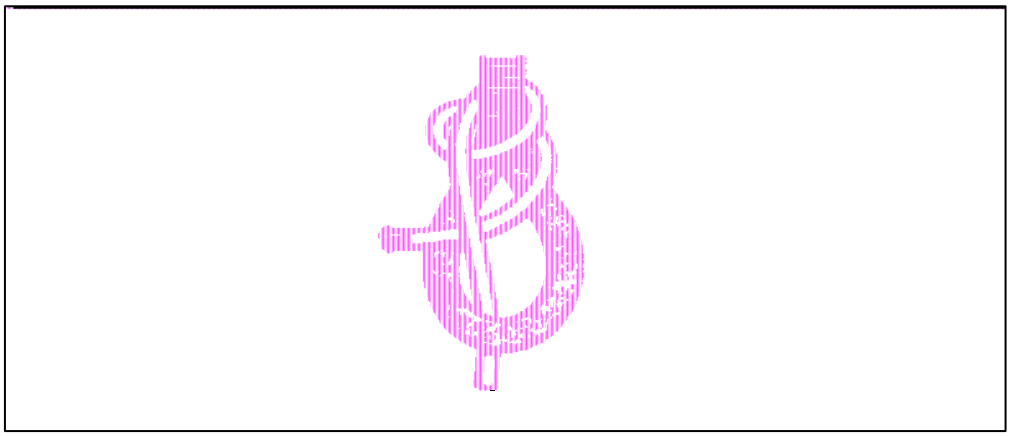


Figure 5.7-9 - Round Turn and Two Half Hitches

5.7.11 Double Sheet Bend

This is a method of securing two ropes of different sizes together, with the smaller line being bent to the eye of the larger line. It is used to secure a boat's painter to the eye of the boat

Figure 5.7-10 - Double Sheet Bend



5.7.12 Bowline

This is the most useful knot for making temporary eyes in ropes of all sizes. It can be used as a lifeline around a person's waist and for a great variety of similar purposes. Every member of a ship's company should be able to tie a bowline around his waist with his eyes closed. The bowline is usually made in the following manner, which enables it to be formed while there is a strain on the rope.

(**1**) Take the end in the right hand and the standing part in the left.

(**2**) Place the end over the standing part and hold the cross thus formed between the index finger and thumb of the right hand, with the thumb underneath. The loop so formed becomes the bight of the bowline and, if required, it can be formed around the body of the man making the knot. (Step 1 below)

(**3**) Then turn the wrist to the right, away from the body, and bring the end up through the loop so formed. (Step 2)

(**4**) Now hold the cross in the left hand, leaving the right hand free to manipulate the end. (Step 3)

(**5**) Complete the bowline by dipping the end under the standing part, bringing it up again, and passing it down through the hole.

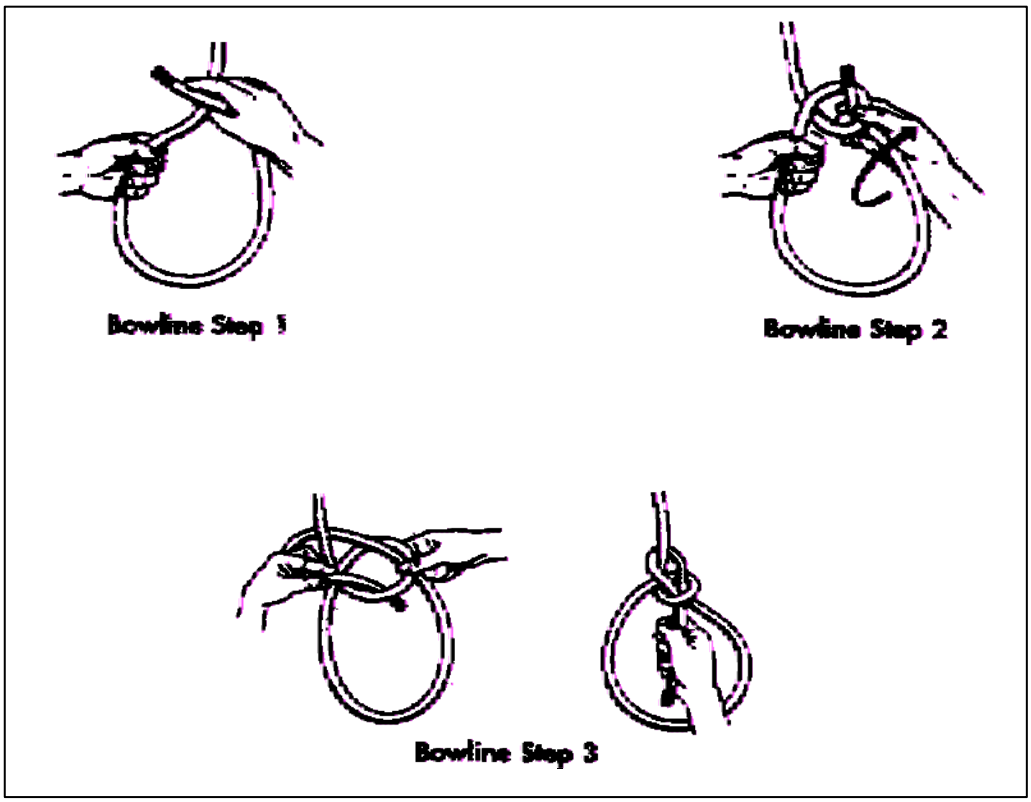


Figure 5.7-11 - Bowline

5.7.13 Running Bowline

This is used to make a running eye in the end of a rope — it must never be placed around a man's body.

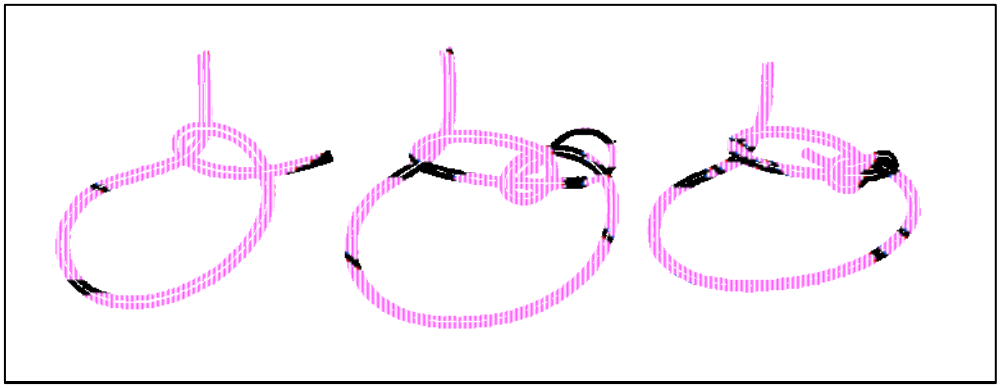


Figure 5.7-12 - Running Bowline

5.7.14 Bowline on the Bight

As its name implies, this type of bowline is made on the bight, the first two operations in its formation being the same as for a simple bowline. It can be used for lowering a man from aloft or over the ship's side, the short bight being placed under his arms and the long one under his buttocks.

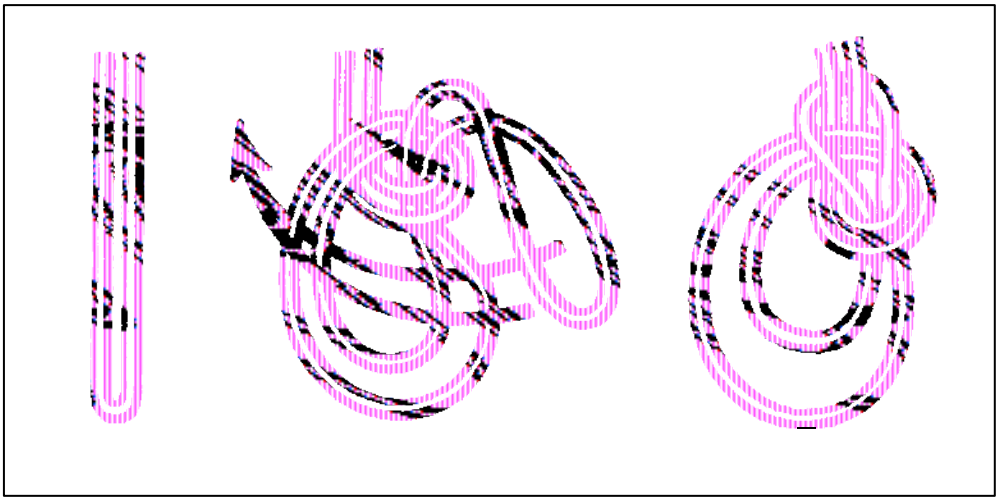


Figure 5.7-13 - Bowline on the Bight

5.7.15 Monkey's Fist

A Monkey's Fist is used to weight the end of a heaving line so that it will carry when thrown against the wind. It is made as follows:

(**1**) Wind three turns around the hand.
(**2**) Pass a second set of three turns across and around the first three.

(**3**) Pass a third set of three turns around and across the second set, but inside the first set and in the direction shown by the arrows. If the knot is correctly made, the end will come out alongside the standing part.

(**4**) To finish the knot, work all parts taut, tie an overhand knot in the end and finish it by seizing the bitter end to the standing part where it comes out of the monkey fist. Tucking the bitter end inside the monkey's fist, then working all parts taut is another method of finishing off the knot.

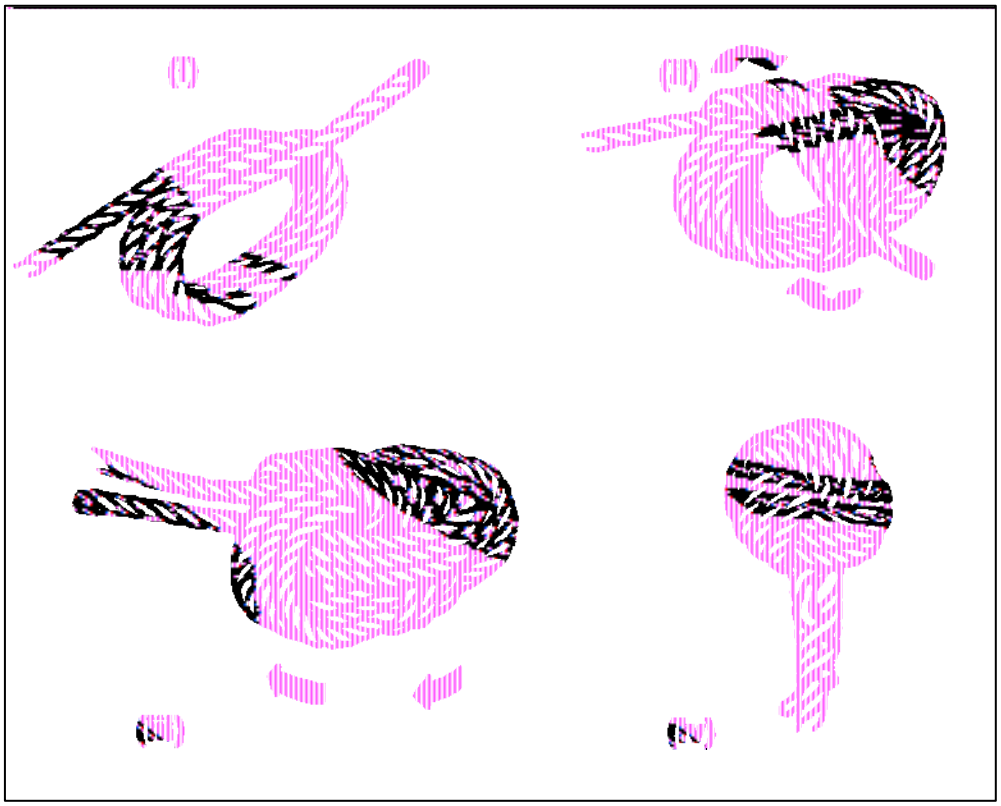


Figure 5.7-14 - Monkey's Fist

5.7.16 Heaving Line Knot

This knot is used as an alternative to the Monkey's Fist and is quickly and easily made as follows:

(**1**) Form a bight about 1.5 m long at the end of the line.

(**2**) Start frapping the end around both parts of the bight at about 20 cm from the actual bend of the bight, and continue until it is all but expended.

(**3**) Then pass the end through the small loop left and haul on the standing part.

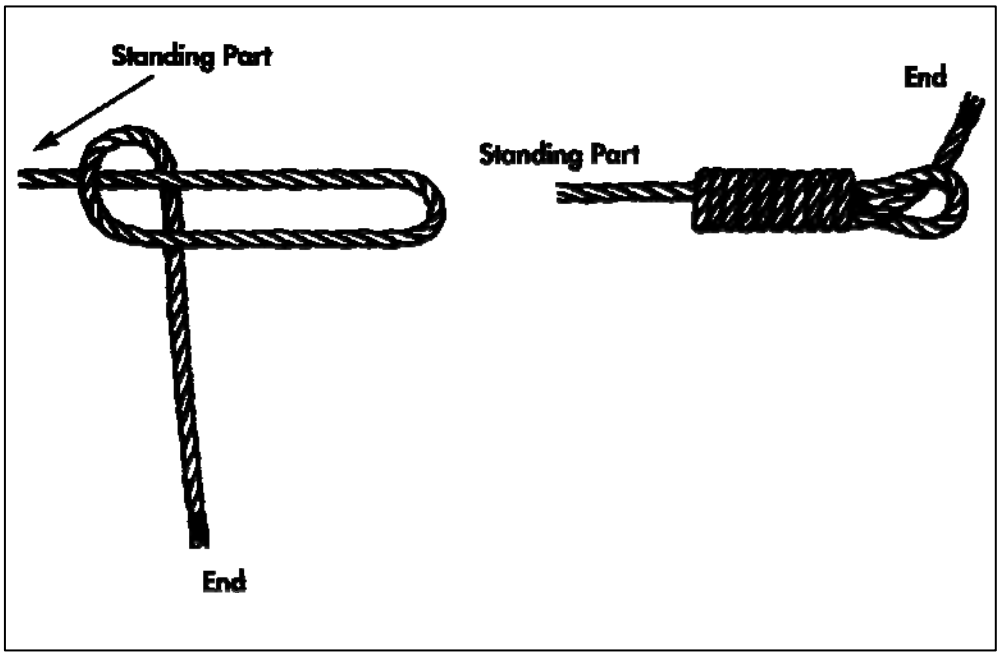


Figure 5.7-15 - Heaving Line Knot

5.7.17 Sheepshank

This is used to shorten the bight of a rope temporarily without cutting it. The strain on the rope will usually prevent the sheepshank from slipping, but if necessary, the loops can be stopped to the standing parts or secured with a toggle.

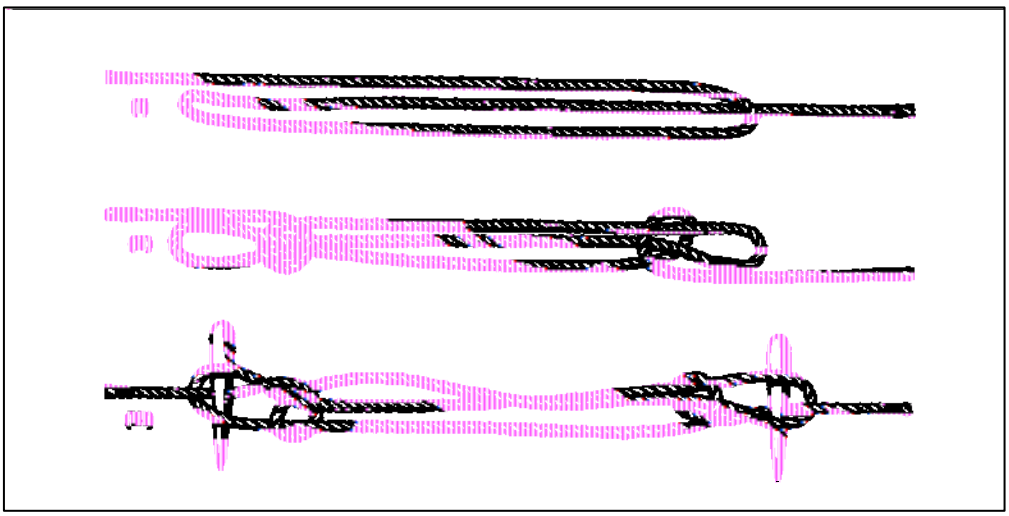


Figure 5.7-16 - Sheepshank

5.7.18 Carrick Bend

A Carrick Bend is used for joining two hawsers together of equal size when the join will have to pass around a capstan or winch. The ends should be stopped to their standing parts.

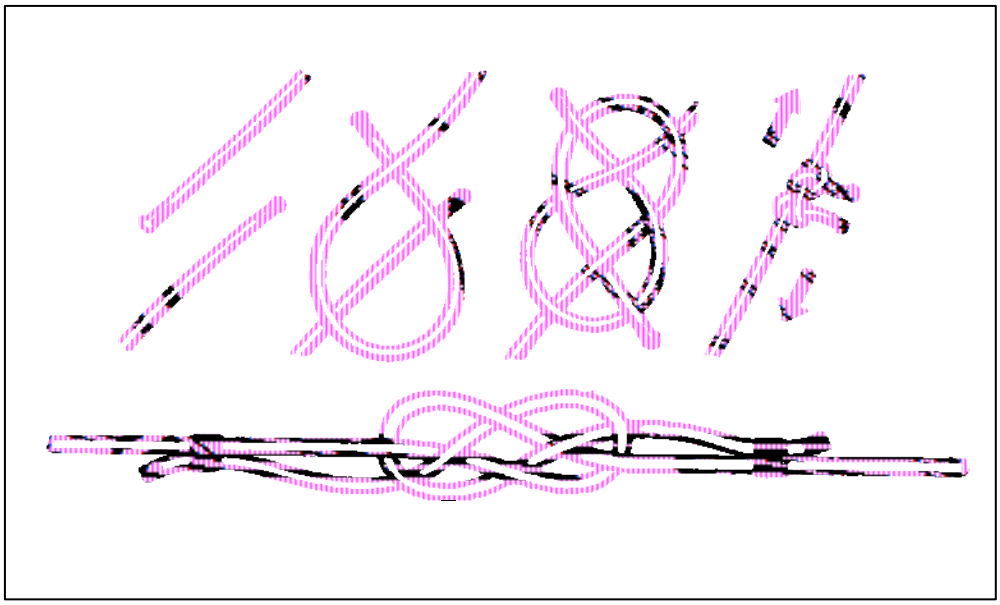


Figure 5.7-17 - Carrick Bend

5.8 KNOTS

The functions of a knot have been described earlier. Below is a description of how a few commonly used knots are made. To assist in the description, the strands are lettered A, B, C, etc., and their respective bights are lettered a, b, c, etc.

5.8.1 Crown Knot

When finished, the crown knot leaves the three strands pointing back along the rope. It is used to begin a back splice and as a basis for more complicated knots, but is seldom used on its own. To form a crown, do as follows:

(**1**) Whip the rope at a distance from its end equal to 12 times its diameter.
(**2**) Unlay the strands to the whipping, whip their ends, and spread them out in the form of a star with the centre strand farthest away from the body.
(**3**) Bring strand C to the front to form a loop.
(**4**) Place strand A over C and behind B.
(**5**) Thread strand B through the loop of C.
(**6**) Pull all strands taut until knot is tidy and uniform.

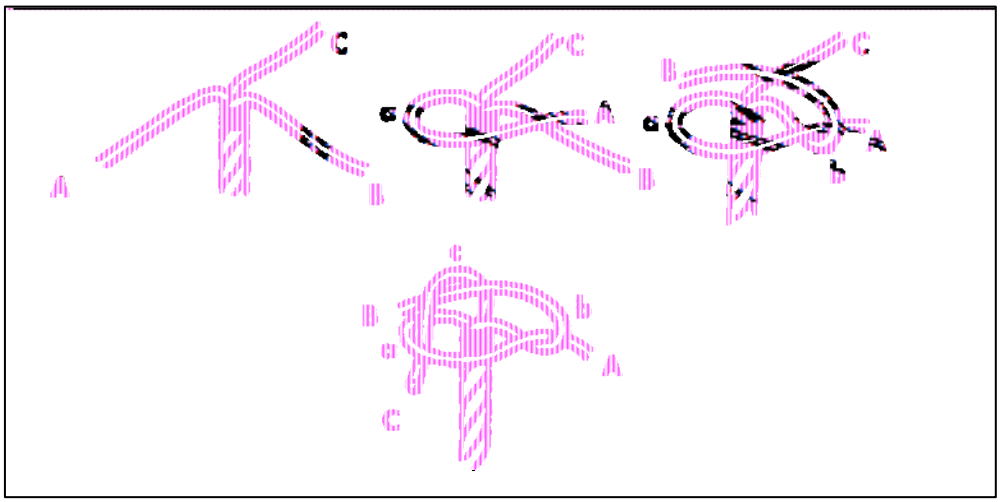


Figure 5.8-1 - Making a Crown Knot

5.8.2 Wall Knot

When finished, the wall knot leaves all three strands pointing in the original direction. It is, in fact, a crown knot turned upside down. To create a wall knot, do the following:

(**1**) Prepare the rope as for a crown.
(**2**) Take strand A and pass it under B.
(**3**) Take strand B around A so as to enclose it, and pass it under C.
(**4**) Take strand C around B so as to enclose it and bring it up through bight a.

If the wall knot is to be used by itself to prevent a rope unreeving, the strands should be whipped together where they emerge from the knot and the ends should then be cut off.

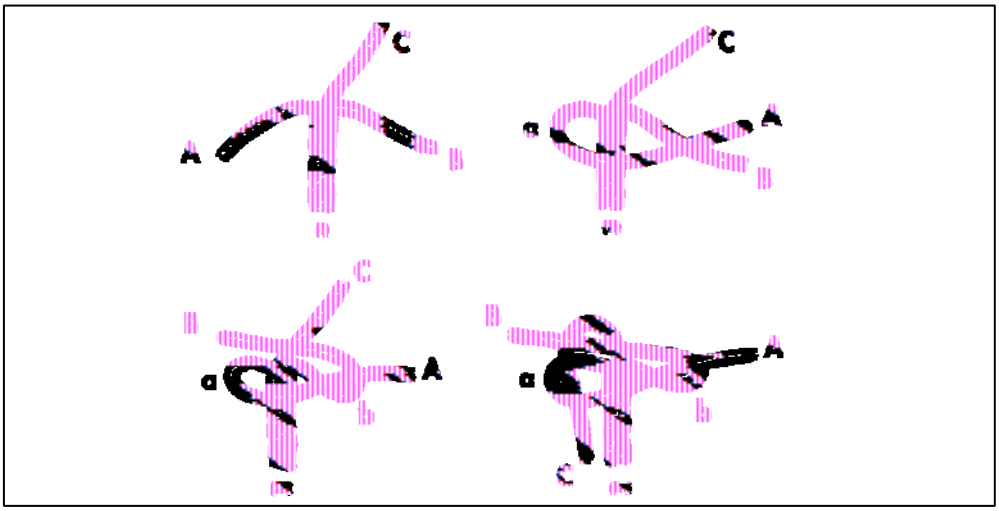


Figure 5.8-2 - Making a Wall Knot

5.8.3 Wall and Crown Knot

This can be used to prevent a rope from unreeving and also to form the foundation for more advanced knots. The whipping is placed at a distance from the end equal to 20 times the diameter of the rope; the wall being formed first and the crown made on top of it.

5.8.4 Crown and Wall Knot

This differs from the wall and crown knot in that the crown is made first and the wall formed under it. It is used for finishing off the end of seizing to prevent them from unreeving. The strands are unlaid right down to the turns of the seizing, against which the crown is formed as close as possible. The wall is then made under it and hauled taut, thus jamming the knot in tightly.

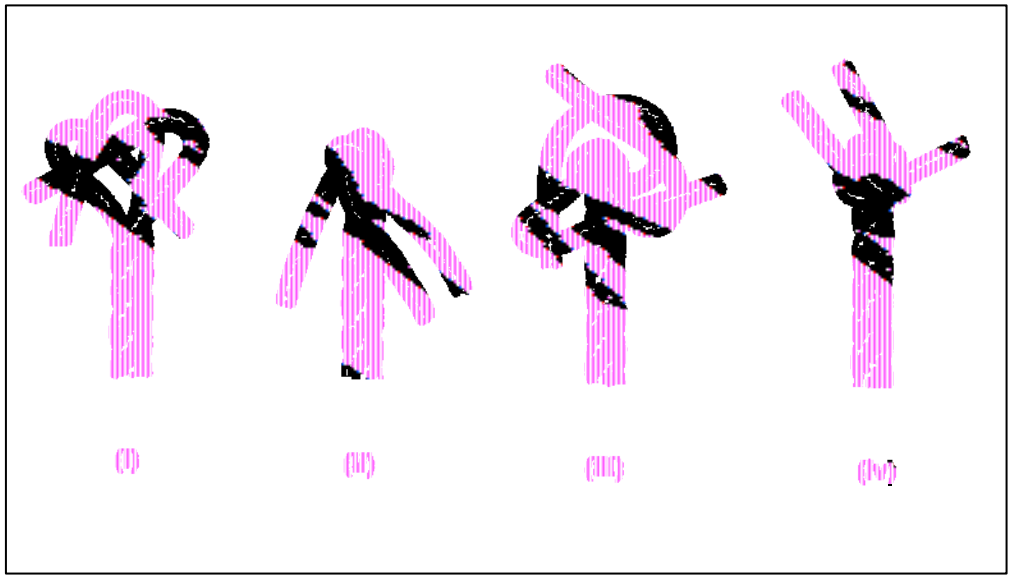


Figure 5.8-3 - Making a Crown and Wall Knot

5.8.5 Manrope Knot

The manrope knot is a decorative knot .

(**1**) Whip the rope at a distance from its end equal to 20 times its diameter, unlay the strands to the whipping, and whip their ends.
(**2**) Make a wall and crown, keeping the knot fairly loose (i).
(**3**) Take strand A and follow it around its own part, thereby doubling up strand A (ii).
(**4**) Work the other two strands similarly, haul all parts taut, and cut off the ends where they protrude from the base of the knot (iii).

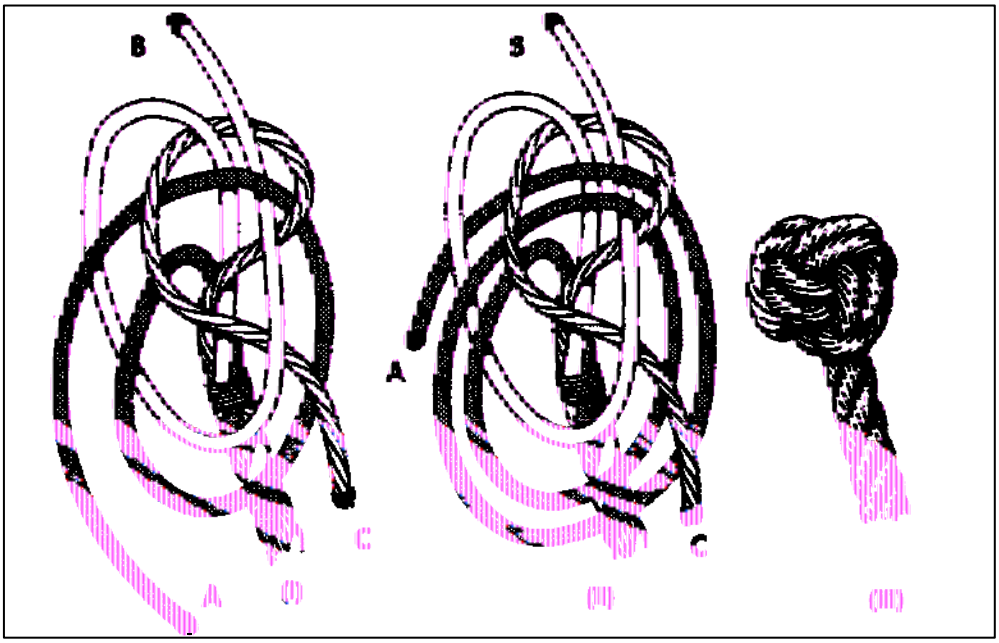


Figure 5.8-4 - Manrope Knot

5.8.6 Turk's Head

The Turk's Head is an ornamental knot which is supposed to resemble the turban once worn in Turkey, and should consist of three or more parts followed around two or more times. It may be made either as a standing or a running knot, according to whether it is to be fixed to an end or a bight, or formed around another part of a rope or a stanchion. Three different forms of this knot are described below.

a. **Standing Turk's Head.** Made at the end of a rope. This is a manrope knot, but the ends are followed around a third or fourth time. However, before starting the knot, the strands must be unlaid for a distance of no less than 25 times the diameter of the rope.

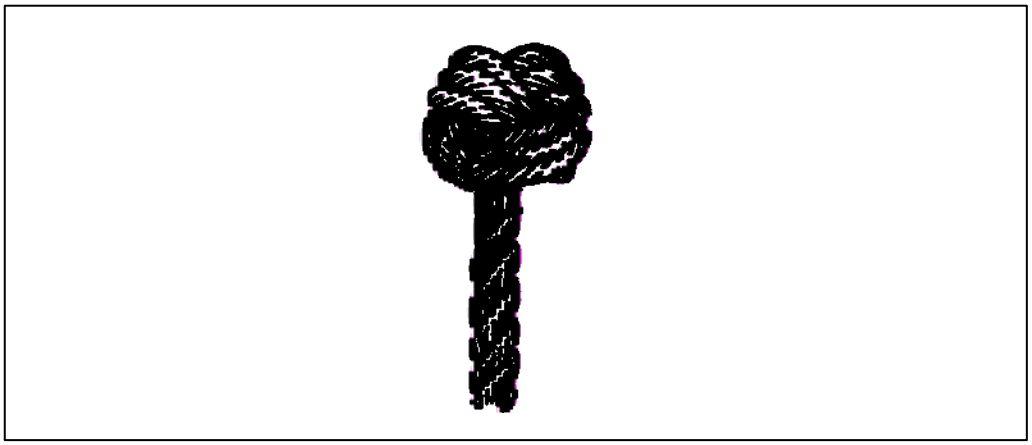


Figure 5.8-5 - Standing Turk's Head

b. **Running Turk's Head.** Made at the end of a rope and around its own bight (as in a running lanyard). This is similar to a standing Turk's Head made at the end of a rope, except that the wall and crown with which it is begun are made around the bight of the rope. The strands are then followed around two or more times, thereby forming a knot that will slide up and down the bight.

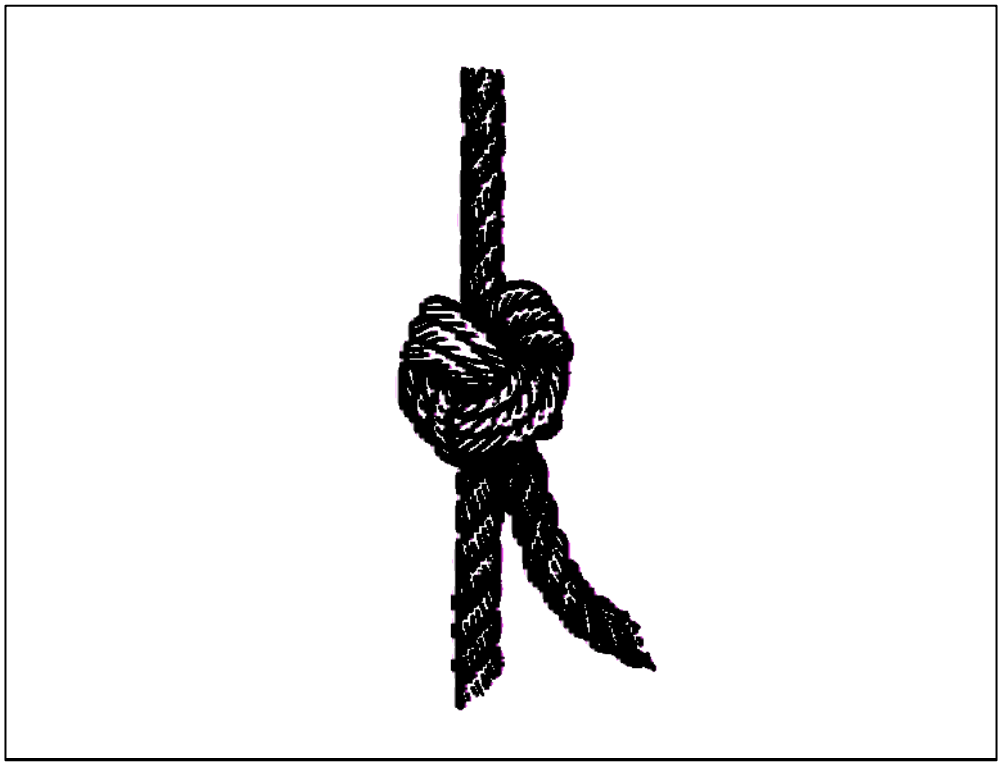


Figure 5.8-6 - Running Turk's Head

c. **Running Turk's Head.** Made around a bight of rope, a stanchion or other fitting. This is formed out of a single length of rope as follows:

(**1**) A half hitch is made around the rope or fitting, and then followed by a round turn;
(**2**) The end is then dipped under the bight of the half hitch (i).
(**3**) The bights around the rope are crossed, the bight which is on the same side as the end of the line being placed underneath.
(**4**) The end is then passed down between the bights (ii) and brought over the other side.
(**5**) The second and third operations are repeated until the rope is encircled (iii).
(**6**) The ends are then followed around as often as may be required.
(**7**) All parts are hauled taut (iv), and the two ends finished off with a crown and wall knot.

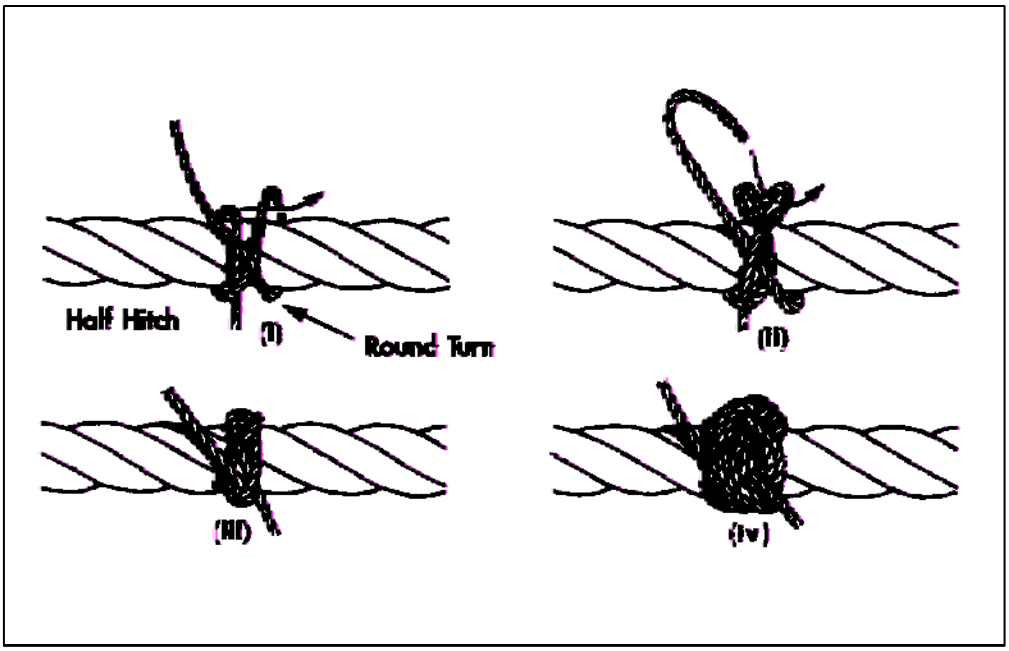


Figure 5.8-7 - Running Turk's Head on a Bight

5.9 WHIPPINGS

A whipping is the binding around the bare end of a rope to prevent the strands from unlaying. Three types of whipping are described below.

5.9.1 Common Whipping

A common whipping is created as follows:

(**1**) Place the end of the sailmakers along the rope; pass turns of the sailmakers over the rope against its lay, working towards the end of the rope, and haul each taut.

(**2**) Lay the other end of the sailmakers along the rope, and pass the remaining turns over it, taking the bight of sailmakers over the end of the rope with each turn.

(**3**) When the bight becomes too small to pass over the end of the rope, haul this second end of the sailmakers through the turns, which you have passed over until it is taut, thus completing the last turn around the rope.

(**4**) Cut off the end.

An alternative finish, which can be used when the whipping is on the bight of the rope, is to take the last three or four turns loosely over one finger and pass the end back through them. Work the turns taut, and haul the end taut as above.

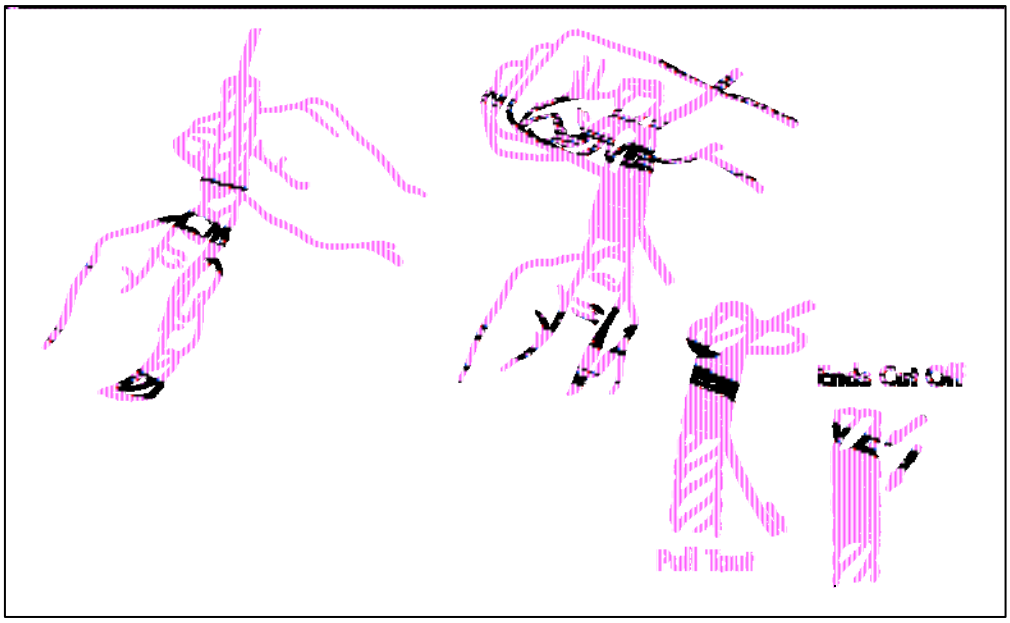


Figure 5.9-1 - Common Whipping

5.9.2 West Country Whipping

A West Country whipping is made as follows:

(**1**) Middle the sailmakers on the rope in the position required, pass the two ends round the rope in opposite directions and tie an overhand knot on the other side.

(**2**) Bring the ends up and tie an overhand knot again, and continue in this manner, making an overhand knot every half turn so that the knots lie alternately on opposite sides of the rope.

(**3**) Finish off with a reef knot.

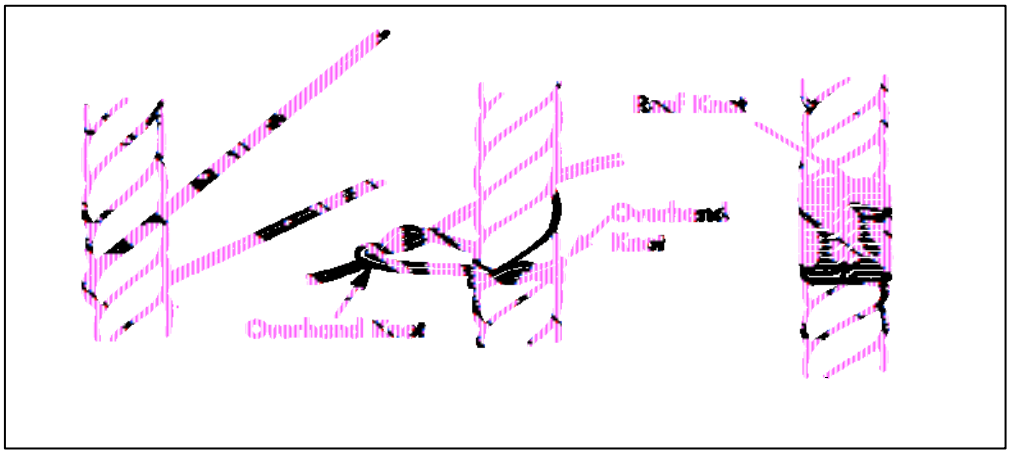


Figure 5.9-2 - West Country Whipping

5.9.3 Sailmakers Whipping

This whipping is the most secure, but of course it can only be used on hawser-laid (three-strand) rope as follows:

(**1**) Unlay the end of the rope for about 50 mm and hold it in the left hand pointing upwards, with the middle strand farthest away.

(**2**) Make a bight in the sailmakers about 20 cm long and pass this bight over the middle strand only with the two ends towards you.

(**3**) With the bight of sailmakers hanging down the back of the rope and the ends pointing down in front, lay up the rope with the right hand.

(**4**) Leave the short end of sailmakers where it is and, with the long end, pass the turns of the whipping, working towards the end of the rope against the lay.

(**5**) When sufficient turns are on, take the bight of the sailmakers, pass it up outside the whipping, following the lay of the strand around where it was originally put, and pass it over that strand, where the latter comes out at the end of the rope.

(**6**) Now haul on the short end so as to tighten the bight.

(**7**) Then bring this end up outside the whipping, again following the lay of the rope, and reef knot the two ends in the middle of the rope and out of sight.

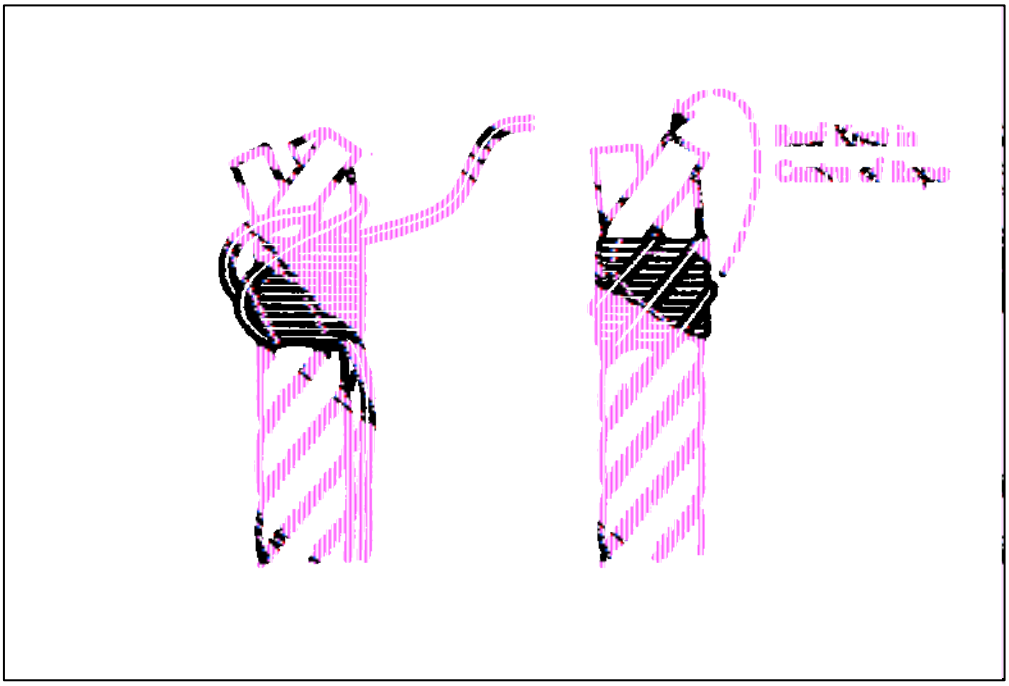


Figure 5.9-3 - Sailmakers Whipping

5.10 MOUSING

A mousing is used for keeping the pin of a shackle or slip in position, or to prevent inadvertent unhooking from an open hook. Shackle pins can normally be safely moused with Insulok nylon ties (tie-wraps) (Fig 5.10-1); however, it is advisable to mouse with seizing wire (Fig 5.10-1) if the pin of the shackle is likely to be subjected to considerable movement, for example the pin of the shackle securing the slip of both the light and heavy jackstay rigs. Slip pins must always be moused with seizing wire (Fig 5.10-2). Most hooks now in use in the Canadian Navy incorporate a spring-loaded safety catch; however, should an open hook be encountered, the method of mousing it with seizing wire is shown in Fig 5.10-3.

5.10.1 Strap Tiedown (tie-wrap) Mousings

Mousings are easy to apply (Fig 5.10-1 (i)). First ensure that the shackle pin is fully screwed home, and then lead the end of the tie through the eye of the pin, around the shank of the shackle, and finally through the jamming breech on the end of the tie. Haul taut and cut off the surplus end 5 mm from the jamming breech.

5.10.2 Seizing Wire Mousings

a. To mouse a shackle pin with seizing wire (Fig 5.10-1 (ii)) do the following:

(**1**) Middle a length of the wire through the eye of the pin and twist the two parts together two or three times to attach the wire to the pin.
(**2**) Pass the two ends of the wire in opposite directions three or four times around the shank of the shackle and back through the eye of the pin, making sure that each turn is tight.
(**3**) Finish off by twisting the two parts tightly together two or three times.
(**4**) Cut off any surplus wire from the final twist and bend down the ends.

b. When mousing a slip pin (Fig 5.10-2):

(**1**) Attach one end of a length of seizing wire to the eye of the pin.
(**2**) Then wind the wire tightly in figures-of-eight across the tongue of the slip and around the pin, locking the pin in position.

Three or four turns of wire are normally required, but because of the possibility of an emergency breakaway, mousings on slips used in replenishment rigs and towing are moused with only one full figure-of-eight turn.

c. Mousings on open hooks are applied as shown in Fig 5.10-3.

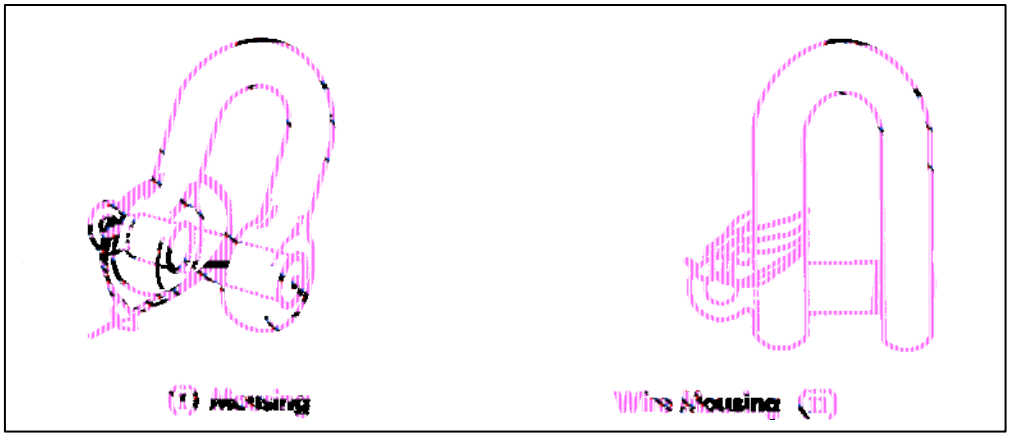


Figure 5.10-1 - Mousing a Shackle

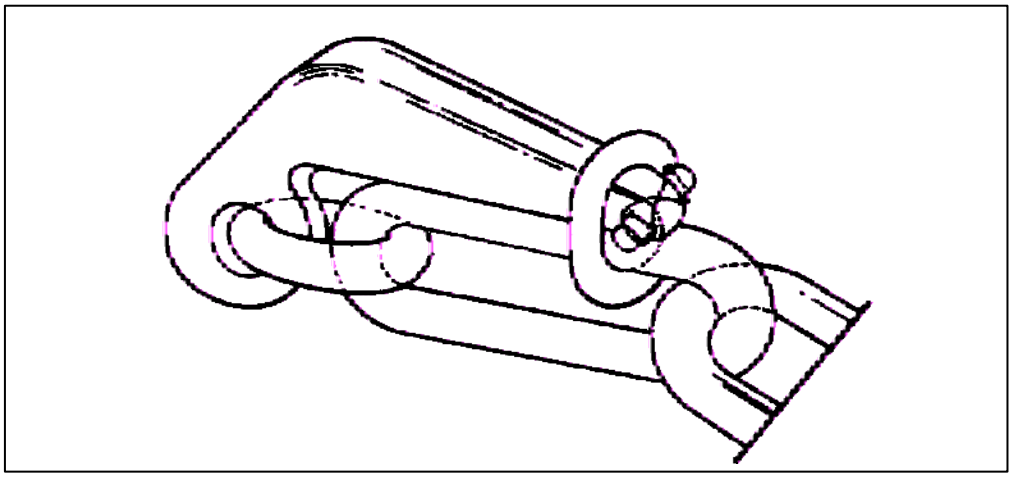


Figure 5.10-2 - Mousing a Slip

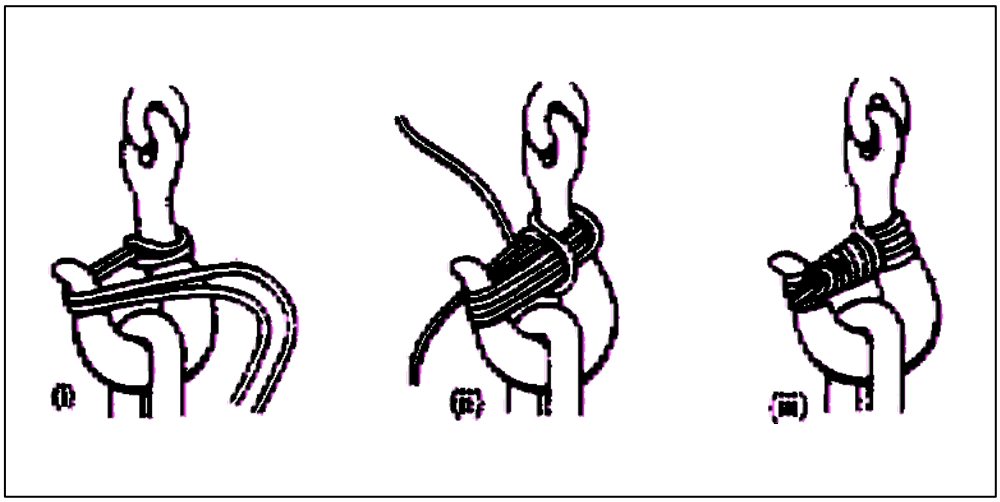


Figure 5.10-3 - Mousing an Open Hook

5.11 SEIZING

5.11.1 Types of Seizing

A seizing is a method of fastening together two parts of rope sufficiently strong enough to stand a required strain. Two standard seizing designed to meet certain specific standards are employed in the Canadian Navy.

a. **Flat Seizing.** A light seizing for use when the strain on the two parts of rope is equal. It consists of one layer of approximately 11 round turns.

b. **Racking Seizing.** When the strains on the parts of the rope are unequal or exerted in opposite directions, a racking seizing is used. It is formed by passing one layer of racking turns, and then passing one of the round turns so that they lie between the racking turns. The number of round turns is necessarily one less than the number of racking turns. Sufficient turns are taken for the length of the seizing to be equal to three times the diameter of the rope, e.g., for racking two 24 mm ropes, an overall length of seizing of 72 mm is required.

5.11.2 Strength of Seizing

For seizing cordage, it is normal to use small stuff (tarred marlin or line of appropriate size to the rope being seized). When seizing wire ropes, flexible mild steel wire is used. The number of turns to be used for a seizing depends upon the strength of the seizing line and the strain to which the seizing will be subjected. For cordage, 11 and 21 turns are recommended for flat and round seizing respectively. These seizing are based on a size of the seizing line of about one-seventh of the size of the rope, e.g., 6 mm seizing line would be required for seizing a 40 mm diameter nylon rope.

5.11.3 Making up Seizing Line

Wind the seizing line around one hand in an anti-clockwise fashion with as many riding turns as are required, and finish with a clove hitch on the bight around the middle. Work with the first end that is drawn out through the opposite side of the coil, thus thorough footing the seizing line and making it easier to work by taking the turns out of it. The turns in the coil are held in place by the clove hitch.

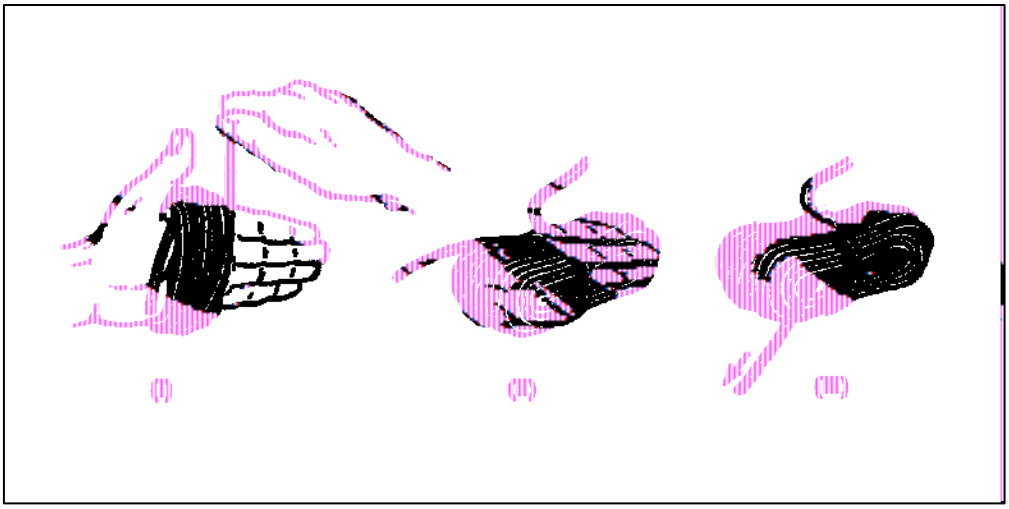


Figure 5.11-1 - Making up Seizing Stuff

5.11.4 Use of a Serving Mallet

When serving heavy rope, the turns must be hauled more than hand-taut, and for this purpose a serving mallet can tighten the lower turns of the serving as follows:

(**1**) Lay the mallet in the bight of the line as shown in Fig 5.11-2 (i) and as close up to the work as possible.
(**2**) Take a turn diagonally round the head of the mallet, bringing the end up the opposite side of the handle (ii).
(**3**) Take half a turn around the handle, and take the end again behind the head (iii).
(**4**) Jam the end between the head and the standing part, and bring it up over the handle, as indicated by the dotted line (iii).
(**5**) Place the head against the rope and heave, using the handle as a lever.

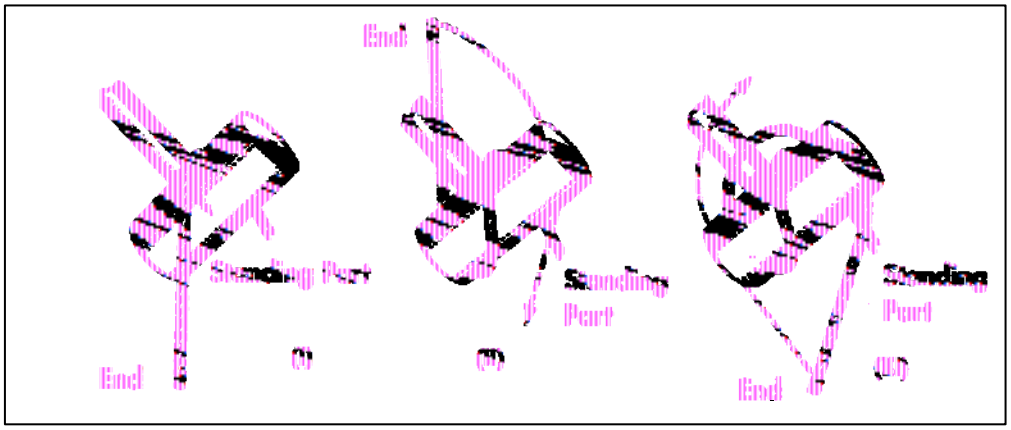


Figure 5.11-2 - How to Use a Serving Mallet

5.11.5 Starting a Seizing

Cordage seizing are begun by making a small eye in the end of the seizing line. Wire seizing are started by taking the end around one of the ropes to be fastened and then half hitching it around its own part. Take care to keep the eye or half hitch in the centre and clear of both parts of the rope.

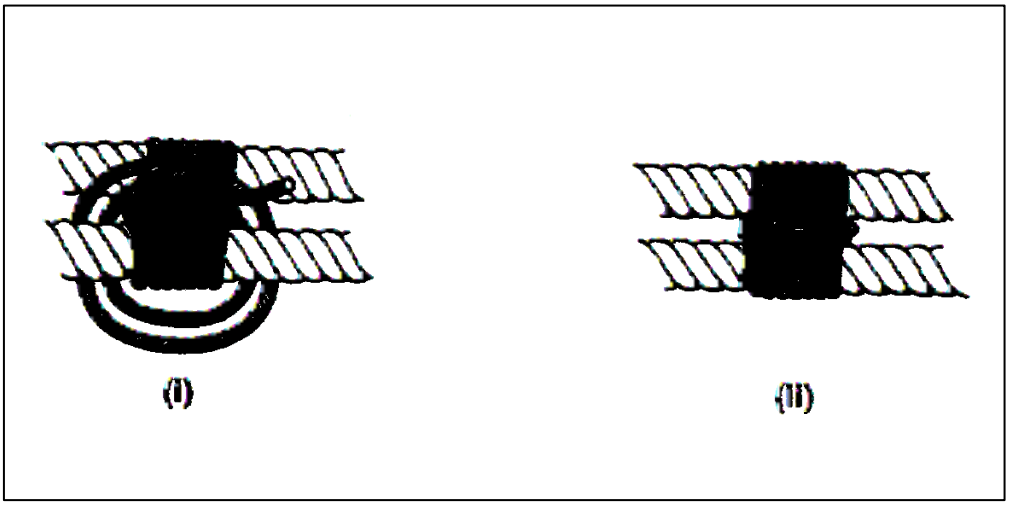


Figure 5.11-3 - Starting a Seizing

5.11.6 Passing a Flat Seizing

Having begun the seizing as described, continue as follows:

(**1**) Take the round turns very loosely around both parts of the rope and then pass the end back, along and between the two parts of the rope, under the turns and through the eye or half hitch of the seizing as in Fig 5.11-4.

(**2**) Heave each turn taut and take a cross turn around the seizing between the two parts of the rope.

(**3**) Haul the seizing taut and secure its end with a clove hitch, one part of the clove hitch being on each side of the round turn.

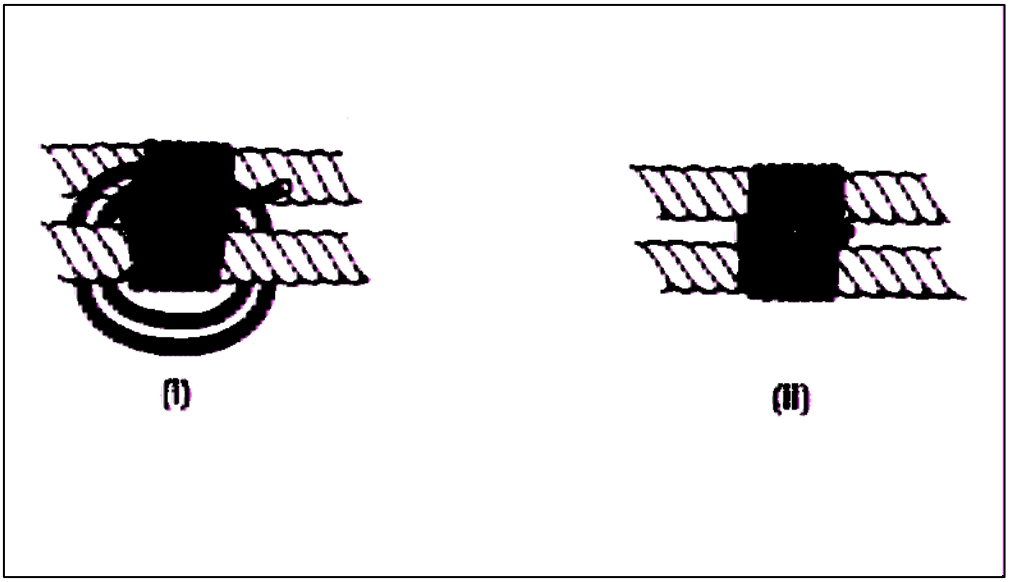


Figure 5.11-4 - Passing a Flat Seizing

5.11.7 Passing a Racking Seizing

Start the seizing as already described and, if the seizing slips when taken around both parts of the rope, do the following:

(**1**) Take the end around one part only and reeve it through the eye.

(**2**) Then dip the end between the two parts of rope and take a number of figure-of-eight turns around each part alternately, taking care to have the same number round each part and to leave room between each racking turn for the around turn which will come later (i).

(**3**) When the racking turns have been hove taut, dip the end under the last turn and pass the round turns back towards the eye, filling the spaces between the racking turns (ii).

(**4**) When the last round turn has been passed (see that there is one less than the racking turns), complete the seizing by taking one round turn around the whole seizing and forming a clove hitch between the two parts of the rope.

(**5**) Finish off as for a flat seizing.

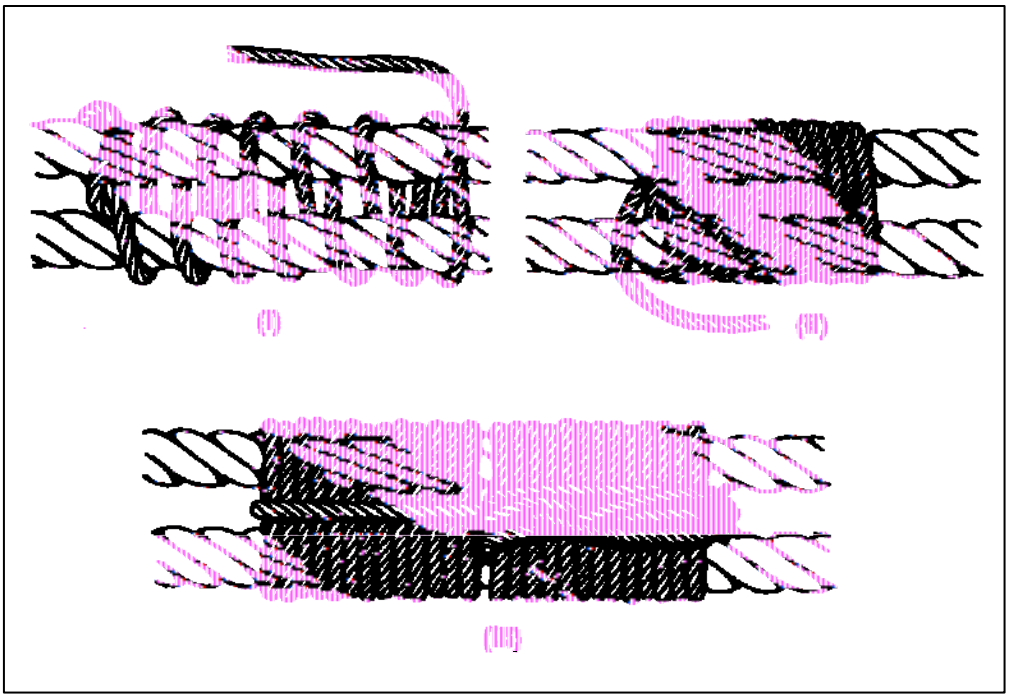


Figure 5.11-5 - Passing a Racking Seizing

5.12 WORMING, PARCELING AND SERVING

A rope or part of a rope is wormed, parceled and served (Fig 5.12-1) to protect its outer surface against wear from chaffing, to make its outer surface smoother so as to prevent other ropes from chaffing when led over it, and, in the case of a steel wire rope, to protect the hands of those using it from the sharp ends of wire projecting from any splice in it. Worming, parceling and serving are not necessarily damp-proof and there is a danger that a rope may rot underneath its covering. Ropes so treated should therefore be inspected frequently for deterioration.

5.12.1 Worming

This consists of filling in the spaces between the strands with lengths of small stuff laid along the lay of the rope. The object is to make the rope smooth and round.

5.12.2 Parceling

This consists of binding the rope with strips of rot-proofed canvas or similar material. The strips should be from 50 to 75 mm wide. It is customary to bind them on in the direction of lay of the rope, working towards the eye. Each turn should overlap that preceding it by half the width of the strip, and the rope, if not man-made fiber, should first be well tallowed. When parceling and serving a stay throughout its whole length, the parceling should be worked upwards from the eye of the lower splice to the eye of the upper splice as this affords the maximum obstruction to the entry of water.

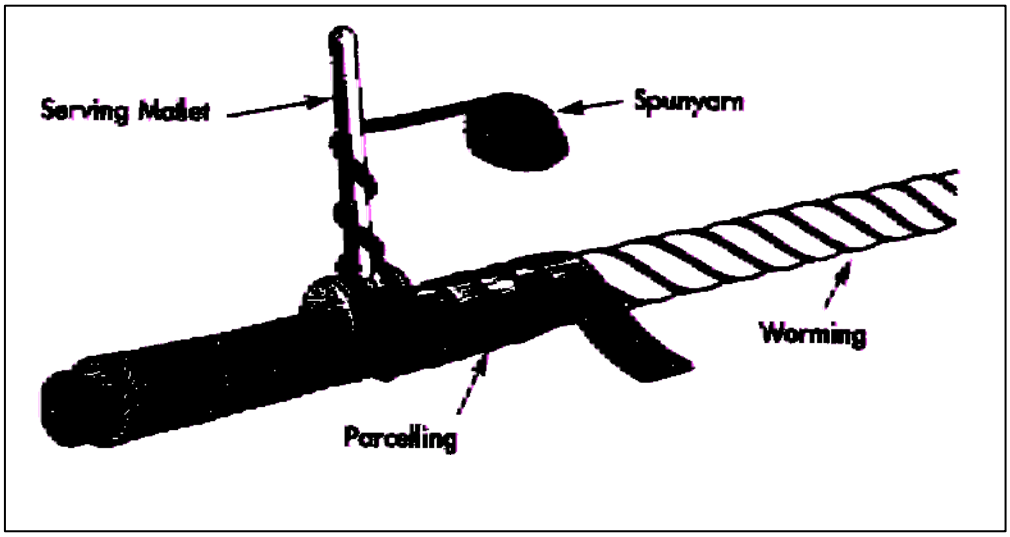


Figure 5.12-1 - Worming, Parcelling and Serving

5.12.3 Serving

a. This consists of binding a splice or a length of rope with close turns of small stuff or tarred marlin. (Flexible mild steel wire rope can be used to serve steel wire rope.) Each turn is hove taut with a special serving mallet that has a score in its head to fit the rope, and a wooden handle about 40 cm long. A service is always bound on in the direction opposite to that of the parceling in order to avoid bunching up the latter. It is, therefore, put on against the lay of the rope, a rule that can be memorized thus: worm and parcel with the lay, turn and serve the other way. A serving is begun as for a common whipping, although when serving with the larger sizes of flexible mild steel wire it may be necessary to stop the first end down to the rope until sufficient turns have been applied to hold it firmly. The first few turns are put on by hand and hauled taut with a spike or heaving mallet. The serving mallet is then placed on the rope and the turns of the service are passed as follows:

(**1**) Take a half-turn around the handle and then one turn around the fore end of the head of the mallet and the rope.
(**2**) Dog the serving around the handle of the mallet.
(**3**) To put on a serving, stand with the rope on your left side while facing in the direction in which the turns are advancing.
(**4**) Pass the ball of serving line around and around in step with the serving.
(**5**) Having completed the required length, finish off the service by passing the end back under the last four turns, hauling all parts taut and making a crown and wall knot or, if finishing a wire seizing, breaking off the wire close to the hitch and tucking away the ends so no harm will result when the rope is handled.
(**6**) Finish the serving of a wire serving on an eye splice in a customary and similar manner to that of a seizing; a cross turn is therefore taken round the last few turns of the serving,

inside the neck of the eye, and is followed by a clove hitch, the ends of the wires being then broken off and tucked away.

b. If serving over a restricted length of rope (up to an eye splice for example), which does not allow the mallet to advance ahead of the last turns, the serving line should be brought to the mallet as follows:

(**1**) up over the cut in the fore end of the head;
(**2**) one-quarter turn around the handle;
(**3**) one turn around the rope and rear end of the head (taken in the direction of the service, i.e., against the lay of the rope); and
(**4**) dogged around the handle.

5.13 ROPE SPLICING

Splicing is a method of joining the ends of two ropes together, making an eye in the end of a rope, or finishing off the end of a rope instead of applying a whipping. A splice will reduce the strength of a rope by about one-eighth. The tools required for splicing hawser-laid rope are:

(**1**) A fid, which is a pointed wooden spike made of hardwood.
(**2**) A mallet for pounding tucks into place (on larger line).
(**3**) A sharp knife and whipping of some type to prevent the ends of the strands or the line from unraveling.

When reference is made in the text on splicing to the left or right of a rope, imagine yourself to be looking along the rope towards the end that you are handling.

5.13.1 Special Considerations when Splicing Man-Made Fiber Cordage

Special care is needed when splicing MMFC because an unsatisfactory splice may be dangerous. When unlaying strands make sure that the yarns are disturbed as little as possible. Each strand should be marled or taped every 50 mm along its length to maintain its form. Firm whippings of twine or tape must be used and the ends of the strands must be heat fused. When making an eye splice, a throat seizing is recommended. Serving an MMFC splice is not recommended because it tends to loosen when the rope's diameter decreases under load; if such a rope has to be served, it must be very tight. When splicing man-made fiber hawser-laid rope, five full tucks should be made if the ends of strands are to be dogged. To complete the splice, the ends of strands should be fused. Four full tucks reduced to two-thirds and one-third should be made if the splice is tapered. If the splice is then served, the first three tucks should be left uncovered. When splicing MMFC, take care that:

(**1**) Strands lifted for tucking are not kinked. To avoid strand distortion, use a small fid of oval cross section; then follow this with larger fids until it is just possible to pass the strand without distorting it.

(**2**) Strands are pulled back as far as possible.
(**3**) The rope is kept level the whole time and strands are lifted only high enough for the tuck to take place.
(**4**) The rope itself is not allowed to kink.

5.13.2 Types of Splice

a. **Back Splice.** For finishing the end of a rope that is not required to be rove through a block; it prevents it from unlaying.

b. **Eye Splice.** For making a permanent eye in the end of a rope.

(**1**) A soft eye is a small eye spliced in the end of a rope, and a thimble eye is formed by fitting and splicing the end of the rope around a thimble, the splice holding the thimble in place. It is fitted in the ends of cordage and wire ropes that are intended to be used in conjunction with a joining shackle or other rigging fittings. The hawser eye is an alternative to the thimble eye and is just as efficient.
(**2**) The eye is first spliced larger than the thimble, then the thimble is fitted into the eye and secured in place by a strong seizing just below it. This enables the thimble to be easily removed and replaced, merely by cutting the seizing and then renewing it. A bollard eye is a long soft eye, 1.5 m long from crown to splice, which is fitted in the ends of berthing hawsers so it can be placed over bollards.

c. **Short Splice.** For joining two ropes not required to pass through a block.

d. **Long Splice.** For joining two ropes which are required to pass through a block. A well-made long splice does not increase the diameter of the rope and should not reduce its strength.

e. **Cut Splice.** For making a permanent eye in the bight of a rope.

5.13.3 Back Splice in Hawser-Laid Rope

a. This method of finishing the end of a rope must not be used if the rope is to pass through a block, eye plate or similar fitting. Follow these steps:

(**1**) Whip the rope at a distance from its end equal to 20 times the diameter of the rope.
(**2**) Unlay the strands to the whipping and whip the end of each strand.
(**3**) Make a crown knot (i).
(**4**) Cut the whipping and then tuck each strand over one strand and under the next, to the left and against the lay of the rope, as shown in (ii).
(**5**) After each strand is tucked, pull the strands taut and tidy up this first tuck until each strand is uniform.
(**6**) Repeat this tucking twice more (iii), four times more if splicing MMFC. Always tuck to

the left, using the next strand to the left.

b. If the splice is to be served, taper it down after the third tuck (or fourth if splicing MMFC) as follows:

(**1**) Take one-third of the yarn out of each strand and tuck the remaining two-thirds once, as already described. Though discarded, the thirds should not be cut off until the splice is completed.
(**2**) Halve the reduced strands, then tuck one-half of each and leave the other.
(**3**) Haul all parts taut, including the discarded ends, which should now be cut off.

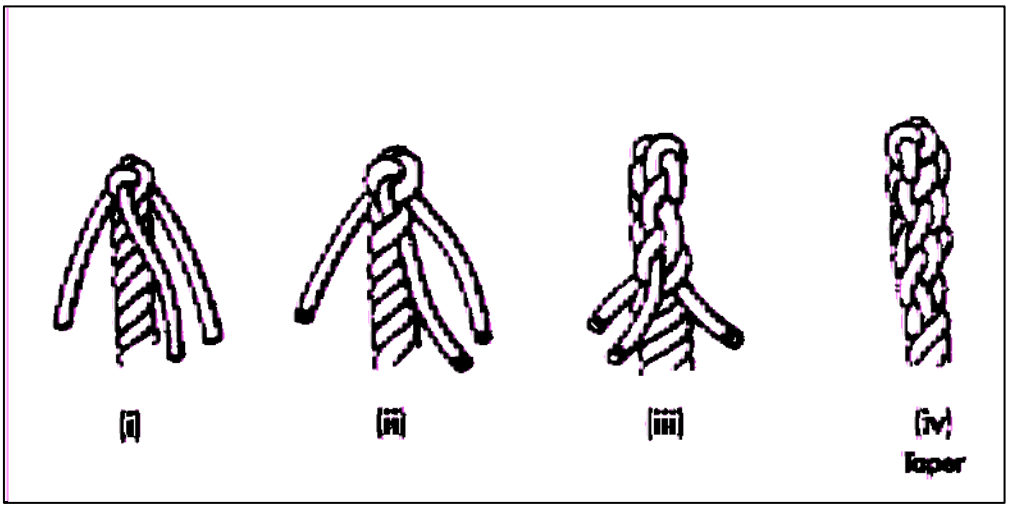


Figure 5.13-1 - Making a Back Splice

5.13.4 Soft Eye Splice in Hawser-Laid Cordage

a. Whip the rope at a distance from its end equal to 20 times the diameter of the rope, then unlay it to the whipping and whip the end of each strand. Mark the place intended for the crown of the eye, and bend the rope back from there so as to bring the unlaid strands alongside the place where the splice is to be made, with the left and middle strands lying on the top of the rope. The set of the splice will depend on selecting this middle strand correctly.

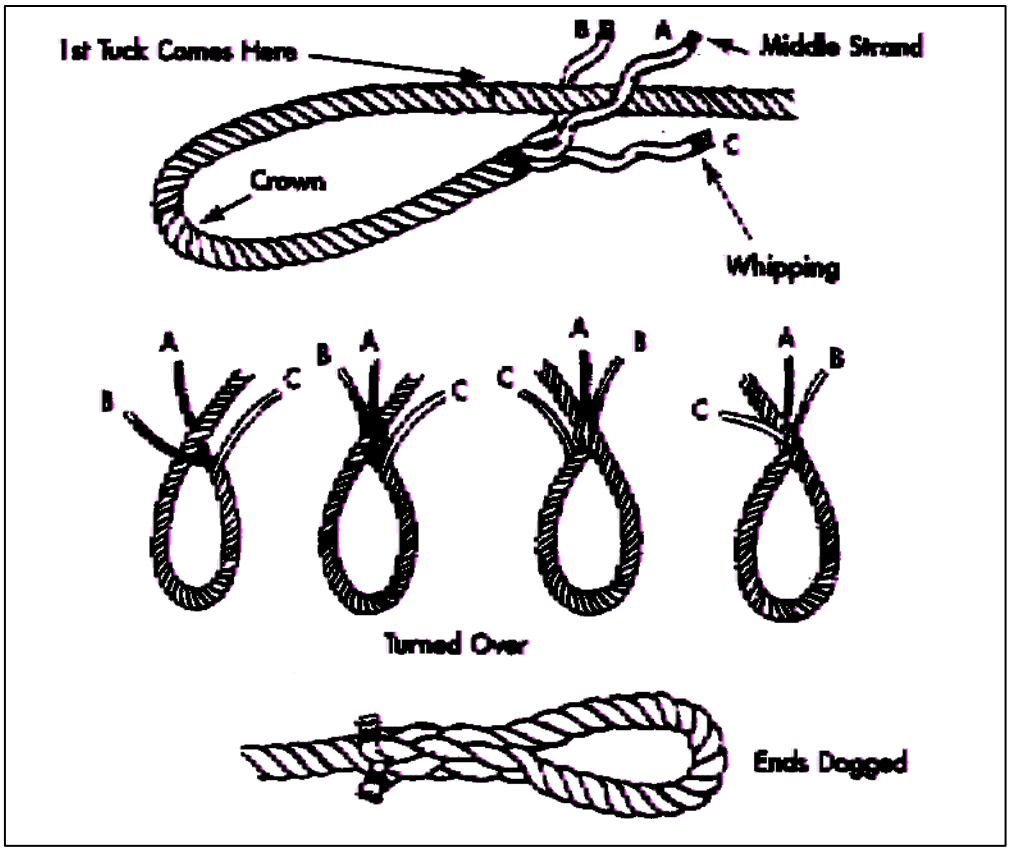


Figure 5.13-2 - Making an Eye Splice

b. Now refer to Fig 5.13-2 in which the middle strand is marked A, the left-hand strand marked B and the right-hand strand marked C, and make the splice as follows:

(**1**) Tuck A, from right to left, under the nearest strand of the standing part.

(**2**) Tuck B, from right to left, under the next strand of the standing part.

(**3**) Now turn the rope right over so as to bring the remaining strand C on the top, and then tuck C from right to left under the unoccupied strand of the standing part. Care must be taken to retain the lay of the rope in the last strand tucked, as this enables it to lie closer.

(**4**) Now, beginning with C, heave each strand taut with a heaving mallet. Then tuck all three strands a second and third time (fourth and fifth time if splicing MMFC).

(**5**) Finish off by tapering the splice as described for the back splice or, if the appearance of the splice is of secondary importance and maximum strength is required, dogging the ends by halving each of the three strands and whipping each half to its neighbor over the adjacent strand.

5.13.5 Short Splice in Hawser-Laid Rope

The strands of each rope are tucked between the strands of the other rope against the lay, each strand being taken over the strand on its left, then under the next strand and emerging between this and the subsequent strand. In Fig 5.13-3 the ends of the rope are lettered A and B, and their unlaid strands C, D, E, F, G and H respectively. Certain whippings and stops have been omitted to show the tucking of the strands more clearly. Follow these steps for a short splice in hawser-laid rope:

(**1**) Whip each rope at a distance from its end equal to 20 times the diameter of the rope (this whipping has been omitted from rope A in the illustration).
(**2**) Unlay the strands to the whipping and whip their ends (these whippings have also been omitted).
(**3**) Marry the two ropes so that one strand of each lies between two strands of the other (i).
(**4**) Having ensured a close marry, whip the strands strongly round the joint to prevent them slipping, and stop ends C, D and E to rope B with a strong stop (whipping and stops have been omitted).
(**5**) Cut the whipping on A.
(**6**) Take F over C, under E, and bring it out between D and E (ii).
(**7**) Take G over E, under D, and bring it out between D and C (ii and iii).
(**8**) Take H over D, under C, and bring it out between C and E (iii).
(**9**) Stop G, F and H to A, cut the stop and whipping on B, and tuck C, D and E in a similar manner.
(**10**) Heave all six strands equally taut with a heaving mallet.
(**11**) Again tuck each strand over the strand on its left and under the next one, and then repeat this operation a third time (fourth and fifth time if splicing MMFC).
(**12**) Finish off as described for an eye splice.

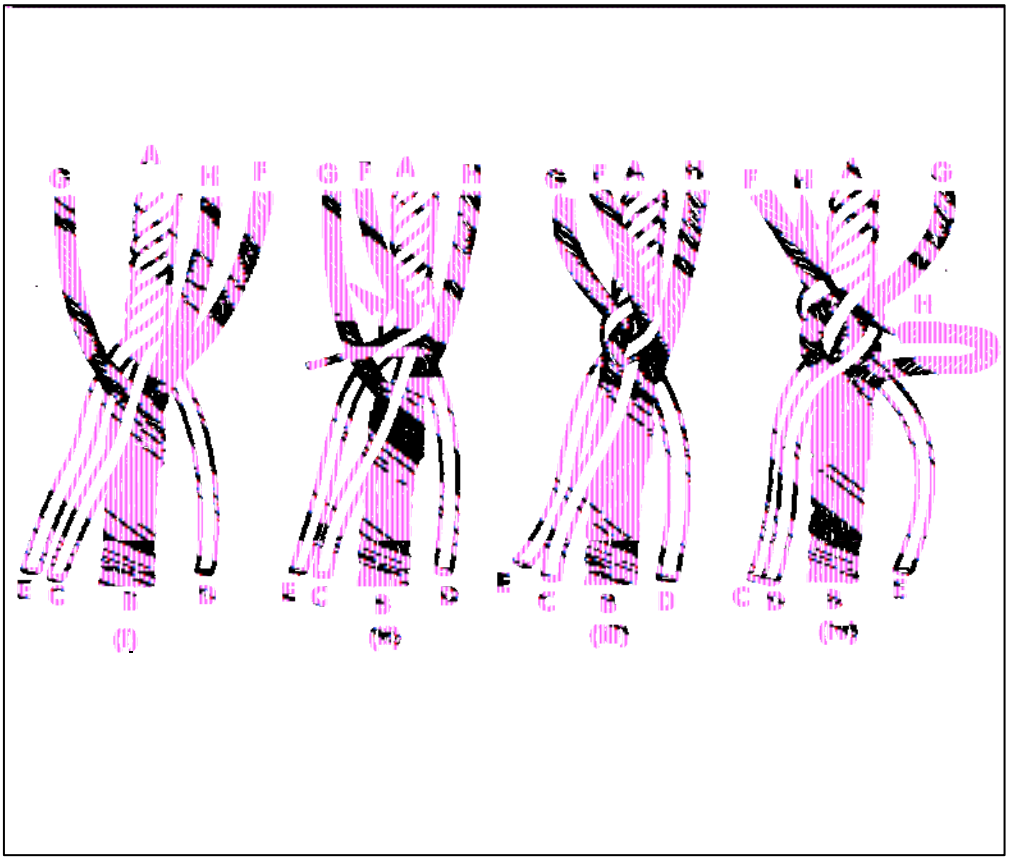


Figure 5.13-3 - Making a Short Splice

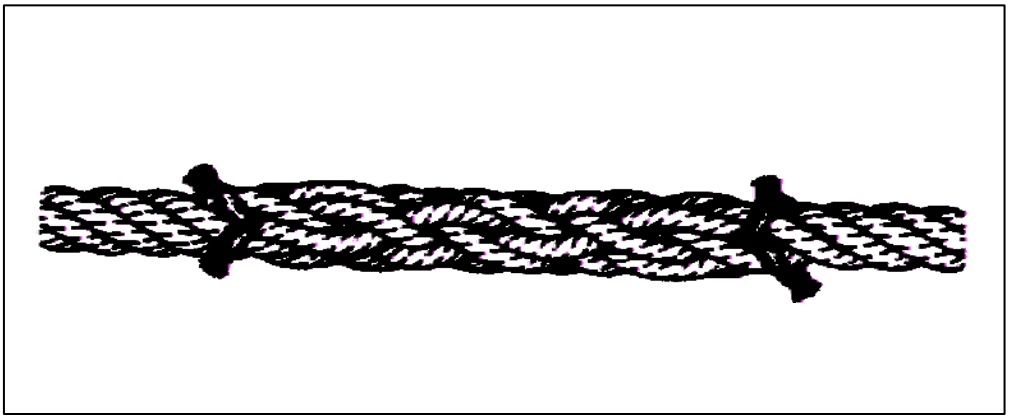


Figure 5.13-4 - Finishing a Short Splice by Dogging

5.13.6 Cut Splice in Hawser-Laid Cordage

This splice is used when it is required to make a permanent eye in the bight of a rope as follows:

(**1**) Whip each rope at a distance from its end equal to 20 times the diameter of the rope.
(**2**) Unlay it to the whipping and whip the end of each strand (i).
(**3**) Place the ends of the two ropes alongside and overlapping each other, and stop them together.
(**4**) Tuck the unlaid strands of both ropes as for an eye splice.
(**5**) Finish off as for an eye splice.

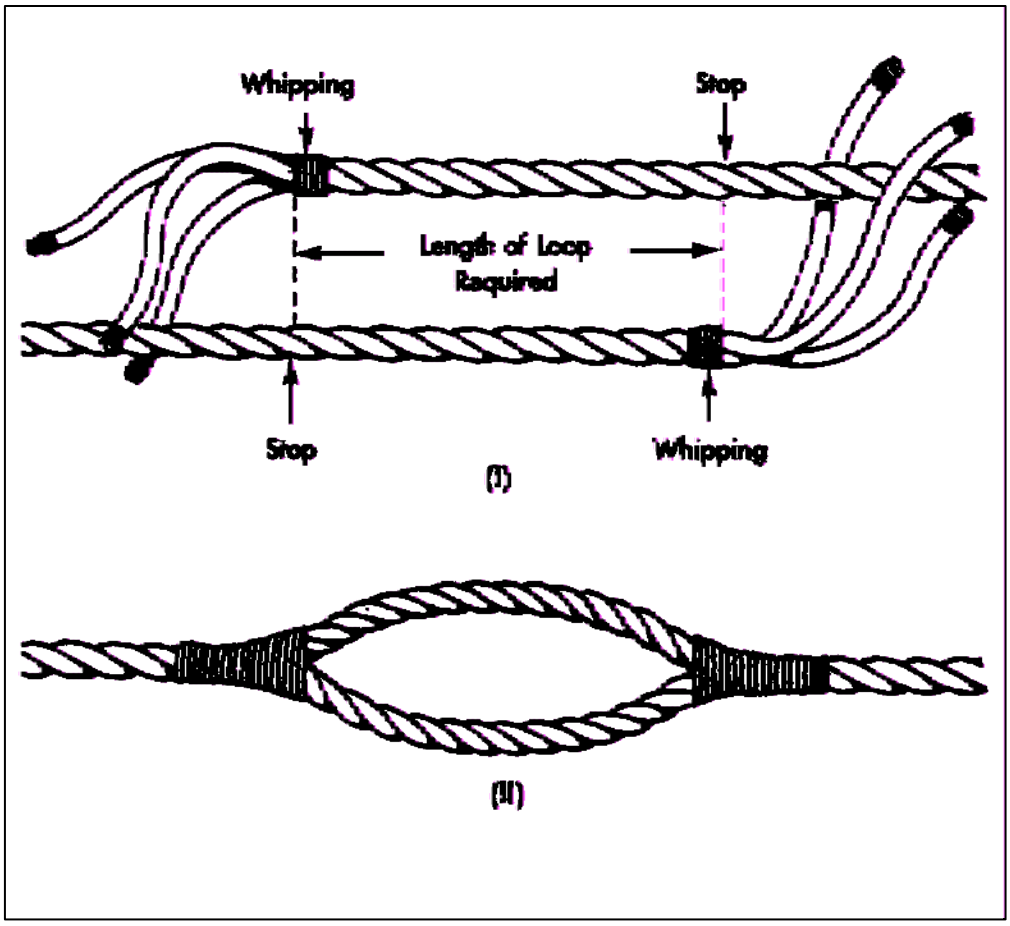


Figure 5.13-5 - Making a Cut Splice

5.13.7 Long Splice in Hawser-Laid Cordage (natural fiber cordage only)

This splice is used to join two ropes that are required to pass through a block. Provided the splice is well made, it will not increase the diameter or weaken the rope. It is possible to make a long splice in MMFC, but results are usually unsatisfactory. The principle of the long splice (Fig 5.13-6) differs radically from that of the short splice as follows:

(**1**) One strand from each rope is unlaid, and the corresponding strand of the other rope is given a twist and laid up in its place.
(**2**) The remaining strand from each rope remains at the marry, resulting in three pairs of strands spaced equidistantly along the married ropes.
(**3**) One third of the yarn is now taken out of all strands (not shown in (iv) and, though discarded, these yarns should not be cut off until the splice is completed).
(**4**) Each pair of strands is then tied in an overhand knot (left over right for a right-hand laid rope).
(**5**) Each strand is tucked over one strand and under the next, as for a short splice.
(**6**) Half of the yarns in each strand are now taken out and the remaining yarns tucked once more, to give a gradual taper (v).
(**7**) The splice is finished off by stretching it, hauling all ends taut (including the discarded yarns) and then cutting them off.
(**8**) To make a long splice, whip each rope at a distance from its end equal to 40 times the circumference of the rope.
(**9**) Then unlay the strands to the whipping and whip their ends.
(**10**) Marry the two ropes together, as in a short splice.
(**11**) Each strand unlaid as described above is followed up by the strand from the other rope which lies on its right in the marriage, so that H is unlaid and followed up by E, D is unlaid and followed up by F, and C and G remain at the marry. Each strand is unlaid until the length of the end of the strand following it up is reduced to 12 times the diameter of the rope.
(**12**) The splice is now finished off.

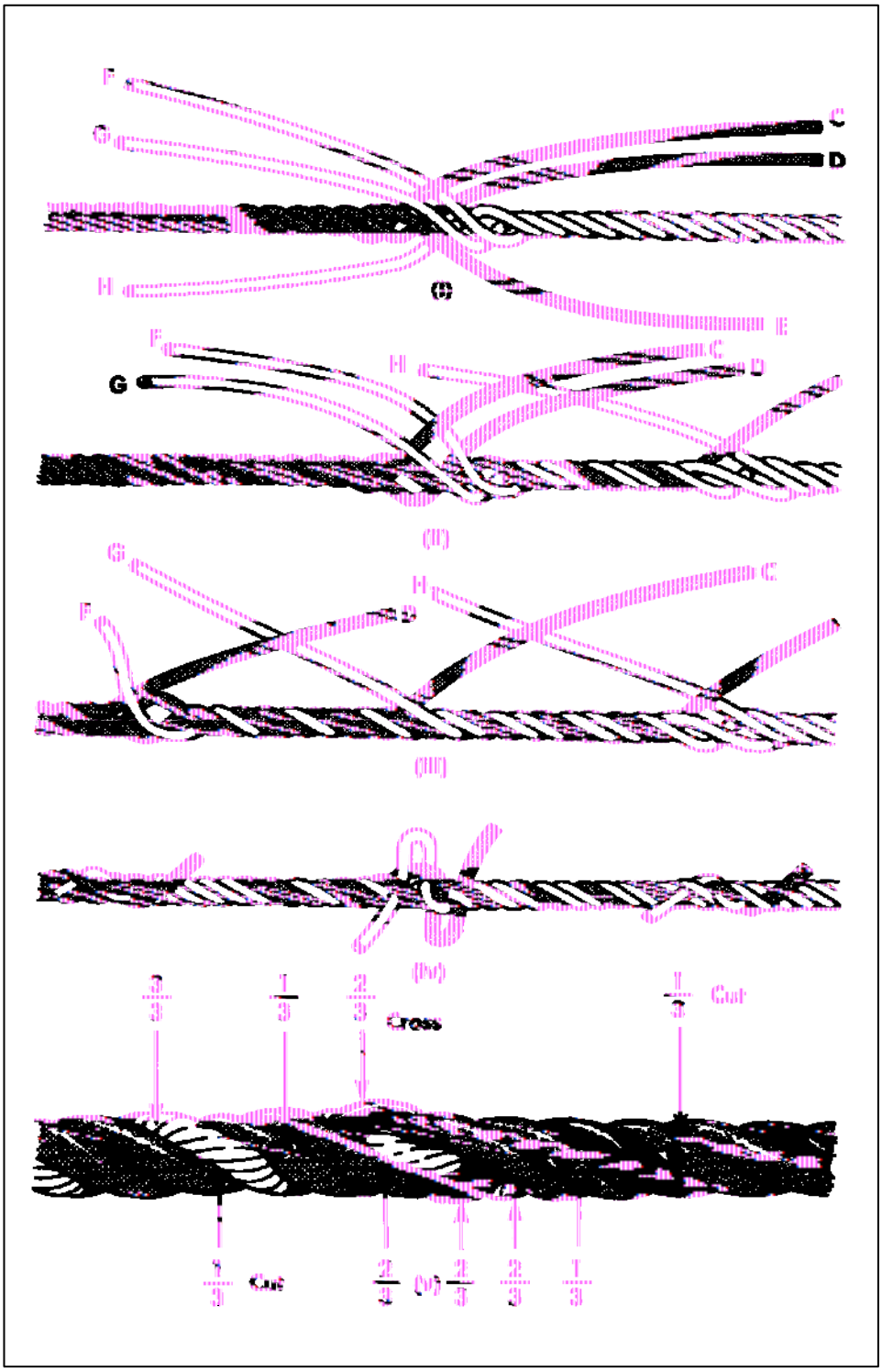


Figure 5.13-6 - Making a Long Splice

5.14 CONSTRUCTION, CHARACTERISTICS AND DETAILS OF SUPPLY OF STEEL WIRE ROPE (SWR)

Improvements in the design and characteristics of MMFC and slings, and the need in ships to reduce top weight, limit noise and minimize interference to radar equipment has resulted in a reduction in recent years in the use of SWR throughout the fleet. However, SWR still has many applications aboard warships and this requirement is likely to remain in the foreseeable future.

5.14.1 Construction

a. A wire rope is constructed of a number of small wires that extend continuously throughout the entire length. These wires are laid up into strands, and the strands themselves are laid up to form the rope. With the exception of certain special types described later, all wire rope used at sea is preformed, has a galvanized finish, and consists of six strands. The wires forming a strand are laid up left-handed around a fiber or wire core and the strands forming the rope are laid up right-handed around a fiber main core.

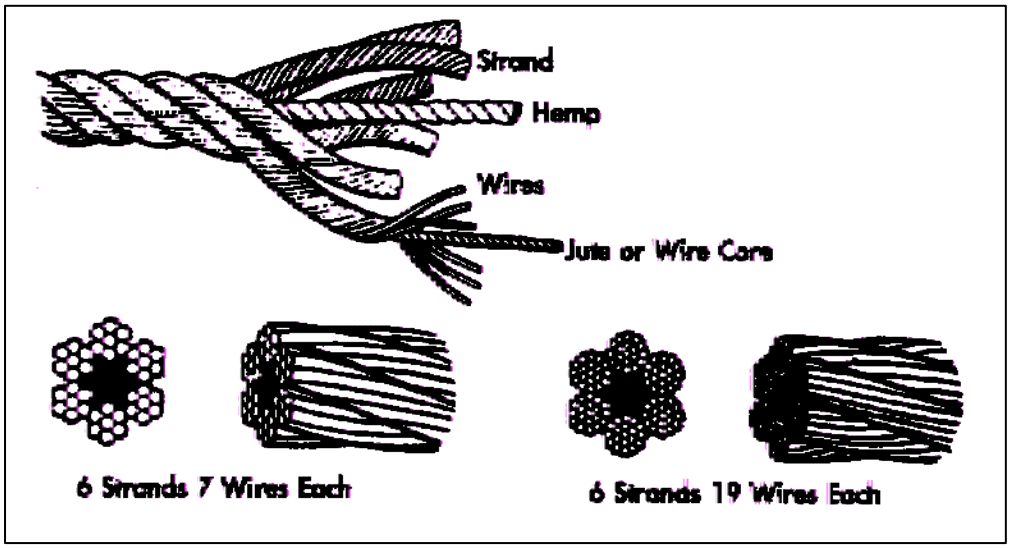


Figure 5.14-1 - Construction of a Wire Rope

b. During manufacture, the individual strands are preformed to give the exact spiral they take up in the completed rope. Therefore, the wires and strands lie in their true positions free from internal stress and will not spring out of place should the rope break or be cut. The main fiber core of a wire rope has two main functions:

(**1**) It acts as a cushion into which the strands bed, allowing them to take up their natural positions as the rope is bent or subjected to strain.

(**2**) It absorbs the lubricant with which the rope should be periodically dressed, so that as the rope is stretched or flexed the lubricant is squeezed between the wires, thus lubricating them and reducing the friction between them.

c. A wire rope can be made flexible in one of two ways:

(**1**) By replacing the centre wires of each strand with a large fiber core, in which case strength is sacrificed for flexibility.

(**2**) By making up each strand with a large number of small-gauge wires around a wire core in which case the full strength is retained.

5.14.2 Description

The full description of SWR states the diameter and construction of the rope followed by the construction of each strand in brackets, e.g., 24 mm 6 x 26 (15/9/Fibre) fiber-core SWR. This indicates a diameter of 24 mm, a construction of 6 strands around a central fiber main core, each strand constructed from 26 wires, 15 of which are laid up around 9 which in turn are laid up around a fiber (hemp/jute) core. In practice, a SWR is identified simply by quoting the size and rope construction only and omitting the strand construction, e.g., 24 mm 6 x 26 SWR. Wire used by the Canadian Navy is manufactured on the foregoing principles and falls into the following groups: 6 x 19, 6 x 25, and 6 x 37. The degree of flexibility improves as the number of wires in the strands increases.

5.14.3 Uses

a. **SWR (6 x 19, 6 x 25 and 6 x 37 construction).** This range of ropes has greater strength and flexibility and is used for standing and running rigging, and slinging and towing pendants. The strands are constructed of a number of small gauge wires made up around a fiber core.

b. **Non-Rotating Wire.** This type of wire rope (Fig 5.14-2) has its strands laid up in the same direction as that in which their constituent wires are twisted. All the wires and strands are small, and the inner strands are arranged so that the tendency of the rope to rotate under load is reduced to a minimum. It is very flexible and is particularly suitable as a whip for cranes and single point davits, where strength and non-unlaying action are essential. The wire requires very careful handling before and during installation. It has no tendency to twist either way but it is so pliable that turns either way can be imparted. When making fast the plain end to the side of the drum or crane structure, ensure that the entire cross section of the rope is firmly secured. At present, non-rotating wire rope whips are supplied as made-up items, details of which can be found in the manuals dealing with the maintenance and operating instructions for davits and cranes.

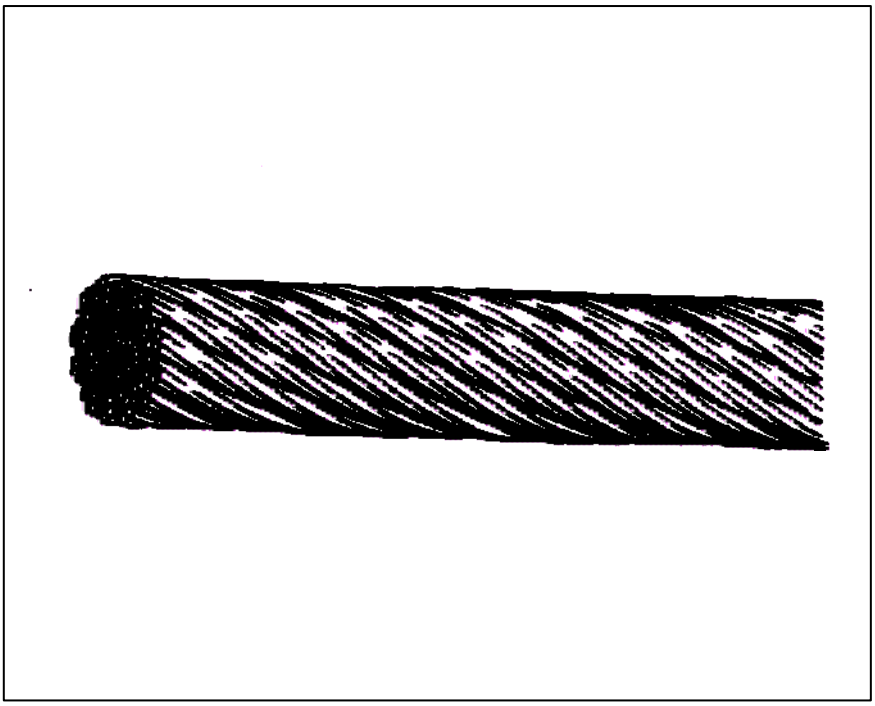


Figure 5.14-2 - Non-Rotating Wire Rope

5.14.4 Strength

The rule-of-thumb method of calculating the breaking strain of conventional SWR is to divide the square of the diameter by a known factor. Table 5.14.1 gives the approximate strength of new SWR according to its construction and its diameter (d) in mm. However, the test certificate supplied with the rope is the most accurate guide to the breaking strength.

Table 5.14-1: Formula for Calculating Approximate Breaking Strength of Conventional SWR

Construction	Range of Sizes	Breaking Load of Rope
6 x 19	3-8 mm	$d^2/17$ tonnes
6 x 25	10-12 mm	$d^2/17$ tonnes
6 x 37	14-28 mm	$d^2/17$ tonnes

5.15 HANDLING OF WIRE ROPE

Wire rope is much less resilient and, therefore, much less tractable than cordage. It resists being bent, does not absorb turns readily, is much more liable to kinking and snarling, and tends to spring out of a coil, or off a drum or bollard. However, if handled correctly, it can be used for most of the purposes to which cordage is put, but bends and hitches should not be made in it.

5.15.1 Kinking and Crippling

Because of its construction and comparative lack of flexibility, wire rope requires more care in handling than cordage; if carelessly handled, it may suffer serious damage through kinking and crippling.

a. **Kinking.** Any loop or turn in a wire rope can all too easily be pulled into a kink, which permanently damages it. If a kink is seen to be about to develop, it should be removed as indicated in Fig 5.15-1, and no attempt should be made to pull it out in the manner shown in Fig 5.15-2.

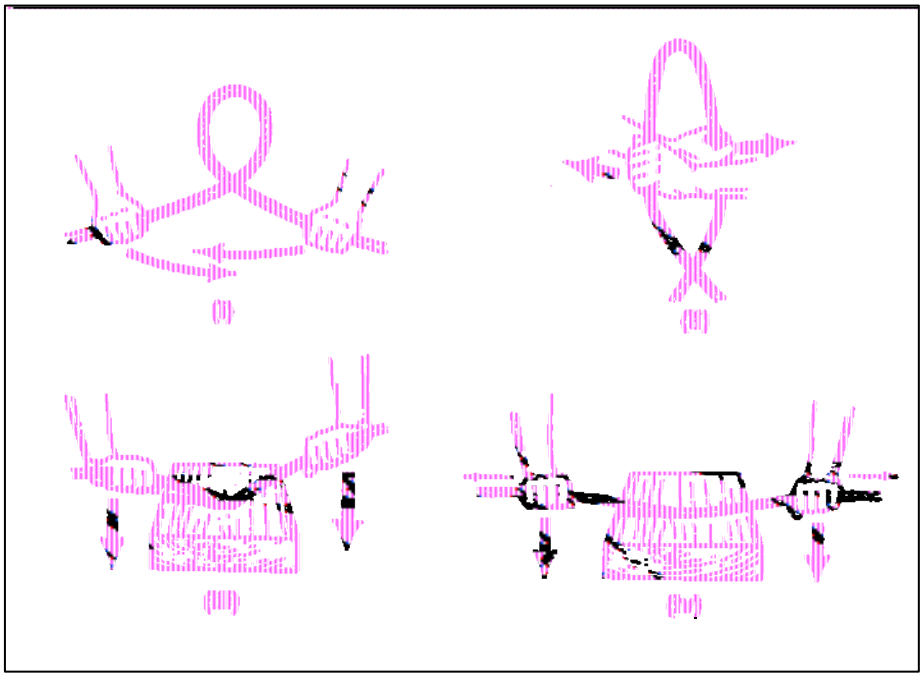
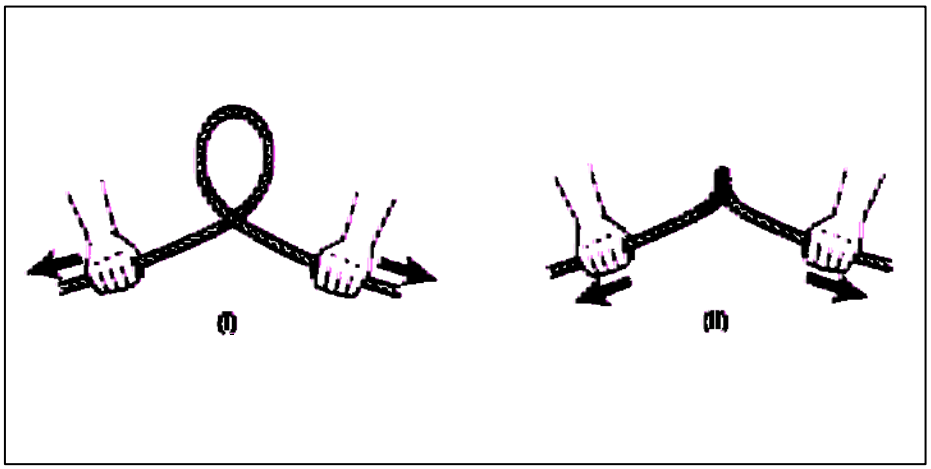


Figure 5.15-1 - Right Way to Remove a Kink in Wire Rope

Figure 5.15-2 - Wrong Way to Remove a Kink in Wire Rope



b. **Crippling (bad nips).** If a wire rope is bent at too acute an angle or led over a sharp edge, it will be seriously damaged by distortion of its strands, which may result in a permanent kink or even in the rope parting. A rope so led is said to form a bad nip and this results in it being crippled. To freshen the nip is to veer or heave in a short length of rope that is under strain so as to bring a fresh portion of the rope to take the chafe where it passes through fairleads or around bollards. To prevent crippling, a wire rope, which will come under strain, should never be led through a shackle or eye plate to alter the direction of its lead. In addition, it should not be around a bollard or drum of a diameter less than 13 times the diameter of the rope. If it has to run through a block, the diameter of the sheaves should be at least 20 times the diameter of the rope.

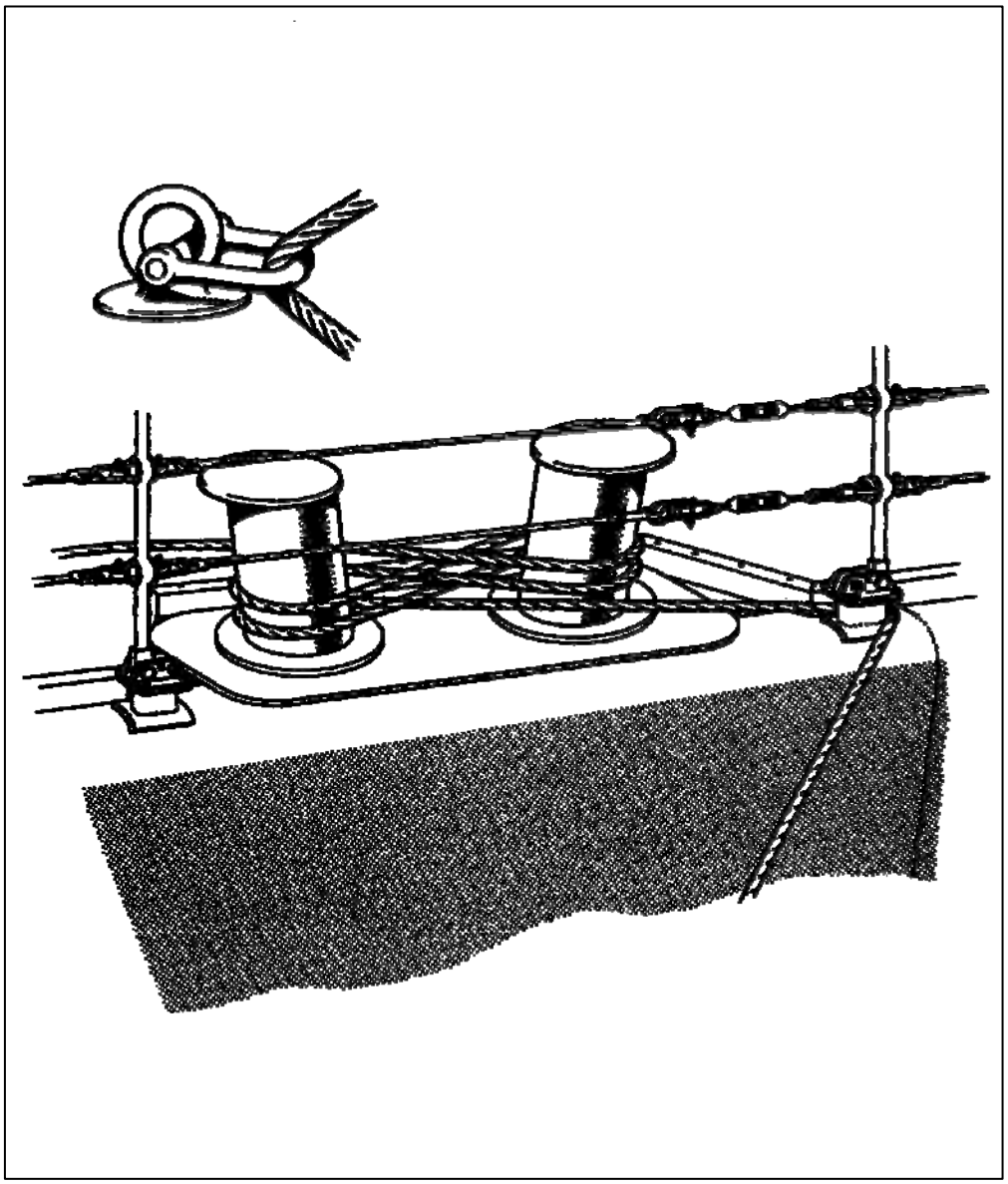


Figure 5.15-3 - Examples of Bad Nips (Leads)

5.15.2 Coiling and Uncoiling

Wire rope, especially long lengths of it, should be stowed on reels, but where this is not practical, it must be coiled down. Wire rope is less able to absorb turns than fiber rope. When coiling down, it is therefore all the more necessary to have the uncoiled length free to revolve. Where this is impossible, an alternative is to use left-handed loops, called Frenchmen, in the coil (Fig 5.15-4). These Frenchmen serve to counteract the twists put in by coiling down right-handed. Frenchmen are also necessary when coiling down a wire rope of which some portions have contracted a left-hand set (as will occur when a rope belayed left-handed round a bollard has been subjected to strain). Such portions will resist being coiled right-handed and each loop must be allowed to become a Frenchman. It is wise to stand clear when rope is being hauled off a coil containing Frenchmen as such turns are very likely to jump off. A coil of wire rope should always be well stopped to prevent the coils from springing out of place.

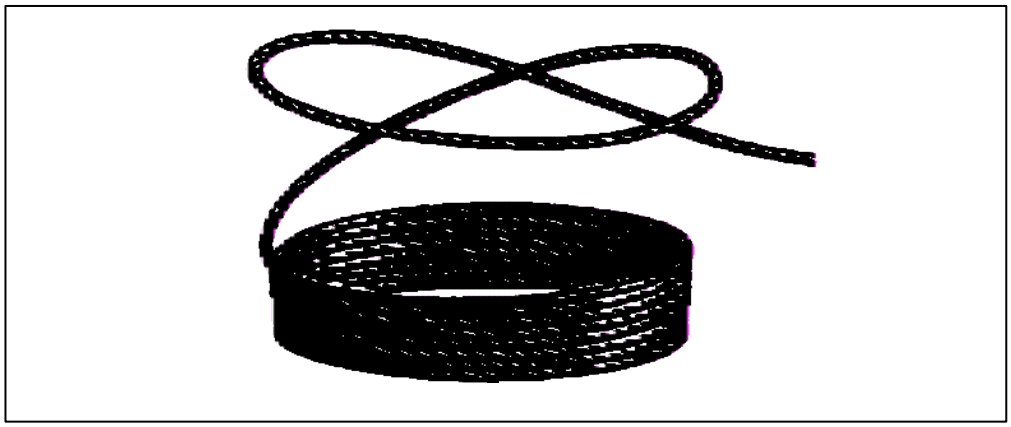


Figure 5.15-4 - A 'Frenchman'

The best way to run out a coiled down wire is shown in Fig 5.15-5.

Figure 5.15-5 - Running Out a Coiled Down Wire

5.15.3 Handling New SWR

a. **To unreel or uncoil a new rope:**

(**1**) New wire ropes are supplied either in machine-wound coils or on cable drums (reels). They must be taken off the coils or drums in the correct manner or kinks will quickly develop. A small coil can be rolled along the deck, but if space does not permit, or the rope is heavy, place the coil on a turntable and lash down two strong battens crosswise on the top of the coil (Fig 5.15-6). This will prevent the rope from springing up over the top of the coil and kinking. Then cut the stops, and haul the rope off the coil as it rotates on the turntable.

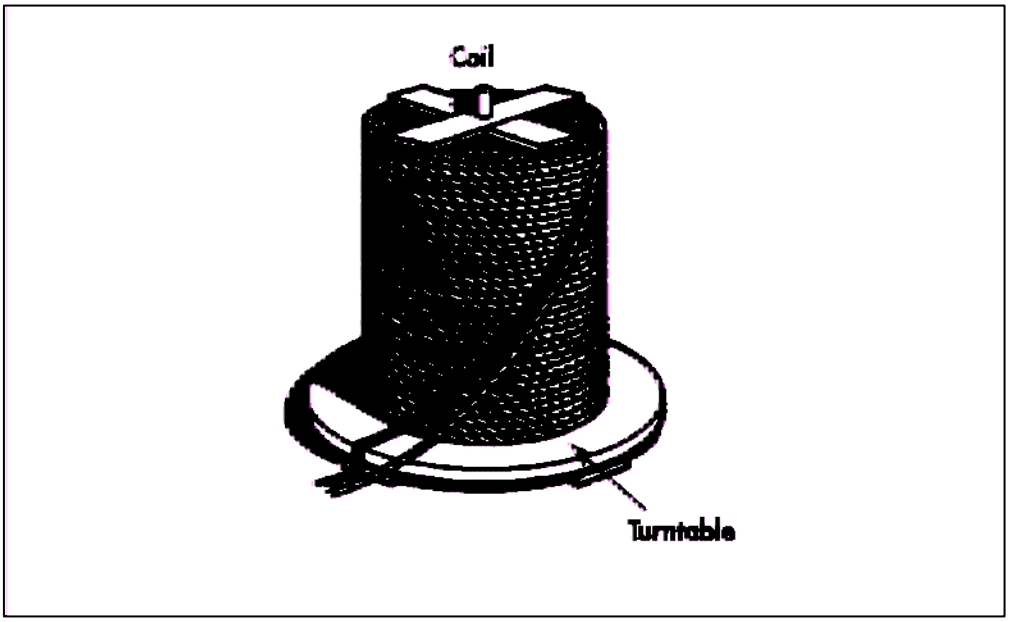


Figure 5.15-6 - Uncoiling a New Wire Rope

(**2**) To unreel the rope from a drum, pass a shaft through the drum and support the shaft at either end, thus allowing the drum to revolve. Then cut the outer stops and unreel the rope off the drum (Fig 5.15-7). To coil down a small rope from a drum, up-end the drum as shown in Fig 5.15-8 and lap the rope off the top of the drum, lapping off each turn anti-clockwise. The twist put in the rope as each turn is lapped off is cancelled automatically by coiling the rope down clockwise.

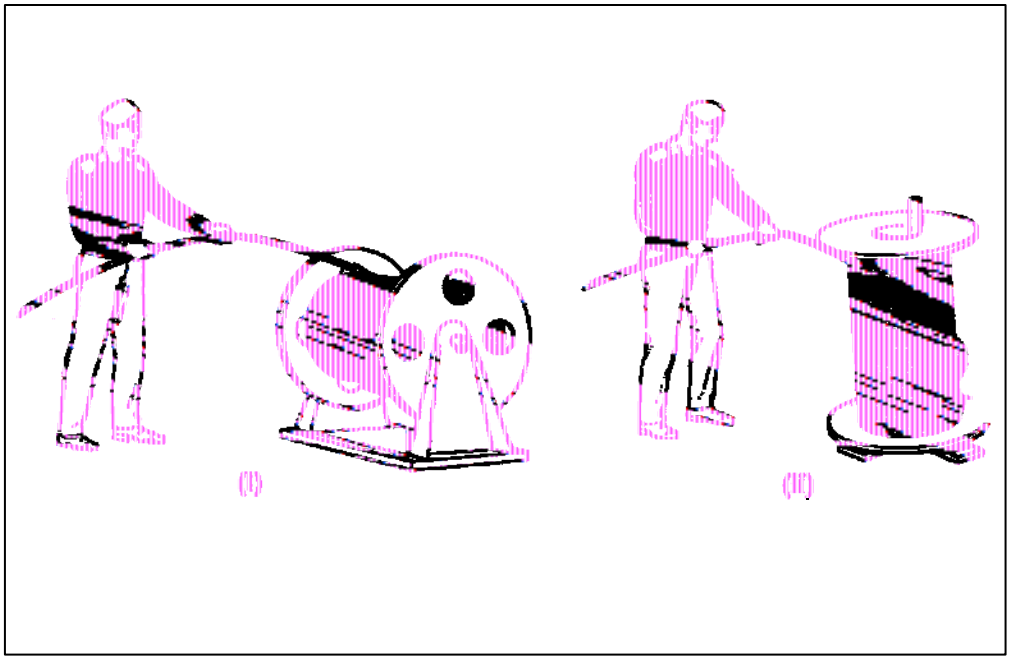


Figure 5.15-7 - Unreeling a New Wire Rope

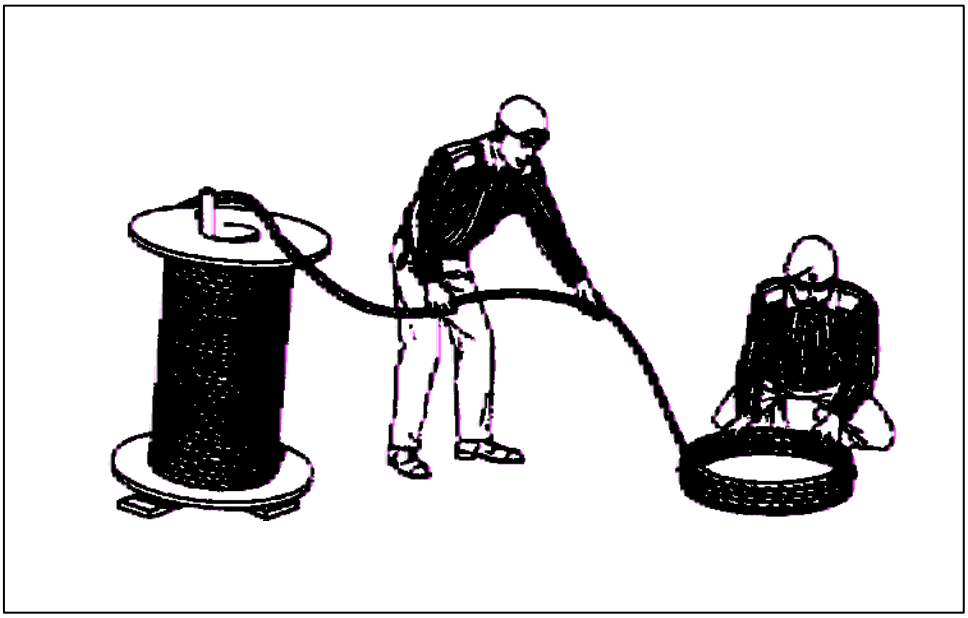


Figure 5.15-8 - Lapping Off and Coiling Down a Small Wire Rope

b. **To cut off a length of wire rope.** The rope should be very firmly whipped about 25 mm on each side of the position at which it is to be cut, and then placed on the top of a bollard or similar hard surface. The strands should then be cut with a hammer and cold chisel or with a wire-cutter. Whenever a length of rope is cut off a coil or a drum, the coil or drum should be clearly marked, indicating either the length cut off or the length remaining.

5.15.4 Care and Maintenance of SWR

a. Wire ropes have a lubricant incorporated during manufacture. This serves a dual purpose: it provides corrosion protection and also minimizes internal friction. The protection provided by this manufacturing lubricant is normally adequate in preventing deterioration due to corrosion during the early part of a rope's life. However, the lubricant applied during manufacture must be supplemented by lubrication in service. This service lubricant is called dressing. The kind of dressing used and the frequency of application vary with the type of rope and its usage. Details of the maintenance of SWR carried by, or fitted in, HMC ships are laid down in the Ship's Maintenance Management Information System (SMMIS).

b. Wire hawsers should be stowed on reels under a fitted cover whenever possible. When being reeled in or otherwise stowed, the surface of a wire hawser should be washed with fresh water to free it from salt, then dried with cloths and lightly smeared with the appropriate lubricant.

5.15.5 Inspecting SWR

SWR carried or fitted in HMC ships must be inspected periodically in accordance with the NAMMS system. When inspecting, the indications described below should be sought:

a. **Distortion of Strands.** This is the result of damage by kinking, crushing, serious crippling round a bad nip, or other mistreatment. If likely to cause the strands to bear unequal stresses, they must be considered as reducing the strength of the rope by 30 percent. Should they be sufficiently serious to cause the heart to protrude, the rope must be discarded. A crushed rope may be restored to some extent by the careful use of a mallet.

b. **Flattening of Some of the Outer Wires by Abrasion.** These flats are easily seen because the abrasion gives the flattened wires a bright and polished appearance. However, they do not affect the strength of the rope unless they are very pronounced. Flats that extend to three-quarters of the diameter of the wires will reduce their cross sections and, therefore, reduce their individual strengths by 10 percent. As only a limited number of wires will be affected, the loss in strength of the whole rope will be very small. (These flats must not be confused with flattening of the whole rope which indicates distortion of the strands and is, therefore, much more serious.)

c. **Broken Wires.** These are usually the result of fatigue and wear, and mostly occur in crane wires. It is generally accepted that a wire rope is coming to the end of its useful life when one wire of any strand breaks. To deal with a broken wire, grip the broken end with a pair of pliers

and bend the wire backwards and forwards until the wire breaks inside the rope between the strands where it can do no harm. A rope should be discarded if more than 5 percent of its wires are broken in a length equal to 10 times the diameter of the rope. For example, a 24 mm diameter, 6 x 24 wire rope should be discarded if seven broken wires are found in a length of 240 mm. Because of the danger to handlers, berthing wires should be discarded if any broken wires are discovered.

d. **Corrosion.** Wire rope can be corroded by:

(**1**) The action of dampness on the wires from which the galvanizing has worn off. If this happens to the inner wires first, it causes rust to fall out of the rope and is therefore easily detected.

(**2**) The action of fumes and funnel gases, which attack the outside wires. The effect then becomes visible on inspection.

(**3**) Contact with acid, which soaks into the heart and attacks the inside wires. This is not necessarily noticeable on the outside of the rope and can be the cause of parting without warning.

(**4**) Lack of lubrication. This is a frequent cause of corrosion. When a wire rope is under tension it stretches and becomes thinner, and during this process the individual wires are compressed and friction is set up. The fiber heart and cores are also compressed, releasing oil to overcome the friction. A wire rope of outwardly good appearance but with a dry powdery heart or core has not been properly maintained and should be treated with caution.

e. **Effect of Extreme Cold.** When subjected to extreme cold, a wire rope may become brittle and lose its flexibility, and an apparently sound rope may part without warning. The brittleness is not permanent and the rope will regain its resilience in a normal temperature, but the potential danger should be remembered when working wires in very cold climates.

5.15.6 Testing of SWR

The wire from which the rope is to be made is tested before manufacture of the rope to ensure it complies with the relevant standards and specifications with regard to tensile strength, torsion and galvanizing properties. After manufacture of each production length of rope, test samples are cut from the finished rope and strand. These samples are used for a tensile test to destruction, tests of rope performance, and tests on a mixture of the individual wires with regard to diameter, tensile strength, torsion and quality of galvanizing. A certificate of conformity and a test certificate showing the guaranteed minimum breaking strength of the wire when new accompany each coil of wire.

5.16 GENERAL REMARKS ABOUT SWR

5.16.1 How to Measure the Size of a Rope

The size of a wire rope is the diameter in mm of a true circle that will just enclose all the strands (Fig 5.16-1). Measure at each of three places at least 2 m apart. The average of these measurements is to be taken as the diameter of the rope.

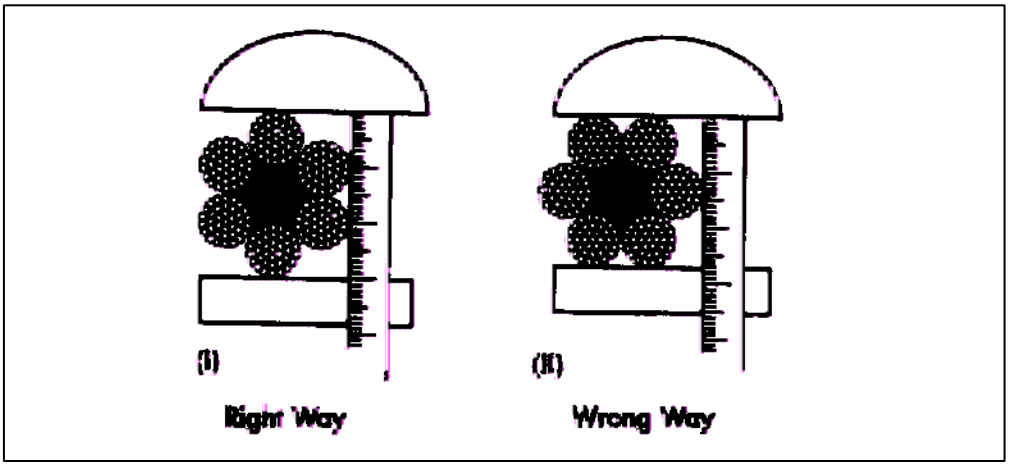


Figure 5.16-1 - How to Measure the Diameter of a Rope

5.16.2 Sheaves for Wire Rope

a. **Size of Sheave Required for a Wire Rope Hoist.** The diameter of sheave required for each type of six-strand wire rope supplied to the Canadian Navy should be at least twenty times the diameter of the wire. The diameter of a sheave used for any wire rope will considerably affect the life of that rope. As the rope bends around a sheave, the strands and wires farthest from the centre of curvature move apart and those nearest the centre of curvature move closer together. This results in the generation of considerable friction between these wires and strands, and the smaller the sheave the greater will be the friction. Friction also increases rapidly with the speed at which the rope is moving. While the rope is bent around a sheave, the outer wires are also subjected to a marked additional stress, and the smaller the diameter of the sheave, the greater will be the stress. For these reasons the minimum diameters of sheaves recommended from practical experience for various types of ropes at speeds not exceeding 60 m per minute are 20 times the diameters of the ropes. For each increase in speed of 30 m per minute, 5 percent must be added to these figures. This will give a rope a reasonable life, but it is emphasized that its life will be greatly increased if still larger sheaves are used. Similarly, if a smaller sheave than that recommended has to be accepted, it will shorten the life of the rope. On no account should a sheave be used that is more than 20 percent smaller than that determined by reference to the above criteria.

b. **Use of Correct Sheave.** Using the wrong type of sheave can also considerably shorten the life of

a rope used for hoisting. The groove in the sheave must fit and support the rope as it travels around the sheave. Otherwise, there will be increased internal friction and external wear. Fig 5.16-2 (i) shows a sheave with too wide a groove, resulting in a flattening of the rope and considerable distortion and internal friction. Fig 5.16-2 (ii) shows a sheave with too narrow a groove, resulting in the rope not being supported, the wires of the strands being subjected to considerable wear, and friction being set up between the rope and the sides of the groove. The groove of the correct sheave should be shaped in cross section to the true arc of a circle for a distance equal to one-third of the circumference of the rope. The radius of the groove should be between 5 to 10 percent greater than the specified radius of the rope (Fig 5.16-3).

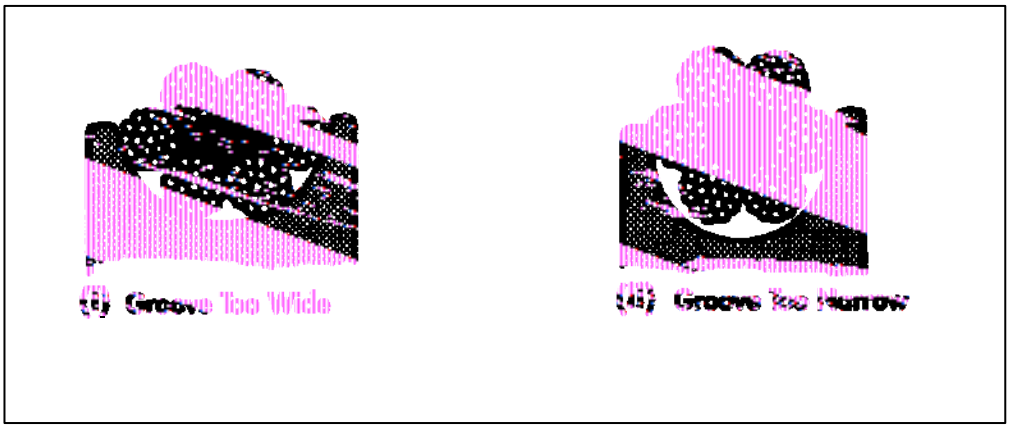


Figure 5.16-2 - Incorrect Sheaves

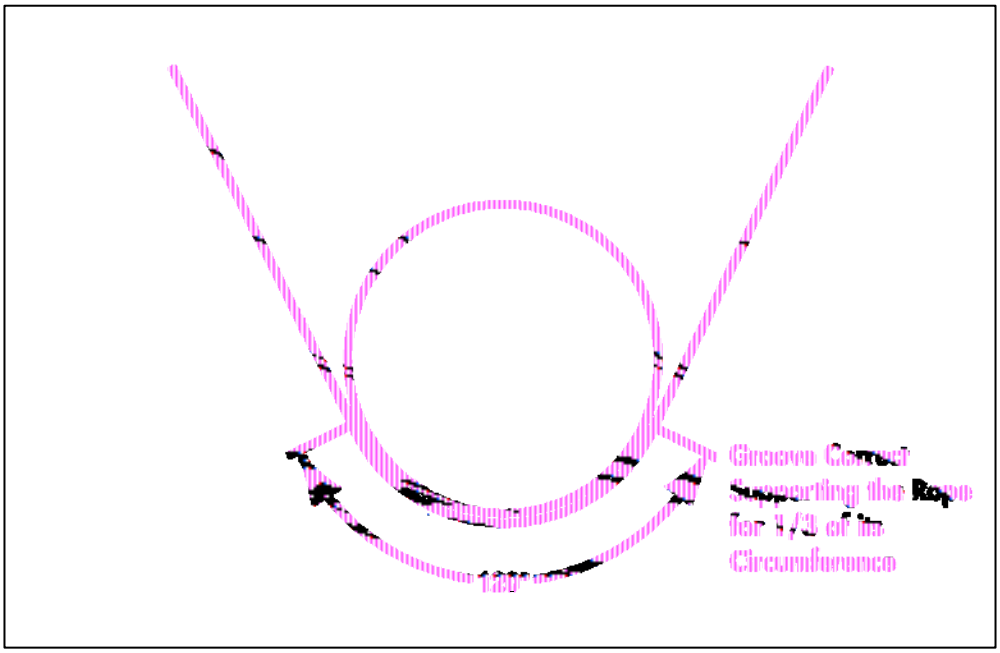


Figure 5.16-3 - Correct Sheave

5.17 SPLICING WIRE ROPE

a. The dockyard splice is the only splice accepted for use in the Canadian Navy at the present time. To prepare the wire and first tuck, proceed as follows:

(**1**) Put a whipping on the wire at a distance equal to 4 cm from the end of the wire for every mm of diameter of the wire. For example, a 28 mm diameter wire would require a whipping 1.1 m from the bitter end. The whipping length should be equal to the diameter of the wire and should be applied to the wire with a serving mallet.

(**2**) Unlay the wire from the end to the whipping, wiping off the strands and taping the ends of each strand.

(**3**) Form the eye to the desired size and secure the eye in a vise. Cut the heart out from between the strands at the seizing if it is a wire heart, or tuck the heart when tucking the No. 2 strand and cut it off.

(**4**) Insert the spike from the back of the wire, picking up two strands, and emerging to the left of centre inside the wire. Tuck No. 1 against the lay.

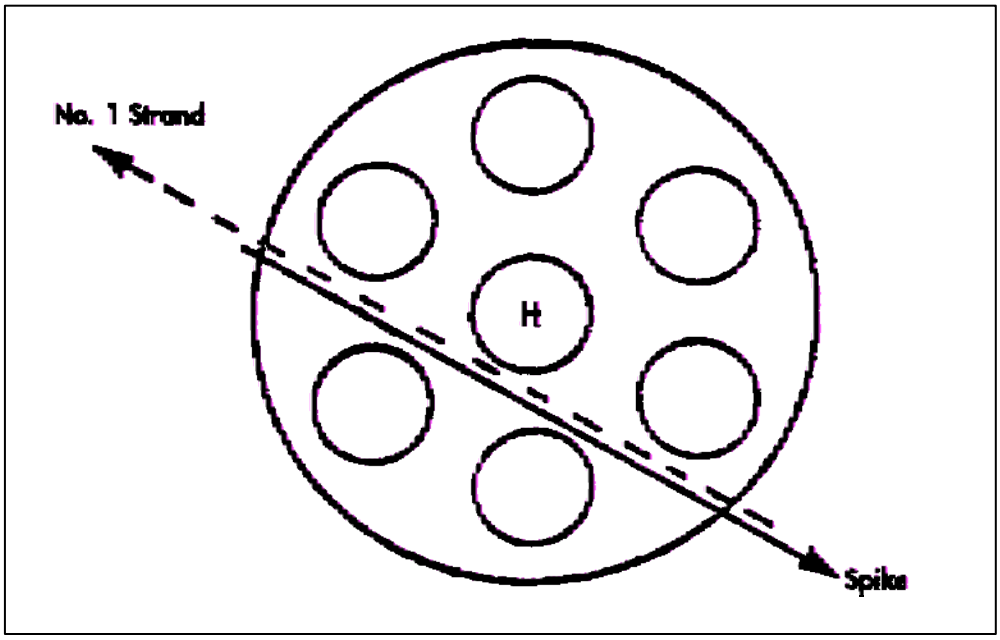


Figure 5.17-1 - Dockyard (DKYD) Splice

(**5**) Move to the left one strand and pick up three strands, tucking No. 2 wire with the lay. Ensure that the core is to the right.

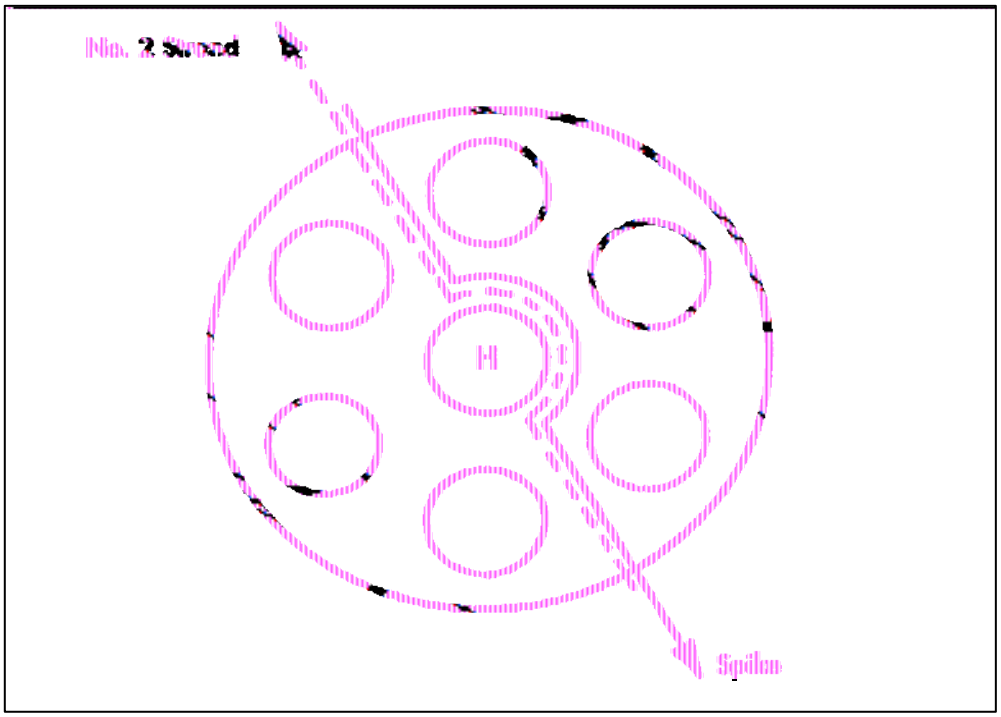


Figure 5.17-2 - DKYD Splice

(**6**) Continue to move the spike in a clockwise direction, pick up two strands and tuck No. 3 wire.

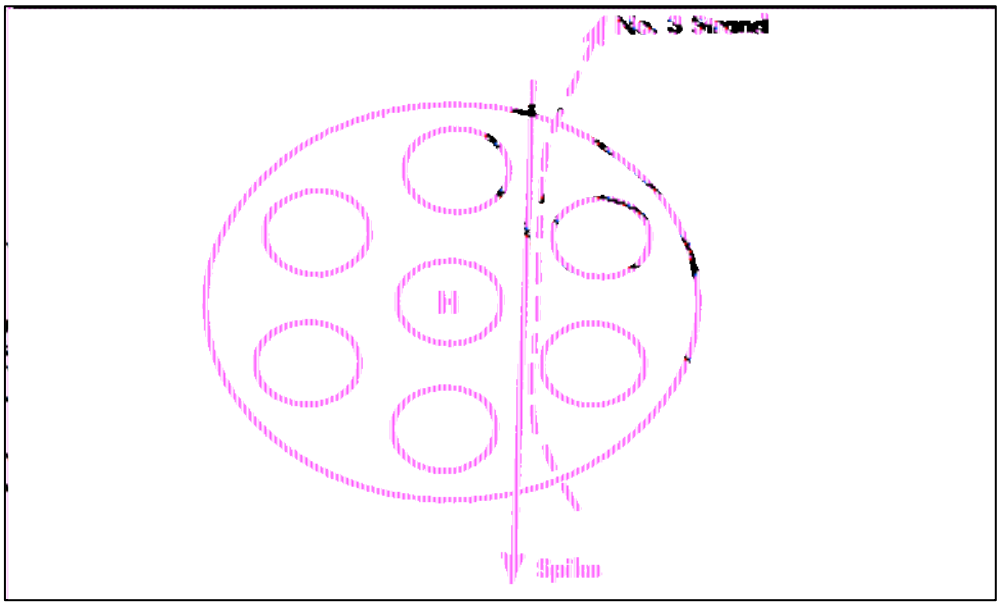


Figure 5.17-3 - DKYD Splice

(**7**) Continue clockwise, pick up one strand and tuck wire No. 4.

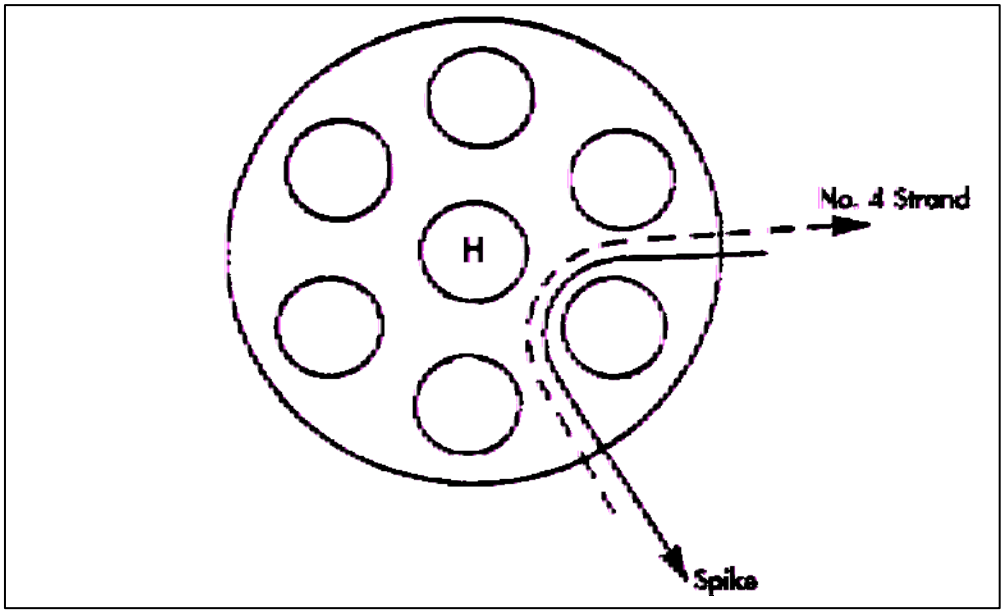


Figure 5.17-4 - DKYD Splice

(**8**) Move clockwise again and place the spike under the next wire so that No. 5 will enter to the left of the strand and will come out where 1, 2, 3 and 4 enter.

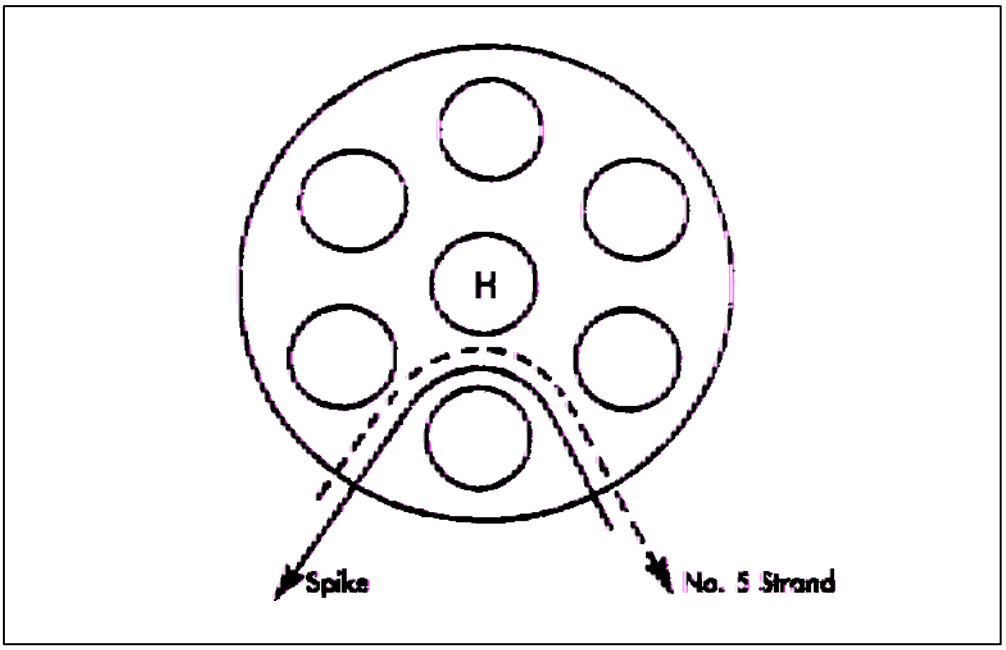


Figure 5.17-5 - DKYD Splice

(**9**) Move clockwise again and pick up one strand so No. 6 enters the wire on the left and comes out where No. 5 goes in.

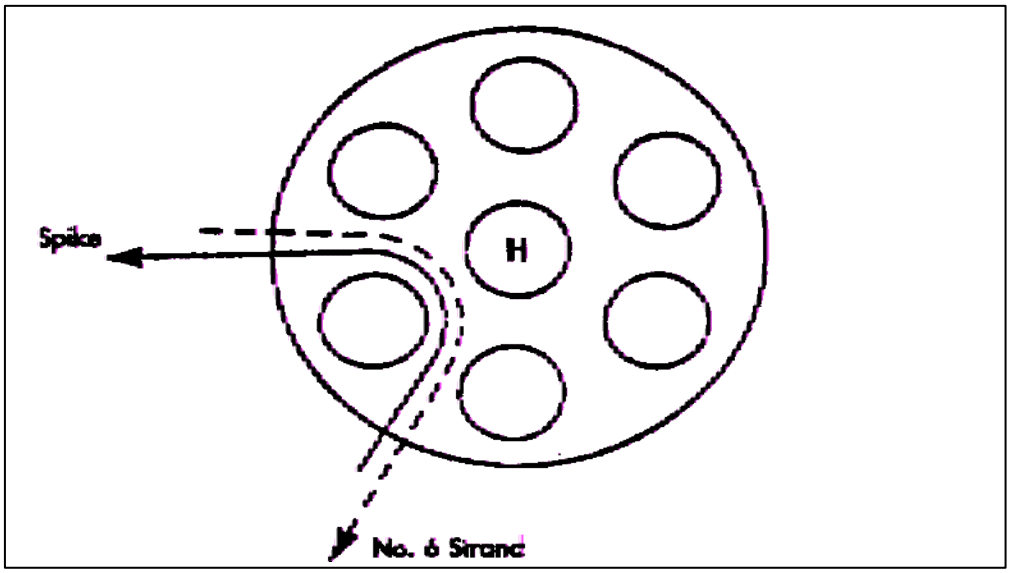


Figure 5.17-6 - DKYD Splice

(**10**) Now enter the hole as you did for wire No. 6 and pick up two strands tucking No. 1 wire with No. 6 wire.

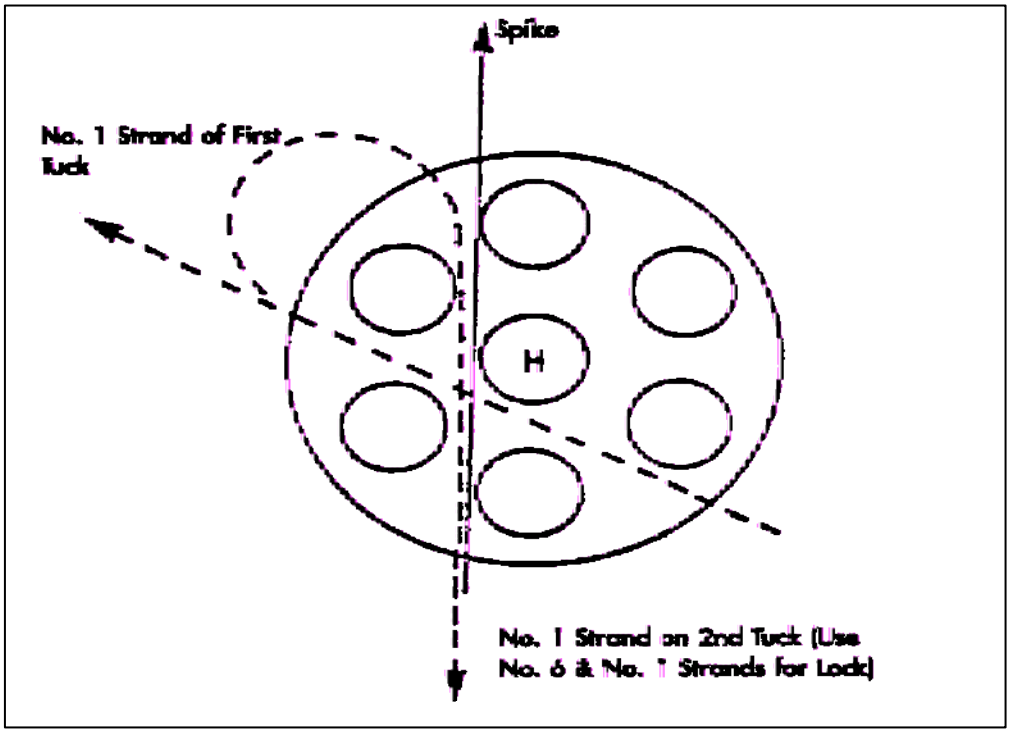


Figure 5.17-7 - DKYD Splice

(**11**) Pick up two more strands and tuck No. 2 wire.
(**12**) Repeat the above steps with wires No. 3, 4 and 5.
(**13**) Pick up two wires and cross wire No. 6 and wire No. 1, tucking the bottom wire (No. 6) around and over.
(**14**) Pick up two more strands and tuck No. 2 wire.
(**15**) Repeat Steps 12 through 14 two more times.
(**16**) Taper by tucking wires No. 1, 3 and 5, picking up two strands (one on either side of the wire).
(**17**) The splice is now complete.
(**18**) Round the splice in a vise, cut off the excess strands and serve.

b. To form the wire around a thimble, complete the following steps:

(**1**) Find the point of the wire that will lie at the crown of the thimble.
(**2**) Seize the wire firmly at the crown to secure the thimble.
(**3**) Pull the rope to form a "U" as close around the thimble as possible.
(**4**) Cross the parts of the wire until they close the throat of the thimble.
(**5**) Seize the wires at the cross-over point.
(**6**) Uncross the parts of wire and lay them side by side.
(**7**) Put two shoulder seizing on either side of the throat of the thimble, ensuring that the thimble fits snugly.
(**8**) Prepare and splice the wire as for a soft eye splice.

NOTE: *Wire splicing carried out in HMC ships is to be done when emergency repairs are necessary. When the ship has returned to home port, a work order will have to be raised to replace the splice with a tested mechanical splice.*

5.18 MECHANICAL SPLICING

Mechanical splicing carried out under various trade names is carried out by dockyard rigging shops and commercially under contract. The splice gives comparable strength to a hand splice and has the following advantages: it uses less wire, requires no worming, parcelling and serving, and is completed in less time. In the Canadian Navy, it has superseded the hand splice. The mechanical splice must be tested and marked with the safe working load prior to use.

5.19 SHACKLES

Shackles come in a variety of shapes and sizes. Shackles are used in standing and running rigging for securing the end of a wire or rope. They are also used for connecting lengths of anchor cable together. The size of a shackle is measured in inches or mm, using the diameter of the metal at the crown. Because of their shape, a straight shackle is stronger than a bow shackle of equal size. The Safe Working Load (SWL) is stamped on all shackles. Screw shackles should be moused to keep the bolt from turning out.

5.19.1 Parts of a Shackle

The ends of a shackle are called the lugs, the space between them is called the jaw, and the part opposite the jaw is the crown. The inside width or length of a shackle is called the clear. A removable bolt that passes through a hole in each lug closes the jaw. Shackles are usually named by reference to the manner in which their bolts are secured in place.

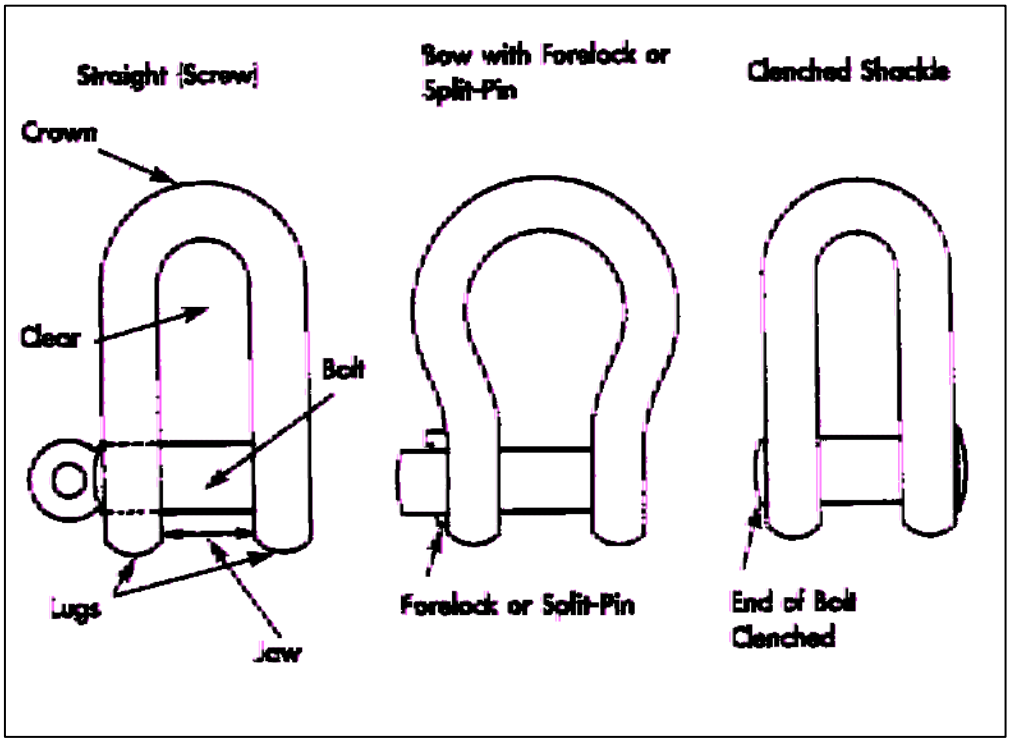


Figure 5.19-1 - Types and Parts of Shackles

5.19.2 Types of Shackles

a. **Screw Shackle.** May be a bow or straight shackle. The end of the bolt is screwed into one of the lugs, and the bolt is fitted with a flange at its head. This type of bolt should be moused.

b. **Forelock Shackle and Split-Pin Shackle.** These shackles may be bow or straight shackles. The end of the bolt projects beyond one of the lugs and has a flat tapered split-pin (forelock) or cotter pin passed through the hole in the end of the bolt. The split pin or cotter pin may be attached to the shackle by a keep chain.

c. **Pin and Pellet Shackle.** A tapered hole is drilled through one of the lugs and the end of the bolt. The bolt is secured in place by a tapered pin being driven into the hole, and held in place by a lead pellet hammered into the mouth of the hole over the head of the pin. This very secure method of locking the shackle bolt is a common arrangement on shackles that are part of the anchor and cable arrangement.

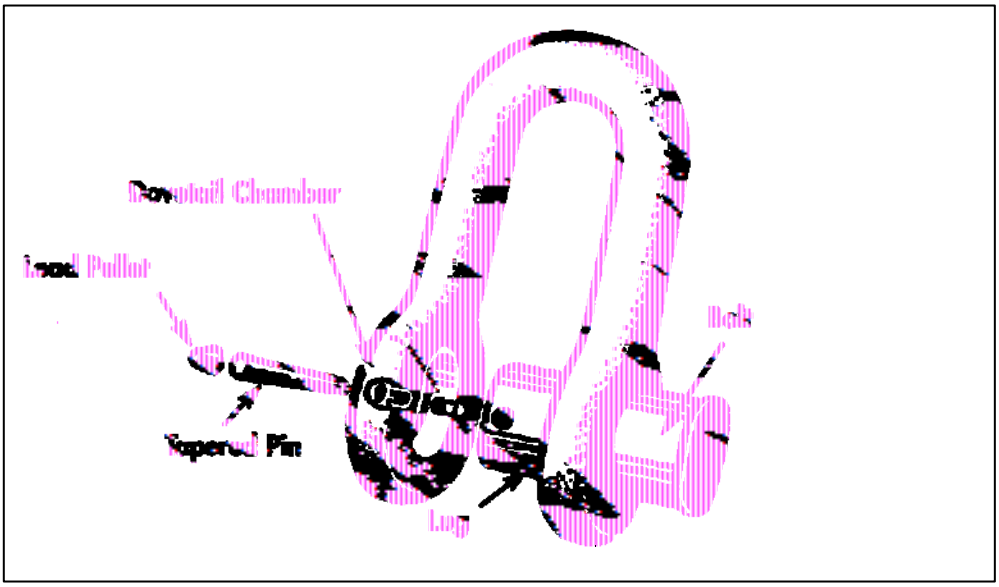


Figure 5.19-2 - Pin and Pellet Shackle

d. **Safety Shackle.** These shackles have a threaded bolt. A nut is fastened on the end of the bolt after it is passed through the lugs. A hole is drilled through the bolt or through the bolt and nut and secured in place with a cotter pin.

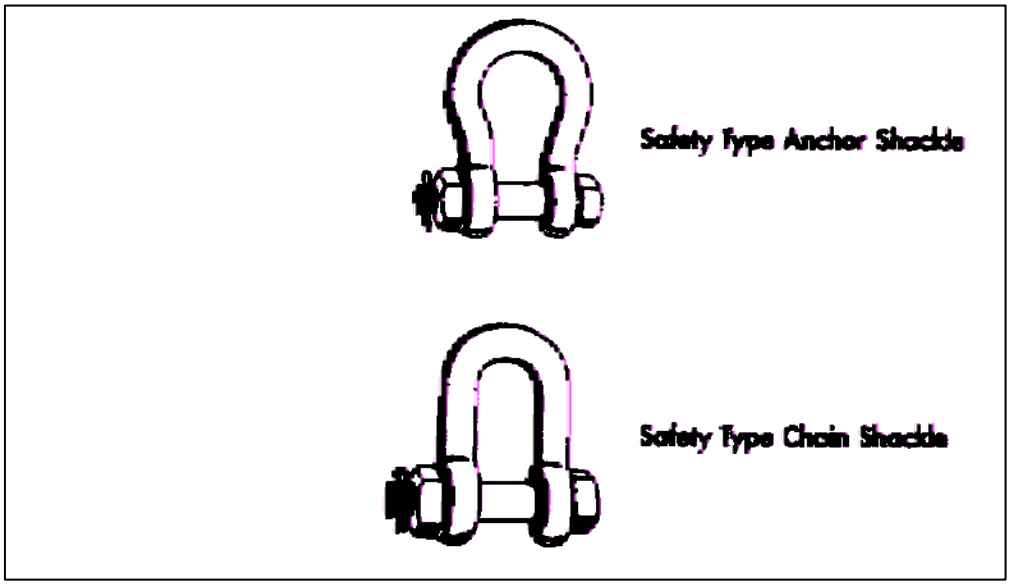


Figure 5.19-3 – Safety Shackle

e. **Roller Shackle.** These shackles are used when rigging awnings. They are placed over the hook on the awning stanchion and a wire is shackled to the awning, passed through the roller shackle and hooked onto a block and tackle.

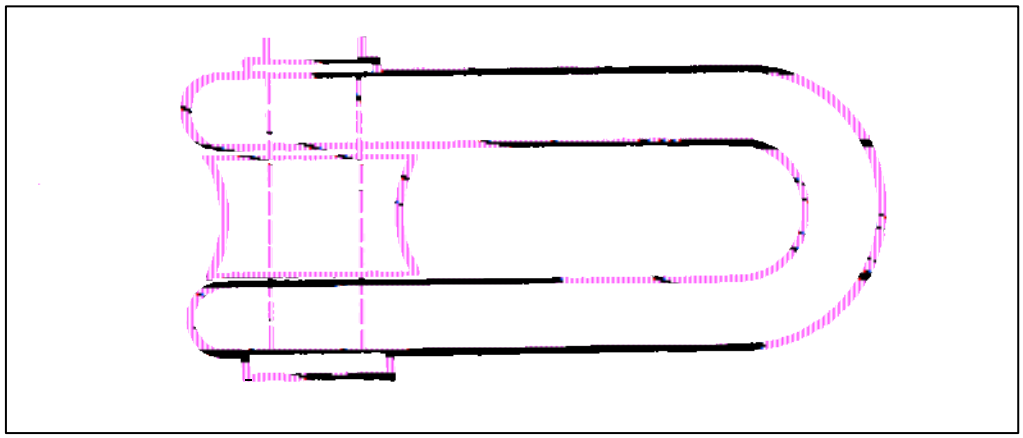


Figure 5.19-4 - Roller Shackle

5.20 THIMBLES

Thimbles are classified according to the diameter of the rope for which they are intended and their shape. When an eye splice is formed in the end of wire or rope, a thimble is inserted to take the chafe of a shackle or shackle bolt and also to support the eye formed in the rope. The support given by the thimble prevents a bad nip in the rope when under tension

5.20.1 Types of Thimbles

a. **Heart-Shaped Thimbles.** These are the most commonly used thimbles for forming a hard eye or hawser eye in the end of a rope or wire.

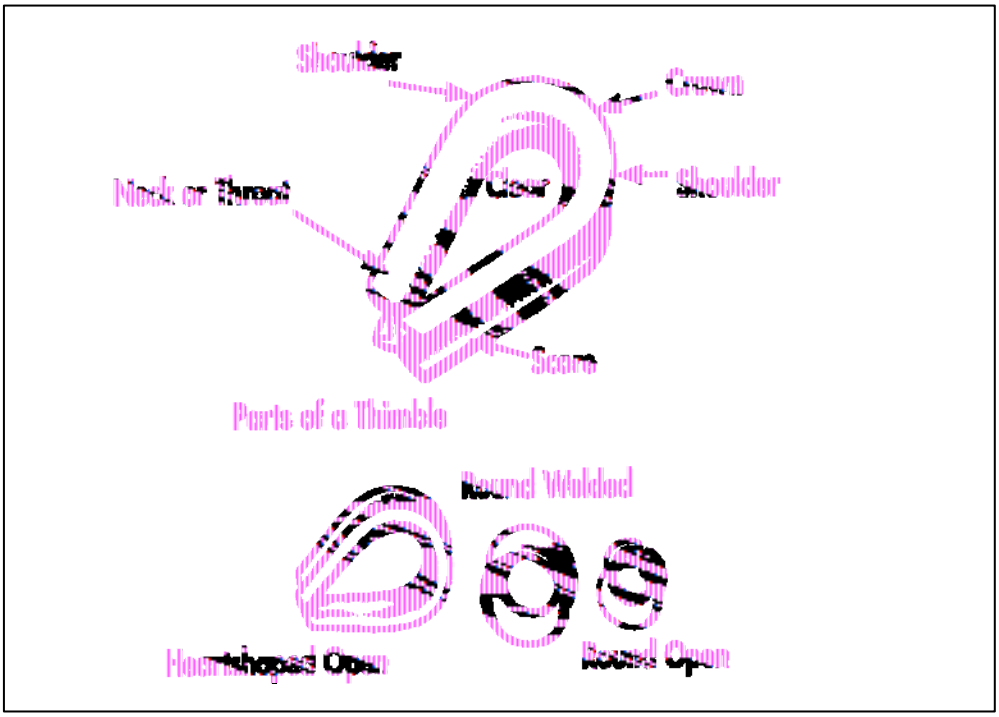


Figure 5.20-1 - Types and Parts of Thimbles

b. **Round Thimble.** These are used when it is necessary to insert something in the eye; for example, the wire grommet at the end of the jackstay, the eye at the tail of a block or the ends of manropes on lifelines.

c. **NEWCO Thimble.** These thimbles are used when splicing braided line. They are most commonly used in the ends of towing hawsers.

Figure 5.20-2 - NEWCO Thimble

5.21 COMMON RINGS

Common rings are available in various shapes and sizes. The most common are round, oval and pear-shaped rings.

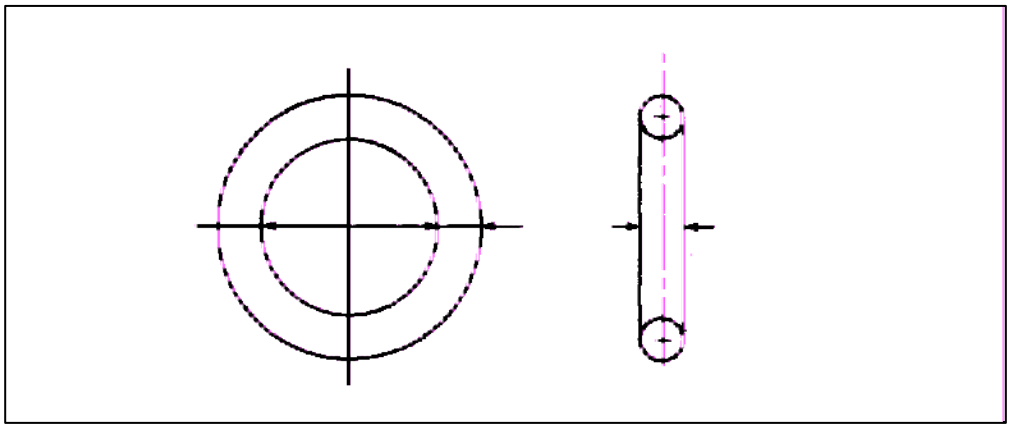


Figure 5.21-1 - Round Ring

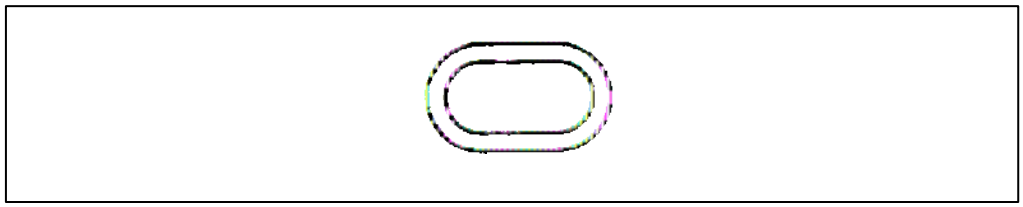


Figure 5.21-2 - Oval Ring

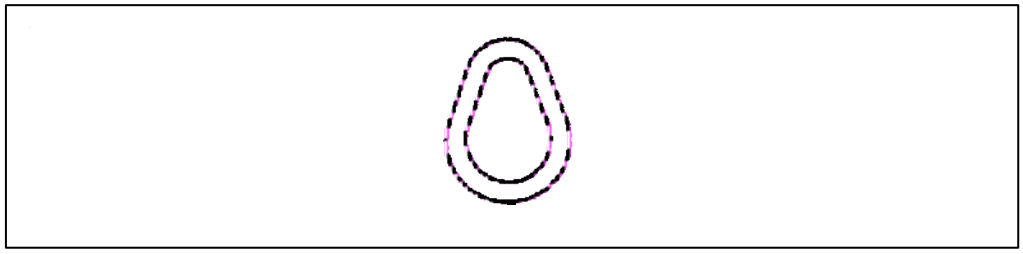


Figure 5.21-3 - Pear-Shaped Ring

5.22 HOOKS

There are two basic types of hooks in use today in the Canadian Navy: the tackle hook and the spring hook. The spring hook is becoming the most accepted hook, as it requires no mousing. The parts of the hook are the eye which is shackled or secured with a splice to a wire or rope, the back, the crown which is at the bottom, the bill which is the point opposite the back, and the clear which is the opening between the back and the bill. The spring hook has the base of the spring near the eye and the other end is in the clear up against the inside of the bill. Tackle hooks should be moused when in use to prevent the chance of the load being tripped from the hook.

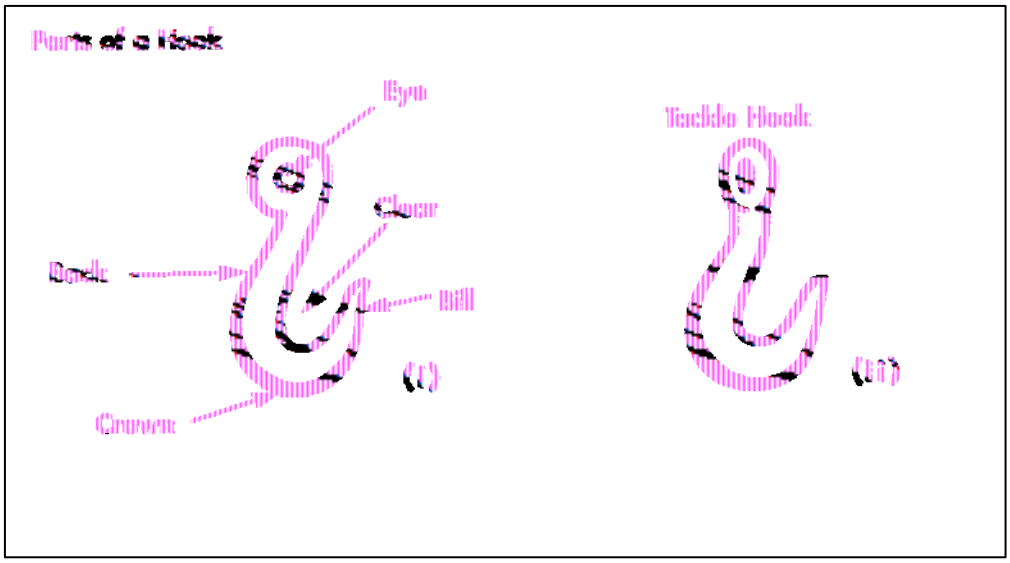


Figure 5.22-1 - Tackle Hook

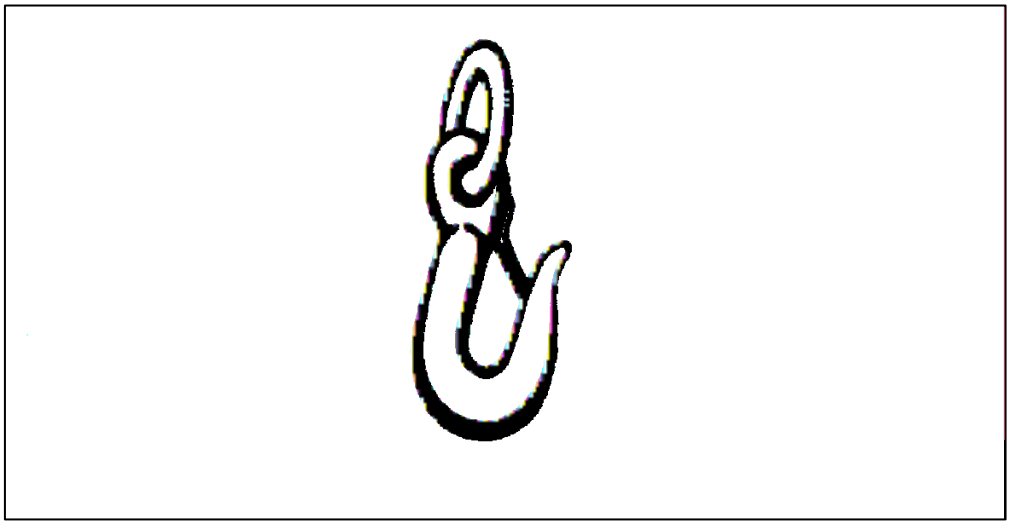


Figure 5.22-2 - Spring Hook

5.23 EYEPADS

There are two types of eyepads in use: fixed eyepads and reversible eyepads. PROTECTEUR and HALIFAX Class ships have reversible eyepads while the remainder of the ships have fixed eyepads, including the AOR Class. Table 5.23-1 identifies the fixed and reversible eyepads on the HALIFAX Class and Table 5.23-2 identifies the eyepads fixed to the superstructure in HALIFAX Class ships. Fixed eyepads are welded permanently in place and are tested for the specific purpose they are used for. The two types of reversible eyepads have either a well (HALIFAX Class) or through deck fitting (PROTECTEUR Class). On the HALIFAX Class, the wells for the eye-pads are filled with oil to ensure they remain lubricated between maintenance routines. The reversible eyepads on HALIFAX Class ships are used for replenishment operations, with the exception of two eyepads on the starboard side that are used for securing the Inflatable Rubber Boat (IRB). In the AOR Class, the through deck fittings must be lubricated by hand between maintenance routines. The reversible eyepads on the PROTECTEUR Class are used primarily for securing deck cargo.

Table 5.23-1: Fixed and Reversible Deck Eyepads in HALIFAX Class Ships	
Eyepad Number	**Function** (f) indicates a fixed eyepad; (r) indicates a reversible eyepad
1(f)	Towing/mooring blake slip clench
2(f)	Ranging block eyepad
3(r)	For stbd anchor platform strongback
4(r)	For port anchor platform strongback
5(f)	For stbd anchor platform
6(f)	For port anchor platform
7(r)	For stbd anchor platform strongback
8(r)	For port anchor platform strongback
9(f)	Blake slip deck clench
10(f)	Bottle screw deck clench
11(r)	For hose-hanging pendant for astern fueling
12(r)	For hose-hanging pendant for astern fueling
13(r)	Kingpost backstay eyepad
14(r)	Kingpost backstay eyepad
15(r)	Messenger eyepad/12” jackstay block
16(r)	Messenger eyepad/12” jackstay block
17(r)	To be determined (obsolete)
18(r)	To be determined (obsolete)
19(r)	To be determined (obsolete)
20(r)	To be determined (obsolete)
21(r)	Kingpost back stay eyepad
22(r)	Kingpost back stay eyepad
23(r)	Messenger eyepad (liquids) (to be relocated during configuration changes)
24(r)	Messenger eyepad (liquids) (to be relocated during configuration changes)
25(r)	Messenger eyepad (solids) (to be added during configuration changes)
26(r)	Messenger eyepad (liquids) (to be added during configuration changes) (jackstay 6” block and new messenger block liquids)
27(r)	Stbd IRB securing eyepad
28(r)	Messenger eyepad messenger
28a(r)	Light jackstay 12” block
29(r)	Stbd IRB securing eyepad
30(f)	For 6” snatch block DRP
31(r)	Stbd IRB securing eyepad
32(f)	Port IRB securing eyepad
33(f)	Stbd IRB securing eyepad
34(f)	Port IRB securing eyepad
35(f)	For 6” snatch block DRP
36(f)	Port IRB securing eyepad
37(f)	Securing eyepad for RIB
38(f)	Port IRB securing eyepad
39(f)	RIB securing eyepad
40	Port jumping ladder eyepad
41	RIB securing eyepad
42	Port boat boom fwd guy eyepad
43	Stbd jumping ladder eyepad
44	Towing cleat
45	Stbd boat boom fwd guy

Table 5.23-2: List of Superstructure Eyepads in HALIFAX Class Ships	
Eyepad Number	**Function** (p) indicates port; (s) indicates stbd
1(s)	Eyepad for lifeline
2(p)	Eyepad for lifeline
3(s)	In/outhaul eyepad (configuration change will move in/outhaul to choker plate on bollard aft of kingpost)
4(p)	In/outhaul eyepad (configuration change will move in/outhaul to choker plate on bollard aft of kingpost)
5(s)	Upper block for light line (new)
6(p)	Upper block for light line (new)
7(s)	Lower block for light line (new)
8(p)	Lower block for light line (new)
9(s)	Fairlead block stowage staple (jigger tackle)
10(p)	Fairlead block stowage staple (jigger tackle)
11(s)	Riding line fairlead (jigger tackle)
12(p)	Riding line fairlead (jigger tackle)
13(s)	Fairlead block stowage staple (jigger tackle)
14(p)	Fairlead block stowage staple (jigger tackle)
15(s)	Riding line fairlead (jigger tackle)
16(p)	Riding line fairlead (jigger tackle)
17(s)	Staple for jackstay pendant
18(p)	Staple for jackstay pendant
19(s)	Eye for hose-hanging pendant
20(p)	Eye for hose-hanging pendant
21(s)	Jigger tackle eyepad
22(p)	Jigger tackle eyepad
23(s)	Jigger tackle securing staple
24(p)	Jigger tackle securing staple

NOTE: *Configuration changes are anticipated that will see the removal of all jigger tackle arrangements.*

5.24 TURNBUCKLES AND BOTTLE SCREWS

Turnbuckles can be supplied with eye-end fittings, jaw-end fittings, hook-end fittings and a combination eye, jaw and hook on one end and a slip on the other. Their rated load depends upon the outside diameter of the threaded portion of the end fitting. Turnbuckles are fabricated from alloy steel, and on HALIFAX Class ships, the turnbuckle assemblies for guardrails are fabricated from aluminum alloy. If the turnbuckle is to be used in an area where vibration is present, it is important to lock the frame to the end fittings using the nuts on the threaded piece or with wire moused through the body and the end of the turnbuckle (jaw, hook or jaw). Care must be taken to ensure that the nut is not

tightened too severely. This could weaken the turnbuckle or distort the threads. Bottle screws are basically the same as turnbuckles, the difference being that bottle-screw fittings are open while turnbuckles are covered.

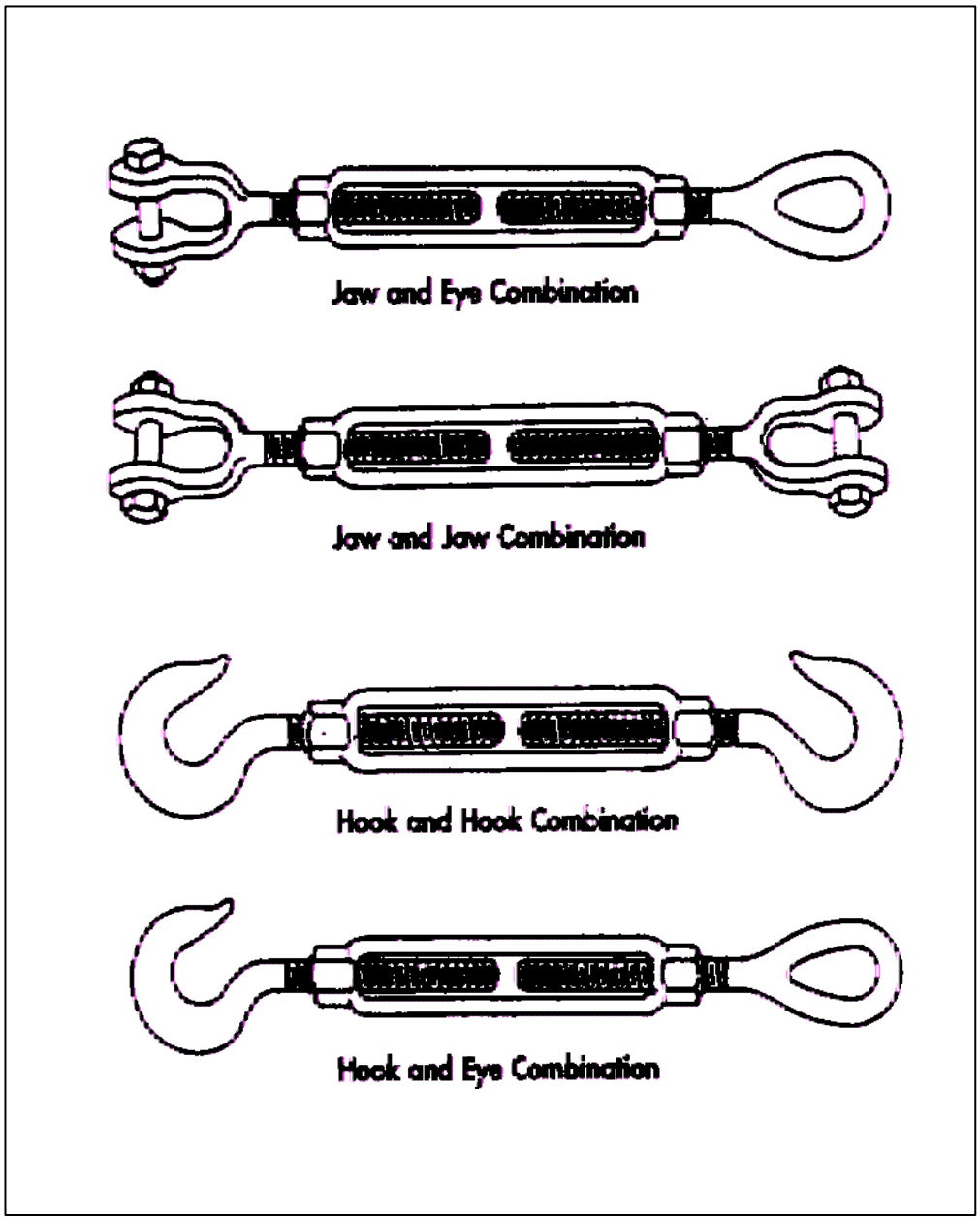


Figure 5.24-1 - Turnbuckles and Bottle Screws

5.25 GUARDRAIL ASSEMBLIES

HALIFAX Class guardrails are made up out of Kevlar (Black Max™) cover with a PVC coating and aluminum end fittings. They are secured to the guardrails with sister hooks. They are made up by shore authorities and are ordered to the desired length. All other classes of ships have PVC-coated aluminum guardrails with aluminum end fittings. They are secured to the guardrail stanchions with galvanized bottle screws that are shackled to the guardrail stanchion at one end, and secured to the guardrail with a jaw fitting at the other end.

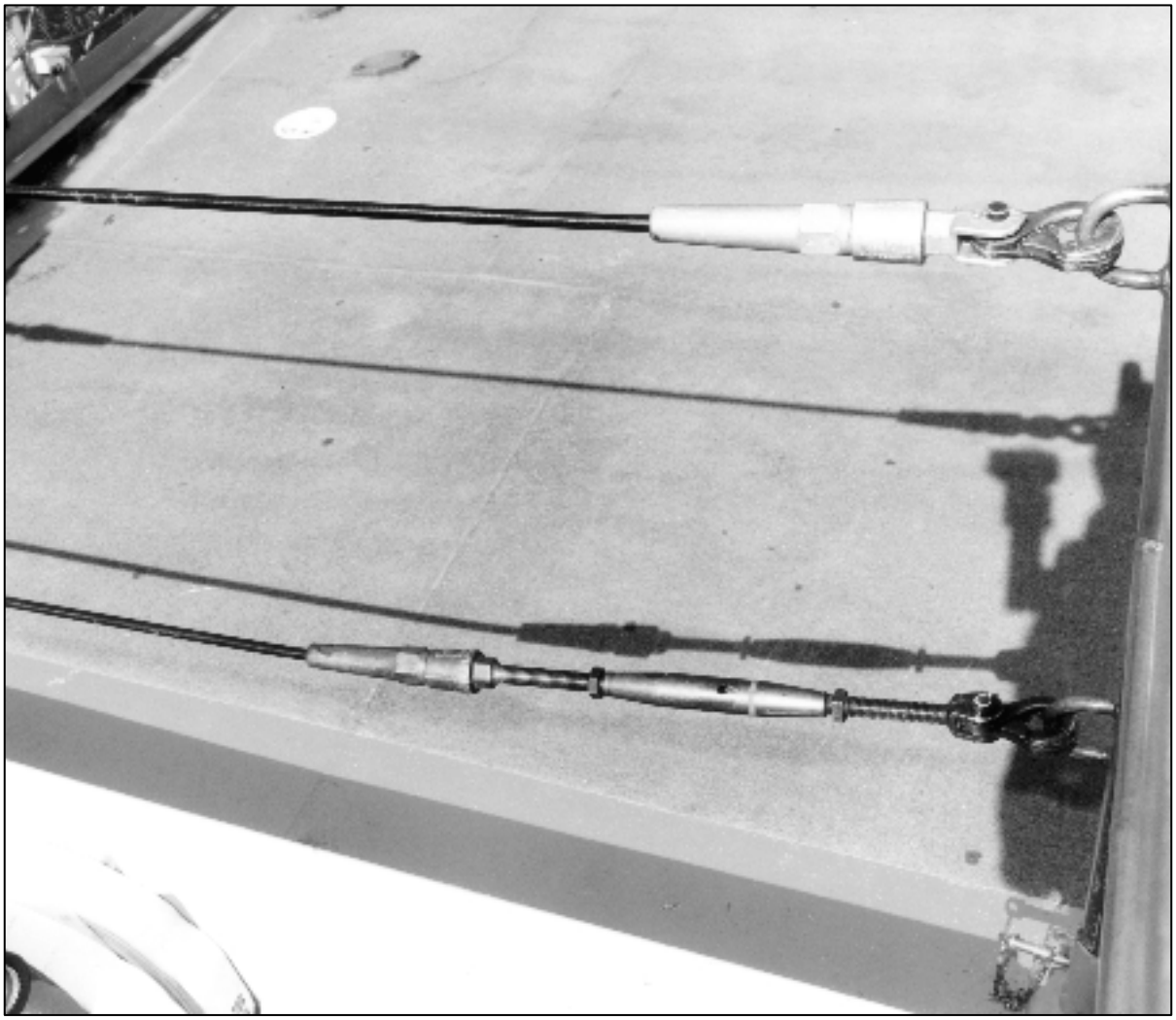


Figure 5.25-1 - HALIFAX Class Guardrail End Fittings

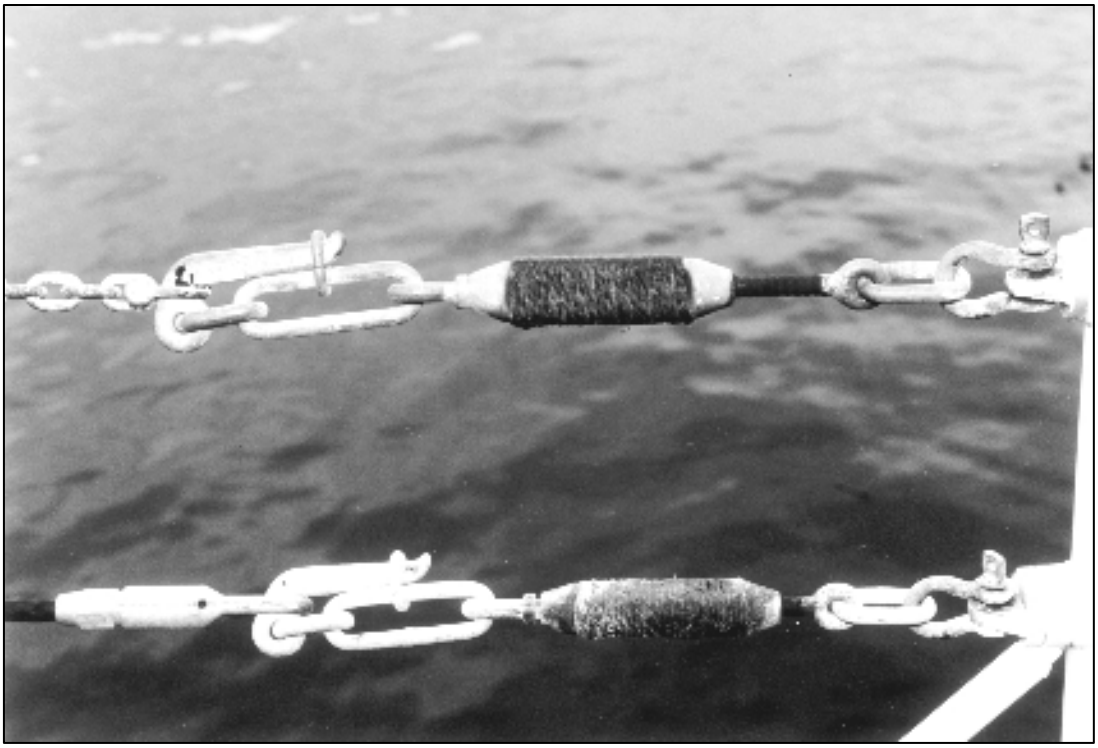


Figure 5.25-2 - Galvanized Bottle Screw Slip and Aluminum End Fittings for all other Classes of Ships

5.26 UNION PLATES

Union Plates have limited use in the Canadian Navy. They are primarily used in the fueling rigs on the PROTECTEUR Class and in the backbone assembly of the awning for the HALIFAX Class. They are used when three securing points are required in a rigged system.

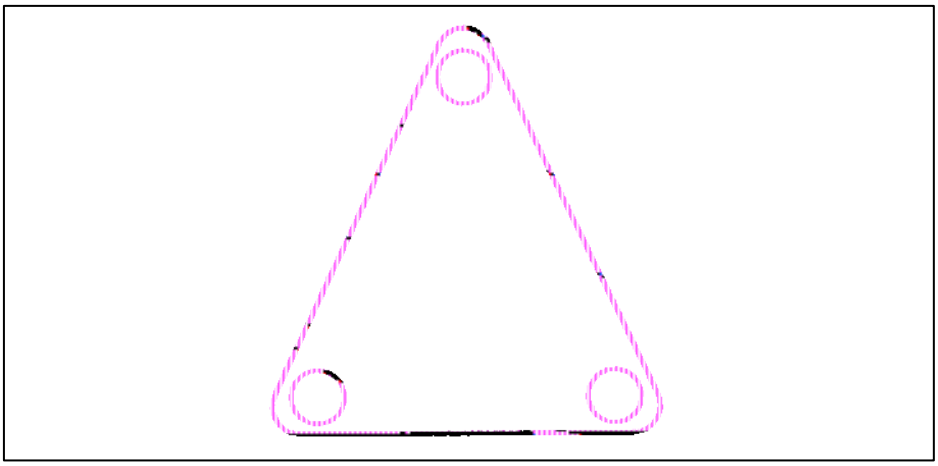


Figure 5.26-1 - Union Plate (Flounder Plate)

5.27 SLIPS

A slip is a quick release link used for joining the end of rope, wire or chain to a fitting when the end may have to be released quickly or frequently. All these slips are called senhouse slips. Slips are used in replenishment operations, towing evolutions, cable-securing arrangements and on the end of guardrail fittings on all ships except those of the HALIFAX Class.

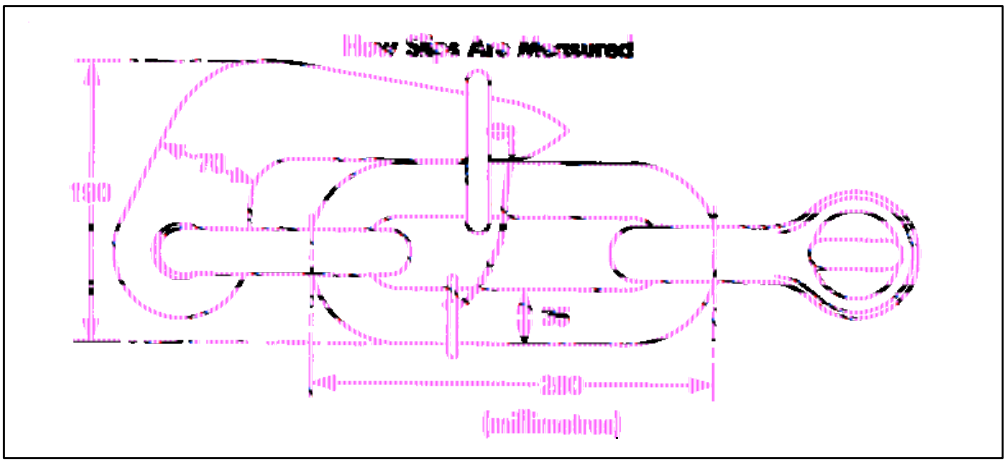


Figure 5.27-1 - Slips for General Use

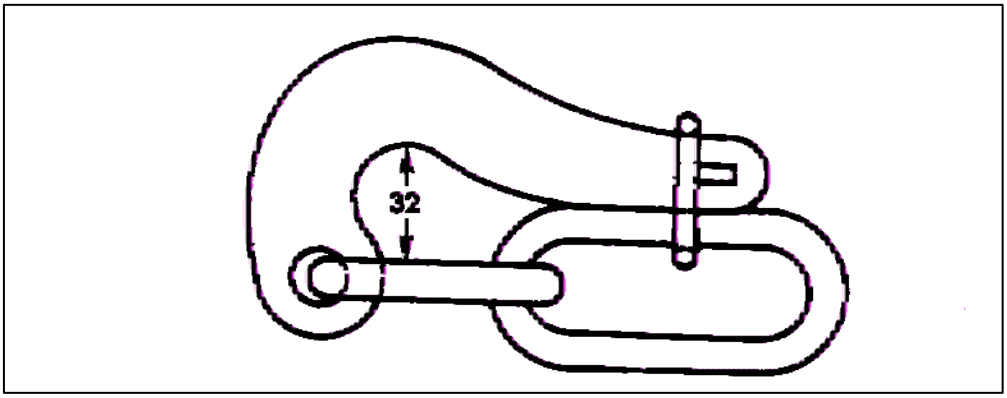


Figure 5.27-2 - Details of Slip for Rigging

5.28 CARE AND MAINTENANCE OF ASSOCIATED RIGGING FITTINGS

Associated fittings such as shackles, snap hooks, slips and guardrail fittings are to be inspected frequently and cleaned of all rust, corrosion and dirt.

a. Shackles worn in the crown or pin (see Fig. 5.28-1) by more than 10 percent of the original diameter should be destroyed.

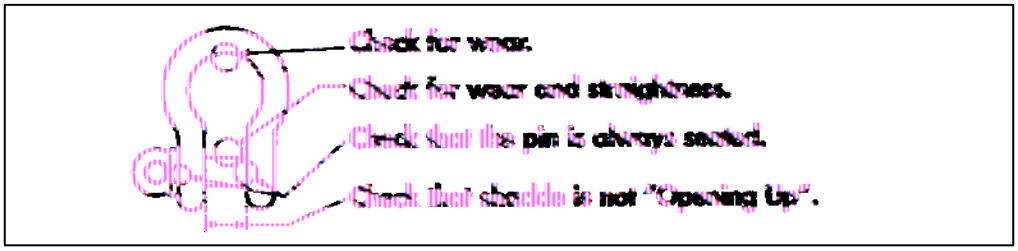


Figure 5.28-1 - Shackle Inspection Areas

b. On snap hooks, look for wear in association with Fig. 5.28-2 in the jaw of the hook, cracks, severe corrosion and twisting of the shank. Be especially careful to measure the bill opening. If there is evidence of opening or distortion, destroy the hook.

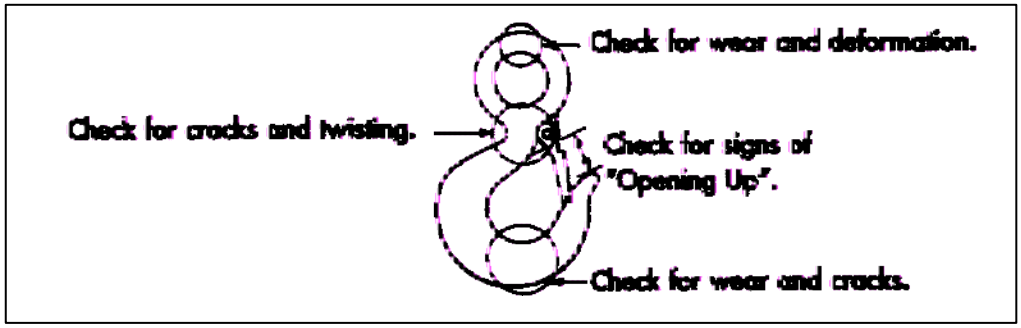


Figure 5.28-2 - Hook Inspection Areas

c. Bottle screws should be checked for cracks in end fittings, deformed end fittings and bent rods in association with Fig. 5.28-3.

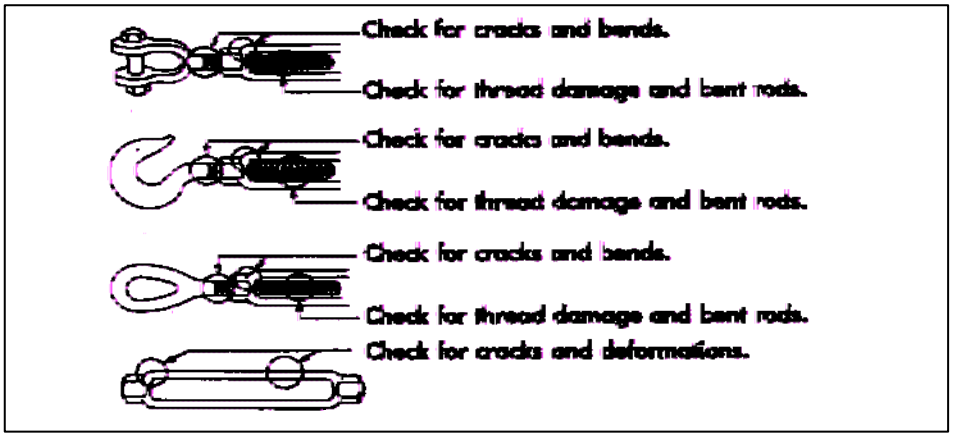


Figure 5.28-3 - Bottle Screw Inspection Areas

d. Slips should be checked for distortion of bill, wear on coupling line and joining links/shackle. If worn more than 10 percent, replace.

5.29 BLOCKS, TACKLES AND PORTABLE LIFTING APPLIANCES

a. **Blocks.** A block is a pulley made of wood, metal and/or synthetic-resin bonded fiber and, in some cases, a combination of wood and metal. The use of blocks is the principal way mechanical advantage is obtained in ships. The sheave is the roller, which turns on an axle called a pin. A rope goes in the opening called the swallow, and it rides on the sheave. The sheave is contained in a shell of which the cheek, crown and tail are parts. An eye or hook may be fastened on the top. Blocks are classified by their size, measured around the shell from crown to tail. An ordinary block takes a line 1/3 its size, so a 9-inch block takes a rope 3 inches in circumference. The one exception is the clump block, which takes a line half its size. Clump blocks are used for boat ropes on boat booms and accommodation ladders.

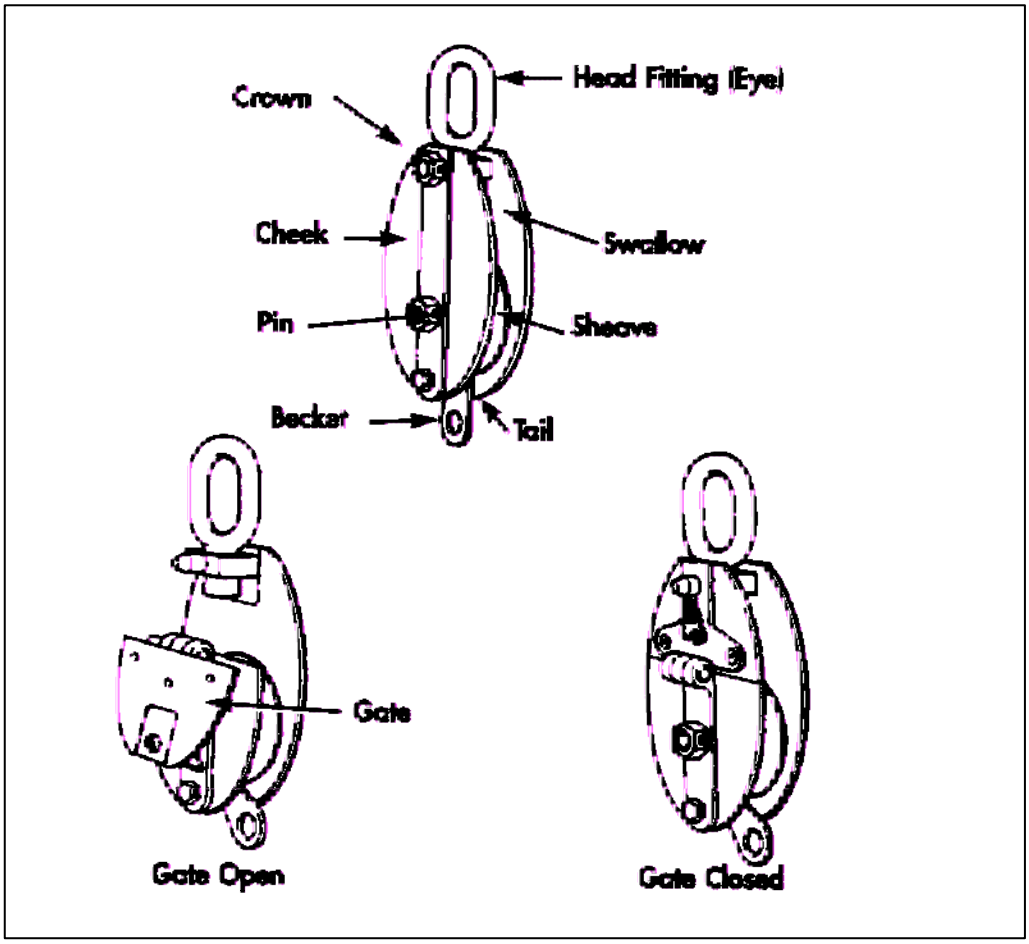


Figure 5.29-1 - Parts of a Block

b. **Tackles.** A tackle is made up of two or more blocks and lines to produce mechanical advantage. There are three types commonly used in the Canadian Navy: the luff made up of a single sheave block and double sheave block; a two-fold purchase made up of two double sheave blocks; and a three-fold purchase made up of two triple sheave blocks.

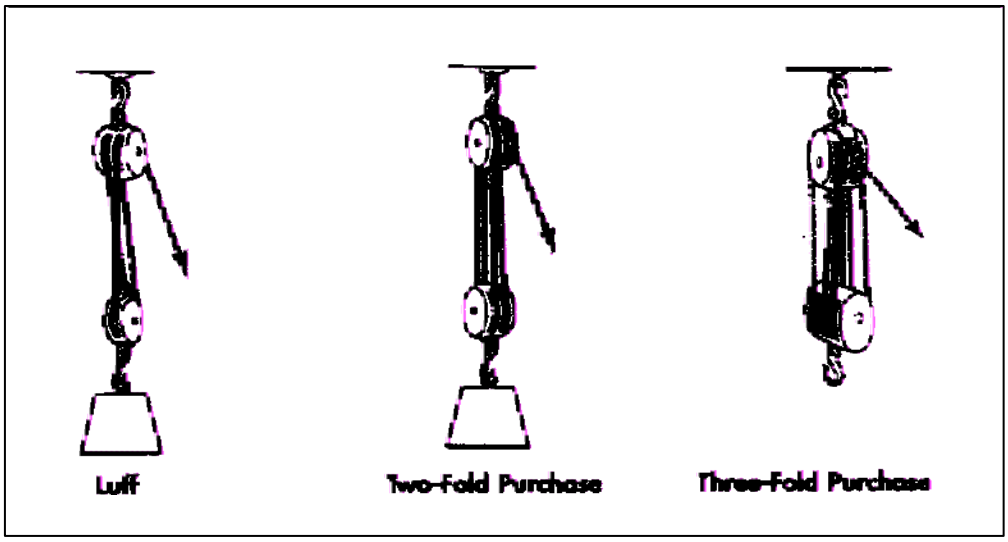


Figure 5.29-2 - Tackles

c. **Parts of a Tackle.** The names of the parts of a tackle are shown in Fig. 5.29-3. The standing part does not move. The running part pulls the running block along the standing part. The standing part can be secured to the standing block or the running block depending on the number of parts that make up the tackle.

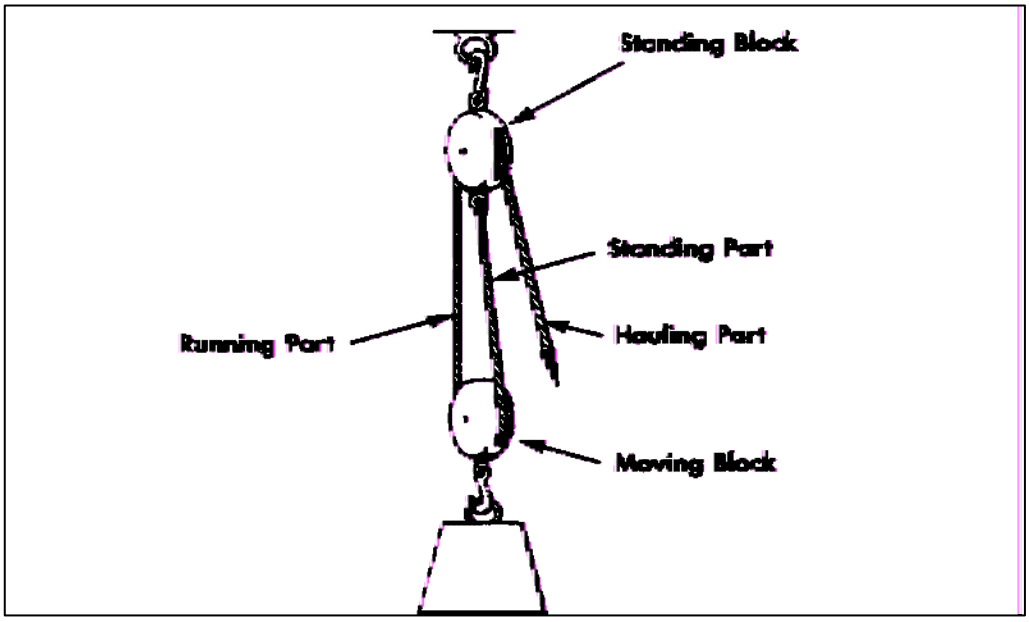


Figure 5.29-3 - Parts of a Tackle

d. **Advantage and Disadvantage.** Tackles are rigged either to advantage or to disadvantage. The simplest way to remember the difference is if the hauling part comes from the moving block, the system is rigged to advantage, and if the hauling part comes from the standing block it is rigged to disadvantage. To determine the amount of force required to move an object (if the weight is known), the number of moving parts is divided into the weight of the object. For example, a luff is rigged to advantage, and the number of moving parts equals three. If the load weighs 100 kg, the amount of force required to move the load is 100 ÷ 3 = 33 1/3 kg. If the luff is rigged to disadvantage, the amount of force is 100 ÷ 2 = 50 kg. This does not take into account the friction that is involved within each system.

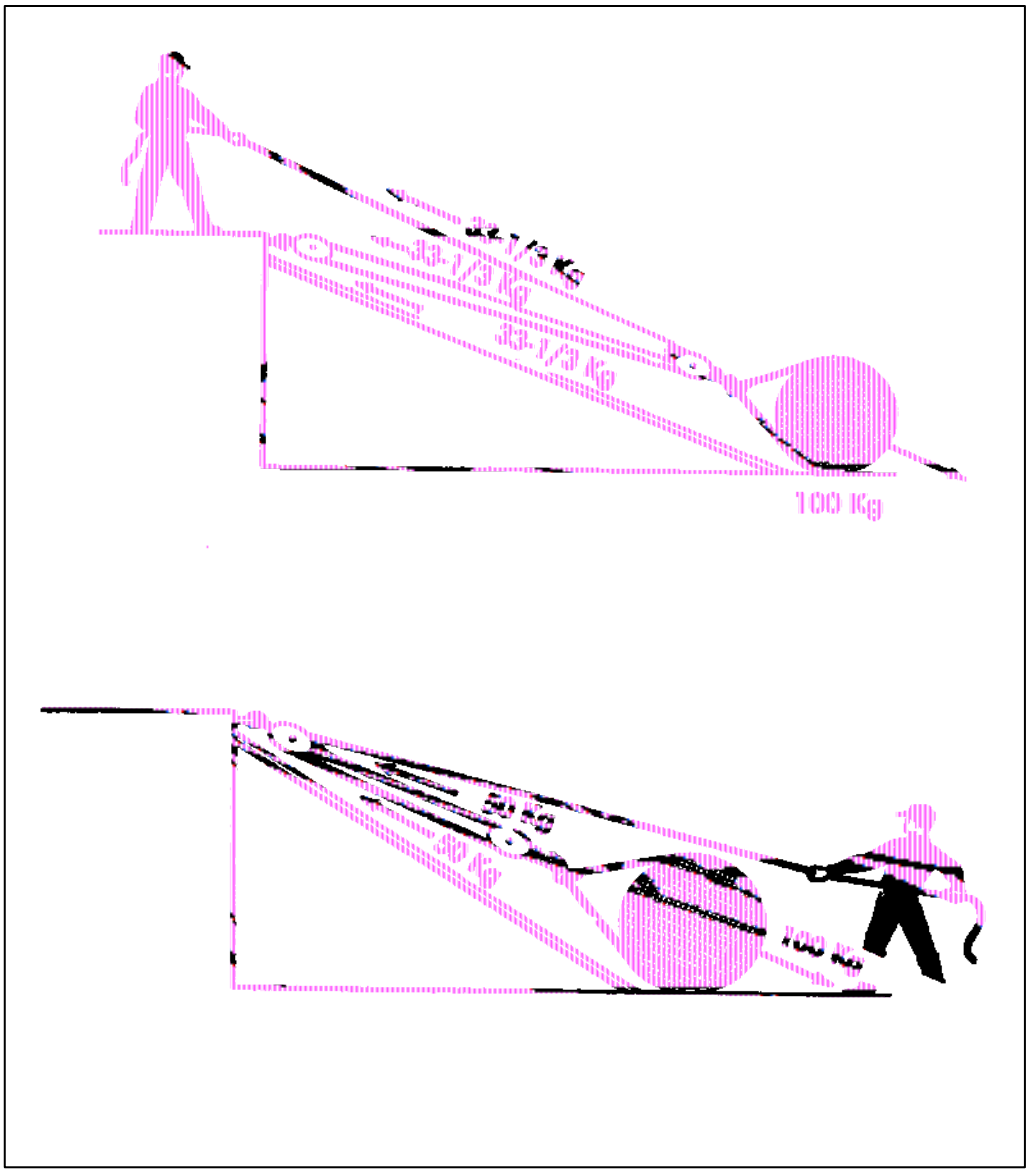


Figure 5.29-4 - Advantage and Disadvantage

e. **Chain Hoists.** There are three basic types of chain hoists in use today. They are chain blocks (suspended), built-in (electric or manual) and "Handy Billy's" (ratchet and lever). They have an advantage over conventional blocks as they consist of a sprocket worked by an endless chain, which operates the sprocket through gearing. The load sprocket carries the chain load to which the hoisting hook is attached.

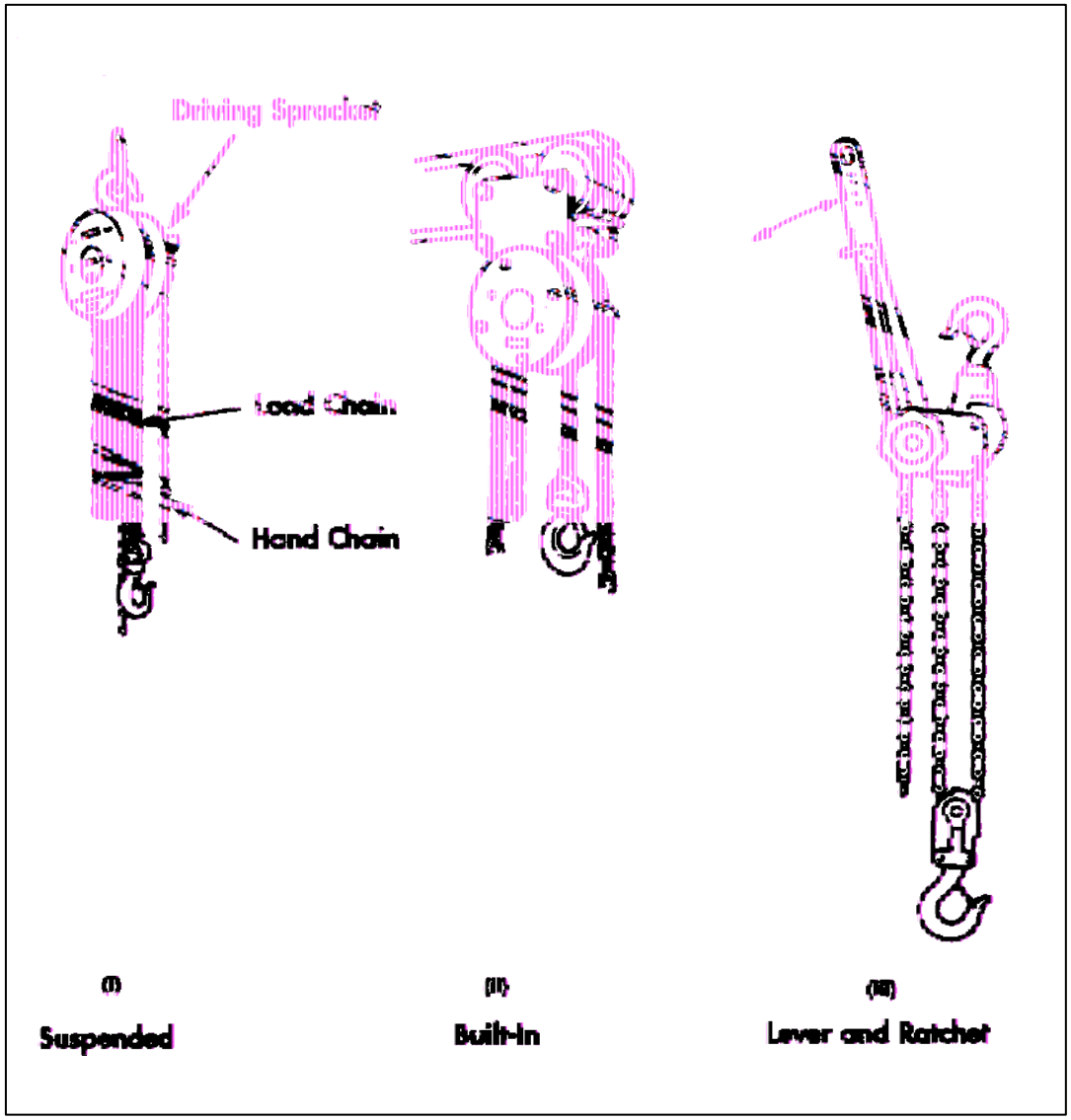


Figure 5.29-5 - Chain Hoists

5.29.1 Care and Maintenance of Blocks

The proper care and maintenance of blocks is essential to their operations. Blocks that are used on the upper decks require monthly maintenance. All blocks should be checked periodically for the following:

(**1**) Check the blocks for excessive wear on the brackets, end connections, sheave bearings and centre pins.

(**2**) Ensure that the sheave grooves are smooth. If a wire rope sheave shows the imprint of the rope, excessive rope wear will occur.

(**3**) Look for signs of overloading, elongated links, shackles bent or stretched, enlarged throats and bent pins. If such conditions are found, the blocks should be replaced.

(**4**) Check the sheave(s) for proper rotation.

(**5**) Check the clearance between sheave(s) and cheek. It should be small enough that there is no danger of the rope slipping between them.

(**6**) Check the tally plate to see when the last test was conducted. Blocks used directly for life saving of personnel must be tested yearly. All other rigging blocks are tested every other year.

NOTE: *If no tally plate is found, have the blocks tested before using.*

5.30 CRANES

The following figures are the types of shipboard cranes operated by the Canadian Navy:

Figure 5.30-1 - PROTECTEUR Class 15-Ton Crane

Figure 5.30-2 - PROTECTEUR Class Mobile Cranes

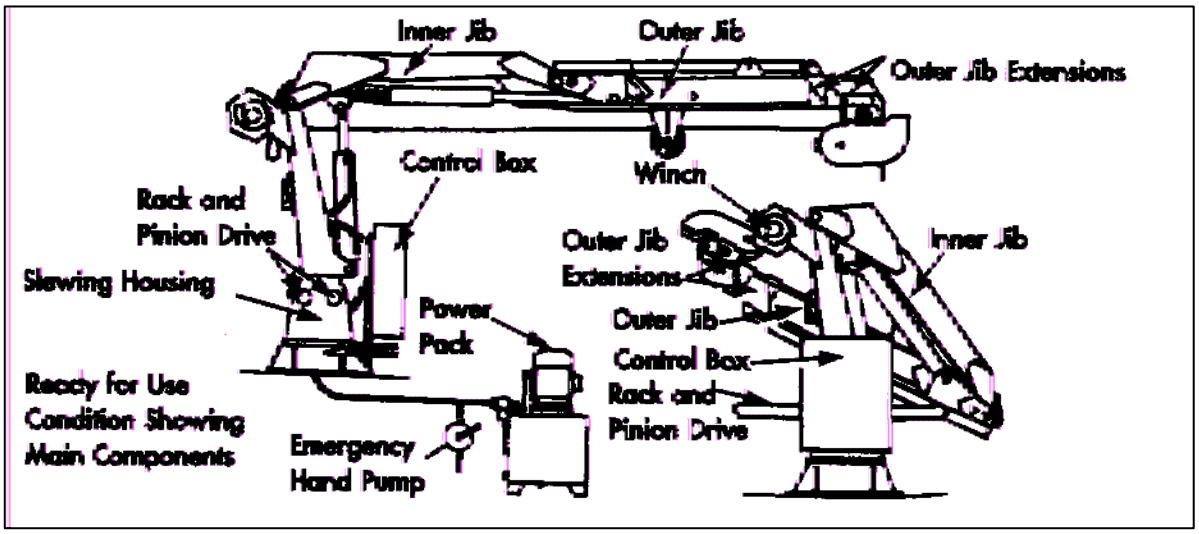


Figure 5.30-3 - IROQUOIS Class Cranes

Figure 5.30-4 - HALIFAX Class Cranes

Figure 5.30-5 - KINGSTON Class Cranes

5.30.1 Care and Maintenance of Cranes

Care and maintenance is to be carried out in association with the applicable manual.

5.31 IMPROVISED LIFTING DEVICES

There will be times when an improvised rigging device will be required in order to move an object in the ship or from the ship. The two basic types employed are the gyn and the baulk.

a. **Gyn.** To rig a gyn, first mark all three spars that are to be used for the legs. Place the two outside legs (cheeks) pointing one way and the centre leg (prypole) facing the other, so the ends overlay approximately 0.5 m. Starting with a timber hitch on one of the cheeks, pass a line over the prypole, under the other cheek, under the prypole and over the starting cheek to form a figure-of-eight pattern. Continue until six to eight figure-of-eight turns have been made and finish off the lashing with a clove hitch on the cheek without the timber hitch. The lashing must not be tight. Raise the poles at the lashing, splaying out the legs to form a tripod. Be sure to place a strop and the lifting tackle over the lashings before raising the gyn to its full height. Tackles are rigged between each leg to prevent the legs from splaying when they come under a load.

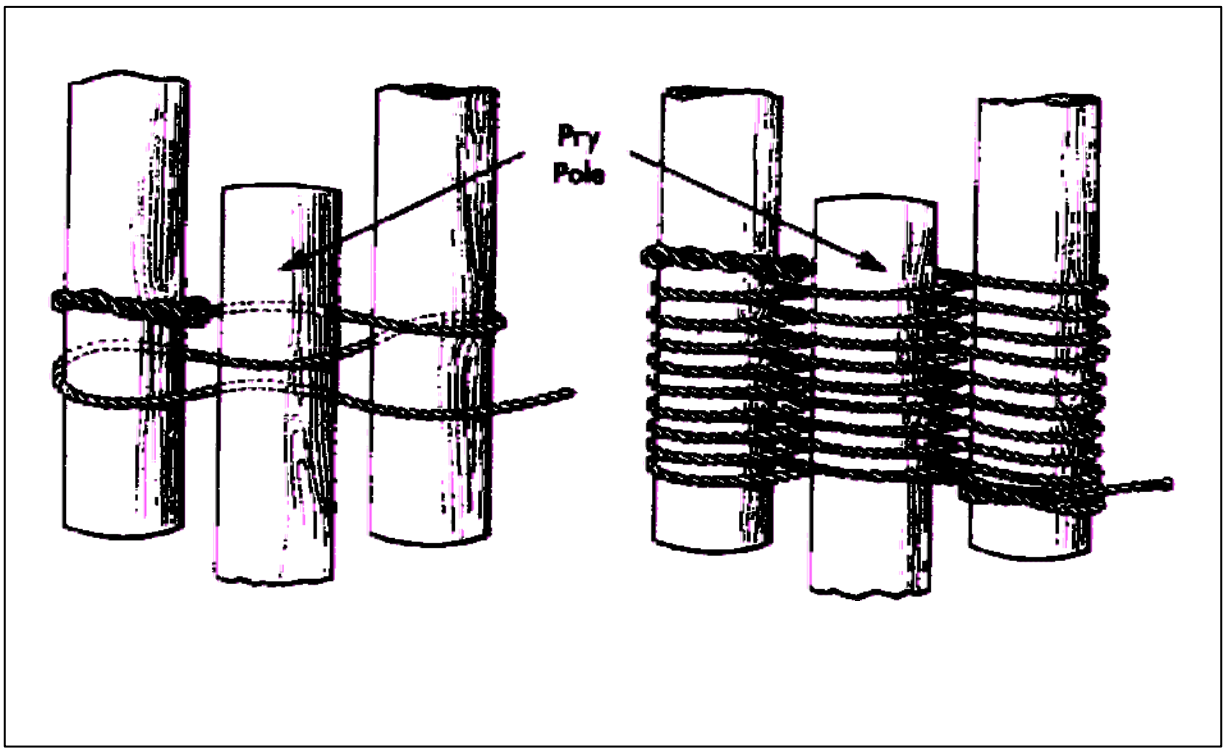


Figure 5.31-1 - Head Lashing for a Gyn

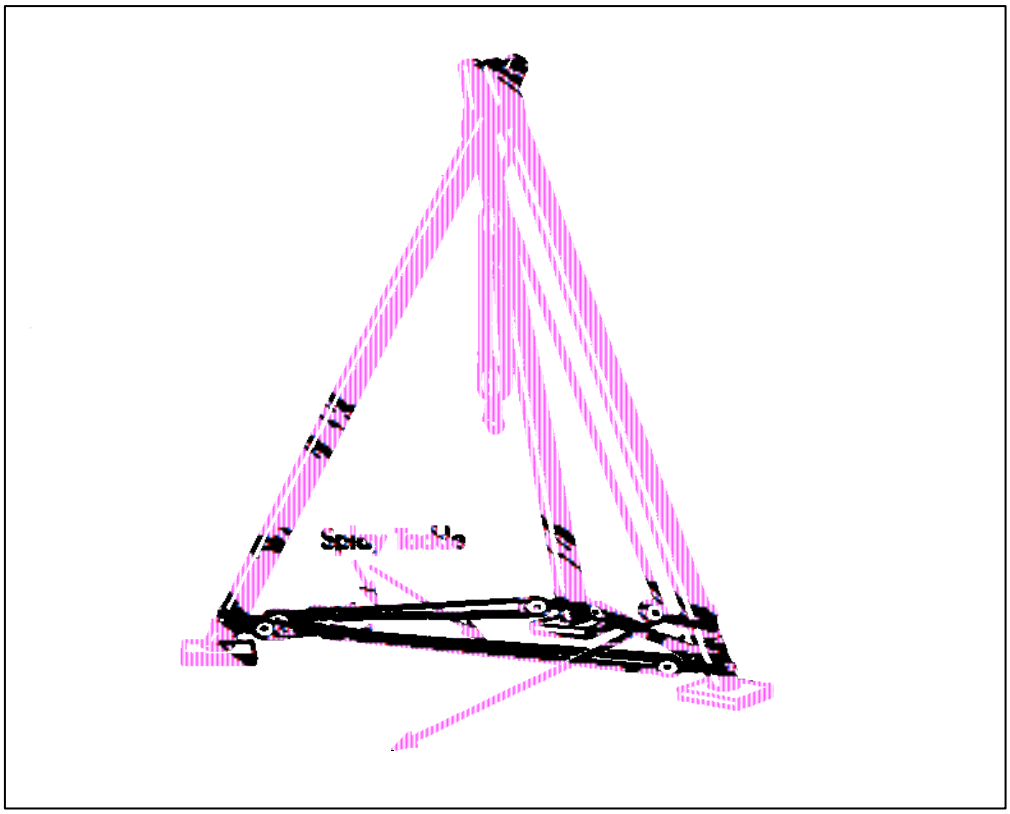


Figure 5.31-2 - Rigged Gyn

b. **Baulk.** A baulk is made from timber or metal that is placed across an opening such as a hatch or door to provide a strong point from which to rig tackle when no eyepads are available.

5.32 ESTIMATING WEIGHTS

a. the most important step in any rigging operation is the determination of the weight of the load to be hoisted. If this information cannot be obtained from shipping papers, tally plates or data from any other source, it may be necessary to calculate the weight.

b. To estimate weights, you must know how to find the area or volume of the articles that are going to be lifted. Symbols used in these calculations and their meanings are as follows:

A = Area
B = Base
C = Circumference
D = Diameter
H = Height L = Length R = Radius
W = Width

V = Volume
π = pi (which is approximately 3.14)

c. To find the area of a given object you will need two of the above in order to be able to make the calculation.

d. To find the area of a square or rectangle, multiply the length times the width.
Area = Length x Width (A = L x W)

e. To find the area of a triangle, multiply half the base by the height.
Area = 1/2 Base x Height (A = 1/2 B x H)

f. To find the area of a circle, the formula is π times the radius squared.
Area = πr^2 (R x R x π)

g. To find the area of a cylinder, multiply the circumference by the height. To find the circumference, multiply the diameter by π.
Area = π x D x H (A= π x D x H)

h. To find the volume of a square or rectangular object, you need to know the height, length and width.
Volume = H x L x W

By applying the above formulas with the weights per cubic foot of various materials from the table below, you can determine the weight of the objects you may be required to lift and the safe working load required of the lifting appliance.

Table 5.32-1: Approximate Weights	
Material	**Approximate Weights**
Aluminum	165 lbs per cubic foot (165 lbs/ ft^3)
Brass	535 lbs per cubic foot
Bronze	500 lbs per cubic foot
Iron	480 lbs per cubic foot
Lead	710 lbs per cubic foot
Steel	490 lbs per cubic foot (A steel plate 1 ft x 1 ft x 1 inch thick = 40 lbs)
Ice	56 lbs per cubic foot
Paper	60 lbs per cubic foot
Gasoline	42 lbs per cubic foot
Oil	58 lbs per cubic foot
Fresh Water	62 lbs per cubic foot
Salt Water	64 lbs per cubic foot
Plywood	1 ft x 1 ft x 1 inch = 3 lbs

5.33 NETS

There are three types of nets used today in the navy: safety nets, cargo nets and scramble nets.

a. **Safety Nets.** Most commonly used under gangways. They can be made of cordage or nylon webbing. When rigged they must extend four feet on either side of the gangway.

b. **Cargo Nets.** Made from nylon webbing and are used to transfer stores at sea during replenishment operations.

c. **Scramble Nets.** Made from polypropylene and metal aluminum tubes. They are fixed on the upper decks close to the ship's side and are used to embark and disembark personnel from boats or the water.

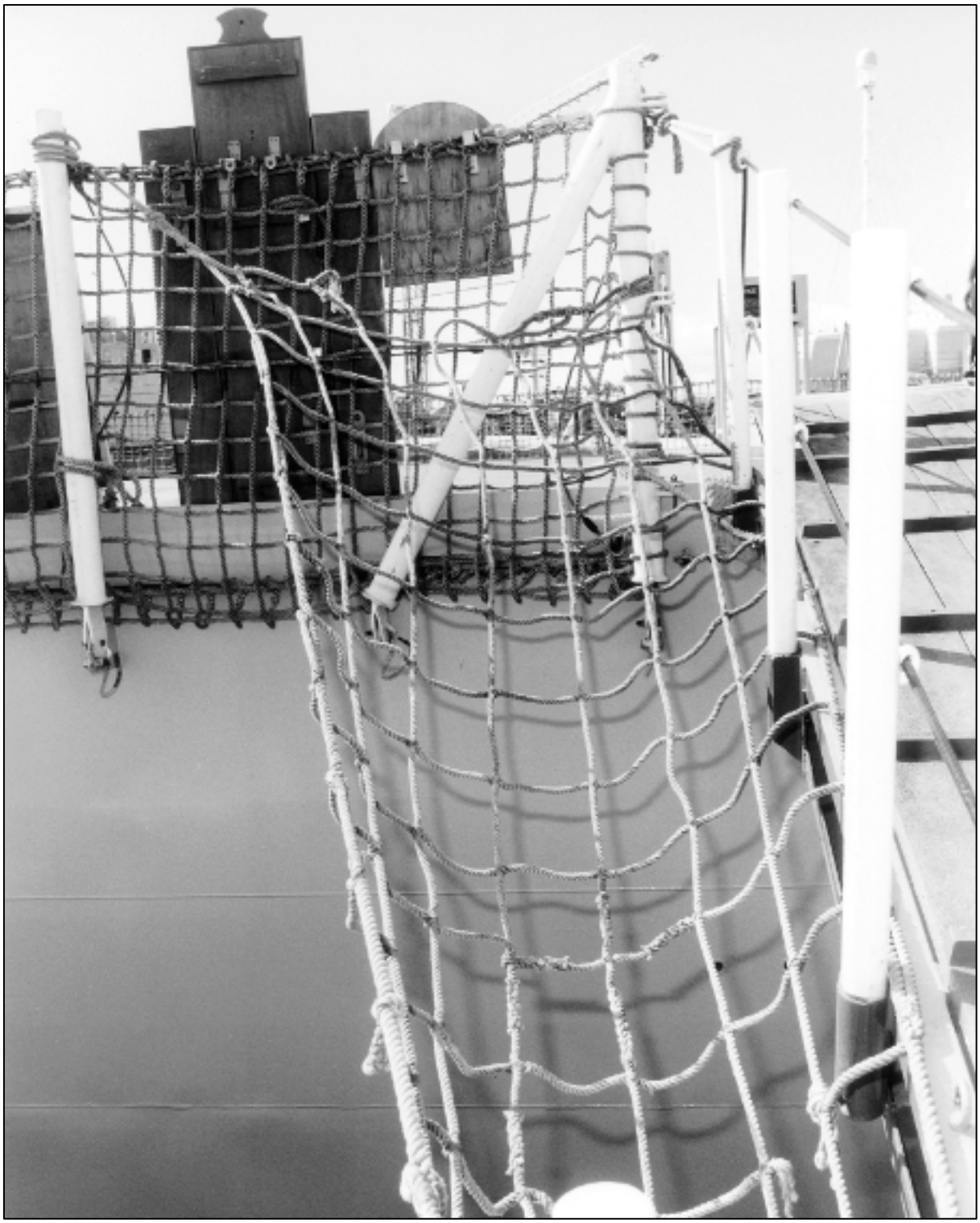


Figure 5.33-1 - Safety Nets

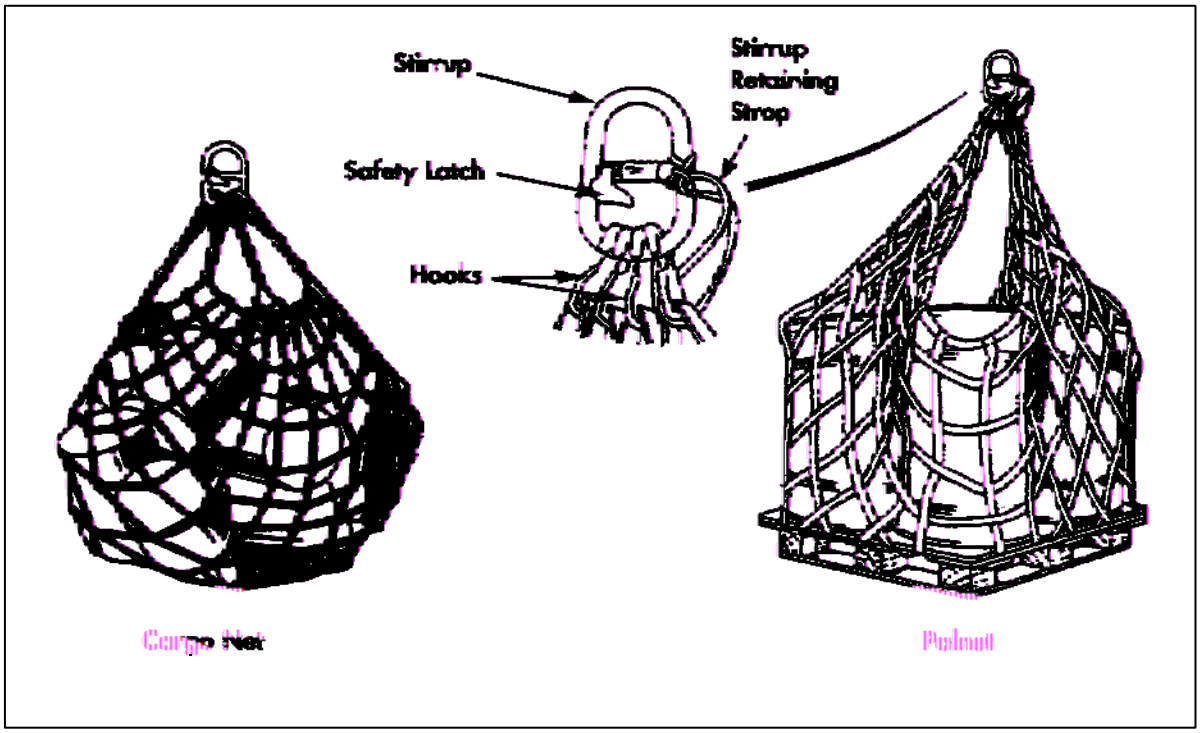


Figure 5.33-2 - Cargo Nets

5.33.1 Care and Maintenance of Nets and Slings

Polyester style nets and slings require little maintenance other than occasional cleaning with water and a mild detergent. They are fully resistant to corrosion and have a high resistance to hydrocarbons. However, ammonia, alkalis and certain acids can cause damage. Slings are to be inspected before use. If the outer core is damaged to the point where the inner yarns are visible, the sling should be cut up and discarded.

5.34 HAND LEAD AND LINE

a. The hand lead and line is occasionally used in today's navy. It is used when entering and leaving a harbour, or where water depth is uncharted or in doubt, in order to ensure that there is enough water under the ship. The Rhib normally goes ahead of the ship. The hand lead and line is made up of the following:

(**1**) The lead is a bar weighing approximately 5 -7 kgs.
(**2**) The line is 50 m of special line.
(**3**) The line is secured to the lead by a rawhide becket.
(**4**) Markings as shown in Fig 5.34-1.

b. The lead on the bottom end is hollow. This hole is filled with tallow. When lowered to the bottom, the type of bottom is indicated by whatever sticks to the tallow. This practice is known as arming the lead. The Leadsman stands in the bow of the Rhib and, with the assistance of the Lazy Leadsman, takes soundings. Soundings are reported to the bridge in a clear voice. When the sounding agrees with one of the marks, it is reported "By the Mark 2, 3, 5", etc. If the bottom is not reached, the report is made "No Bottom at _____".

c. As soon as the sounding is taken, the Lazy Leadsman recovers the line and the Leadsman prepares for the next sounding.

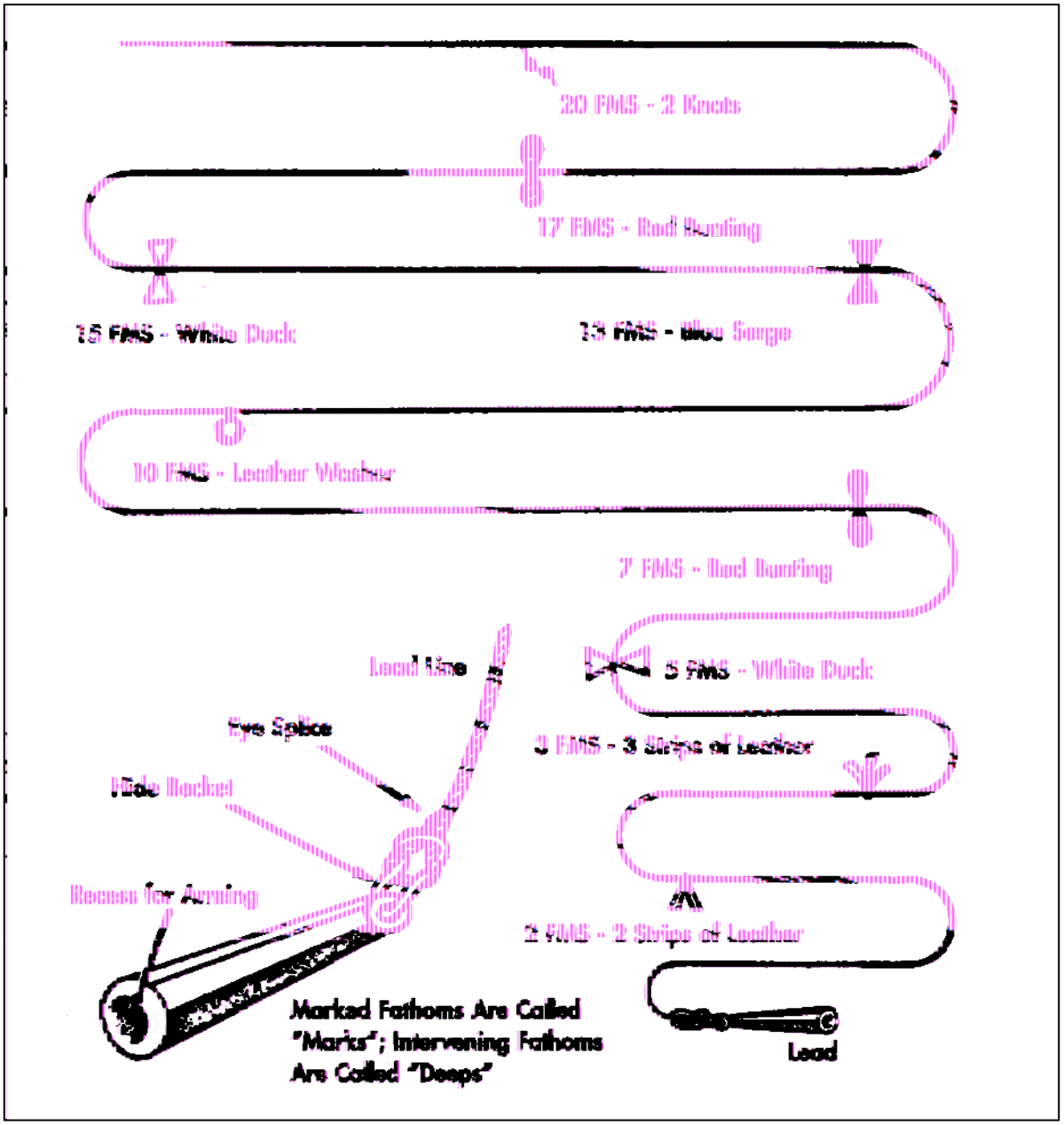


Figure 5.34-1 - Hand Lead and Line

5.35 BOAT'S LEAD AND LINE

This line is similar to the hand lead and line but the lead is lighter, weighing 3 kgs. It is 30 m of line with markings as shown in Fig 5.35-1 and is used in small boats for soundings.

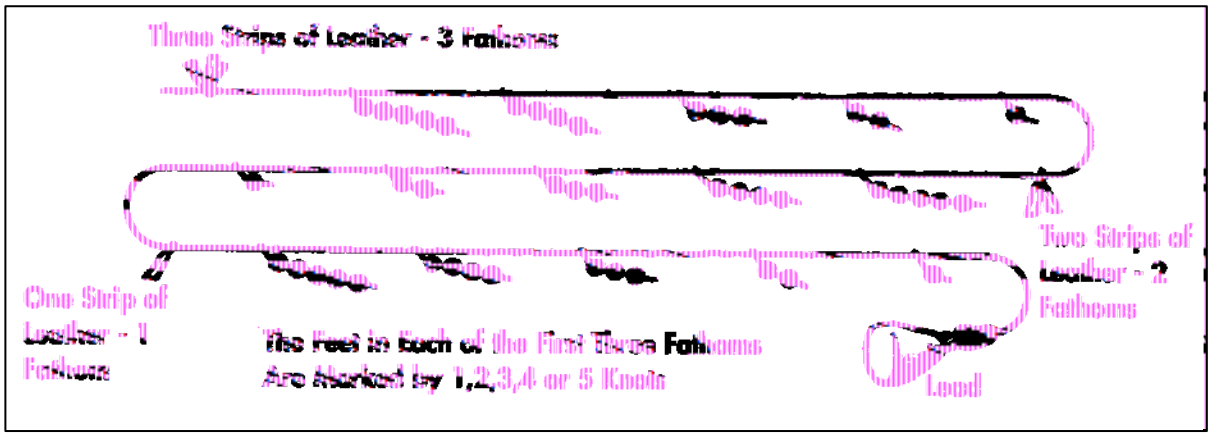


Figure 5.35-1 - Boat's Lead and Line

5.36 ROUGH WEATHER LIFELINES

Lifelines are fitted on all ships for use in rough weather. They are rigged across all exposed decks approximately 1 m above the deck to provide a handhold for personnel. They have short lines with a manrope knot in the lower end and a round thimble on the upper end. The thimble is fitted around a wire, which is secured to strong points on the ship. Hangar top lifelines are left rigged at all times for personnel working in these areas.

5.37 AWNINGS

a. Awnings are fitted over certain exposed decks to give protection from the sun. Side curtains are provided to shelter and protect the areas below large awnings. Most HMC Ships are fitted with a flight deck awning. Minor war vessels are fitted with a quarterdeck or focsle awning. The awnings are made of Dacron and are supported in the middle by a wire backbone. The awning is supported on the sides by awning stanchions. Cringles are sewn along the edges of the awning to receive an earring. Earrings are short pieces of wire with a hard eye in each end. The earring passes through a roller shackle. The roller shackle is placed on the hook at the top of the awning stanchion. The earring is shackled to the cringle of the awning, passes through the roller shackle and is secured on the other end with a small two-fold purchase commonly known as awning tackle. The awning tackle is secured to the bottom of the awning stanchion. The purpose of this arrangement is to secure the outboard of the awning, keeping it tight. The forward end of the awning is normally secured to the superstructure. The after end is secured to a stanchion, which is located on the centreline of the ship. When strong winds are expected, the awning should be struck down and when this is not practical, the awning must be frapped. To frap an awning, line is passed over the top of the awning in a crisscross fashion, forward to aft then forward again. When it is raining, the awning must be sloped. This is done by lowering the roller shackle on every other stanchion to the lower hook provided and then hauling taught. This creates valleys for the water to run off.

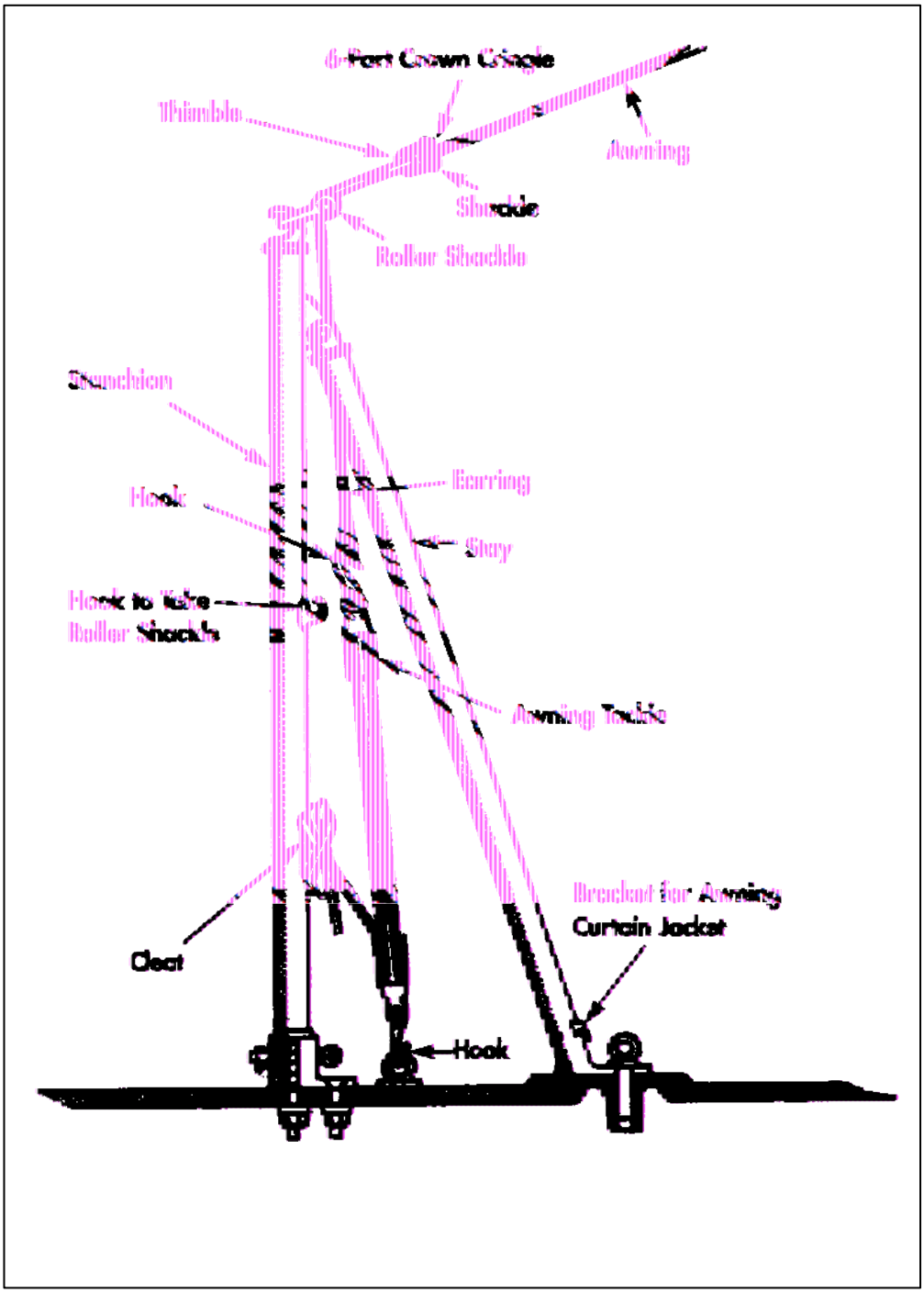


Figure 5.37-1 - Awning Stanchion

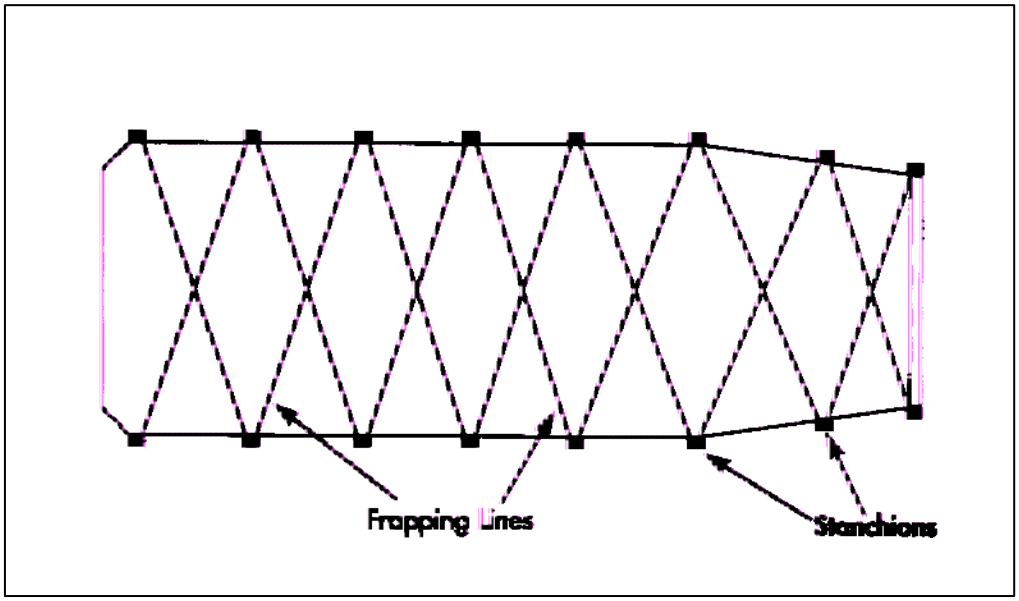


Figure 5.37-2 - Frapping an Awning

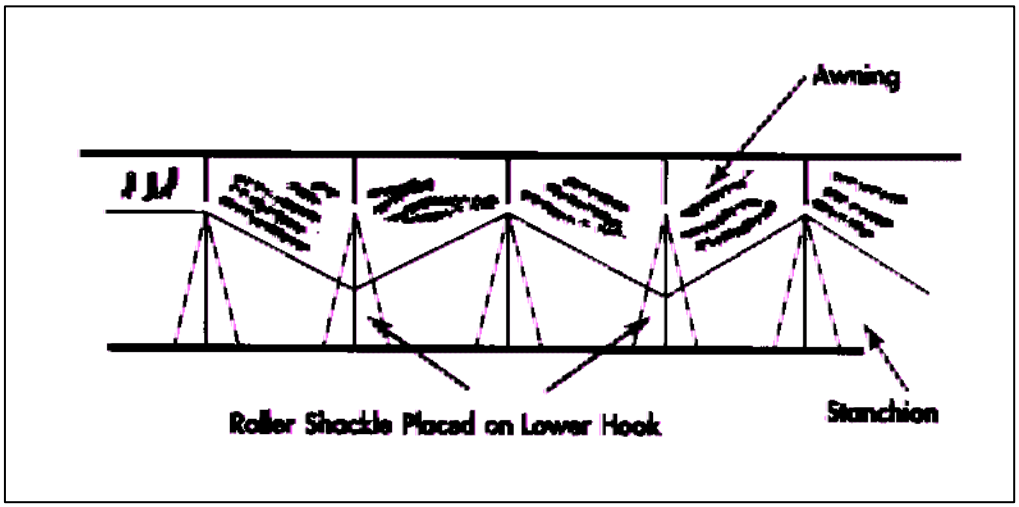


Figure 5.37-3 - Sloping an Awning

b. To rig the awning, it is first laid out on deck and checked that it is serviceable. The awning should always be laid out on the leeward side of the ship. It is passed over the backbone from leeward to windward. Before passing the awning, the leeward cringles are made fast to the earrings and awning tackle. Lines are passed over the backbone to pull the awning over. Care must be taken when passing over the backbone as some stanchions located on the centreline have spikes on their ends to receive the stainless steel grommets sewn into the centreline of the awning. Once the awning is over the backbone, the forward end of the awning is secured to the superstructure. It is then pulled aft and secured at the stern. The awning tackle is hauled taut on

both sides together in order to keep the awning centred.

c. All awnings are fitted with side curtains. Side curtains offer protection from sun, wind and rain to activities taking place under the awning. Side curtains will have openings sewn in at locations where the brow will be placed. The side curtains are fastened at the top end to a wire, which runs the length of the awning on both sides. The bottom of the awning is secured to the bases of the awning stanchions.

d. When striking down an awning, the windward side is released first. The awning tackle is eased out and the leeward side is pulled, allowing the awning to slide over the backbone and onto the deck. Once on deck, all awning tackles are removed and the awning is folded and secured.

e. Ships with hangars will have a tent-like structure for spreading in the hangar. The roof and sides are normally separate and are made of nylon. The peak of the awning is secured to the deckhead of the hangar. The sides have a wire running the length and width of the hangar and are either laced or secured to the wire with snap hooks.

f. Care must be taken whenever handling awnings, as they are easy to tear or soil. Awnings must never be stowed wet. When stowing a Dacron or nylon awning, it must be folded versus rolled to avoid unnecessary wrinkles.

5.37.1 Care and Maintenance of Awnings and Canvas

An awning, or for that matter any canvas gear, should never by stowed below in a wet condition as this will cause rot and mildew. Canvas stored wet also possesses the risk of spontaneous combustion. Awnings/canvas should never be dragged across the deck. Not only can this cause undue wear and damage, but also it will cause unnecessary soiling. Decks where awning or canvas is to be laid out should be free of oil and swept clean. When laid out, it is not to be walked on. If small tears occur, repair immediately to prevent further damage.

CHAPTER 6

Berthing and Slipping

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6.1 INTRODUCTION

a. One vital and constantly practiced aspect of seamanship is that of berthing and slipping. Under benign circumstances when the weather is calm and sea room is ample, a ship's arrival or departure can appear fairly routine. However, circumstances can and often will change very rapidly, requiring Part Ship I/Cs and their subordinates to react smartly and safely.

b. A ship is said to berth (moor) when it comes alongside a pier or jetty. It is held fast to the pier or jetty by several berthing hawsers, commonly referred to as berthing lines. Each of these hawsers has a name and purpose, which will be described later in the chapter. Slipping is essentially the reverse of berthing and involves the taking in of the berthing hawsers and departure from the berth.

c. The guiding principle of berthing and slipping, as in any seamanship evolution, must be safety. It is simply poor seamanship and bad ship handling if any damage is done to the ship, jetty or most importantly to personnel when berthing or slipping (emergencies aside). Communication plays a vital part when berthing or leaving a berth. Each part ship must be in direct communication with Command.

d. **Berthing.** At the Command pre-arrival briefing, the ship and line handling intentions will be promulgated. Under normal circumstances a ship will approach a jetty – bow first – at an angle of approximately 15 degrees. The fore spring is normally the first line ashore, as it is used to check the ship's headway and assist in twisting the stern in towards the jetty. Great care must be exercised on the focsle as excessive headway could lead to the fore spring parting. The head rope is the second line ashore, and is normally taken to the capstan in order to control the ship's head. Aft, the first line ashore is normally the stern rope, which is taken to the capstan and heaved in to bring the stern onto the jetty. The after spring is the second line ashore aft, and is used to check any sternway that develops while manoeuvering alongside. The breast lines (normally two) are taken ashore in no particular order (depending on jetty bollard location) and are down-slacked by hand as the head and stern ropes (and engines) are worked to bring the ship alongside.

e. **Slipping.** At the Command pre-departure briefing, the ship and line handling intentions will be promulgated. Under normal circumstances, a ship will depart a jetty in reverse order from the arrival. The breast lines, after spring, and stern rope are simultaneously taken in to allow the stern to move freely off the jetty. The fore spring is held while the head rope is heaved in on the capstan, and engines are used, resulting in the ship's head being cast in toward the lie of the jetty. Again, great care must be exercised on the focsle as excessive headway may develop, leading to hazardous working conditions with the fore spring. The head rope and fore spring are then taken in, and the ship makes a sternboard departure.

f. There are unlimited sets of circumstances that will result in Command modifying the plans. For instance, a ship may back into a berth with or without tug assistance, and then make a forward departure. An anchor may be used to help control the movement of the bow in high winds. In any event, a sound plan that is made clear to all safety officers, I/Cs and part ship hands is key to the safe conduct of the evolution.

6.2 TERMINOLOGY

Double Up To pass a second line through the same fairlead to the same bollard and middle the weight.

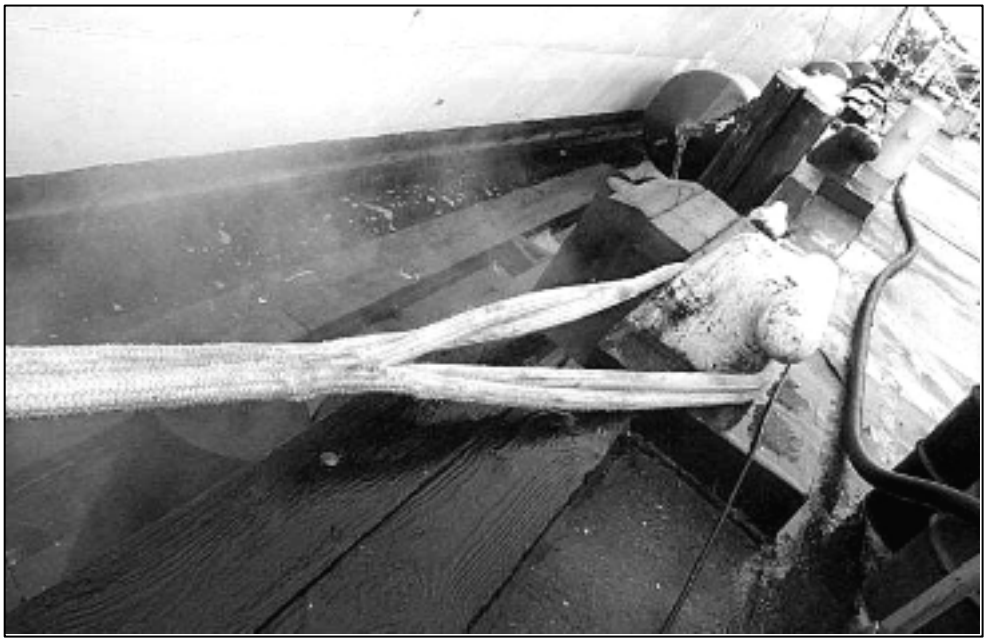


Figure 6.2-1 - Double Up with Second Eye Dipped

Dipping the Eye When more than one eye is required to be passed to the same bollard, the eye of the second hawser is passed up through the eye of the first hawser then onto the bollard. This will allow either eye to be slipped from the bollard first.

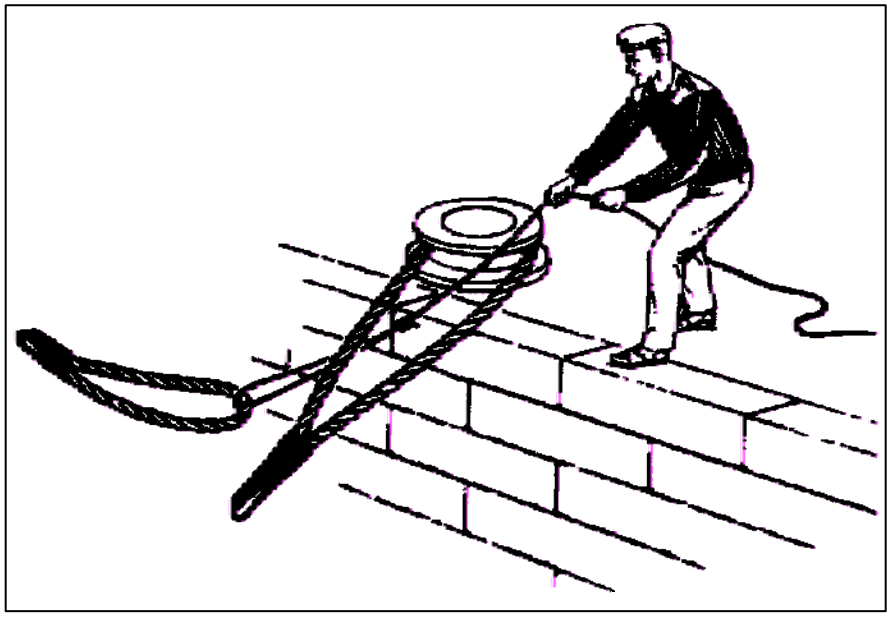


Figure 6.2-2 - Dipping the Eye

Check To ease a line out under control either from a Bollard, or winch.

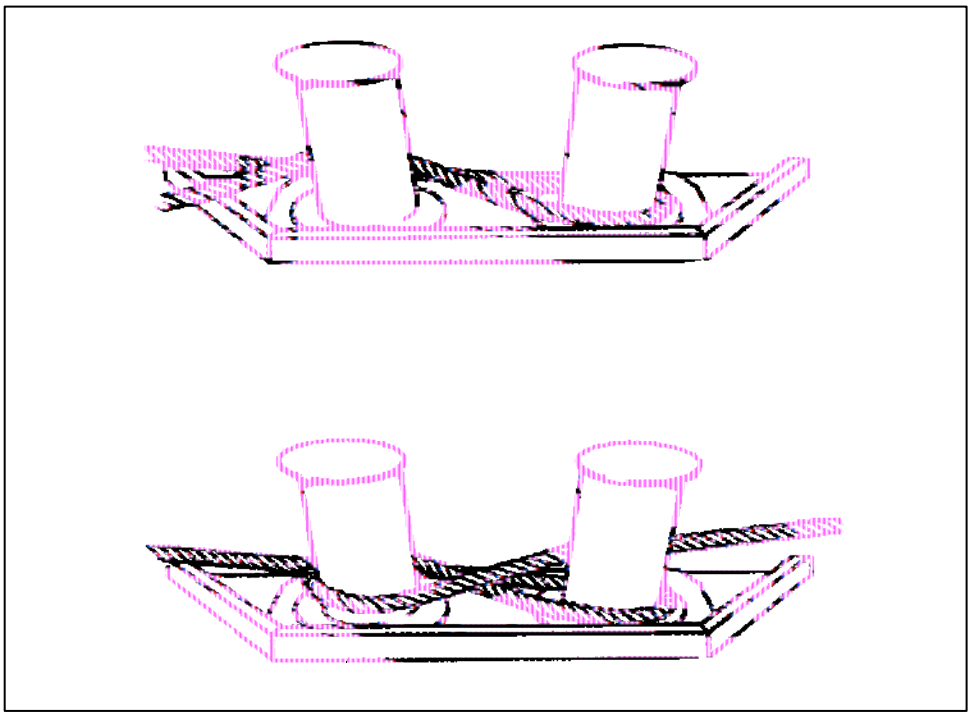


Figure 6.2-3 - Checking a Line

Surge To surge a line is to ease the tension on the line so as to allow the winch to turn without heaving in on the line.

Greasy Fid A large tapered wooden pin with a securing line attached at one end that is used to secure an eye of a hawser back onto itself.

To Fake Down To place a line or wire on deck in large fakes or bights so that it is free for running.

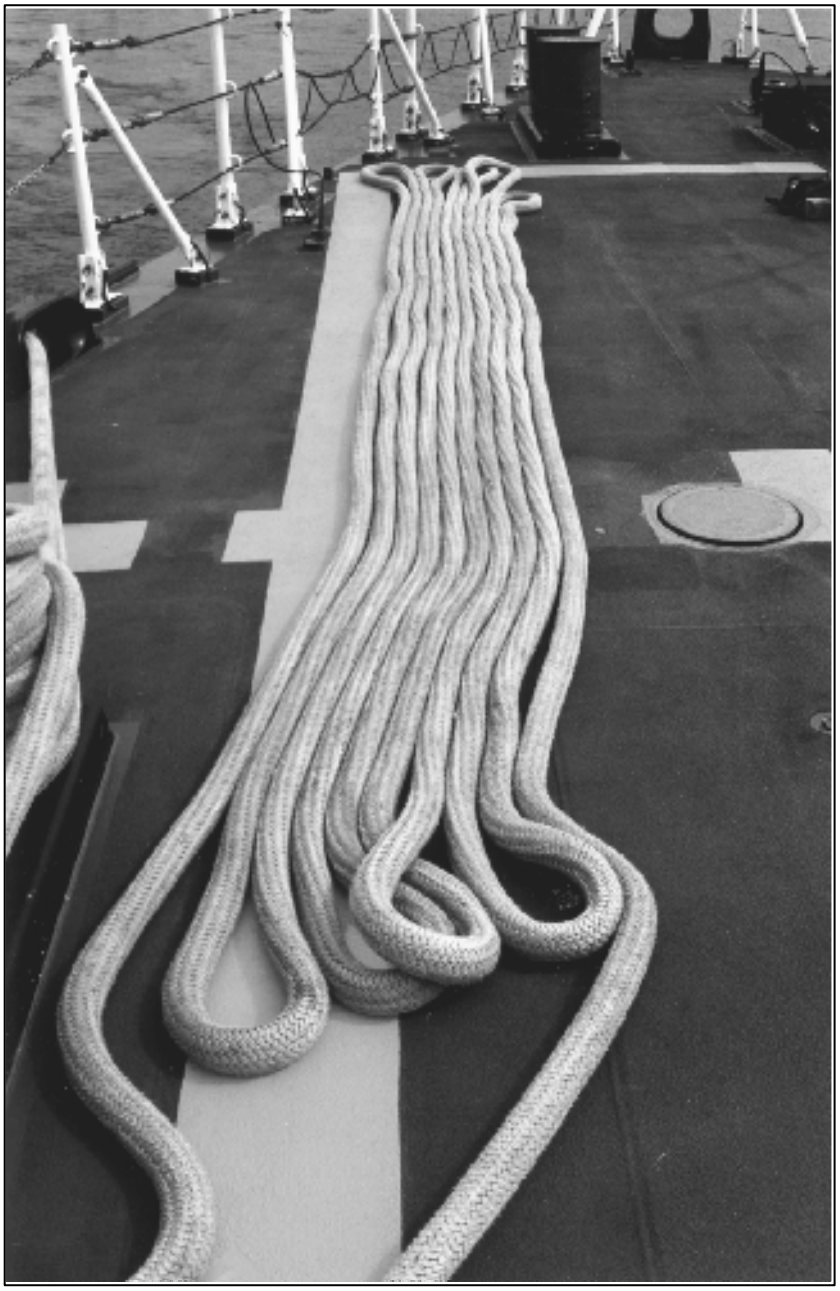


Figure 6.2-4 – To Fake Down

To Cheese Down A method of coiling a rope or line neatly and flat on the deck for stowage commencing with the standing end working inward.

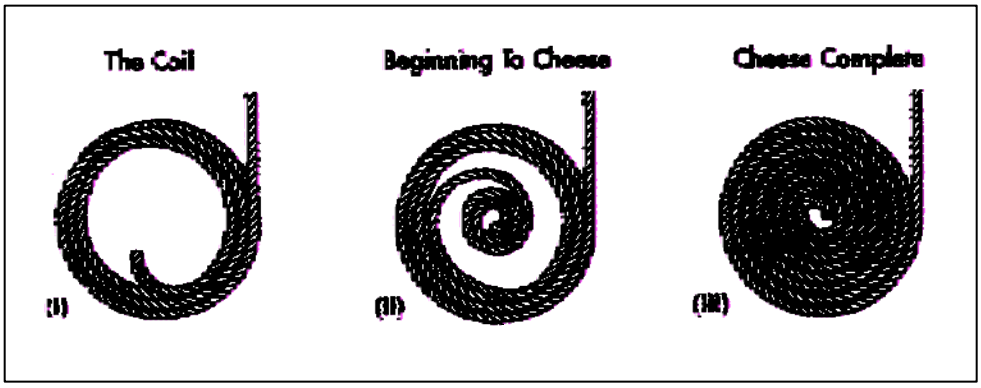


Figure 6.2-5 - To Cheese Down

Snap Back Caused when a hawser is stretched beyond its limit and suddenly breaks. It then contracts and whips back to regain its original size (much like a stretched elastic). When this happens it is capable of severely damaging or injuring anything and anyone in its path.

Racking a Hawser If a wire hawser is to remain on a twin bollard for any length of time, the two upper turns are lashed together. This is called racking.

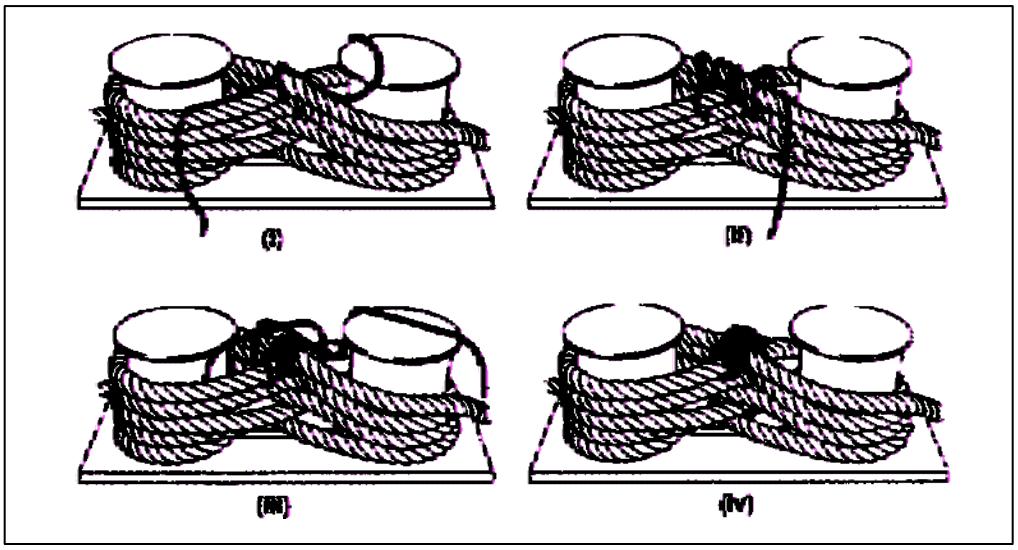


Figure 6.2-6 - Racking a Hawser

Back Up Hold pressure on the hauling part of a hawser under tension to prevent it from surging forward on a winch or bollard.

Hurricane Hawser Specially constructed wire or rope hawsers used mainly if high winds are present or forecast. They are led to the jetty, one from the focsle and one from the after end of the ship.

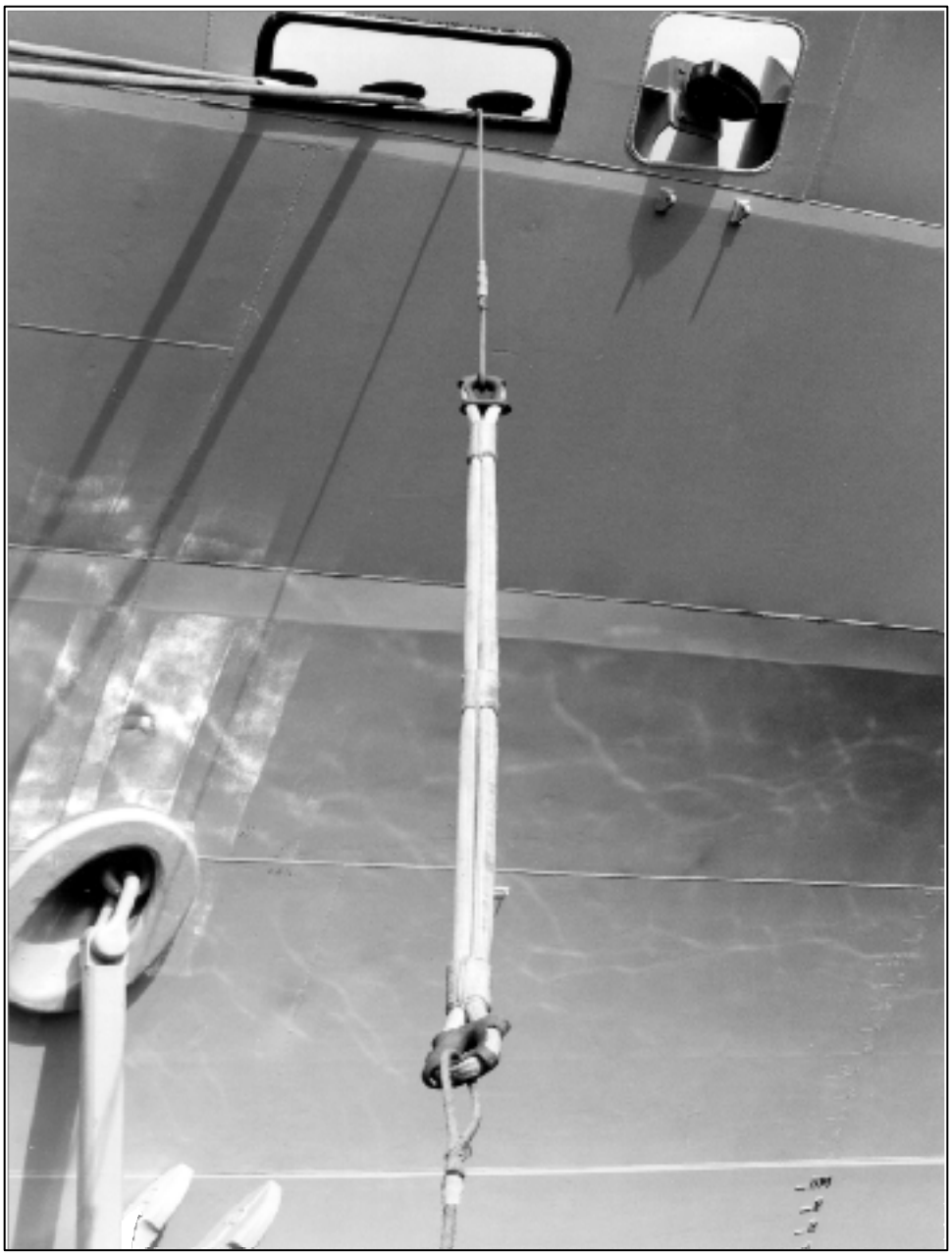


Figure 6.2-7 – Hurricane Hawser

6.3 COMMON ORDERS

The common orders and terms used when handling hawsers or lines are listed below.

Table 6.3-1: Terms/Definitions

Orders or Term	Definition
Heave in	The order to heave in on a capstan, winch or by hand.
Hand over hand	To haul a rope, keeping a steady pull.
Haul taut	An order to take down the slack and take the strain.
Avast	Order to stop hauling or lowering.
Hold	An order to hold a rope under strain so as to keep it from moving.
Marry	The order to bring two ropes together side by side and handle them as one. Also a term used in splicing, meaning to butt two ropes' ends together with their respective strands interlocking.
Handsomely	Slowly, with care (e.g., 'heave in handsomely').
Roundly	Smartly, rapidly.
Walk back	An order to ease a rope out while keeping it in hand and taking a step moving towards the pull.
Light to	An order to let go of the line and let it run freely.
To veer	To pay out under power.
Check away	The order to ease a rope steadily by hand while keeping a strain on it.
To surge	To allow a hawser to ease out by its own weight or by the strain on the outboard end. A hawser slipping around the drum of a capstan or winch is said to surge whether the drum is stopped or turning to heave in. **Surging when the drum is veering is dangerous.**
To back up	To take a line in hand on the disengaged or after side of a capstan or bollard on which turns have been passed.

6.4 PERSONNEL REQUIREMENTS

. The true numbers of Part Ship hands can be found in SSOs but the optimum number of Part Ship hands to work each hawser is shown below:

Table 6.4-1: Personnel Requirements

Class	Calm Weather	Wind Warning Issued
PROTECTEUR	6	10
IROQUOIS/HALIFAX	4	8
KINGSTON	3	3
ORCA	3	3

6.5 EQUIPMENT REQUIRED FOR BERTHING/SLIPPING

6.5.1 Common Associated Equipment

Table 6.5-1: Equipment for Berthing/Slipping	
Rope Stopper	Line-throwing Gun (FX/AX)
Fire Axe	Bolos
4” x 4” Wood Block	Berthing Hawsers
Heaving Lines	Fenders
Brow (if req’d)	Tug Towline (if req’d)
Bollard Strops	Casing Jewellery
Safety Net	Rat Guard
Brow	Shotmat

6.5.2 Hawsers

a. A ship’s hawser berthing arrangement varies according to the size and characteristics of the vessel. Each of the hawsers in a berthing arrangement has a special name and purpose. Berthing hawsers can be one of the following types: head rope and stern rope, breast rope or spring rope.

b. The head rope and stern rope are used to adjust the ship’s position alongside a jetty. They also assist in checking fore and aft, and lateral movement alongside.

c. Springs lead obliquely, but nearly parallel to the keel and control the fore and aft position of the ship with respect to her berth. Any spring that leads aft and prevents the ship from moving forward is known as a head or fore spring and any spring that leads forward and prevents the ship from moving aft is known as a back or after spring.

d. Breasts lead nearly perpendicular to the keel of the ship and control lateral movement or the distance that the ship lies from the jetty.

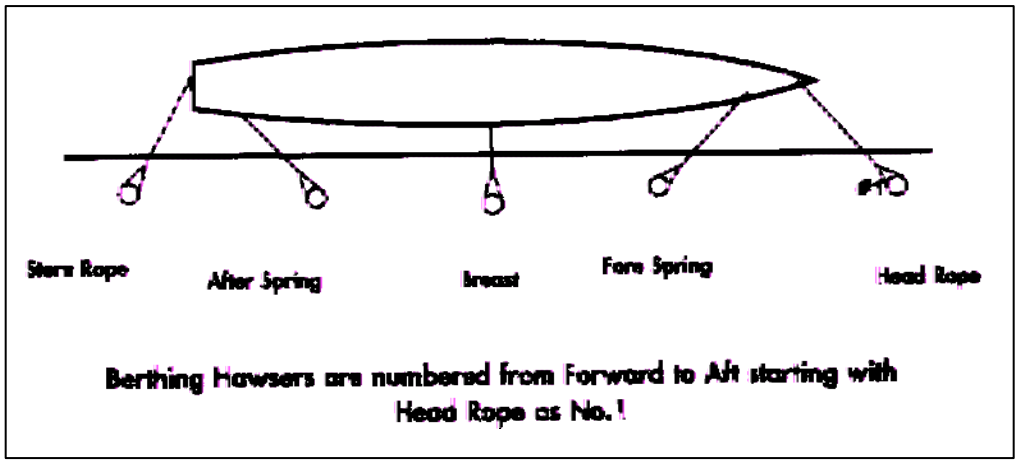


Figure 6.5-1 - A Ship Secured Alongside

e. Berthing hawsers are delivered to the Dockyard Riggers on reels measuring 370 m (1200') in length. It is the responsibility of ships' Chief Bosn's Mates to submit work orders whenever required for lines to be cut to specific lengths with eyes spliced on either end. The following are the required size and length ranges of the berthing lines used in the Canadian Navy:

(**1**) IROQUOIS and HALIFAX Classes:
Diameter: 48 mm double-braided nylon (52.2 tonnes breaking strength).
Length Range: 110 to 150 metres.
Number of Hawsers: 6

(**2**) PROTECTEUR Classes:

a. Diameter: 56 mm double-braided nylon (68.1 tonnes breaking strength).
Length Range: 110 to 150 metres.
Number of Hawsers: 4

b. Diameter: 48 mm double-braided nylon.
Length Range: 110 to 150 metres.
Number of Hawsers: 2

(**3**) KINGSTON/VICTORIA Classes:

a. Diameter: 40 mm double-braided nylon (37.2 tonnes breaking strength).
Length Range: 100 metres.
Number of Hawsers: 5

(4) ORCA Class

a. IAW MOG 4 SOPs

6.5.3 Bolos, Gunline and Heaving Lines

a. In order to pass a hawser or similar type line ashore, a lighter line that can be worked quickly must first be passed to "make contact", and then be used to haul the hawser over. Under normal circumstances, heaving lines are thrown the short distance from the ship to the berthing party waiting on the jetty. When the distance ashore is greater, for instance when a strong off-jetty wind is blowing, a bolo or gunline will be used.

b. **Heaving Lines**. Most heaving lines are made of 10 mm circumference sash cord to lengths of approximately 50 metres. One end of the heaving line is made into a weighted monkey's fist, which leads the line ashore.

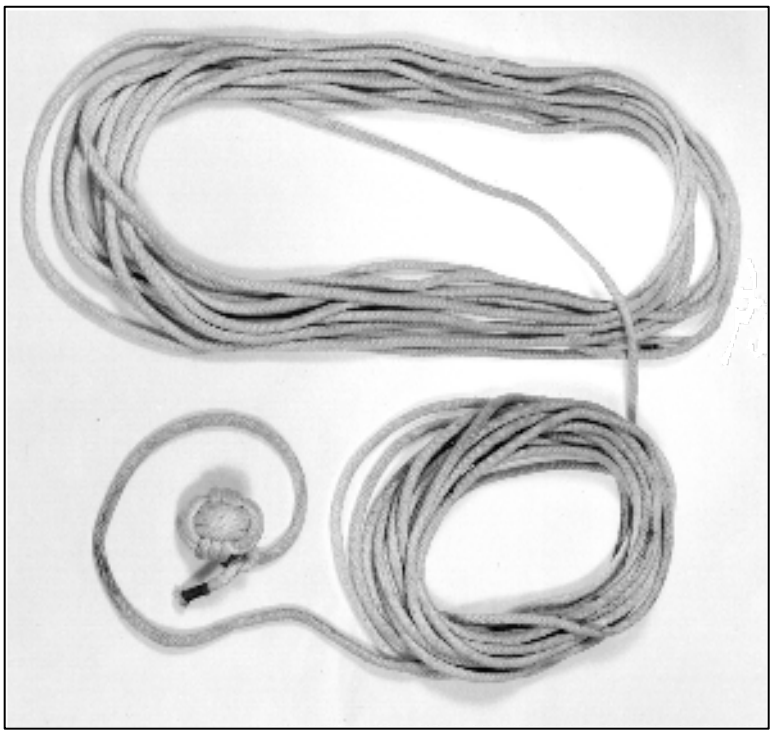


Figure 6.5-2 - Heaving Line

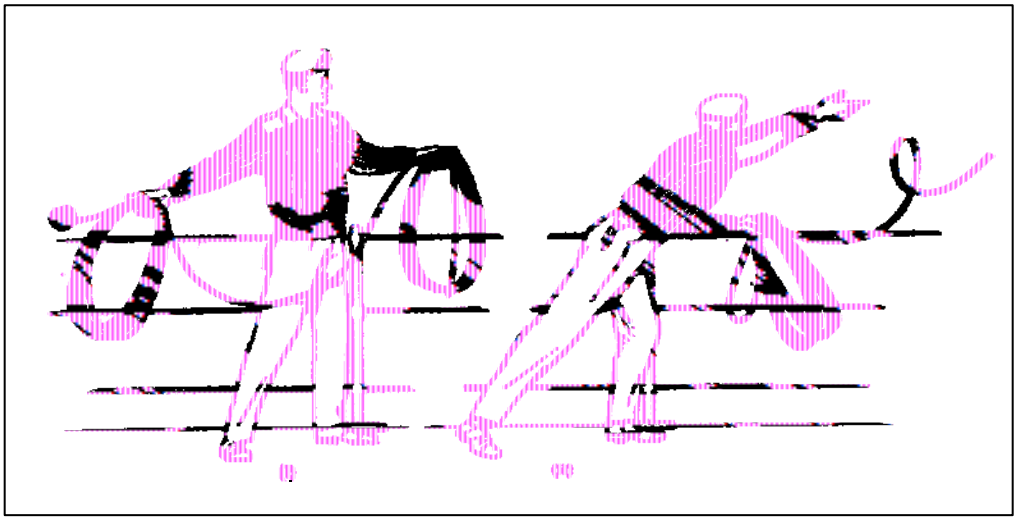


Figure 6.5-3 – Throwing a Heaving Line

c. **Bolos**. Bolos are made using orange buoyant line of 1 mm circumference. A small canvas bag weighted with small lead pellets is attached to one end, which leads the line ashore. It can be thrown greater distances then a heaving line.

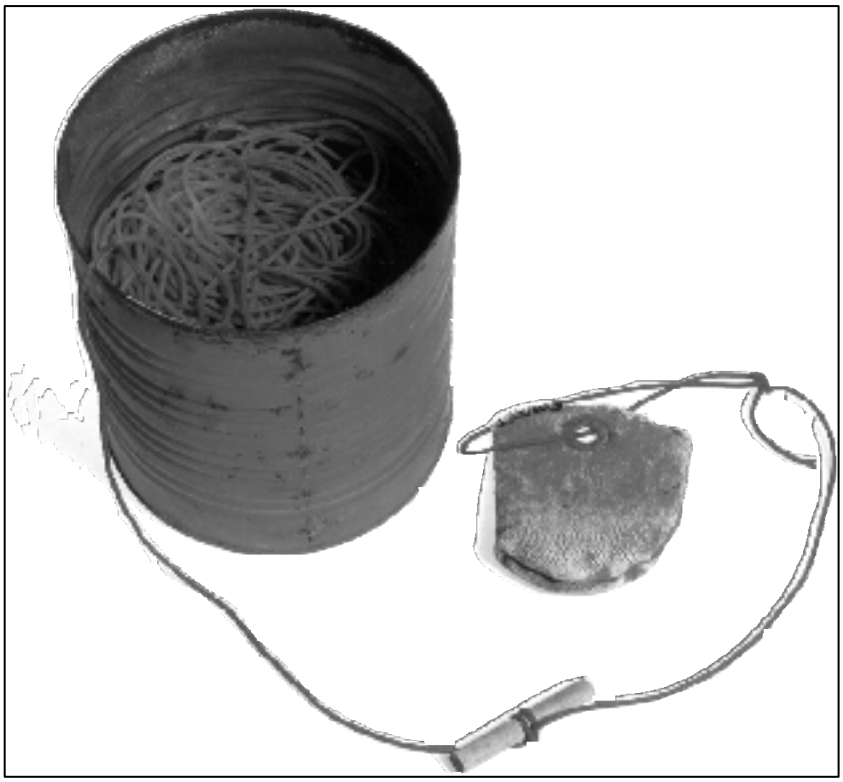


Figure 6.5-4 - Bolo

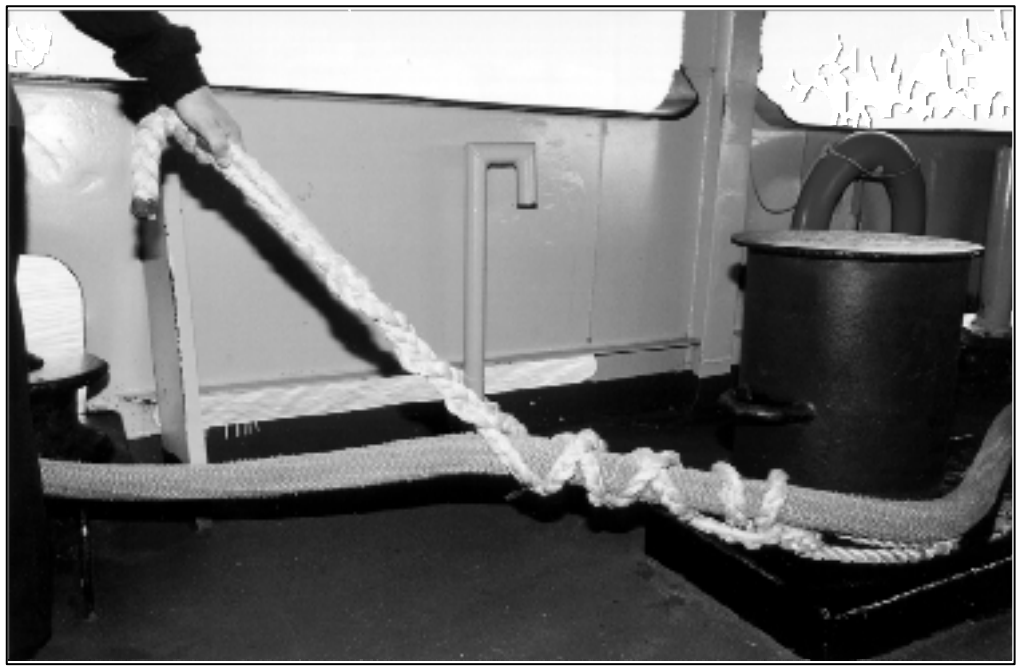
d. **Gunline**. Gunlines are made using the same buoyant line as bolos. One end of the line is attached to plastic projectile which is fired from a line-throwing gun. A blank line-throwing cartridge provides the projectile with considerable momentum, throwing it greater distances than the bolo. It is most commonly used to make contact during RAS and towing evolutions; however, it can prove invaluable during difficult berthing sequences.

Figure 6.5-5

LINE THROWING GUN

6.5.4 Rope Stoppers

To transfer a hawser under strain from the capstan to a bollard or vice versa, the strain must first be taken temporarily by passing a stopper. A stopper consists of a length of line of the same material as the hawser but normally smaller diameter, middled to form two tails and made fast to an eyeplate or other fixture. The stopper is half hitched and laid alongside the hawser with its tails pointing towards the source of the strain. The tails are passed by crossing them under and over the hawser in the direction of the source of the strain. The ends are kept in hand or stopped to the hawser.



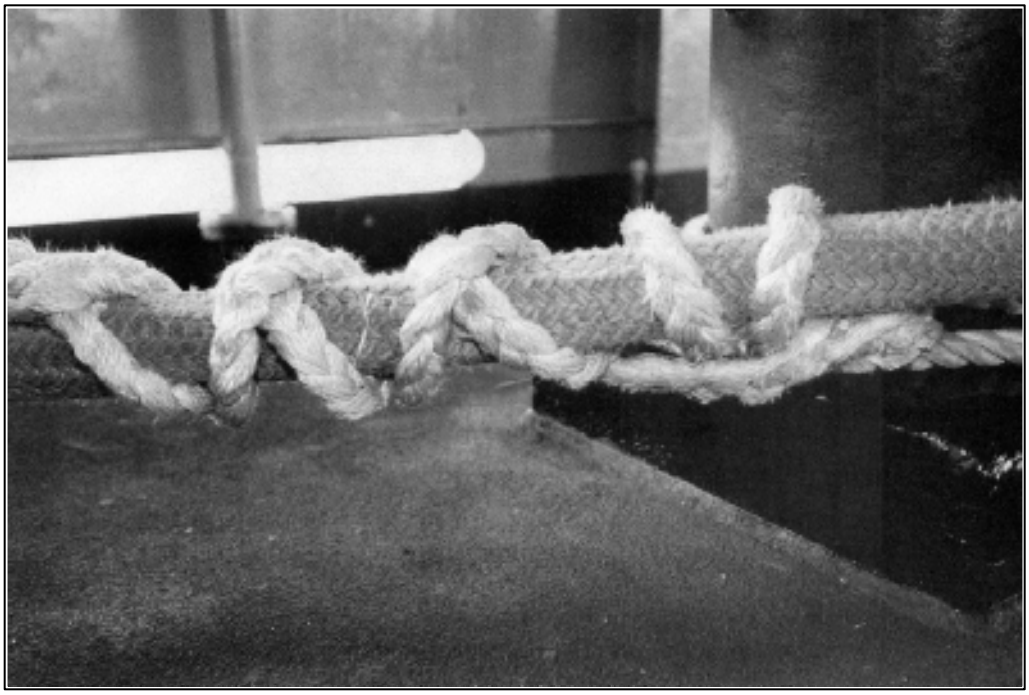


Figure 6.5-6 - Rope Stoppers

6.5.5 Rat Guards

Rat guards are used to prevent rats, mice or any other rodents from climbing up the hawsers from the jetty and infesting the ship. They are used on all lines that lead to the jetty, including shore connections such as power cables. They are placed approximately 1.5 m from the jetty end of a hawser.

Figure 6.5-7 - Rat Guard

6.5.6 Fenders

When berthing and slipping, resilient fenders are necessary to absorb any impact. Impact does not necessarily imply mishap. For instance, during a departure when casting the ship's head into the lie of the jetty, the bow often rests on the jetty to facilitate the twist. There are several types of fenders: those that are fixed to jetties such as large pneumatic and log fenders, and portable fenders that are carried in ships. In all cases, they must be sufficiently robust to withstand the crushing weight of the ship, and large enough to spread and absorb the shock over a large area of comparatively weak hull plating.

Figure 6.5-8 - Compression Catamaran

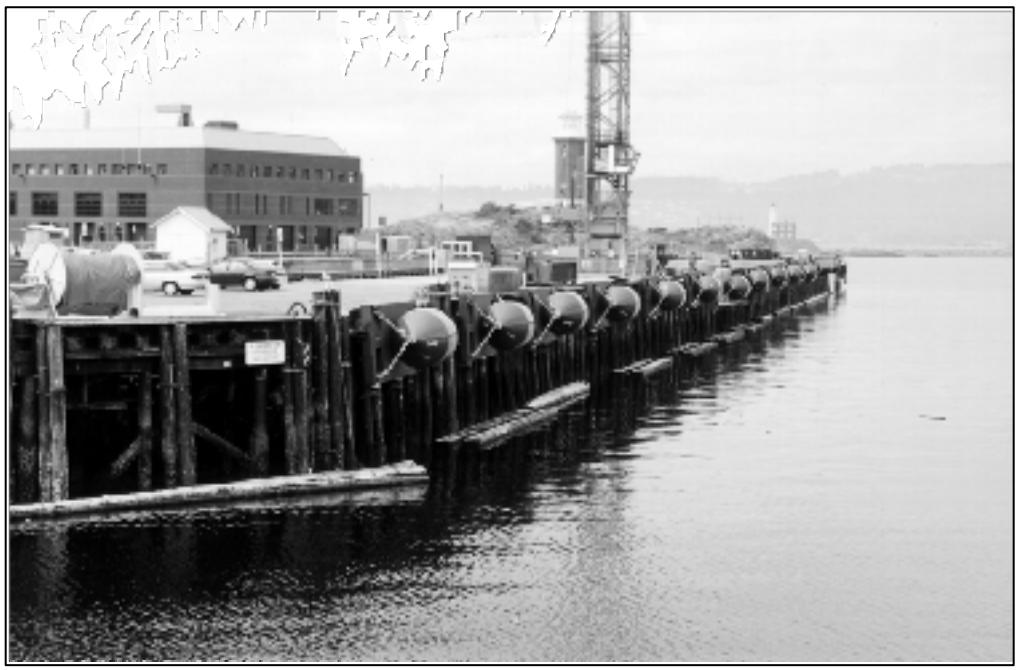


Figure 6.5-9 - Small Pneumatic Fenders

Figure 6.5-10 - Log Fender

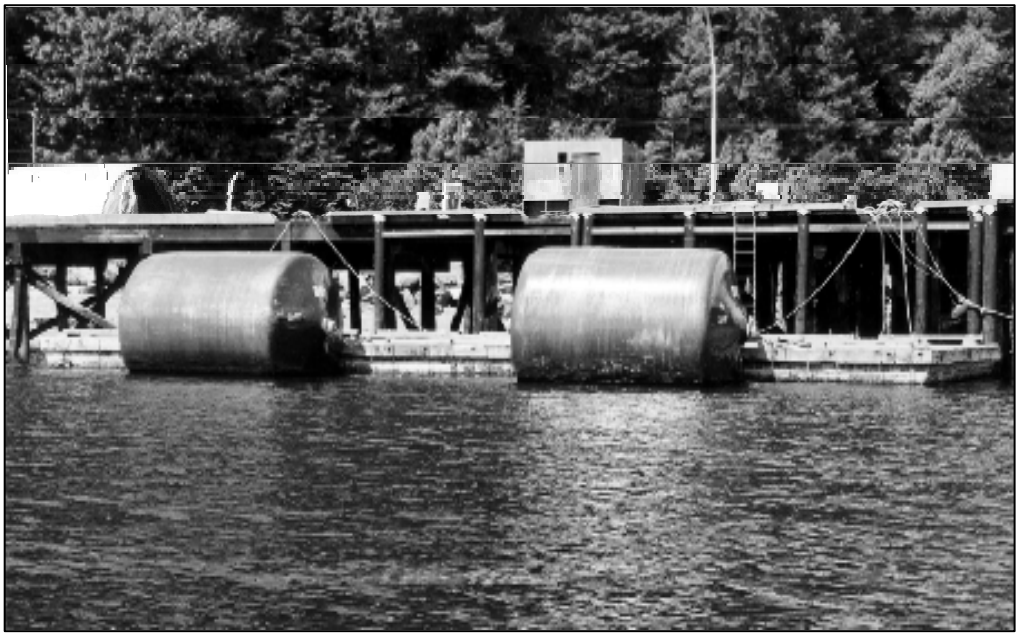


Figure 6.5-11 - Large Pneumatic Fenders (Yokohama)

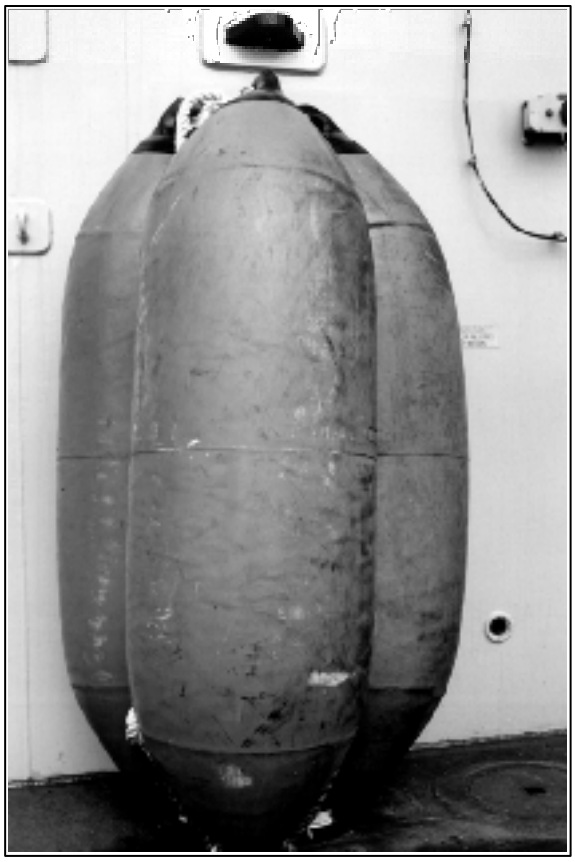


Figure 6.5-12 - Portable Fenders

6.5.7 Safety Equipment

Sledgehammers are required at each part ship in the event that lines are fouled on fittings and require freeing. In addition, axes and 4” x 4” wooden blocks are to be available in case there is a requirement to cut lines under strain in an emergency.

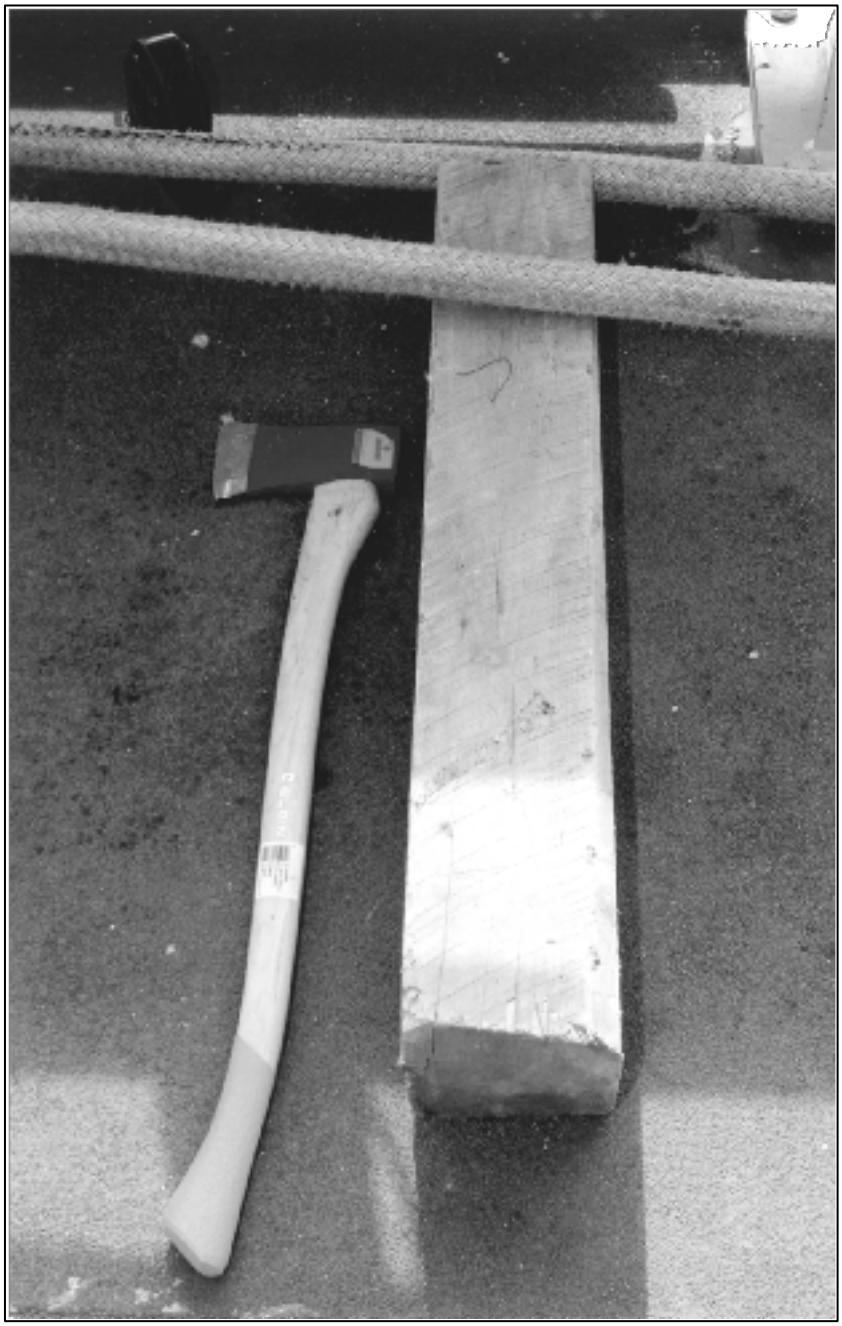


Figure 6.5-13 - Safety Equipment

6.5.8 Deck Fittings

Berthing hawsers leading from a ship to a jetty pass through fairleads near the ship's side. Fairleads are fittings with round surfaces through which a hawser may be led so as to change its direction without excessive friction. A Panama fairlead is an older type of fairlead, which is fitted on top with a fixed or removable plate. It was designed to facilitate the use of the four "mule" lines that are used to safely middle ships at various heights in the locks of the Panama Canal. A roller fairlead is one fitted with rollers designed to facilitate the streaming and recovery of hoses, during an astern fuelling. A Bullring is a fairlead located on the focsle immediately above the stem. A bollard is a single or double bitt used to work or secure hawsers. Cleats are normally used to secure smaller lines, but on occasion can be used for tug lines or hawsers if no bollards are available.

Figure 6.5-14 - Fairlead

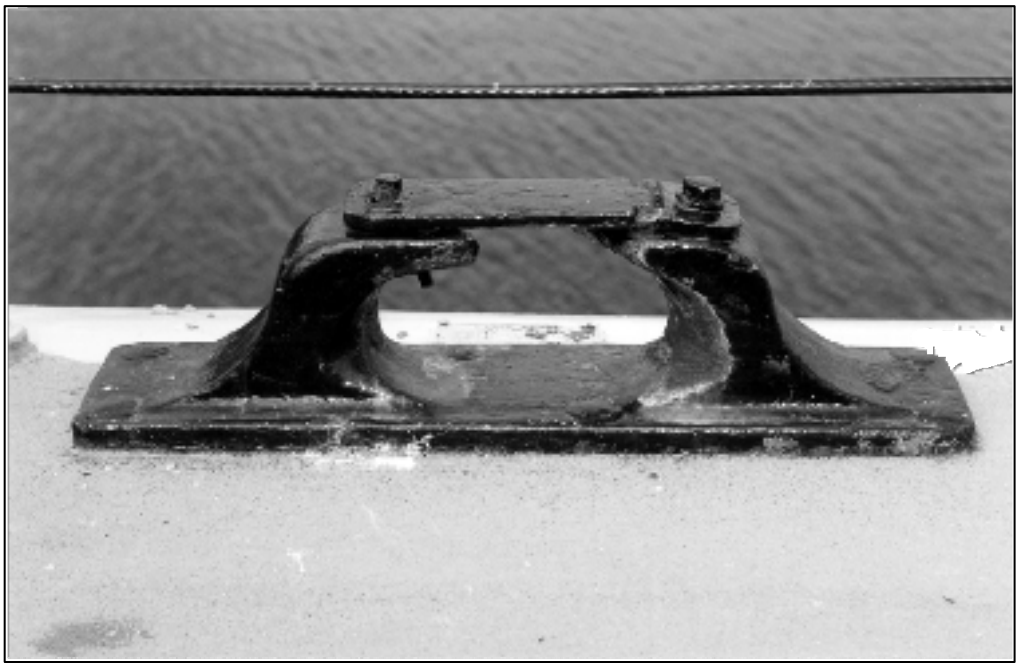


Figure 6.5-15 - Panama Fairlead

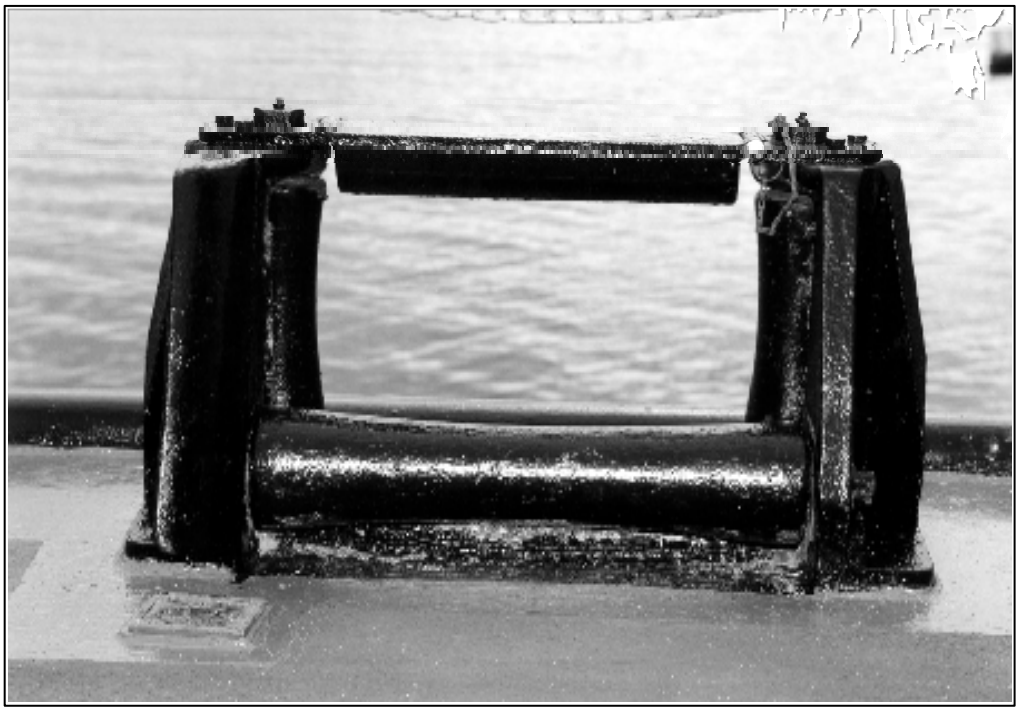


Figure 6.5-16 - Roller Fairlead

Figure 6.5-17 - Bullring with Angle Fairlead

Figure 6.5-18 - Bollard

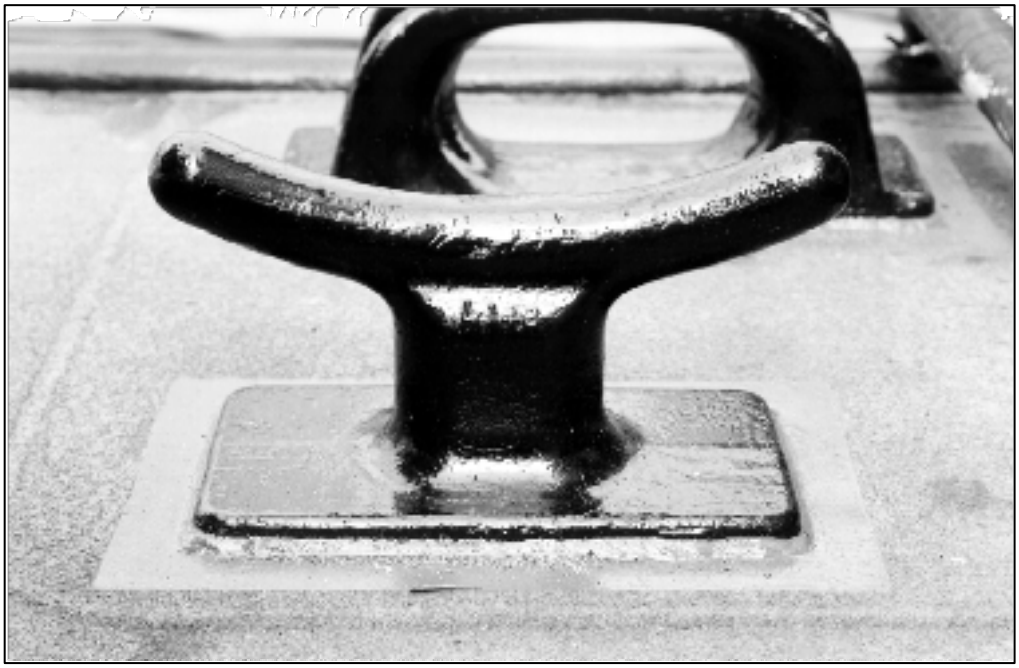


Figure 6.5-19 - Cleat

6.5.9 Brow Ceremonial Equipment

The following table and photos show ceremonial equipment that is set up at the brow whenever a ship is alongside. It is set up prior to berthing, and secured for sea immediately prior to departure.

Table 6.5-2: Brow Ceremonial	
Ship's Bell	Ship's Name Plates
Battle Honours Board	Ship's Kisby Ring
Brow Skirts	Ship's Crest
Pegboards	Quartermaster's Desk

Figure 6.5-20 - Ship's Badge and Bell

Figure 6.5-21 - Name Plate

Figure 6.5-22 - Battle Honours

Figure 6.5-23 - Ship's Kisby Ring

Figure 6.5-24 - Pegboards

Figure 6.5-25 - Quartermaster's Desk

6.5.10 Brow Lifesaving and Emergency Equipment

When secured alongside a jetty or another ship, safety equipment shall be put in place in order to minimize the risk of persons falling overboard, and to provide immediate assistance should a mishap occur. The following is required:

a. A safety net of sufficient size to extend five feet forward and aft of the brow shall be suspended beneath the brow.

b. A jumping ladder shall be rigged forward or aft of the safety net (that side which, considering all features of the brow and approaches, offers the greater chance of someone falling into the water - normally aft).

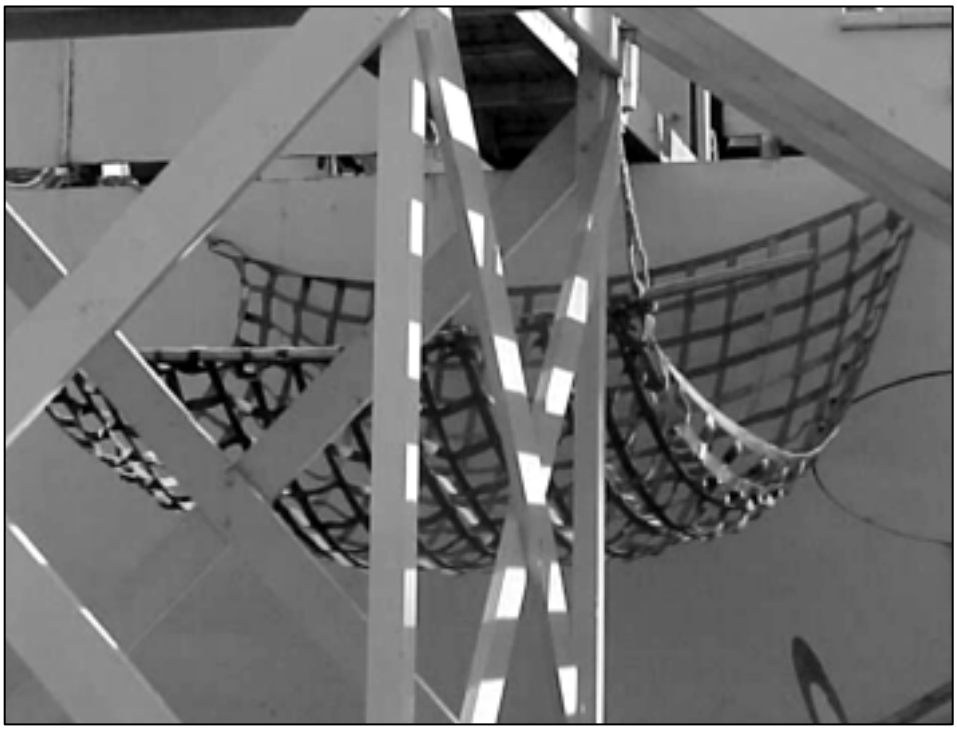


Figure 6.5-26 - Safety Net

Figure 6.5-27 - Jumping Ladder

c. If adequate lighting has not been provided by the shore authority, temporary jetty lighting is to be rigged.

d. Hand lanterns or extension lights of sufficient quantity and brilliance to illuminate the surface of the water between the ship and the jetty shall be available.

e. Kisby ring with 30 m line attached.

f. Steadfast.

g. At least two long handled boat hooks.

h. A fire pull alarm box (if available).

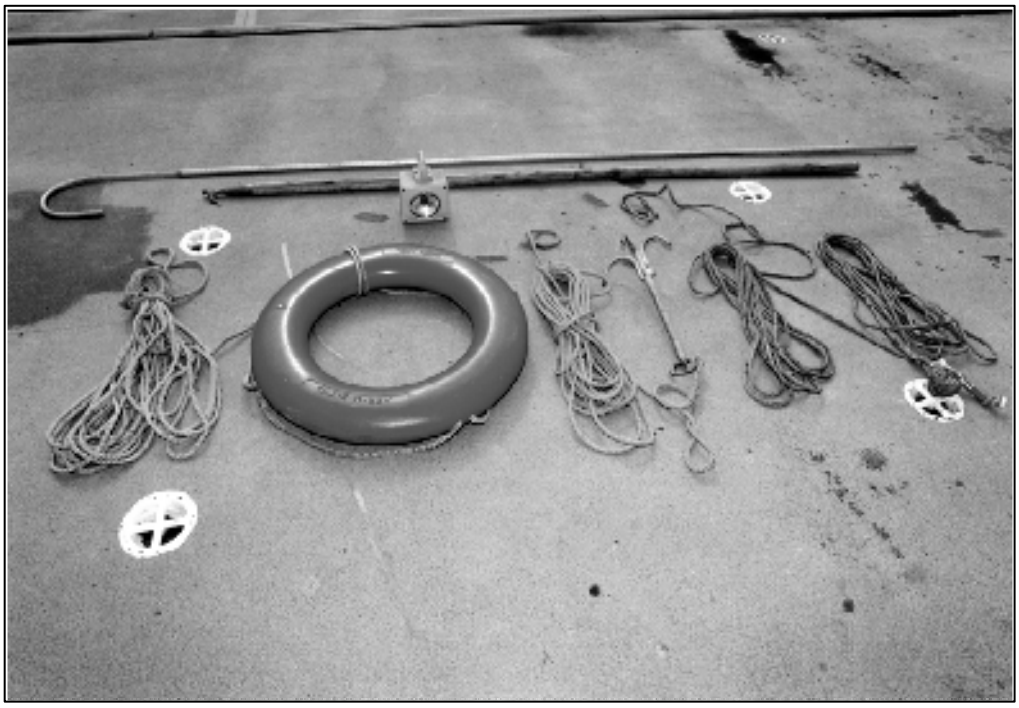


Figure 6.5-28 - Brow Emergency Equipment

Figure 6.5-30 - Pull Alarm Box

6.5.11 Ensign and Jack Staffs

Both staffs should be rigged and in place before entering harbour. The Jack is hoisted when the first hawser is secured to the jetty IAW the Manual of Ceremonial .

Figure 6.5-31 - Naval Jack

Figure 6.5-32 - Naval Ensign

6.5.12 Fire Lines

Fire Lines are required in certain ports to assist the fire tugs in removing a hip from her berth in an emergency. They are made up of wire rope with a soft eye in either end or of braided nylon with a soft eye in either end. They are secured on the Focsle and Quarterdeck, suspended over the ship's side just above the waterline, and secured to a bollard inboard.

6.6 TUG ASSISTANCE WHEN BERTHING/SLIPPING

6.6.1 Introduction

a. The use of tugs is often an essential component of berthing and slipping evolutions. Whenever conditions such as high wind or limited sea room prevail, the use of tugs will be required. For larger ships, such as AORs, tugs are almost always used, regardless of prevailing conditions.

b. Tugs are used either with or without making lines fast to the ship, and either with or without embarking a harbour pilot to control the tugs. If there is only a requirement to push a ship onto a jetty, then tug lines may not be passed. In more complicated maneuvers requiring the swinging of the ship, lines will be passed. When pilots are embarked, which is often deemed mandatory by harbour regulations, they will work directly with Command and retain control of the tugs. When they are not embarked, Command passes orders directly to the tug masters.

c. As Canadian warships most commonly work with the highly maneuverable GLEN and VILLE Class tugs in Halifax and Esquimalt, these will be described in some detail below. However, it is also important to note that in foreign ports, tugs come in a variety of sizes, use a variety of tow ropes, and display varying levels of competence. Safety assumes an even greater importance in these situations, with extreme caution being required in the vicinity of tow ropes under strain.

6.6.2 GLEN Class Tugs

a. These vessels are sometimes referred to as "water tractors" or "tractor tugs" and are fitted with two Voith Schneider cycloidal propulsion units located forward, one on each side of the centre line. These units are vertical axis, controllable pitch propellers that permit thrust to be directed through 360 degrees. They allow the vessel to turn and stop within its own length, navigate stern first with full control, and "crab" sideways with a limited capability. Water tractor/tractor tugs manoeuver more readily than conventional tugs when on a towline. They are fitted with a remote hydraulic tow hook release and have 60 m of 162 mm double-braid nylon towline.

Figure 6.6-1 GLEN Class Tugs

b. There are three GLEN tugs in Halifax and two in Esquimalt. Their principal characteristics are as follows:

Length:	92’6”/28.2 m
Beam:	28’0”/8.5 m
Draft:	15’3”/4.6 m
Bollard Pull:	18.3 tonnes ahead, 15 tonnes astern, 12 tonnes sideways
Horse Power:	1750 bhp
Maximum Speed:	10.5 knots

c. Because of the position of the propellers directly beneath the bridge front (about one third of a ship’s length from the bow), GLEN tugs perform better in the astern configuration in some circumstances. Better results are achieved, for example, by making up alongside an IROQUOIS/HALIFAX Class ship’s quarter, bow to stern, because the wash from the propellers is directed beneath the cutaway when pulling off. Similarly, slightly better performance is achieved by “squaring off” in the stern to position, because the propellers are that much further from the side of the assisted ship. On the GLEN tug, note that the bottom of the nozzle plate which protects the propellers draws nearly sixteen feet. Because of the possibility of fouling the tug’s superstructure under the flare, GLEN tugs have difficulty in securing with short stern lines. Consequently, they may require time to make fast and may not be able to attain an ideal position to push or pull. These tugs have sufficient power to part any line that is improperly led. Towlines should not be led through the bullring of IROQUOIS/HALIFAX Class ships if the tug is expected to work broad on the bow at high power settings.

6.6.3 VILLE Class Tugs

a. These vessels are single-screw and fitted with steerable "Kort" nozzles. The thrust of the propeller can be directed over the arc of normal rudder operation, hence the turning effect is considerable and the vessel can be steered well while proceeding astern. They are fitted with a remote, manual tow hook release and have 60 m of 110 mm double-braided nylon towline.

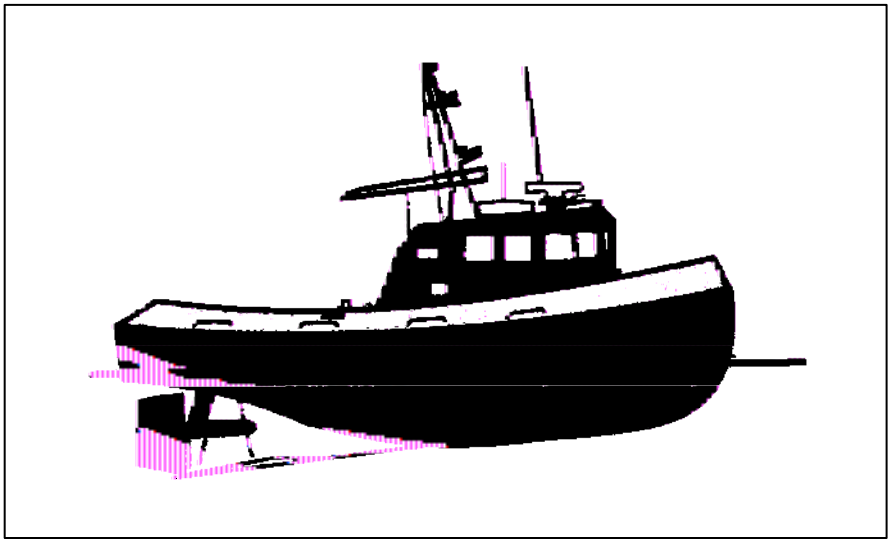


Figure 6.6-2 - VILLE Class Tugs

b. There are three VILLE tugs in Halifax and two in Esquimalt. Their principal characteristics are as follows:

Length:	45'4"/14.14 m
Beam:	14'6"/4.49 m
Draft F:	4'8"/1.15 m, A: 7'7.5"/1.93 m
Bollard Pull:	7.5 tonnes maximum ahead, 4.0 tonnes maximum astern
Horse Power:	365 bhp
Maximum Speed:	0.0 knots

c. The bow flair may restrict the use of a VILLE tug on a head line to a position abaft the bridge. In this position, the pull-off capability is reduced and will be further curtailed by headway, sternway, or strong winds. If a simple pull off a berth is all that is required, it is recommended that a tow line to the VILLE tow hook be used from either the bullring or forward fairlead. However, in this mode it is easy to overpower the tug with ahead or sternway. In this case, the use of the tow hook abort may have to be used to prevent dragging or girding the tug.

NOTE: *Tugs prefer to have the towline on their tow hook, but ships should always have an axe and block ready to cut the towline. If the eye of the towing hawser is passed to the ship, it is invariably to be placed over both bollards.*

6.7 SAFETY

6.7.1 Seamanship Briefing

a. Prior to entering/departing harbour, a Command briefing will be conducted by the Deck Officer.. The seamanship briefing will normally follow the Navigating Officer's general briefing of the weather and navigation plan. Note that the navigation briefing will include direction on the amount of cable to be let go in an emergency anchorage, and recovery intentions in the event of a man overboard within the harbour. In addition, the use of tugs may be discussed, as well as boat launch and/or recovery intentions in the event that the ship must provide her own berthing or slipping party. In some cases, the briefing may take place several hours or even the previous evening before the evolution, so that everyone has time to make the necessary preparations. The following personnel as a minimum will be in attendance: Executive Officer, Deck Officer, Navigating Officer, Part Ship Officers, Chief Bosn's Mate, Senior Naval Communicator, Part Ship I/Cs, Senior Met Tech, Cable Party I/C, and the Special Sea Duty Lookouts and Echo Sounder Operator.

b. Following is a sample briefing format. In this example, the ship is slipping and proceeding to sea:

(**1**) We will be departing (HARBOUR - BERTH) and proceeding to sea at (TIME).

(**2**) (PORT/STARBOARD) watch Special Sea Dutymen, Cable Party and Part Ship hands will be required to close up at (TIME). Upon closing up, each Part Ship I/C will prepare their part ship for departure and give a detailed safety briefing.

(**3**) The Cable I/C will make the anchor ready for letting go, riding on the blake and brake. Lines are to be singled up at all parts of ship on closing up. All shore connections are to be landed without further order except for telephones, which will be landed ten minutes prior to slipping once Command permission has been received. A slipping party is being provided by (SHIP) and is expected 15 minutes prior to departure. A mobile crane is expected to assist in landing the brow, which will occur when ordered by Command immediately prior to slipping.

(**4**) The intention for slipping will be to let go all lines aft, hold No. 2, heave in on No. 1, and use engines to assist in casting the ship's head into the lie of the jetty 15 degrees. On order, the forward lines will be let go, and (OWN SHIP) will make a sternboard departure.

(**5**) On departure, hands will fall in and face to (PORT/STARBOARD) until abeam (LOCATION), when Command will order them to fall out and secure the parts of ship for

sea. The ensign is to be shifted to the sea position at that time, and the ensign and jack staffs struck down and stowed below.

(**6**) The dress for entering/departing harbour will be (DRESS).

(**7**) The Part Ship Officers and I/Cs for the evolution will be (NAMES).

(**8**) Effective communications are essential. Primary shall be (PRIMARY NET), with secondary being (PRC Channel ____).

(**9**) The Chief Bosn's Mate will now brief on the safety-related aspects of the evolution.

6.7.2 Safety Briefing

It is imperative that the Chief Bosn's Mate and the I/Cs give a thorough briefing to all personnel involved in entering/departing harbour. As well as the general shipboard safety items , the following safety points must be covered:

a. Ensure all personnel know the tasks which they are to perform.

b. Safety equipment must be worn by the Cable Party if required to let go the anchor.

c. Never stand directly behind the cable if required to let the anchor go.

d. Never straddle lines.

e. Never stand in bights of lines.

f. Ensure personnel never stand behind a line under tension.

g. The snap back zone safety criteria shall be followed. Personnel must stand clear of the snap back danger zone, and at least 2 m away from bollards and capstans, whenever possible.

h. Proper safety equipment is to be present, including an axe and a 4" x 4" block in the event of emergency.

i. Proper turns on the capstans/winches is four turns with nylon lines and six turns with Kevlar.

j. The naval jack is not to be hoisted/hauled down at the jackstaff until all work on the cable has been completed.

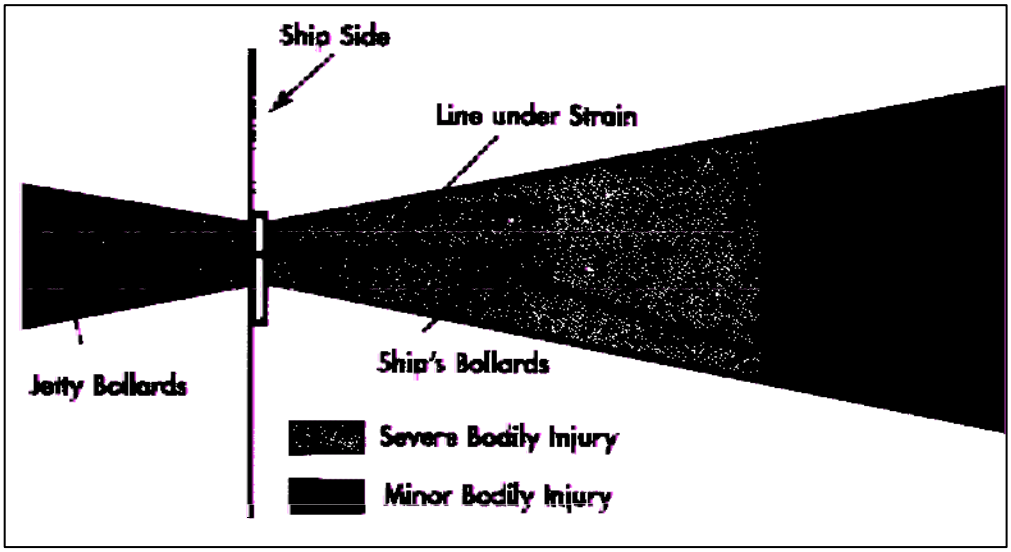


Figure 6.6-3 - Snap Back Danger Zone

CHAPTER 7

Anchors, Cables and Buoywork

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7.1 INTRODUCTION

a. Canadian warships are frequently required to anchor, or moor to buoys. Anchoring is more common, and occurs in bays and harbours where fixed alongside berths are either unavailable, or inadequate. The ship lets the anchor go at the precise position calculated by the Navigating Officer, and pays out enough cable in relation to the depth of water to safely hold the ship. The anchors in the Canadian Navy are designed such that they bury themselves into the sea bottom. This, coupled with the weight of the veered anchor cable, exerts a horizontal pull on the ship, which is sufficient to hold her secure at the anchorage.

b. Mooring to buoys provides more security than an anchorage, as it is virtually impossible to drag ground tackle, whereas it is not uncommon for an anchor to be dragged in high wind conditions. Mooring often occurs in confined harbours where it is difficult to find sufficient searoom for a ship to swing safely on her anchor. In this case, the short scope of the mooring cable or bridle significantly reduces the swinging circle. In essence, the mooring or working cable is broken, led forward through the bullring, and secured to the buoy.

c. This chapter describes the anchor and cable arrangements, and associated equipment fitted in Canadian warships. The sequences of events for anchoring and coming to a buoy are described, followed by the Class-specific preparations and equipment layouts for each evolution. Although manoeuvring alongside using an anchor is an important skill applied by COs when approaching a difficult berth, it is not covered here. From a seaman's perspective, it is simply another occasion for anchoring. However, the Mediterranean Moor is covered, as it is a complex evolution that involves the anchor and berthing lines to back the ship into a stern-to-berth.

7.2 TERMINOLOGY USED IN CABLE WORK

To be able to properly work the ship's cable, and to facilitate effective communications between Command, the I/C and the members of the cable party, specific terms and phrases are used:

A'cockbill	An anchor is said to be A'cockbill when it has been eased out of the hawse pipe and hangs vertically by its ring. (HALIFAX Classes modify this by veering 3 links of cable and retaining the ring in the hawse pipe; otherwise, the anchor would be suspended too close to the waterline).
Anchor Aweigh	The anchor is said to be aweigh when it is immediately clear of the bottom.
Anchor Pocket	The recess in the ship's side where the anchor is stowed.

Clear or Foul Anchor	The anchor is reported clear or foul as soon as it is entirely sighted. To be clear, the anchor must be hanging from its ring, and be clear of both its own cable and of any obstruction such as a bight of rope or chain picked up from the seabed.
Clear Hawse	This term means that the cables are clear of one another when the ship is riding to two anchors.
Dragging	An anchor is said to be dragging when, instead of holding the ship, the ship drags it along the bottom; this may occur in heavy weather, in a strong current, or when insufficient cable has been paid out. A small amount of dragging on anchoring is necessary, in order to bury the anchor in the seabed.
Foul Hawse	A ship has a foul hawse if the cables are crossed or otherwise afoul of each other when she is riding to two anchors.
Long Stay	The cable is said to be at long stay when it is taut, reaches out well away from the hawse pipe and enters the water at an acute angle.
Ship Has Her Cable	A ship has her cable when she has dropped back on her cable and is riding to it.
Short Stay	The cable is said to be at short stay when it is taut, reaches out a short distance from the hawse pipe, and enters the water at a steep angle.
Shorten In	A ship lying at anchor is said to shorten in her cable when she heaves in part of it; for example, a ship riding to eight shackles of cable might shorten in to three shackles of cable in preparation for weighing anchor.
To Come To	A ship is said to come to an anchor as soon as she is riding by her anchor and cable.
To Grow	A cable is said to grow in the direction it leads outside the hawse pipe. When asked, “How does the cable grow?” the reply is given by pointing the arm in that direction, and making the appropriate verbal report, e.g., “Cable grows short stay to starboard”, or “Cable grows up and down.”
To Hang Cable	To hold it temporarily with a stopper or wire pendant.

To Snub To snub a cable is to restrain it suddenly when it is running out, by applying the brake.

Underfoot A buoy or anchor is said to be underfoot when it is directly under the stem, and there is no slack in the cable.

Up-and-down The cable is said to be up-and-down when it hangs vertically from the hawse pipe and enters the water at a right angle.

Weighing Anchor The sequence of events culminating in heaving in the cable until the anchor is broken out of the bottom

7.3 SHIPS' CABLE

7.3.1 Sizes and Quantities Held

Anchor and mooring chain cables in use in the Canadian Navy are fabricated from Grade 2 or 3 forged special steel links. Except for the very smallest, the links are studded to prevent kinking. The cables are fabricated in lengths of 15 fathoms (90 feet/27.5 metres) and half-lengths of 7.5 fathoms (45 feet/13.75 metres), called shackles and half-shackles respectively. These shackles are combined to form the full length of the cable by means of joining shackles, either lugged or lugless. The standard joining shackle is the lugless pattern, which will reeve through a common link. Shackles are numbered consecutively from their outer to inner end.

Table 7.3-1: Cable Characteristics by Class

Class (1 anchor)	**Description**	**Break Load (tonnes)**	**No. of Shackles Stbd Anchoring**	**No. of Shackles Port Mooring**	**Mooring Buoy Class**
HALIFAX	Stud link GR3 48 mm	182	10	4	1
IROQUOIS	Stud link GR2 46 mm	118	10	4	2
VICTORIA	Stud link GR2 25.4 mm	25	5	N/A	3
Class (2 anchor)	**Description**		**No. of Shackles Stbd**	**No. of Shackles Port**	
KINGSTON	Stud link GR3 28 mm	TBP	7	7	3
PROTECTEUR	Stud link GR2 66.7 mm	237	11	10	1
ORCA	Stud link chain		6		

7.3.2 Cable Markings

a. When anchoring and mooring it is necessary to be able to tell, at a glance, how many shackles of cable have been paid out. Prior to the evolution commencing, Command will order the number of shackles "on deck" that are to be paid out by the cable party. For anchoring, this could range from 4 to 10 shackles, while for mooring, the bridle is typically ordered to be of 1 to 2 shackles in length.

b. Marking the cable is achieved by painting the common links white on either side of the joining shackles. The number of common links painted indicates the shackle number. For instance, a joining shackle with three common links painted white on either side would mark the three shackle point. Often, the paint will be worn off by a combination of the effects of salt water corrosion and of the working of the cable. Therefore, the last painted link on either side of the joining shackles has wire served around the stud to assist in identifying the shackle number.

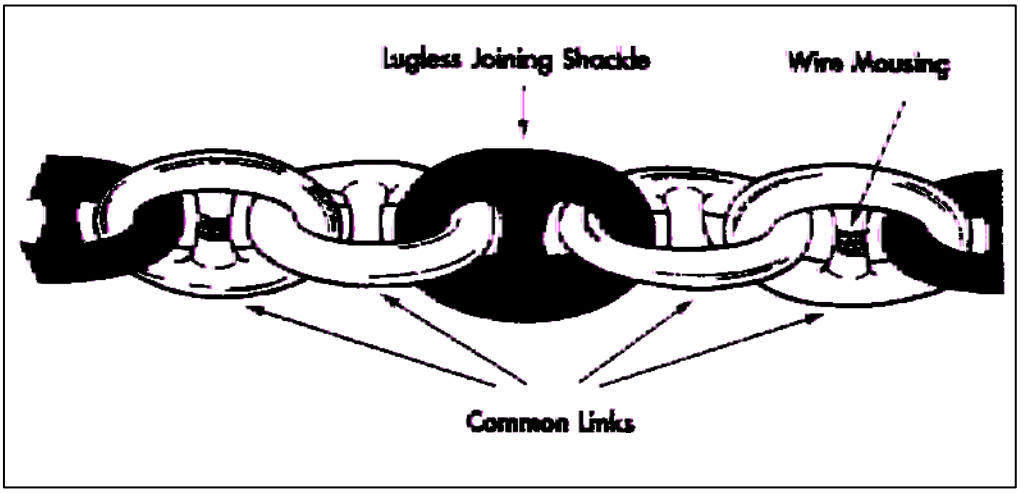


Figure 7.3-1 - Cable Markings (Two Shackles)

7.4 CABLE EQUIPMENT

7.4.1 Fittings

The fittings described below are part of a ship's fitted equipment and are associated with the use of anchors and cables:

Blake Slip	A cable stopper used to back up the brake in the event it fails.
Bonnet	A bonnet is a fixed or portable cover for a naval pipe or compressor. It is designed to stop water from flooding the cable locker. Bonnets vary with the class of ship and are not fitted on all classes.

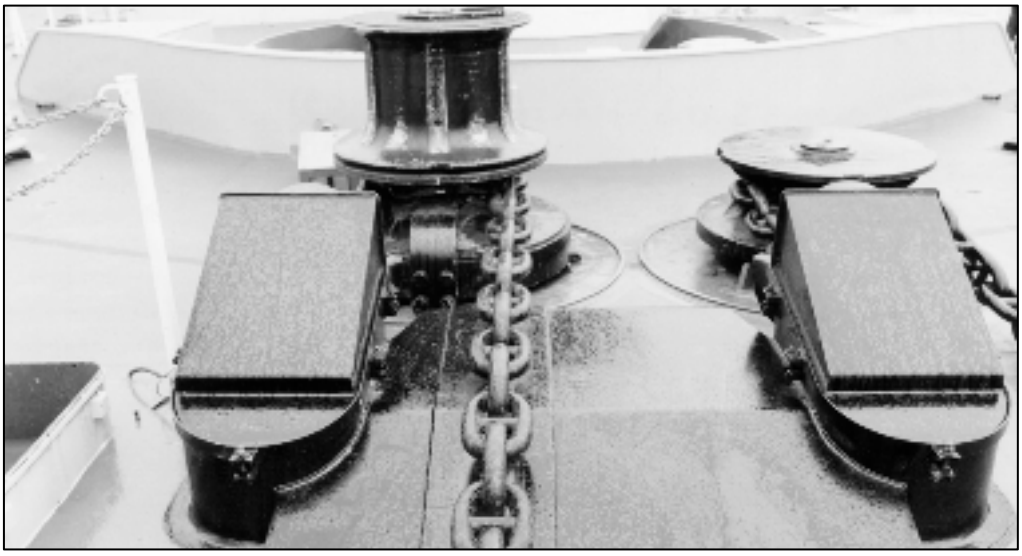


Figure 7.4-1 - HALIFAX Class Bonnets Fitted on Top of Deck Bolsters

Bottle-Screw Slip A cable stopper used to heave the anchor tightly home in the hawse pipe when securing for sea.

Bullring A bullring is fitted on the bow to give a direct lead for the head rope, picking-up rope, or ship's cable.

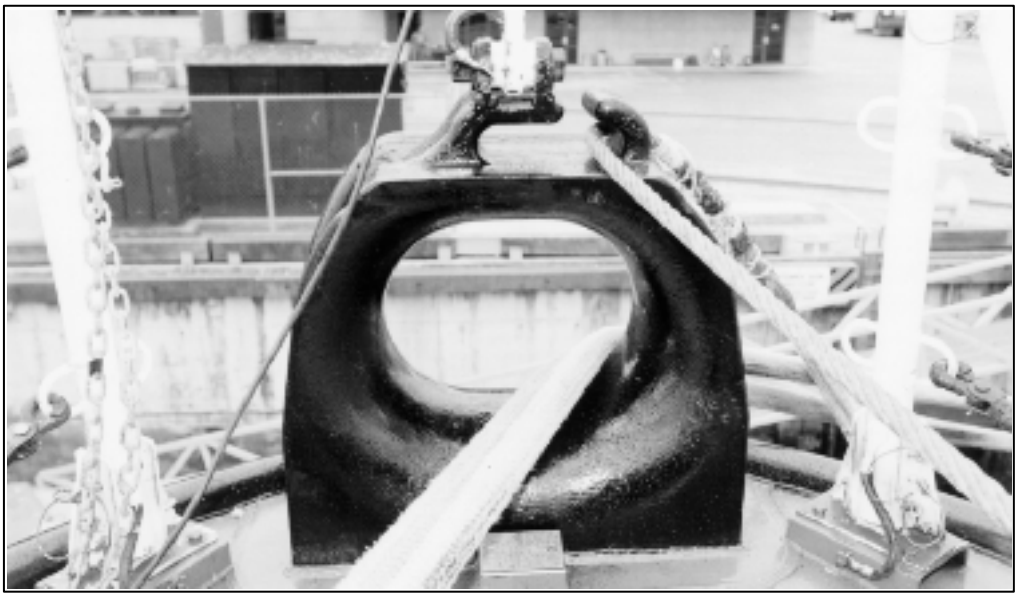


Figure 7.4-2 - Bullring with Angel Fairlead

Centreline Blake Slip A blake slip that is secured to the centreline deck clench. It is used for middling the weight between the blake and brake when towing and for securing the working cable when secured to a buoy.

Deck Bolster The deck bolster is a pad, welded to the deck, where the ship's cables enter the upper end of the naval pipes and hawse pipes. It protects the deck from wear and keeps water from entering the naval pipes. A bonnet may be fitted on top of the bolster.

Figure 7.4-3 - Hawse Pipe with Deck Bolster

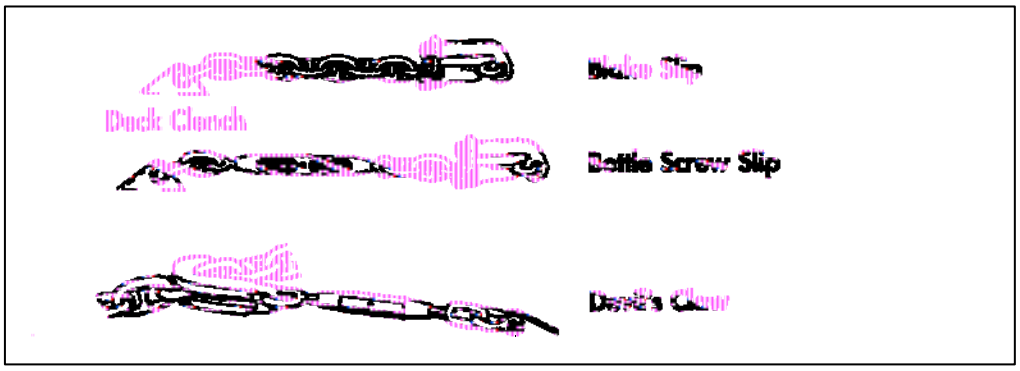


Figure 7.4-4 - Slips

Devil's Claw A cable stopper used to heave the anchor tightly home in the hawse pipe when securing for sea. (KINGSTON Class)

Hawse Pipe Pipe for the passage of the anchor cables out from the ship.

Naval Pipe Pipe for the passage of the anchor cables to and from the cable lockers. Their upper ends stand proud of the deck to ensure smooth working of the cable and to prevent water from finding its way below.

Roller Bow Stopper A steel plate that manually drops down over the cable. It has a tongue that rests on the horizontal link with the face of the link, thus stopping the cable from paying out.

Figure 7.4-5 - Naval Pipe

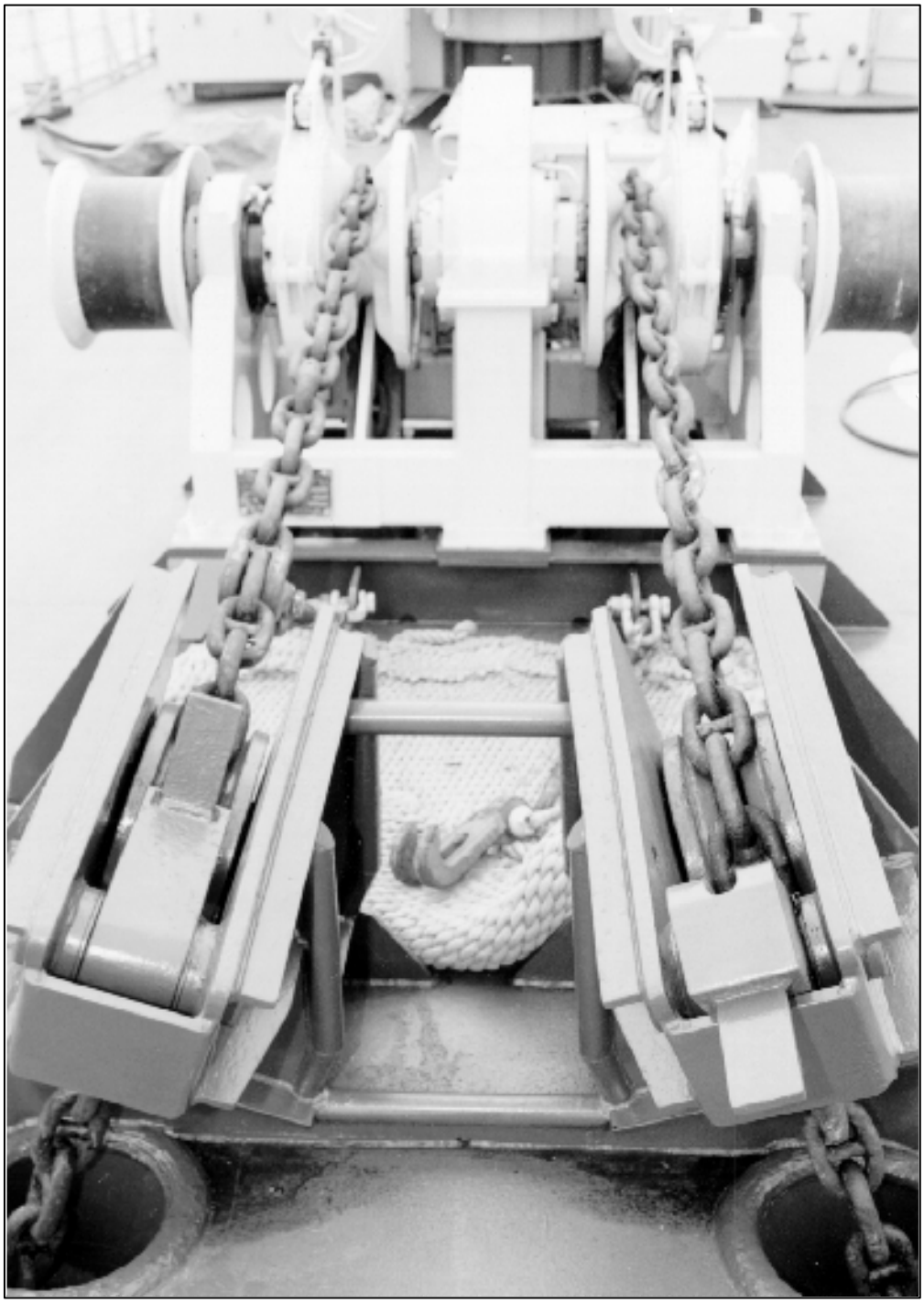


Figure 7.4-6 - Roller Bow Stopper KINGSTON Class

Windlass A motor-driven shaft connected to a cable holder/gypsy used for veering the cable under power, and for heaving in the cable.

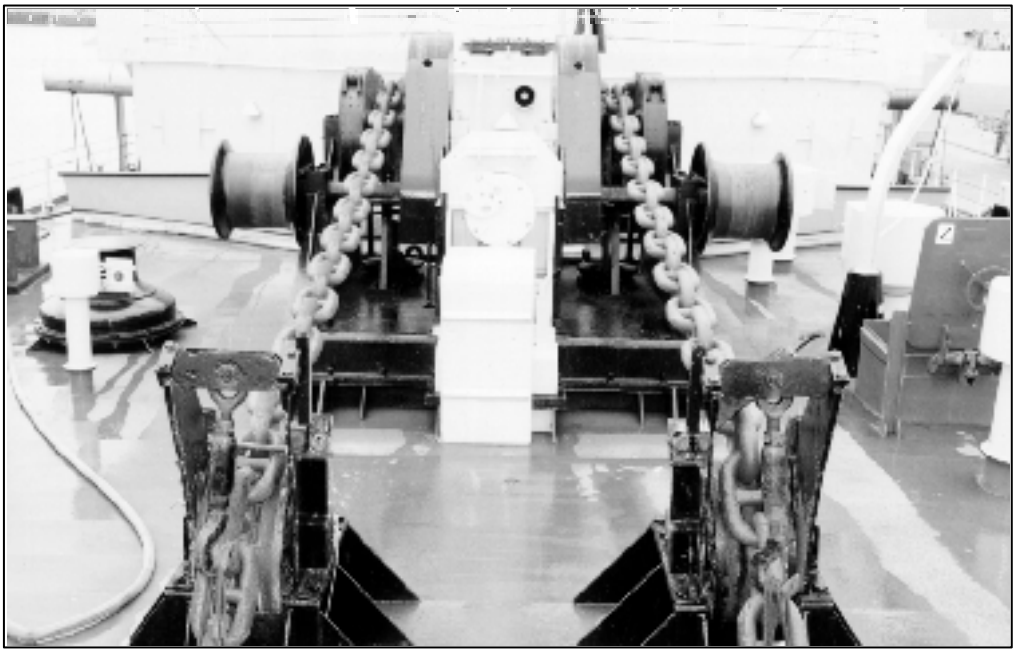


Figure 7.4-7 - Anchor Windlass PROTECTEUR Class

7.4.2 Portable Equipment

The portable equipment shown below comprises smaller pieces that are specifically associated with anchor and cable work.

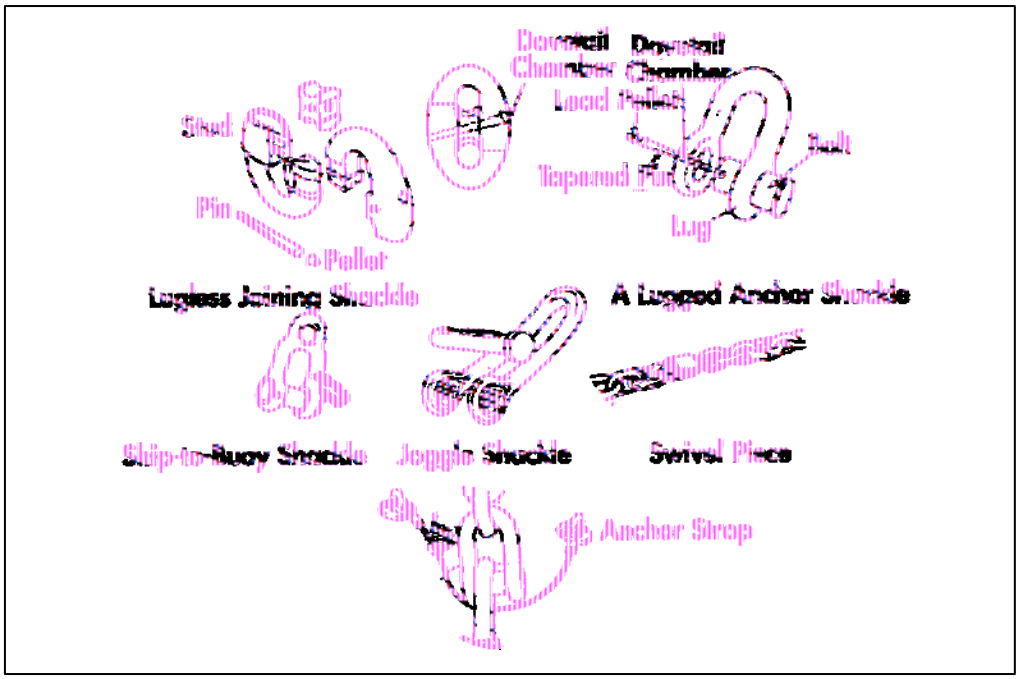


Figure 7.4-8 - Portable Equipment

Lugless Joining Shackle. Lugless joining shackles are used to join together those shackles of cable that must pass over the cable holder/gypsy. They consist of three pieces, one of which is the stud. The two main parts are attached to the ends of the cable and then are fitted together. he stud then slides in place and locks the whole. The stud is secured in place by hammering a tapered pin and lead pellet into a hole drilled diagonally through all three parts of the shackle. The hole is tapered, and when the pin is driven right home, a small conical recess called the dovetail chamber is left clear above its head. The three main components of lugless joining shackles are not interchangeable, because each shackle is made as one unit.

Lugged Joining Shackle. Lugged joining shackles are used to secure the ends of the ship's cable when they have no requirement to pass over the gypsy. They are also used to secure the slips to the deck clenches. A lugged joining shackle is a straight shackle with a bolt secured by a tapered pin. The pin fits into a tapered hole drilled through the bolt and one lug of the shackle. Lugged joining shackles are commonly referred to by the name of the equipment, with which they are used, i.e., anchor shackle, towing shackle.

Ship-to-Buoy Shackle. Ship-to-buoy shackles are used for securing the ship's bridle to the buoy shackle (ring) fitted on top of a mooring buoy, or to the reducing link that is secured to the buoy shackle. It can be used with either a lugged or a lugless joining shackle.

Joggle Shackle. A joggle shackle is a long and slightly curved shackle used to secure a wire rope or hawser to the cable. It is rarely used but could prove invaluable in some instances, such as "pointing ship" when an after spring hawser is led forward from a quarterdeck fairlead and secured to the anchor cable in order to prevent swinging and to maintain the ship on a desired heading.

Swivel Piece. A swivel piece is a swivel attached between the anchor and the ship's cable. It is fitted to prevent the ship's cable from twisting when at anchor.

Anchor Strop. An anchor strop is a wire pendant used to hold the anchor when catting it.

7.5 PERSONAL REQUIREMENTS

7.6 ANCHORING

Focsle part ship hands and the Cable Party, as designated on the Watch & Station Bill and Special Parties Board, are required in all instances where anchoring, weighing anchor, and coming to or slipping from a buoy. Special Sea Dutymen will also be required. When use of the boat is planned, as is the case with buoywork, then the boat's crew, lowerers and buoy jumpers will be required.

NOTE: *All shackles are to be leaded to prevent the tapered pins from coming out. When inserting the lead pellets, goggles must be worn.*

NOTE: *Testing of Anchors, Cables and Associated Fittings is to be conducted IAW C-28-010-024/MS-001.*

7.6.1 General

a. A ship can be secured to the seabed by means of her ground tackle, i.e., her anchors and cables. The anchor holds by laying flat on the bottom until the pull of the ship on the cable drags the anchor along the bottom. The tripping palms then tilt the flukes, which dig themselves into the bottom. After a further amount of dragging, the anchor embeds itself completely until it holds. For the anchor to maintain its hold, the pull of the cable must always be horizontal where the cable emerges from the seabed. The ship is held at her anchorage by a combination of the anchor and the cable laid along the seabed. Normally ships will only go to an anchorage using a single anchor, however ships with two anchors may, on occasions, use both to ride out a gale.

b. The amount of cable required for any particular anchorage is determined by Command and depends on a combination of the following factors: water depth at the anchorage, weight of cable, length of stay, weather, and the nature of the sea bottom. A common rule is to pay out a number of shackles equal to one and a half times the square root of the depth of water in metres.

c. There are two methods of laying the ship's cable on the seabed: the running anchorage and the dropping anchorage. In both instances the anchor is dropped with the ship moving slowly either ahead or astern in order to ensure that the cable is laid out from the anchor and not piled up on top of it. The choice of a running or dropping anchorage is dependent upon prevailing wind and current conditions. Since the ship will swing with the combined effect of the wind and current, it is preferred that the cable be laid out downwind/stream. If the approach is upwind/stream, then a dropping anchorage is ideal, with the ship making a sternboard downwind/stream away from the anchorage position after letting go. If the approach is downwind/stream, then the running anchorage is best, with the ship maintaining slight headway after letting go, and swinging 180 degrees into the wind/stream as the cable is laid out.

7.6.2 Anchors Used on HMC Ships

All warships use stockless anchors. Although there are a number of different designs of stockless anchors, they all share the same distinguishing features.

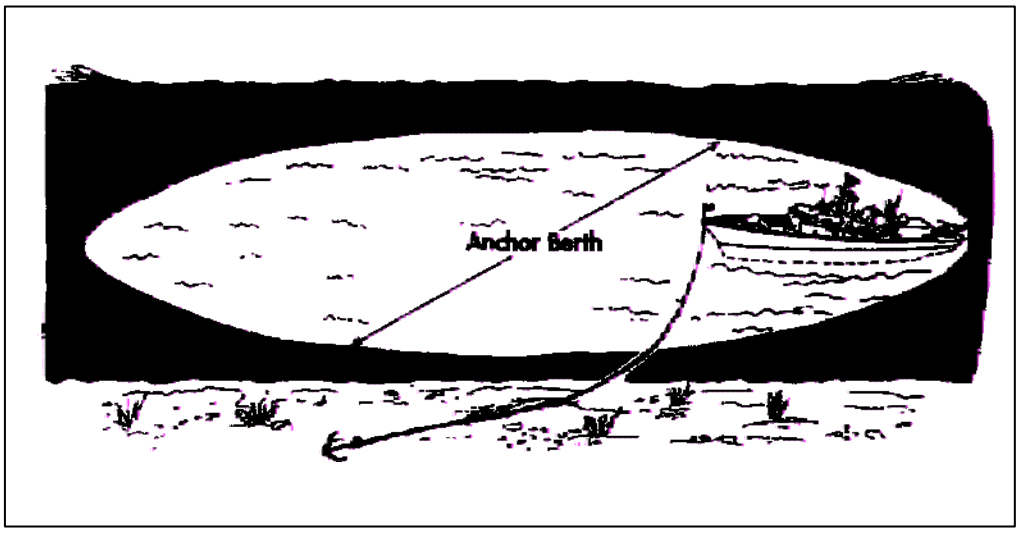


Figure 7.6-1 - Ship at Angle anchorage

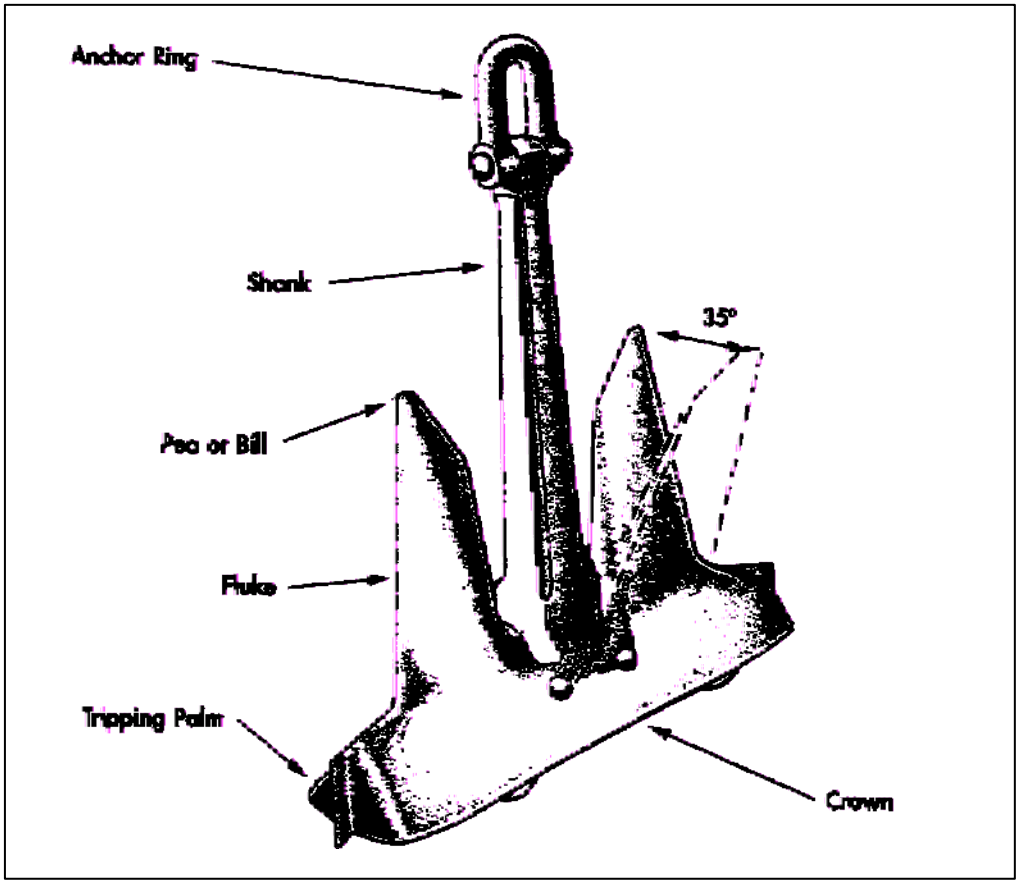


Figure 7.6-2 - Parts of an Anchor

Figure 7.6-3 - HALIFAX Class Pool KM 2835 kg

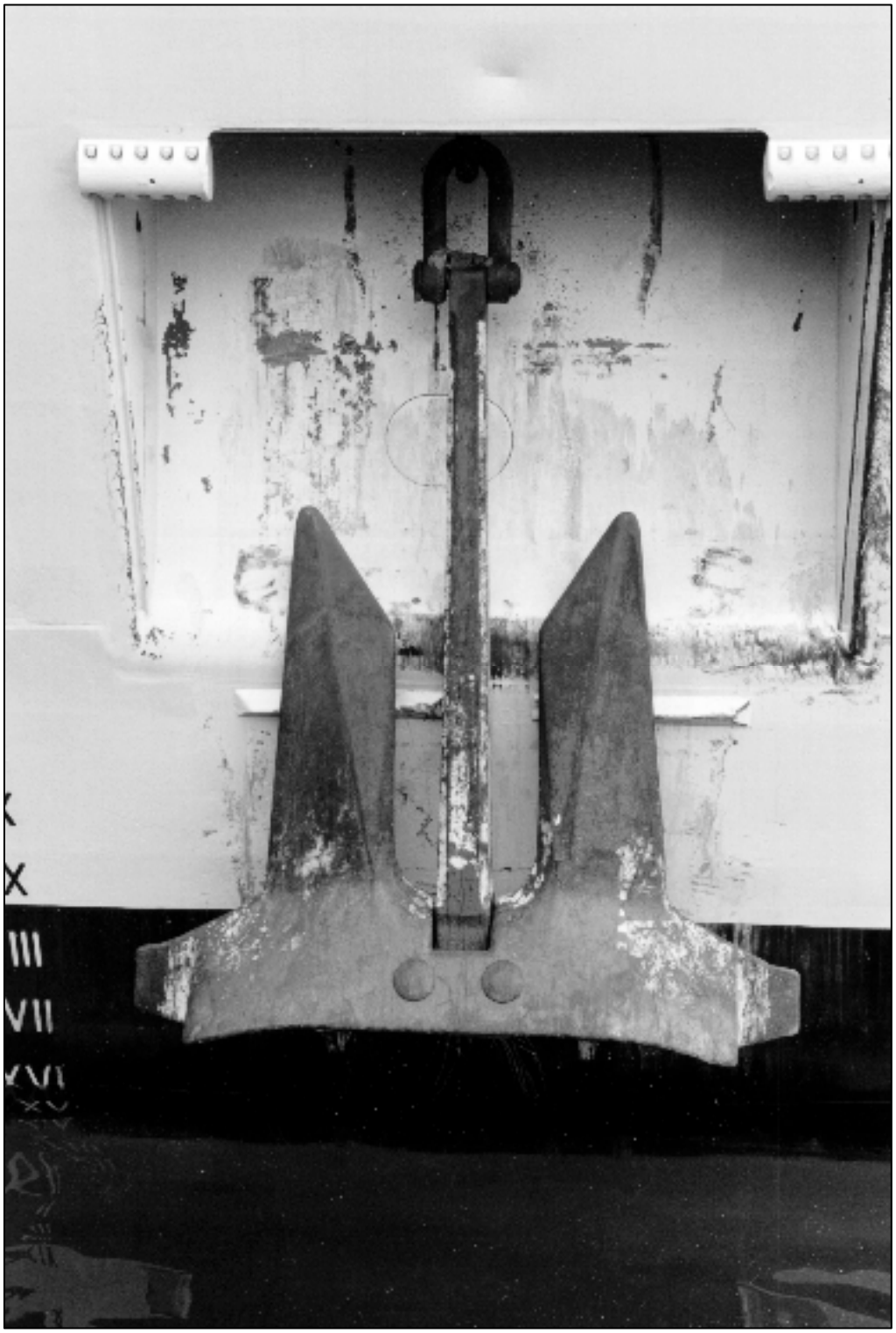


Figure 7.6-4 - IROQUOIS Class Marine Fluked Stockless 2360 kg

Figure 7.6-5 - KINGSTON Class Danforth 800 kg

Figure 7.6-6 - PROTECTEUR Class Marine Fluked Stockless 5448 kg

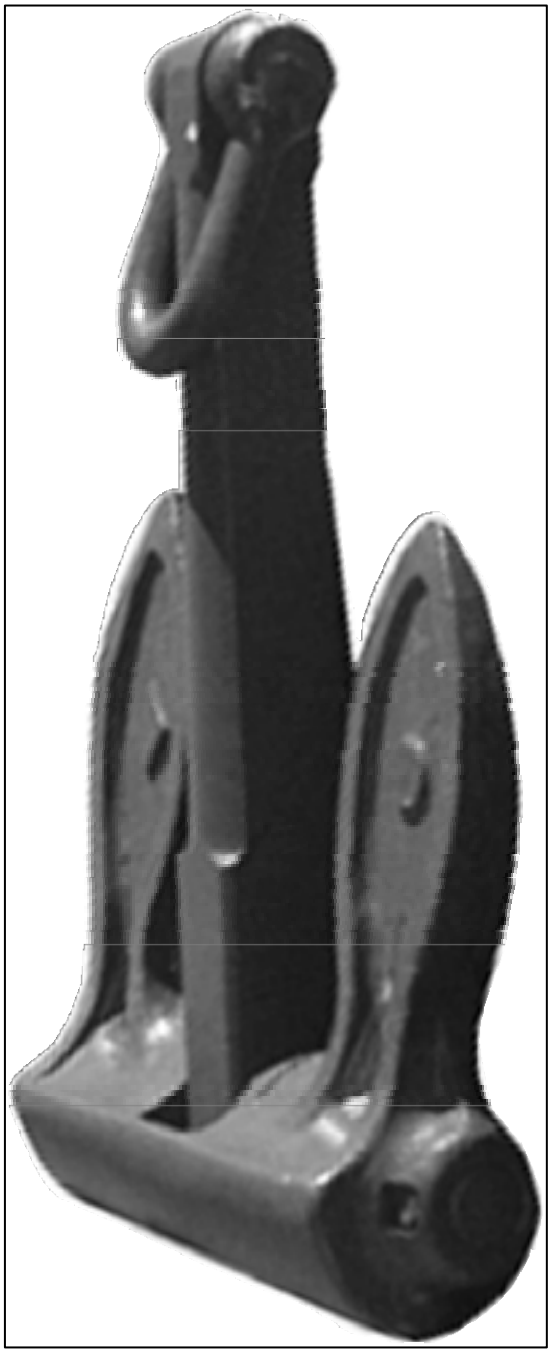


Figure 7.6-7 - VICTORIA Class Byer's Type 813 kg

ORCA TBP

Figure 7.6-8 - Boat's Anchor

7.6.3 Common Associated Equipment Used for Anchor/Cable Work

The following table lists common miscellaneous non-fitted equipment that is required as for anchoring/mooring, regardless of ship's class:

Table 7.6-1: Equipment - Anchor/Cable Work	
Cable Jack	Pry Bar/Cable Bar
Anchor Flag/Wand (Red/Green)	Mousing Line/Wire
Hard Hats	Knife/Spike
HDLJ	Cable Bag
Safety Goggles	Fire Hose
Safety Harnesses	Chemlites
Sledgehammer	Comm Set
Jack Staff	Anchor Chain(s) [Platform]
Portable Light	

Cable Bag. A cable bag should be readily available when working cables. Its contents should be no less then what is depicted below.

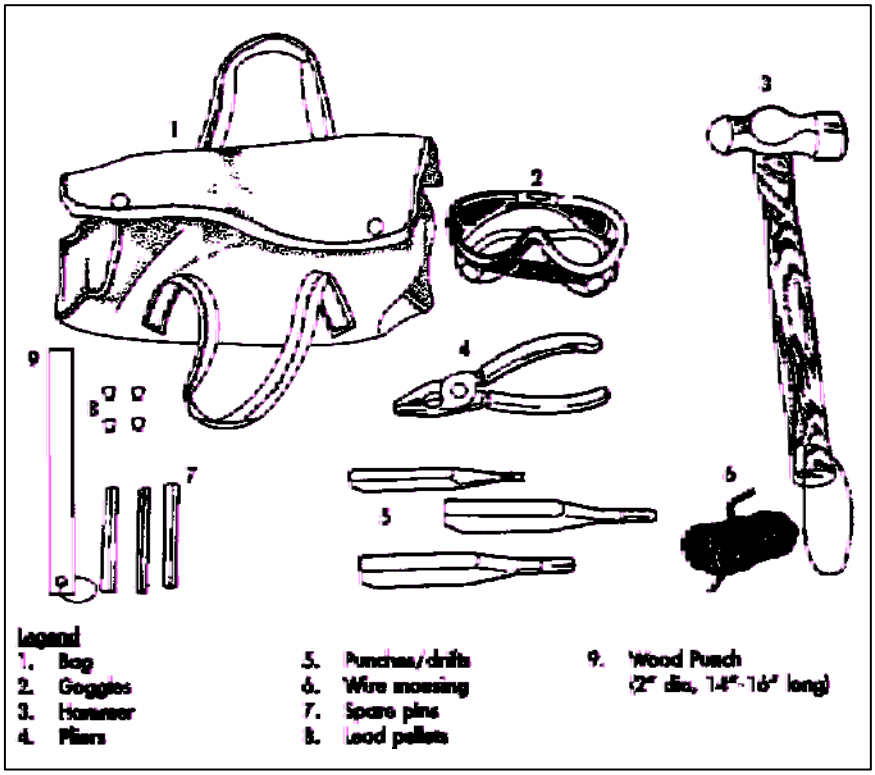


Figure 7.6-9 - Cable Bag

Cable Jack. A cable jack is used to assist the cable worker in lifting the cable so that the slips can be removed or attached

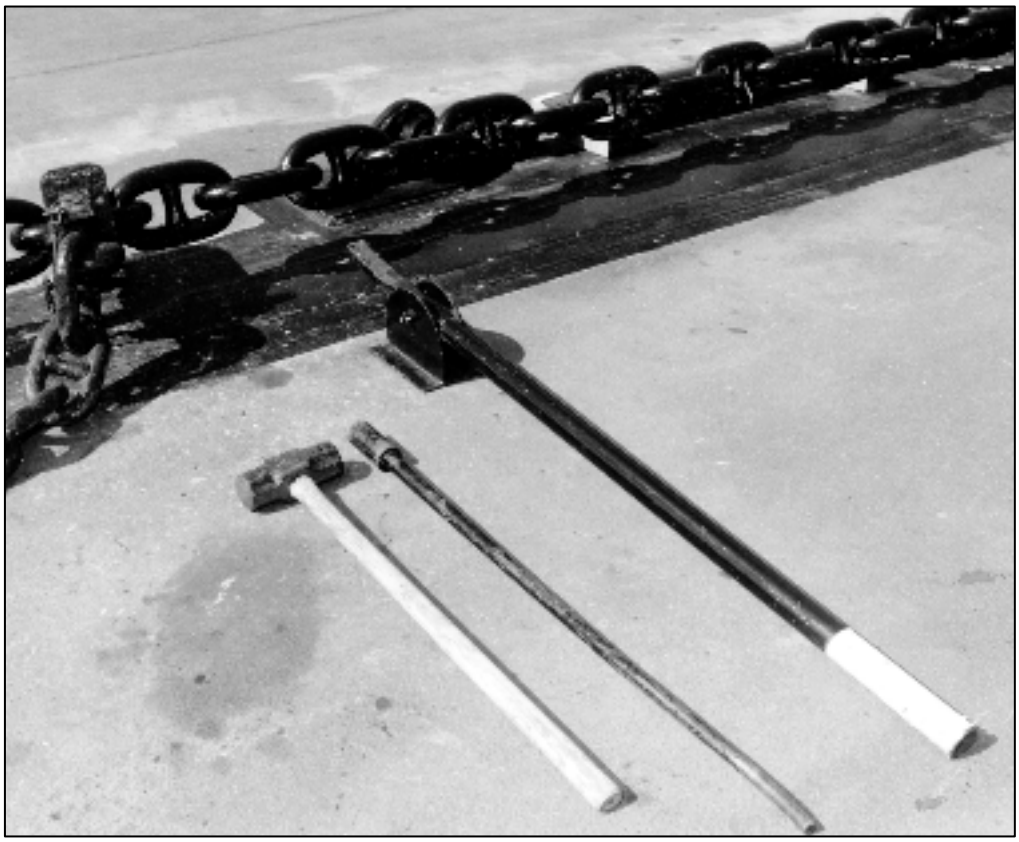


Figure 7.6-10 - Cable Jack

7.6.4 Sequence of Events: Anchoring

The following table reflects the generic sequence of events to be followed when anchoring. Preparations and equipment layout specific to each Class are shown in sections 7.13 to 7.18.

Order	From	Action Taken
Make Closing-up Report	Command	When all required personnel have closed-up, an initial report is made. When all preparations are complete and a safety briefing has been given, the I/C directs the SSD Communicator to report: "Cable Party closed up. Anchor a'cockbill, riding on the brake and blake."
Man the Chains	Command	FX Officer mans the chains at two cables to the anchorage position.
Stand By (Executive Officer raises anchor flag)	Command	Blake slip is removed. FX Officer raises arm.
Let Go (Executive Officer lowers anchor flag)	Command	When the ship is at the anchorage position, the brake is released on the windlass and the anchor is let go. The FX Officer lowers his arm, and commences pointing the direction of the cable and making reports as to how the cable grows. e.g., " Three shackles at the waterline, cable grows up and down."
Snub	I/C	The cable is allowed to run freely until the anchor touches bottom (normally 2 to3 shackles), and then it is snubbed to prevent it from piling up. As the ship moves away from the anchorage position, the flukes open and dig into the bottom.
Off/On Brake	I/C	As the cable approaches a long stay, the brake is released and more cable is paid out until it returns to a short stay. The cable is snubbed again, and the process is repeated until the ordered amount of cable is out, and the brake is re-applied. The FX Officer and I/C observe the cable closely. After growing to a long stay, a noticeable shudder will be seen on the cable and an audible metallic click heard before it begins returning to a short stay. This indicates that the anchor and cable are holding. The FX Officer then reports, "The ship has her cable."
On Blake	I/C	Once the ship has her cable, the blake slip is secured to the cable to prevent any slippage should the brake fail.
Secure	Command	The weight is middled between the blake slip and the brake. All gear is secured with the exception of a life jacket, safety harness with line attached, and a flashlight. A cable watch is established. Normally the cable is reported to the OOW every 15 minutes or as ordered by Command.

7.6.5 Sequence of Events: Weighing Anchor

The following table reflects the generic sequence of events to be followed when shortening in the cable and weighing anchor.

Order	From	Action Taken
Commence Shortening In to (ordered #) Shackles on Deck	Command	See below.
Engage	I/C	The windlass is engaged in preparation for heaving in the cable.
Off Brake	I/C	The brake is released.
Heave In	I/C	The cable is heaved in a short distance in order to remove the weight from the blake slip.
Avast	I/C	Stop heaving in.
On Brake	I/C	Brake is applied.
Off Blake Slip	I/C	The blake slip is removed and cleared from the cable.
Man the Chains	I/C	FX Officer mans the chains.
Off Brake	I/C	The brake is released.
Shorten In	I/C	Cable is heaved in until the ordered amount is "on deck". The FX Officer will pass continuous reports on how the cable grows and the number of shackles remaining at the waterline.
On Anchor Wash	I/C	Cable worker opens valve to the anchor wash.
Avast	I/C	Cable has been shortened in to desired length as ordered by Command.
On Brake	I/C	The brake is applied.
Weigh Anchor	Command	This is the executive order to bring the anchor home or to recover it to the a'cockbill position until the ship leaves pilotage waters.
Off Brake	I/C	The brake is released.
Heave In	I/C	Cable party commences heaving in. If excessive strain comes on the cable prior to it being aweigh (i.e., long stay and a moaning windlass) the I/C must inform Command so that engines can be used to bring the ship closer to the anchorage position and ease the strain. The FX Officer gives continuous reports to Command of how the cable grows, number of shackles at the waterline, and the following: "Anchor is Aweigh", "Anchor is in Sight", "Anchor is Clear/Fouled", and "Anchor is Clear of the Water".
Avast	I/C	Given when the anchor is a'cockbill or home, as ordered.
On Brake	I/C	Brake is applied.
On Blake	I/C	The Blake slip is normally attached to the cable in a position such that the cable can be payed out or heaved in 3 to 4 links without removing it.
Disengage	I/C	If the anchor is to remain ready for letting go until the ship leaves pilotage waters, the windlass is disengaged so that the anchor is a'cockbill and riding on the brake and blake.
Secure	Command	Executive order to secure the anchor and focsle for sea.
Engage	I/C	The windlass is engaged to prepare to heave in.
Off Brake	I/C	The brake is released.
Heave In	I/C	The cable is heaved in to bring the anchor home.
On Brake,	I/C	The brake is applied
Disengage	I/C	Windlass is disengaged and shut down.

Order	From	Action Taken
Secure the Anchor for Sea	I/C	Bottle screw slip is attached and associated gear is secured for sea. On completion, the FX Officer reports, "Focsle secured for sea" to the Executive Officer.

7.7 MOORING

7.7.1 General

a. Mooring a ship implies securing to the seabed by attaching the ship's cable to a buoyed ring on the end of a riser pendant that is itself secured to the seabed by means of ground tackle.

b. The three main parts of a mooring are the ground tackle, the riser pendant and the buoy. The ground tackle consists of two or more anchors, with a ground arm of mooring chain shackled to each and led to a central mooring ring. The combined effect of the embedded anchors and weight of ground tackle supply the mooring with its holding power. The riser pendant is shackled to the central mooring ring, and provides the connection between the vessel secured to the buoy and the ground tackle. It is through the riser pendant that the forces of wind, tide, current and waves, acting upon the vessel, are transmitted to the bottom where they are absorbed.

c. The purpose of the mooring buoy, as shown in figure 7.7-1, is to support the weight of the riser pendant. It is usually cylindrical in shape and constructed of steel. It is divided into watertight compartments. The riser pendant passes up through a central trunk in the buoy and is attached to a large external ring or buoy shackle. Smaller reducing links are fitted to the buoy shackle to accommodate the ship-to-buoy shackle.

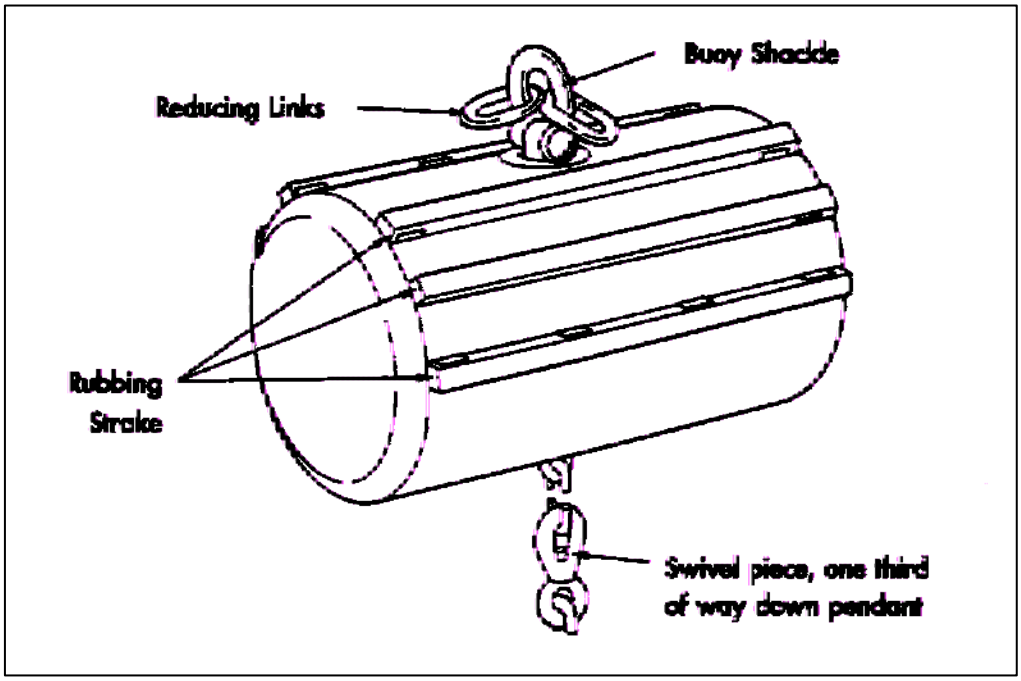


Figure 7.7-1 - Standard Mooring Buoy

7.7.2 Types of and Classifications of Moorings

a. There are three types of permanent moorings: the single-buoy or swinging mooring, the two-headed or head-and-stern-mooring, and the multiple-buoy or trot mooring.

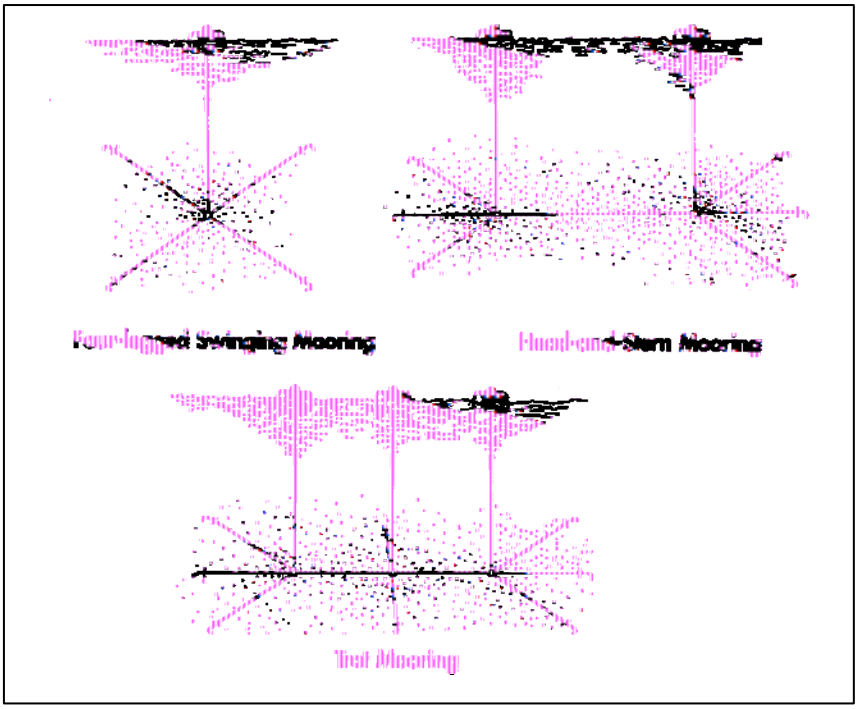


Figure 7.7-2 - Types of Moorings

(**1**) The swinging mooring is more suited to exposed locations because the secured vessel can swing freely around it, thus taking up the most advantageous position under the combined influence of wind, current, tide and wave action.

(**2**) The head and stern mooring is employed where space is limited in a harbour or waterway. It consists of two sets of ground tackle joined on the seabed, two riser pendants, and two mooring buoys.

(**3**) The trot mooring is also employed where space is limited, and is intended for mooring more than one ship. Ships secure head and stern between two consecutive buoys.

b. Moorings are further classified in terms of the maximum size of the ship's anchor cable which may be safely attached to the mooring as follows:

(**1**) Class 1 (AOR Mooring) - for ships with anchor cable breaking strength not exceeding 241 tonnes;

(**2**) Class 2 (DDH Mooring) - for ships with anchor cable breaking strength not exceeding 122 tonnes;

(**3**) Class 3 - for ships with anchor cable breaking strength not exceeding 45 tonnes; and

(**4**) Class 4 - for ships with anchor cable breaking strength not exceeding 25 tonnes.

c. All mooring systems operated by the Canadian Navy are Class 1 AOR moorings, and fall under the control of QHM Halifax and Esquimalt. The single moorings, such as those laid in Bedford Basin are all four-legged (four ground arms).

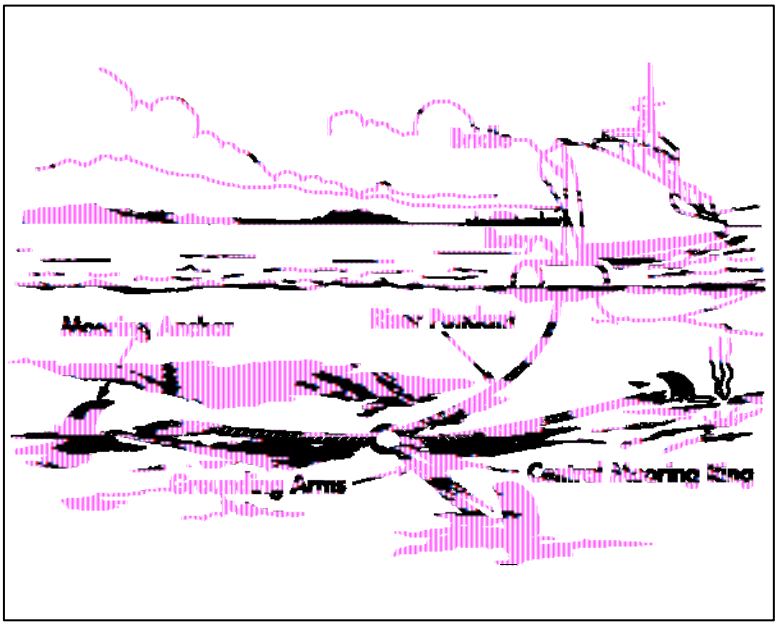


Figure 7.7-3 - Parts of Mooring

7.8 SINGLE MOORING: COMING TO BUOY

7.8.1 Lines to be used for Mooring

The following table shows types and characteristics by ships' Class of all lines used when coming to a single buoy.

Table 7.8-1: Lines Used for Mooring			
Type	**Length in Meters**	**Diameter in Millimeters**	**Make**
Heaving Line	37	6	Sash Cord
Light Messenger	60	12	Polypropylene
Ranging Line	65	24	Polypropylene
Picking-Up Rope			
HALIFAX	110	56	Double-braided nylon
IROQUOIS	110	56	Double-braided nylon
KINGSTON	110	40	Double-braided nylon
ORCA	TBP	TBP	TBP
AOR	110	87.5	Double-braided nylon
VICTORIA	46	42	Double-braided nylon
Wire Strop	**Size**		
HALIFAX	24(6x36) SWR		
IROQUOIS	24(6x36) SWR		
KINGSTON	SWR		
ORCA	TBP		
AOR	SWR		
VICTORIA	SWR		

7.8.2 Common Associated Equipment Used in Coming to a Buoy

In addition to the equipment described in Section 7.4, the following table lists common miscellaneous non-fitted equipment that is required as for single mooring evolutions, regardless of ships' class.

Table 7.8-2: Equipment (see above) - Coming to a Buoy	
Shot Mat	Heaving Lines
Centreline Blake Slip	Bullropes
Snatch Block	Ship-to-Buoy Shackle
Ranging Line	Light Messenger
Picking-Up Rope	

7.8.3 Sequence of Events: Coming to a Buoy

The following table reflects a generic sequence of events to be followed when coming to a single buoy ahead. Preparations and equipment layout specific to each class are shown in sections 7.13 to 7.18.

Table 7.8.3: Sequence of Events: Coming to a Buoy

Order	From	Action Taken
Make Closing-Up Report	Command	When all required personnel have closed up, an initial report is made. When all preparations are complete and a safety briefing has been given, the I/C directs the SSD Communicator to report "Ready to come to the buoy."
Launch the Boat	Command	The boat (IRB or RIB as determined by Command) is launched with crew and buoy jumpers embarked. Buoy jumpers are to wear sea boots (not running shoes), with wet weather gear a recommended option to protect clothing from guano on the buoy. After launch, the boat's Coxn is to position the boat off the ordered bridge wing at 50 to 100 metres.
Order boat along- side, and pass the messenger	Command	Boat Coxn positions the boat 10 to 15 metres from the focsle in preparation for receiving the messenger.
Pass Messenger to the Boat	I/C	Messenger is passed to a buoy jumper in the boat.
Control of the Buoy Jumpers: Strict control of the movement of the jumpers on/off the buoy is critical to their safety. They cannot be allowed onto the buoy when there is any risk that the ship may overrun the buoy and knock them into the water. There are **two control methods** available to Command to ensure safe control. **Firstly**, Command can retain control at all times, providing positive direction to the boat Coxn as to when to put the jumpers on the buoy, and when to get them off. The advantage to this method is that Command orders main engine movements and best appreciates the expected movement of the ship with respect to wind and current. The disadvantage is that the buoy and boat are often out of sight beneath the bow, which hinders the Command appreciation of rapidly changing relative movements of the ship, boat and buoy. However, the FX Officer is expected to order the jumpers off the buoy whenever he recognizes an unsafe situation developing. **Secondly**, control of the boat and jumpers can be passed to the FX Officer for the entire mooring sequence once the messenger is in hand. The advantage to this method is that the FX Officer always has the buoy and boat in sight. This, coupled with informative reports of engine movements from Command, allows him to decide when it is best to put the jumpers on and off the buoy. The disadvantage is that miscommunication between Command and the FX Officer with respect to engine movements might lead to a dangerous situation; however, Command always retains a veto, i.e., Command can order the jumpers off the buoy as soon as any safety hazard is deemed to exist.		
Buoy Jumpers on the Buoy	Command or FX Officer	Boat Coxn positions boat next to the buoy without placing the boat between the buoy and the ship. Jumpers proceed onto the buoy with the messenger in hand.
Pass the Picking- Up Rope	I/C	The wire pendant on the picking-up rope is passed through the buoy shackle and the snap hook is secured to the picking-up rope.
Buoy Jumpers off the Buoy	Command or FX Officer	Buoy jumpers clear the buoy and the boat lays off in a safe position.
Down Slack Picking Up Rope	I/C	Slack is removed from the picking-up rope by hand.
Turns to the Capstan	I/C	Line handlers will take four complete turns on the capstan.

Table 7.8.3: Sequence of Events: Coming to a Buoy		
Order	**From**	**Action Taken**
Heave in Handsomely	I/C	The capstan operator heaves in handsomely, bringing the buoy under foot.
Buoy Jumpers on the Buoy	Command or FX Officer	Buoy jumpers attach ship-to-buoy shackle to reducing link; pin is inserted and leaded.
Buoy Jumpers off the Buoy	Command or FX Officer	Buoy jumpers clear the buoy; boat lays off in a safe position.
Veer Picking-Up Rope	I/C	The picking-up rope is veered in order to transfer the weight to the ship's cable.
Buoy Jumpers on the Buoy	Command or FX Officer	Buoy jumpers remove the picking-up rope from the buoy by unhooking the wire pendant.
Buoy Jumpers off the Buoy	Command or FX Officer	Buoy jumpers clear the buoy; boat lays off in a safe position. The picking-up rope is recovered onto the focsle.
Veer Cable	I/C	Cable is veered to the ordered amount of cable out.
Secure Bridle	I/C	The bridle is secured on deck with the centreline blake slip.
Veer Cable	I/C	The weight is middled between the blake slip and the windlass.
Secure	Command	FX part ship hands, cable party, and boat's crew and lowerers are secured; cable watch is set. Reports are made to the OOW every 15 minutes.

NOTE:

1. *Mooring Windlass automatic clutch replaces brake for Halifax Class.*
2. *Roller shackle method is also available during inclement weather.*

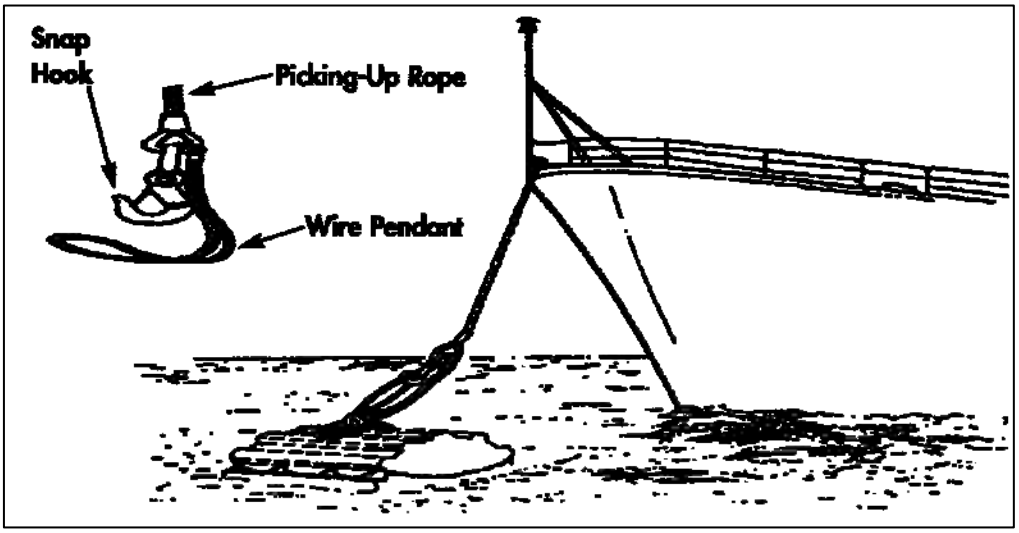


Figure 7.8-1 - Wire Pendant and Picking-Up Rope Attached to Buoy

7.8.4 Sequence of Events: Slipping from a Buoy

The following table reflects the generic sequence of events to be followed when slipping from a single mooring ahead. Closing up reports, boat launch and control of the buoy jumpers are as per the sequence of events for coming to a buoy.

Table 7.8.4: Sequence of Events: Slipping from a Buoy

Order	From	Action Taken
Boat ordered into position	Command	Boat lays off the focsle in preparation for taking the messenger in hand.
Shorten In	Command	The I/C orders the blake slip removed, and the mooring cable heaved in until the buoy is underfoot.
Order boat along-side, and pass the messenger	Command	Boat Coxn positions the boat 10 to15 metres from the focsle in preparation for receiving the messenger.
Pass the Messenger to the Boat	I/C	The messenger is passed to a buoy jumper in the boat.
Buoy Jumpers on the Buoy	Command or FX Officer	The boat Coxn positions the boat next to the buoy without placing the boat between the buoy and the ship. Buoy jumpers proceed onto the buoy with the messenger in hand and heave in on the slip rope. The soft eye of the slip rope is passed up through the buoy shackle back onto the focsle. It is secured to the senhouse slip on the bollard strop.
Passing the Slip Rope. There are **two methods** used to pass the slip rope. **First**, the slip rope is passed out the angel fairlead (bullring in KINGSTON Class) (pedestal roller in AOR 509), through the buoy shackle, and back onboard through the forward port fairlead and onto the senhouse slip. This method is preferred in AORs and the KINGSTON Classes. **Second**, the slip rope is passed out the forward starboard fairlead, through the buoy shackle, and back on board through the port forward fairlead. This method is preferred in the IROQUOIS and the HALIFAX Classes.		
Buoy Jumpers off the Buoy	Command or FX Officer	Buoy jumpers clear the buoy; boat lays off in a safe position.

Table 7.8.4: Sequence of Events: Slipping from a Buoy		
Order	**From**	**Action Taken**
Down Slack Slip Rope	I/C	Line handlers remove slack from the slip rope by hand.
Turn up the Slip Rope	I/C	Line handlers turn up the slip rope with four turns on the bollard.
Veer to the Slip Rope	I/C	Ship's cable is veered until the slip rope takes up the weight, and the cable with the ship-to-buoy shackle is left slack. The second method is to turn up on the capstan and heave in the slip rope until there is slack in the bridle.
Buoy Jumpers on the Buoy	Command or FX Officer	Buoy jumpers remove the ship-to-buoy shackle.
Buoy Jumpers off the Buoy	Command or FX Officer	Buoy jumpers clear the buoy; boat lays off in a safe position.
Heave in on the Cable	I/C	The cable is heaved in until it is recovered on deck. (Note: constant tension must be kept on the slip rope to ensure it does not foul during recovery of the cable.)
Standby to Slip	I/C	The cable worker designated to slip places himself in a safe position near the senhouse slip with hammer in hand.
Slip	Command	The I/C orders the senhouse slip tripped. The ship backs away from the buoy, and the slip rope is recovered.

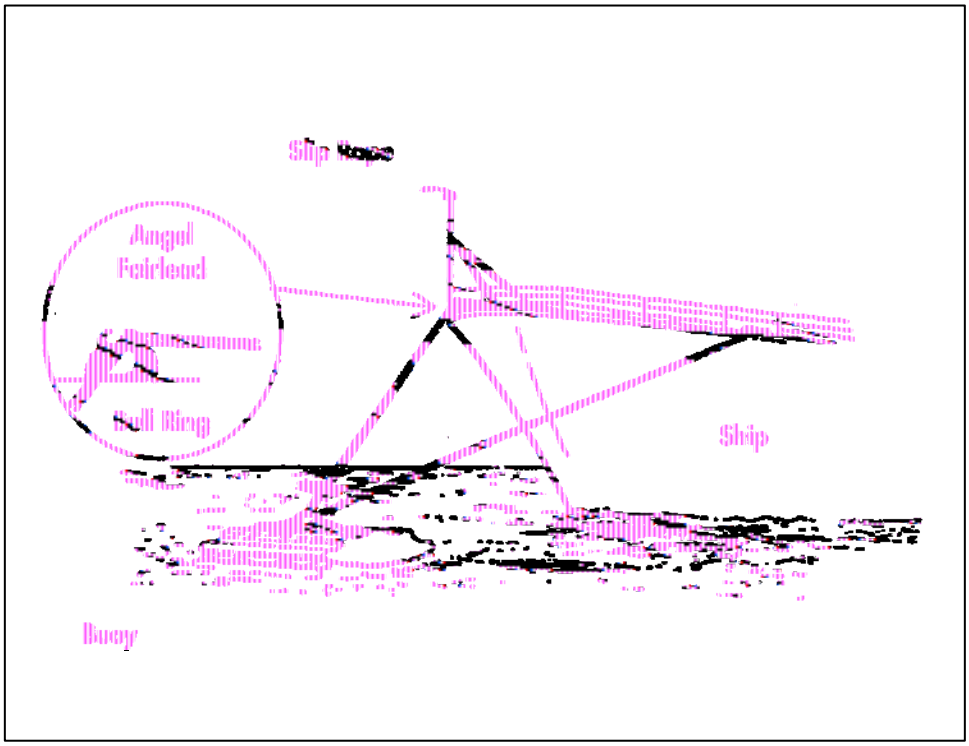


Figure 7.8-2 - Method 1 – Slip Rope Rigged for Self-Slipping

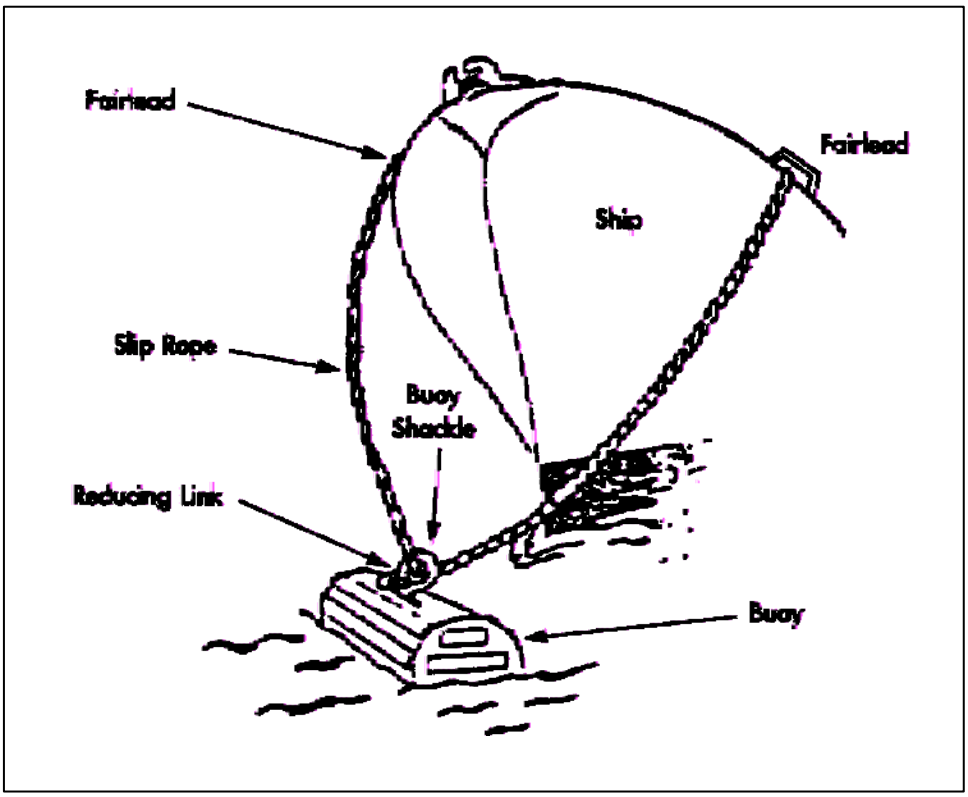


Figure 7.8-3 - Method 2 – Slip Rope Rigged for Self-Slipping

7.9 TWO POINT MOORING

a. Securing to head-and-stern buoys is straightforward from a seamanship perspective, although the ship handling challenge is significantly increased. The head buoy is normally "snatched" first, following the sequence of events described above for a single mooring. Greater scope on the bridle may initially be needed to allow Command greater flexibility in manoeuvring the stern towards the second buoy.

b. The sequence of events for snatching the stern buoy differs due to the absence of cable arrangements on the quarterdeck. Instead of the mooring cable, the eye of a berthing hawser is passed through the buoy shackle and held in place with a 4' x 4' wooden fid. Depending on weather and the expected stay at the buoys, two hawsers may be passed, one from either quarter fairlead. In addition, the towing hawser can be employed. The after capstan is used to take the slack out of the line(s). Once both head-and-stern buoys have been snatched, the weight between the two is middled.

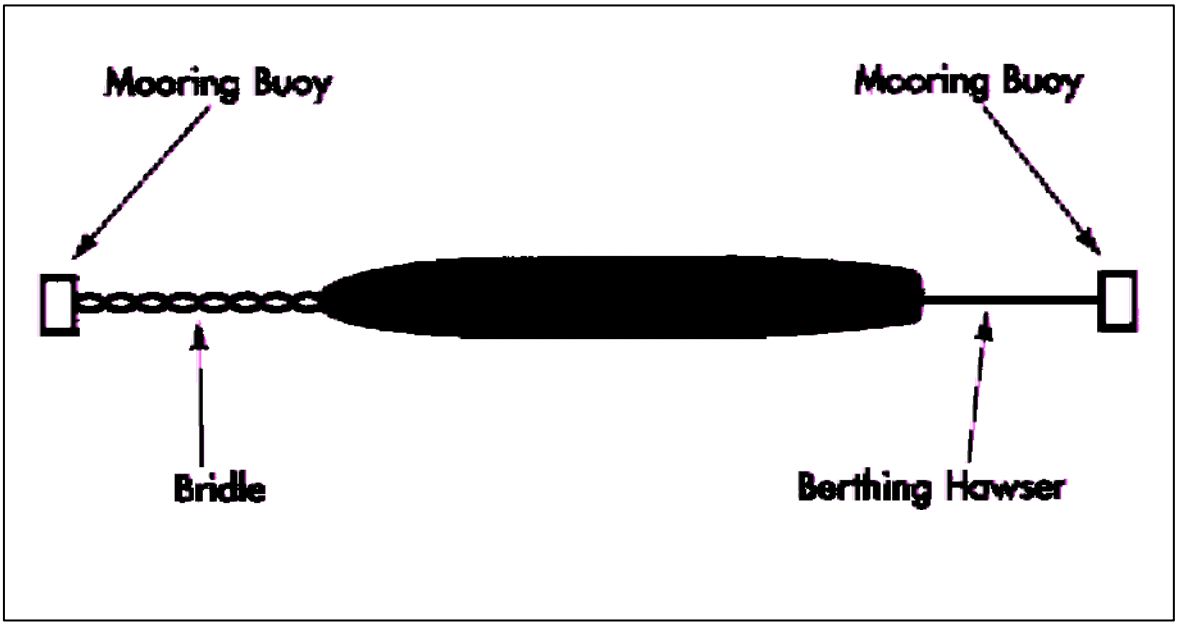


Figure 7.9-1 - Two Point Mooring

c. The following table shows the sequence of events that occurs aft when securing to a stern buoy. It is assumed that the ship has secured to the buoy ahead.

7.9.1 Sequence of Events: Two Points Mooring

Order	From	Action Taken
Make Closing-Up Report	Command	I/C makes initial report when Quarterdeck part ship hands have closed up. Equipment required aft comprises hawsers, 4 x 4 fid, axe and rope stopper, as well as standard associated equipment for working lines. Once complete, and safety briefing has been given, I/C directs SSD Communicator to report: "Ready to secure to stern buoy."
Launch the Boat	Command	A second boat with a second set of buoy jumpers may be launched, or Command may choose to use the same boat and jumpers that worked on the head buoy. The boat shall take position on the ordered quarter at 50 to 100 metres.
Boat Proceed to Port/Stbd Quarter and Take Messenger in Hand	Command	Boat Coxn positions boat 15 to 20 metres off the quarter. Messenger is passed to buoy jumper in boat. **Note: Boat control remarks in single mooring sequence of events apply.**
Buoy Jumpers on the Buoy	Command or AX Officer	Boat Coxn positions boat next to the buoy without placing the boat between the buoy and the ship. Jumpers proceed onto the buoy with the messenger in hand. Buoy jumpers will pull messenger and hawser through the buoy shackle on the buoy, pass a bight of the hawser through the eye and insert a 4 x 4 fid.
Buoy Jumpers off the Buoy	Command or AX Officer	Boat Coxn lays off in a safe position.
Down Slack the Hawser	I/C	Hawser is down slacked by hand, rove through the bollard and taken to the capstan.
Turns on the Capstan	I/C	Line handlers will take minimum of 4 turns on the capstan.
Heave In/Veer	I/C	The hawser is adjusted in order to middle the weight between the head and stern buoys.
Pass the Stopper	I/C	The stopper is passed around the hawser.
Veer to the Stopper	I/C	The hawser is veered to ease the weight to the stopper.
Light To, Turn Up	I/C	Turns are taken off the capstan and turned up on the bollard.
Off Stopper	I/C	Stopper is removed.
If more than one hawser is being passed, the above steps will be repeated.		

7.10 FOUR POINT MOORING

a. When a stationary mooring is necessary, such as required for deperming or static sound ranging, a ship will be required to moor to four buoys. The mooring cable is not used. Instead, berthing hawsers are used fore and aft to secure buoys on either bow and either quarter. The sequence of events for passing the lines (fore and aft) is identical to that described above for securing to a stern buoy.

b. Two or more boats (with buoy jumpers) will be used. The key is to snatch one buoy at a time, commencing with the windward buoys. Once they are secured, the process is repeated for the leeward buoys.

c. All part ship hands, as well as extra boats crews, will be required. The evolution must be thoroughly planned and briefed beforehand, especially with respect to Command intentions and communications.

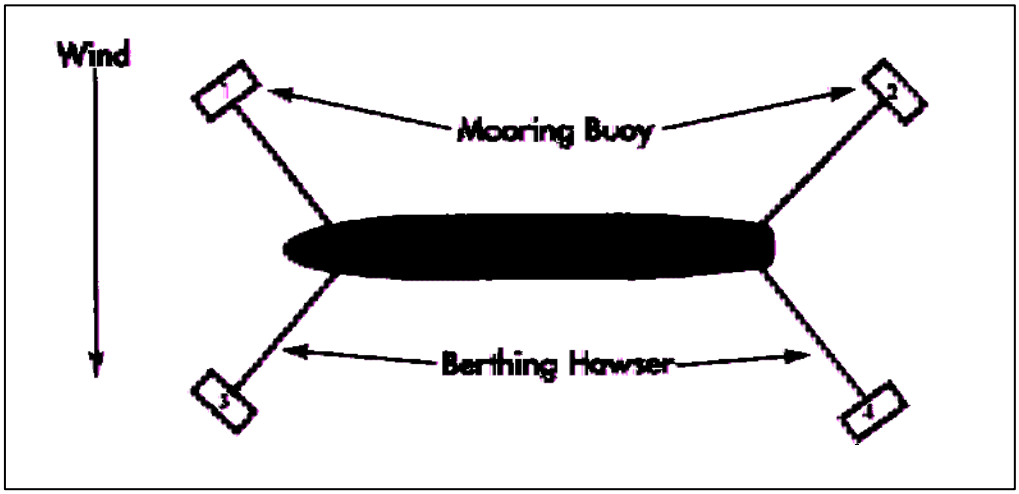


Figure 7.10-1 - Four Point Mooring

7.11 MEDITERRANEAN MOORING

7.11.1 General

a. A Med Mooring describes a unique berthing arrangement which involves a ship placing her anchor(s) on the harbour bottom, and then veering her cable while simultaneously twisting the stern toward the jetty and making a sternboard approach to a stern-to berth. A brow is then placed from the stern onto the jetty. Ships fitted with two anchors are best suited for the Med Moor as they can be placed so that they form an approximate 60-degree angle with the bow, thereby providing excellent stability.

b. The advantage of a Med moor is that little jetty space is required, and so several ships can berth side by side in a small and/or congested harbour. In addition, each ship has a separate brow to the jetty, which is often preferred over being berthed outboard in a nest. This arrangement is very popular in European ports, thus the name.

c. As with all seamanship evolutions, a well-conceived and briefed plan is critical to the safe and smart conduct of a Med moor. Clear communications between Command and the parts of ship is vital, especially if/when transferring the con from the bridge to the quarterdeck during the final phases of the approach.

d. During a Med moor, the personnel and equipment requirements and sequence of events for anchoring are identical to those described in section 7.6, except that a marker buoy must be attached to the anchor prior to letting go so that the anchorage position is clearly marked. The line must be of sufficient length to reach the surface of the water at high tide. Tugs are often required, depending on weather, sea room in the harbour, and the class of ship. The personnel and equipment requirements

on the quarterdeck are the same as for a normal berthing. The major difference occurs in berthing procedures aft, where a unique line arrangement is used to hold the stern fast to the jetty.

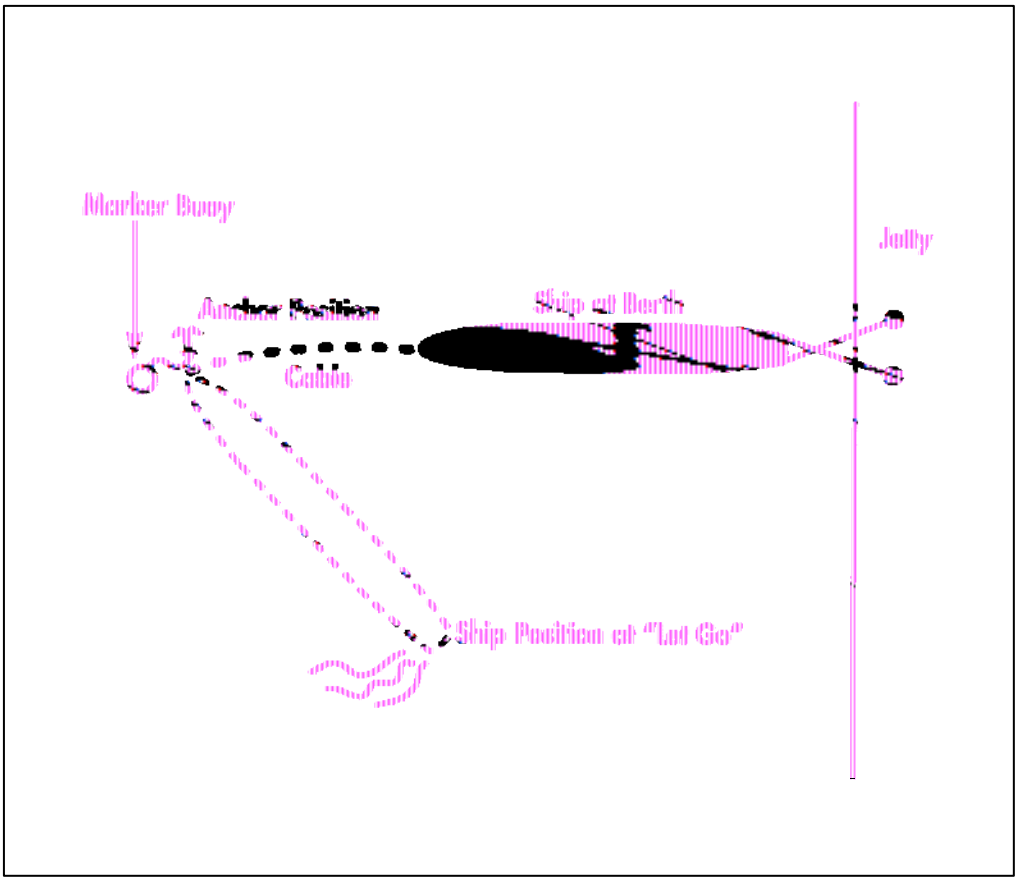


Figure 7.11-1 - Med Mooring

7.11.2 Sequence of Events: Mediterranean Mooring

a. The following table shows the sequence of events that occurs aft when conducting a Med Mooring. All orders are given by the I/C.

Table 7.11.1: Sequence of Events: Mediterranean Mooring

Order	Action Taken
Fire Gunline/Bolo	Contact is made with the berthing party via a gunline, bolo, or heaving line.
Take the Line in Hand.	The soft eye of the hawser is passed out through the towing fairlead and led to the jetty.
Heave in Handsomely	Slack is taken out of the stern line and strain put on to assist the ship in closing the jetty. Concurrently, the cable is being veered on the focsle.
Avast	The stern is in position to pass and cross port/stbd lines.
Throw for the Spring Lines	Two spring lines are sent to the jetty crossing port and stbd.
Down Slack Lines	By using line handlers and the capstan, the slack is removed from the lines.
Avast	Spring lines are turned up.
Double Up	Lines are doubled up.
Once the ship is secured in position, the brow is placed at the stern.	

b. When leaving a Med Mooring, a plan that takes prevailing circumstances into account will be required. The normal method is to let the lines go aft, and then heave in the cable(s), using engines to keep clear of obstructions. Command may require one or two lines to remain on the jetty, and to be checked away as the ship moves forward from the berth, in order to maintain greater control over the movement of the stern.

7.12 SAFETY

7.12.1 Seamanship Briefing

a. Prior to all anchoring and mooring evolutions, a command briefing will be conducted by the Deck Officer. The seamanship briefing will normally follow the general briefing of navigation and operations plan. The following personnel will, as a minimum, be in attendance: Executive Officer, Deck Officer, Navigating Officer, Focsle Officer, Chief Bosn's Mate, Senior Naval Communicator, Part Ship I/Cs and Cable Party I/C.

b. Following is a briefing format to be followed:

(**1**) (OWN SHIP) will be anchoring at (LOCATION) at (TIME).
(**2**) (PORT/STARBOARD) watch SSD, Cable Party and Focsle Part Ship hands will be required to close up at (TIME), at which time the chains will be rigged on the starboard side, the jackstaff raised, and the anchor made ready for letting go, riding on the blake and brake.
(**3**) The dress for this evolution will be (DRESS).
(**4**) The Focsle Officer, Focsle I/C and Cable, Party I/C will be (NAMES).
(**5**) (OWN SHIP) will be anchoring in (DEPTH) metres. This will be a dropping anchorage, with seven shackles on deck being required. The blake slip will be removed when the order "Stand By" is given at one half cable to the anchorage position. The intention on letting go is to allow the cable to run freely for two shackles, which will put the anchor on the bottom. The cable will then be snubbed until it grows to a long stay. The Cable I/C will then control the paying out of the cable using the brake so that it is laid properly on the bottom.
(**6**) Effective communications are essential. Primary shall be (INTERNAL COMM.), with secondary being (PRC Channel X).
(**7**) I/Cs are to thoroughly brief all closing up personnel on their duties and the sequence of events.
(**8**) If required, a debrief will be conducted on completion of the evolution. Place and time to be promulgated.
(**9**) This completes the briefing. Are there any questions?
(**10**) The Chief Bosn's Mate will now brief the safety-related aspects of the evolution.

7.12.2 Cablework Safety Briefing

a. It is imperative that the Chief Bosn's Mate and the I/Cs give a thorough briefing to all personnel involved in cable work prior to the evolution beginning. As well as the general shipboard safety items listed in chapter 4, the following safety points must be covered:

(**1**) Goggles must be worn by the Cable Party when letting go the anchor and inserting the lead pellets.
(**2**) Never stand directly behind the cable when letting go.
(**3**) Never straddle the cable or take shortcuts across it.
(**4**) The boat Coxn is never to allow the boat to get between the ship and a buoy.
(**5**) The Focsle Officer must wear a safety harness and floatation device (HDLJ) when manning the chains.
(**6**) The Naval Jack is not to be hoisted at the jackstaff until all work on the cable has been completed.
(**7**) Tools are to be kept well clear of the cable.
(**8**) The snap back zone safety criteria are to be followed once the picking-up rope is rigged.
(**9**) Care must be exercised when slipping the slip rope.

7.13 IROQUOIS CLASS

7.13.1 Anchoring and Weighing Anchor

a. IROQUOIS class ships are fitted with a single stockless marine fluked anchor. The cable locker is divided into port and starboard compartments. The starboard compartment houses the anchor cable (ten shackles in length), while the port compartment houses the mooring or working cable (four shackles in length). A cable clench is fitted in each compartment of the cable locker to secure the bitter end.

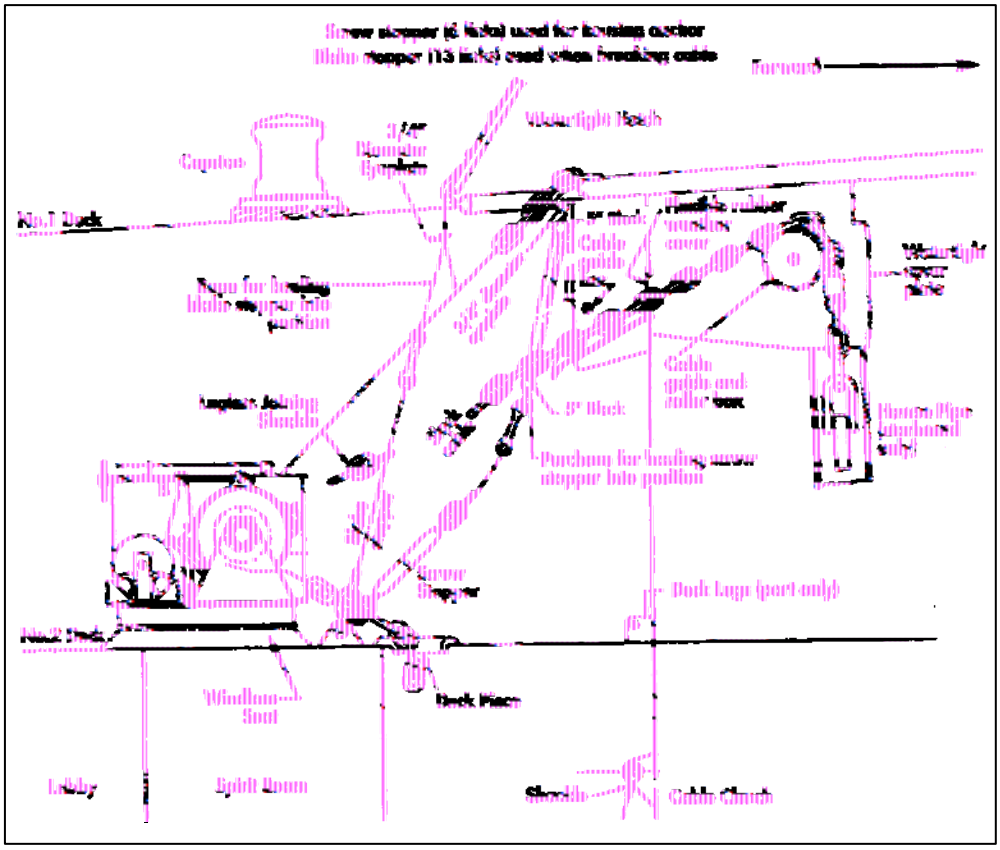


Figure 7.13-1 - IROQUOIS Class Anchor and Cable Arrangement

b. **Equipment Layout - Rigging the Anchor Platform (chains)**

(1) The anchor platform and guardrails are removed from their stowage in the anchor windlass compartment and brought to the focsle for assembly.

(2) The platform can only be rigged on the starboard side of the focsle. It is secured to the brackets fitted outboard of the guardrail.

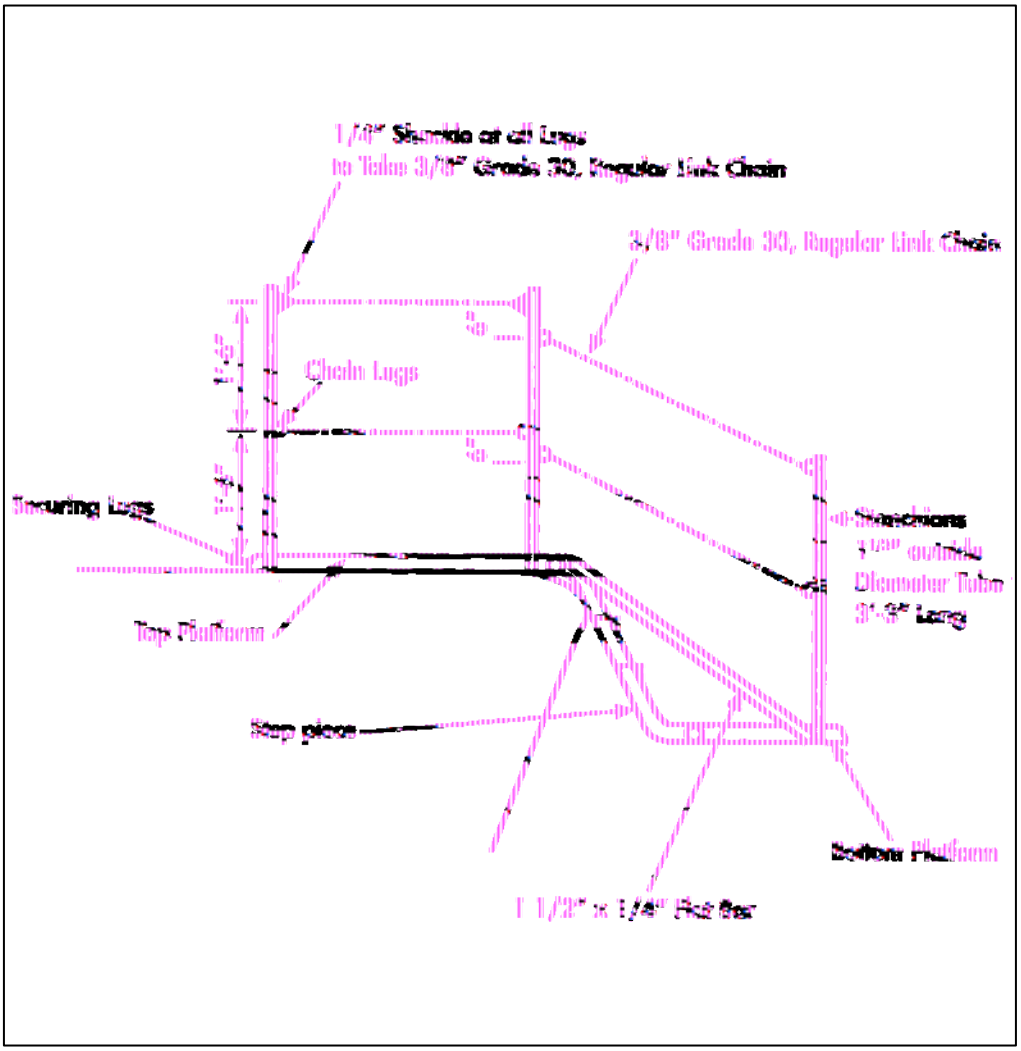


Figure 7.13-2 - IROQUOIS Class Anchor Platform

c. **Anchor Windlass/Capstan**. The anchor windlass, which is powered by an electric motor, is located in the cable deck and is used exclusively for working the anchor and mooring cables. The capstan, which is located on the focsle and is powered by hydraulics, is designed for working lines only.

d. **Preparations for Anchoring**

(**1**) Ensure the brake is on.

(**2**) In order to ensure that there is sufficient power available to start the windlass, permission must first be obtained from the Machinery Control Room. Once done, apply power and engage the clutch.

(**3**) Open the view port and remove the cable locker cover.

(**4**) Remove the bottlescrew and Blake slips, in that order.

(**5**) The brake is released and the cable veered far enough to ensure that the anchor is free of the anchor pocket or a'cockbill (eight links).

(**6**) The brake is then re-applied, the Blake slip put back on, and the clutch disengaged. The anchor is now ready for "Letting Go".

e. **Preparation and Procedure for Weighing Anchor**

(**1**) The chains are manned.

(**2**) A fire hose is laid out and charged on the focsle.

(**3**) Power is applied to the windlass, and the clutch engaged. Concurrently, the anchor wash is activated (valve located in No. 1 Rope Stores).

(**4**) The brake is removed and the cable is heaved in until the anchor is home and strain comes on the cable.

(**5**) The brake is re-applied and the Blake and bottlescrew slips are secured to the cable. The bottlescrew slip is then tightened down in order to prevent the anchor from banging in the anchor pocket.

7.13.2 Coming to a Buoy

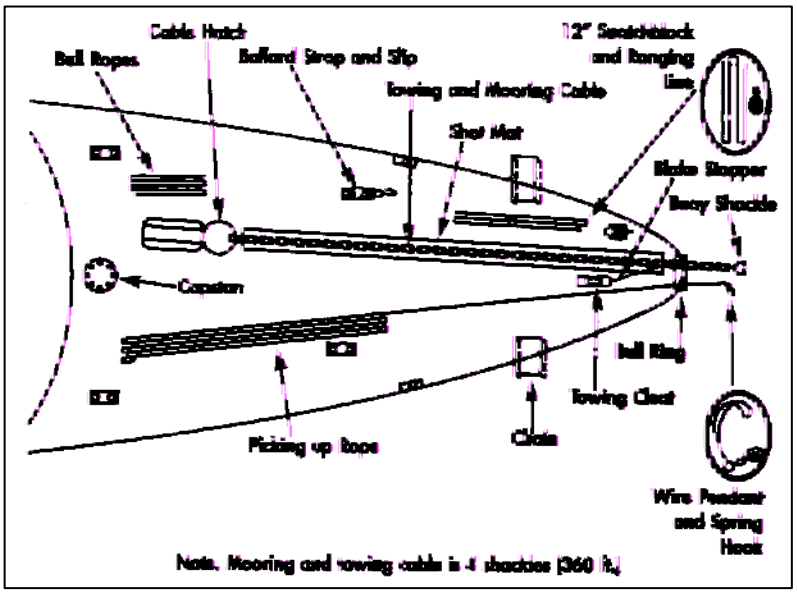


Figure 7.13-3 - IROQUOIS Class Coming to a Buoy Layout

a. **Preparation and Equipment Layout - Hanging Judas Method.**

(**1**) Check the power supply, and then apply power to the windlass.

(**2**) Secure a 12" ranging snatch block with a 3/4" shackle to the farthest forward eye pad on the focsle.

(**3**) Lead the ranging line forward from the capstan to the ranging snatch block and reeve through the block. The ranging line is then lead back to the cable hatch and lowered into the cable deck and secured to the end of the mooring cable with a bowline.

(**4**) Simultaneously veering the cable and heaving in on the ranging line with the capstan, haul enough mooring cable up from the cable deck and onto the focsle to allow for the ship-to-buoy shackle to hang 4 to 6 feet above the waterline once it is passed through the bullring (Hanging Judas). Apply the brake. Use the bullropes and the tag line to fake the cable out on deck.

(**5**) Attach the ship-to-buoy shackle to the end of the mooring cable.

(**6**) Tie a 4-foot tag line to the cable approximately 6 to 8 links above the ship-to-buoy shackle to assist the buoy jumpers in retrieving the ship-to-buoy shackle once on the buoy.

(**7**) Fake the picking-up rope fore and aft along the starboard side of the focsle with wire strop and snap hook (outboard end) inboard. Pass the outboard end out through the angel fairlead such that the wire strop and snap hook are outboard of the angel fairlead and then back inboard over the guardrail on the port side and placed on deck.

(**8**) Secure a messenger (at least 30 metres of 18 mm polypropylene) to the wire strop and fake on deck on the port side.

(**9**) Using bull ropes, heave the ship-to-buoy shackle forward and out through the bullring, and lower the cable so that it is riding on the brake, suspended 4 to 6 feet above the waterline.

(**10**) Secure a centreline Blake slip to the deck clench located midships forward on the focsle.

b. **Preparation and Equipment Layout - Roller Shackle Method**.

(**1**) The alternate method to lower the ship-to-buoy shackle and cable down to the buoy is to run the cable along the picking-up rope using a roller shackle. This method is used in foul weather.

(**2**) The procedures for this method are the same as for the “Hanging Judas” method, with the following exceptions:

(a) Range out sufficient mooring cable to allow for ten links to pass outside the bullring.

(b) Attach the ship-to-buoy shackle to the end of the cable.

(c) Fake the picking-up rope fore and aft along the starboard side of the focsle.

(d) Pass the picking-up rope through the angel fairlead so that the wire strop and snap hook are outboard of the angle fairlead. A bight of line is brought back through the bullring.

(e) Attach the cable seven links back from the ship-to-buoy shackle to the picking-up rope using a roller shackle (the roller shackle is passed over the picking-up rope with the roller resting on the picking up rope and the bow of the shackle secured to the seventh link of the cable using manila lashing).

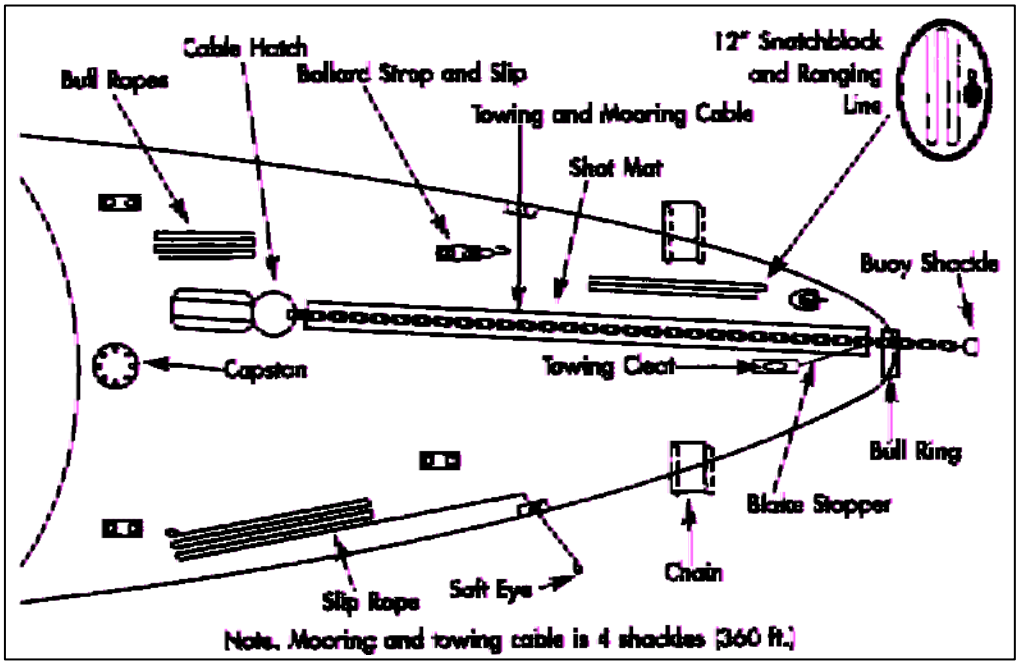


Figure 7.13-4 - IROQUOIS Class Slipping from a Buoy Arrangement

c. **Slipping From A Buoy Equipment Layout**.

(1) Rig a bollard strop and senhouse slip onto the forward bollard on the port side.

(2) Fake out the slip rope fore and aft on the starboard side inboard to outboard so that the soft eye can be led out through the forward fairlead on the starboard side, down through the buoy shackle, and back up through the forward fairlead on the port side where it is secured to the senhouse slip.

7.13.3 Mediterranean Mooring

a. Ship handling when conducting a Med mooring in IROQUOIS Class ships is made more difficult because of the single anchor arrangement, which limits the amount of control the Captain has over the movement of the bow during the sternboard approach to the jetty. In addition, visual appreciation of distance to the jetty is poor due to the hangar obstructing a clear view astern. Therefore, it is recommended that the Command Position be re-located aft to the flight deck with the Executive Officer remaining on the bridge. Conversely, the Executive Officer can proceed aft and pass conning recommendations via radio to the Captain on the bridge.

b. **Equipment Preparation and Layout**

(**1**) The focsle is prepared for coming to anchor. If berthing in a nest, hawsers will be required between focsles.

(**2**) Four berthing hawsers are faked down on the Quarterdeck. If additional springs or breast lines to adjacent ships in a nest are required, two additional hawsers will be laid out.

(**3**) Preparations are made for the brow to be positioned on the port side of the Quarterdeck leading aft to the jetty.

(**4**) The anchor is let go as per normal circumstances, with the intent being to lay it evenly on the seabed as the ship backs towards the jetty.

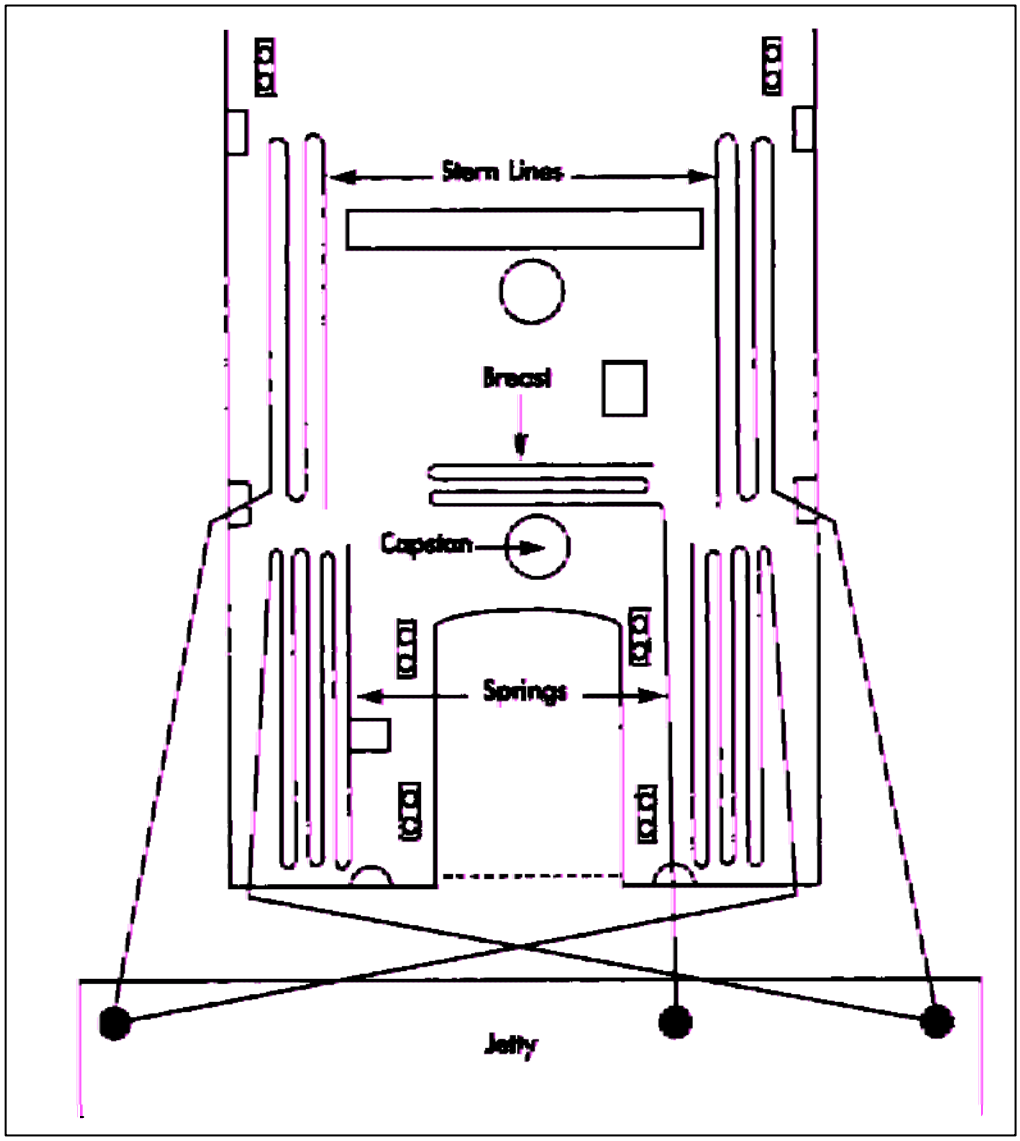


Figure 7.13-5 - IROQUOIS Class Mediterranean Mooring Arrangement

7.14 HALIFAX CLASS

7.14.1 Anchoring and Weighing Anchor General

a. HALIFAX Class ships are fitted with a single bower anchor. The anchoring system is designed to hold the ship in a 70-knot wind with a 4-knot current from the same direction on a firm sand bottom at a 45-metre depth of water, with all cable paid out.

b. The cable locker is divided into port and starboard compartments by a longitudinal non-watertight bulkhead. The starboard compartment houses the anchor cable (10 shackles in length), while the port compartment houses the mooring cable (4 shackles in length). A cable clench is fitted in each compartment of the cable locker to secure the bitter end.

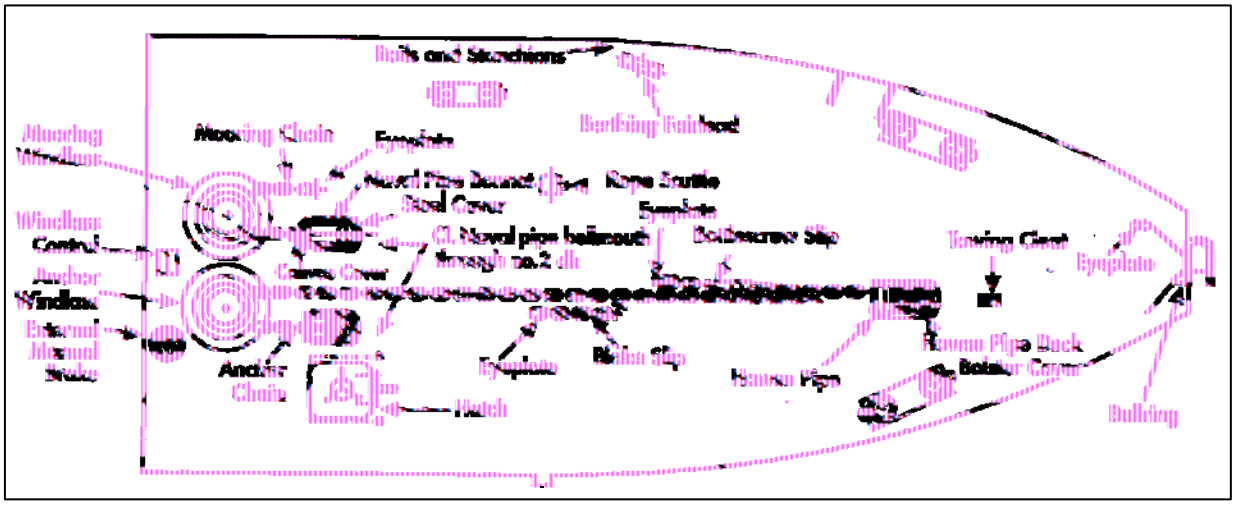


Figure 7.14-1 - HALIFAX Class Anchor and Cable Arrangement (Top View)

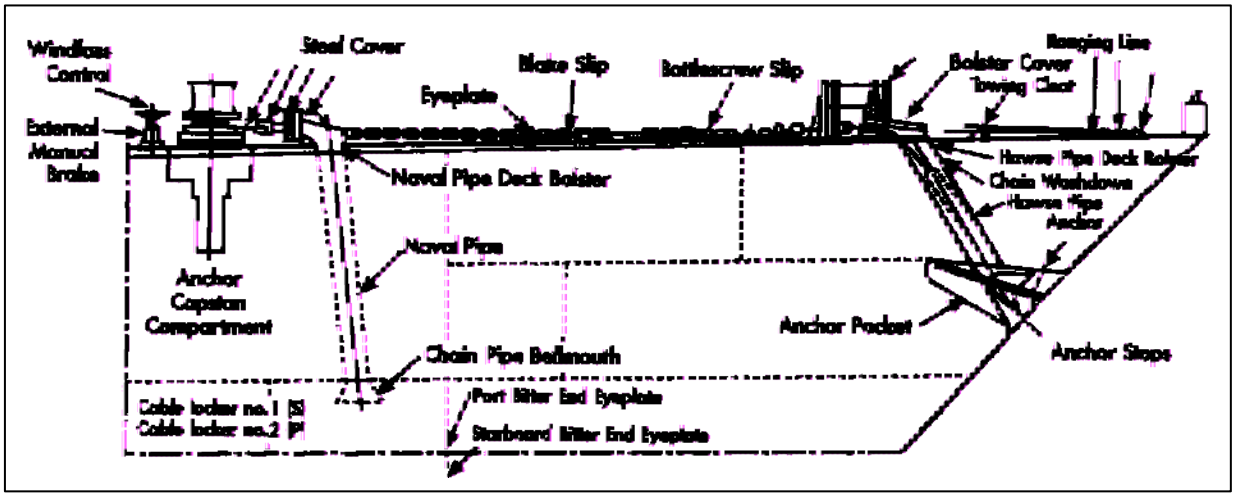


Figure 7.14-2 - HALIFAX Class Anchor and Cable Arrangement (Side View)

c. **Equipment Layout–Rigging the Chains – Anchor Platform.**

(**1**) The chains can be rigged on the port or starboard side of the focsle. The choice will depend on the prevailing weather.
(**2**) The outboard eyeplate is secured to the fixed eyepad (No.5 stbd, No.6 port) on the deck edge.
(**3**) The chain platform is lowered so that it is outboard of the guardrails.
(**4**) The two strong backs are secured to the platform at one end, and to the reversible eyepads on the other (No.3 & No.7 starboard, No.4 & No.6 port).

Figure 7.14-3 - Chain Platform HALIFAX Class

d. **Anchor Windlass/Capstan.** An electric vertical shaft combined windlass/capstan is fitted on the focsle forward of the gun and starboard of the centre- line for anchor cable and line handling. The capstan is independently clutched and braked and is capable of handling lines of up to 56 mm diameter.

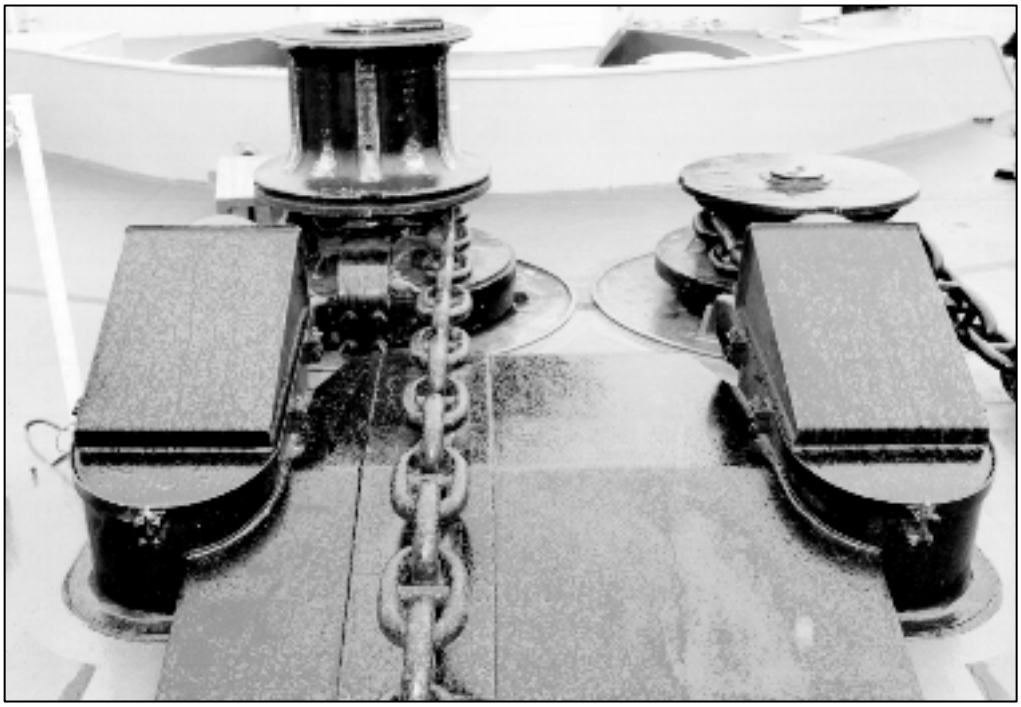


Figure 7.14-4 - HALIFAX Class Forward Capstan Arrangement

The common control console is a pedestal type and is of watertight construction.

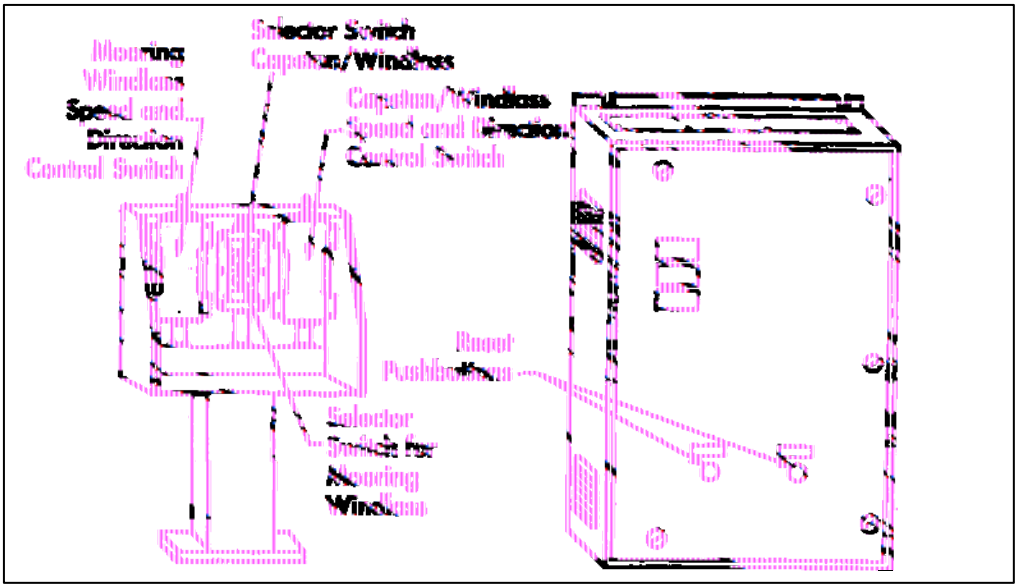


Figure 7.14-5 - Control Console and Motor Controller

e. **Preparations for Anchoring.**

(**1**) The grate may be removed from the hawse pipe.
(**2**) Ensure the brake is on.
(**3**) In order to ensure that there is sufficient power available to start the windlass, permission must first be obtained from the Engineering Officer of the Watch in the Machinery Control Room. Once done, apply power and engage the clutch.
(**4**) Remove the bottlescrew and Blake slip. A cable jack will be required to raise the cable sufficiently high enough to remove the slips.
(**5**) The brake is released and the cable veered 3 links to the harbour position.
(**6**) The brake is then reapplied and the clutch disengaged. The anchor is now ready for "Letting Go".

f. **Preparation and Procedure for Weighing Anchor.**

(**1**) The chains are manned.
(**2**) A fire hose is laid out and charged.
(**3**) Power is applied to the windlass. Concurrently, the automatic anchor wash is activated (valve located in No.1 rope stores).
(**4**) The cable is heaved in until the anchor is home and strain comes on the cable.
(**5**) The brake is applied and the Blake and bottlescrew slips secured to the cable. The bottlescrew slip is then tightened down in order to prevent the anchor from banging.

NOTE: *The flukes must trip aft as the shank approaches and enters the hawse pipe or the anchor will not seat in the anchor pocket. If the flukes have not tripped, veer the anchor to the water and allow the force of the water to trip the flukes; another option is to let the anchor go to half shackle.*

Recovering The Anchor in The Case of Windlass Failure

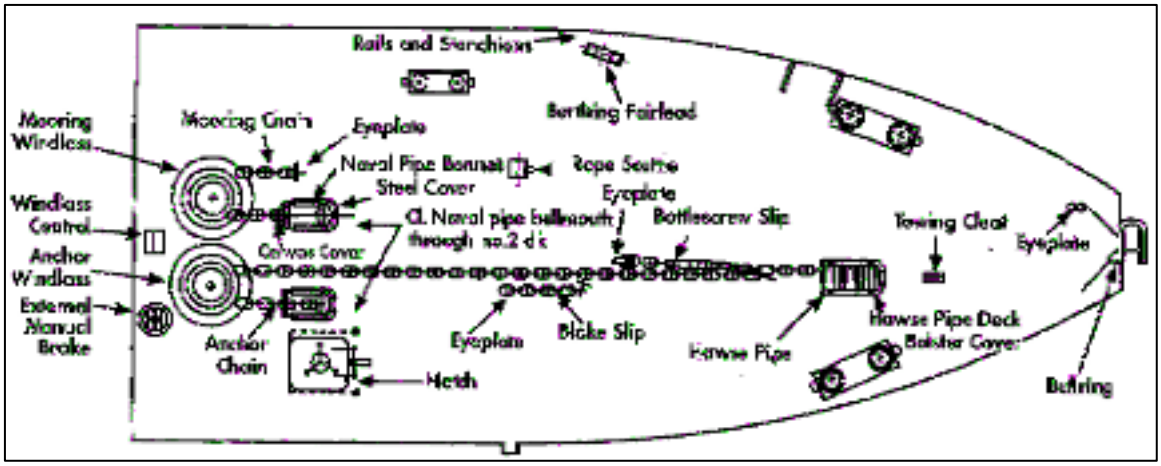
Aim

To introduce procedures for recovering an anchor in the case of a failure of the primary anchor windlass in HALIFAX class ships.

Introduction

There have been instances where an anchor windlass has failed while ships were at anchor. The configuration in HAL class ships, having both a primary anchor windlass and a second mooring cable

windlass, presents an opportunity to recover the anchor and cable despite the unserviceability of the primary anchor windlass. Breaking the anchor cable and leaving the anchor behind for recovery at a later date is not the only available option.



Preparation and Considerations

At all times when coming to anchor, the cable should be arranged so as to position a lugless joining shackle on deck approximately 2 to 3 links aft of the blake slip. This will provide the optimum positioning of the cable in the event that the ship is required to:

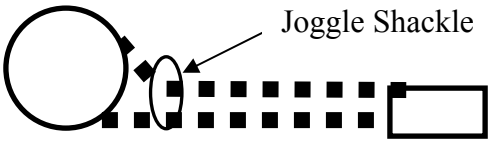
a) break the anchor cable and leave the anchor behind in the case of heavy weather or emergency; or,

b) break the anchor cable and attach it to the mooring cable end in the event of a failure of the anchor windlass.

Conduct

This evolution contains elements of both a normal anchor recovery and procedures for ranging cable in preparation for coming to a buoy.

Step	Action
	Scenario: A ship at anchor has experienced an anchor windlass failure and is unable to recover its anchor. The number of SHOD is irrelevant. The anchor is currently riding on the blake slip and brake.
1	Apply the bottlescrew slip at the hawse pipe and tighten to relieve strain from the blake slip and the joining shackles. Disconnect the blake slip.
2	Place a tommy bar through the anchor cable at the anchor cable naval pipe.
3	Disconnect the lugless joining shackle at the blake slip position. Using the cable jack and a piece of 4 x 4, place the anchor cable on the port side of the bottlescrew and deck clench. This will provide a good lead from the hawse pipe to the mooring cable gypsy.

Step	Action
4	The anchor cable remaining from the break of the lugless joining shackle to the anchor cable naval pipe can be secured by choking it off, bringing it close around the anchor windlass gypsy and joining the two sides of the anchor cable with a joggle shackle. The remaining loose end of the anchor cable can be lashed onto the standing end of the anchor cable towards the naval pipe in order to secure it for sea. 
5	Place a tommy bar through the working cable at the mooring cable naval pipe.
6	Disconnect the mooring cable from the deck clench.
7	Range the mooring cable on deck to allow sufficient slack to join the mooring cable to the anchor cable.
8	Join the end of the mooring cable to the now disconnected end of the anchor cable using a lugless joining shackle. Remove the tommy bar and heave in the slack in until the weight is off the bottle screw slip. Using the cable jack and a piece of 4 x 4, remove the bottle screw slip and then clear it from under the cable. Continue heaving in until all slack is gone.
9	The anchor should now be recoverable under power using the mooring windlass.
10	Secure the Bottle Screw slip as per normal and the centerline blake slip (used for towing/buoy work) to the mooring cable securing deck clench.
Notes	1. Because of the angle created from the hawse pipe to the mooring cable windlass it is expected that: a. The anchor cable will come out of track; b. The anchor shank itself may not return properly to its home position, preventing the anchor from achieving its fully secured position. 2. When recovering the anchor in this fashion a ship could find itself with up to 10 additional shackles of anchor cable in the mooring cable locker. This will affect the ship's stability and a correction may be required to compensate for the added weight on the port side. 3. While this is foreseen as a short term fix that would allow a ship to return to port for repairs, one overriding factor must be taken into consideration: while the anchor is being worked using the mooring cable the anchor cannot be dropped, either deliberately or as part of an emergency anchorage procedure. It can however be veered under power. Ships should therefore use caution when operating in pilotage waters under these circumstances.

7.14.2 Coming to a Buoy

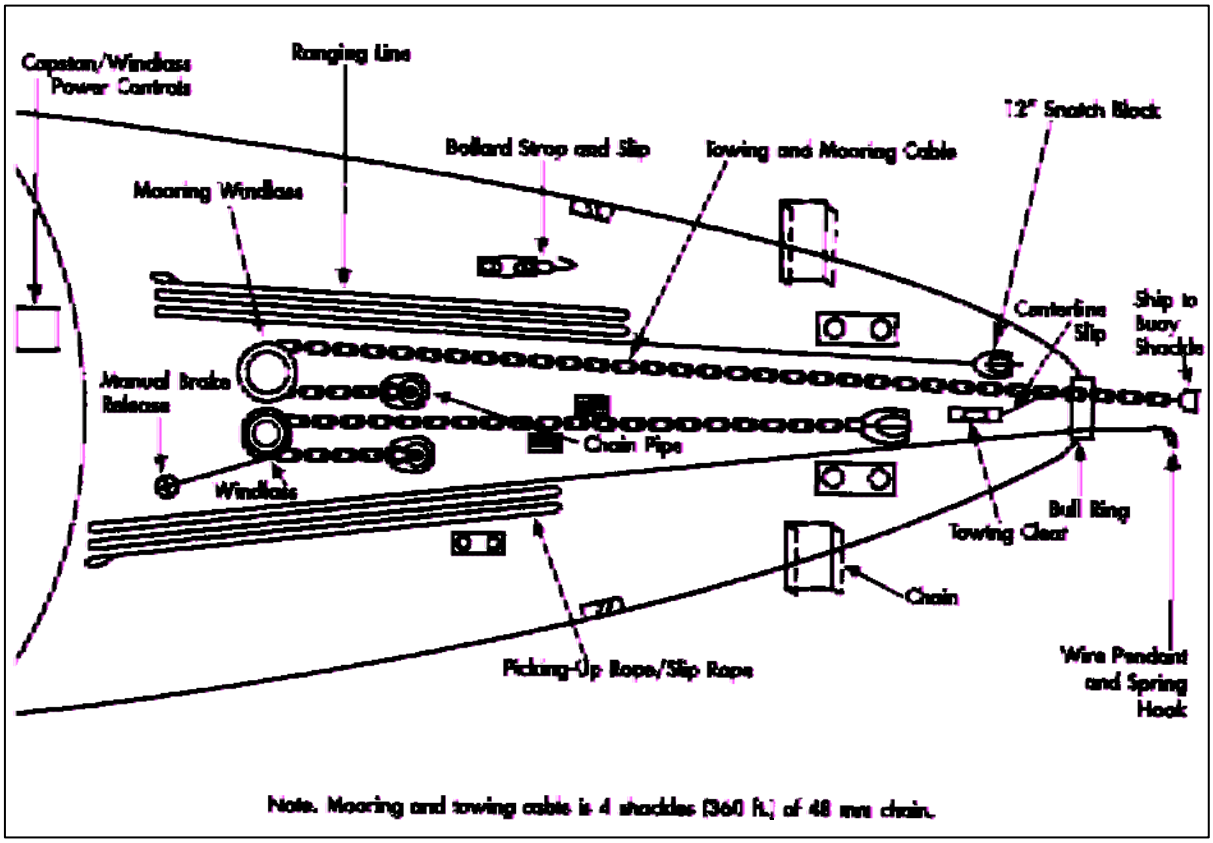


Figure 7.14-6 - HALIFAX Class Mooring Arrangement

a. **Preparation and Equipment Layout – Hanging Judas Method.**

(**1**) Check the power supply, and then apply power to the mooring windlass. Disconnect Port cable.

(**2**) Secure a 12-inch ranging snatch block with a 3/4" shackle to eyepad No. 2 on the focsle.

(**3**) Tie the ranging line to the cable with a bowline and reeve it through the ranging snatch block.

(**4**) Simultaneously veer the cable and heave in on the ranging line until sufficient cable is ranged out on deck to allow for the ship-to-buoy shackle to hang 4 to 6 out clear of the bullring. Apply the brake.

(**5**) Attach the ship-to-buoy shackle to the end of the mooring cable.

(**6**) Tie an eight-foot tag line to the cable approximately 6 to 8 links up from the ship-to-buoy shackle to assist the buoy jumpers in retrieving the ship-to-buoy shackle once on the buoy.

(**7**) Fake the picking-up rope fore and aft along the starboard side ready for use. Pass the outboard end through the angel fairlead such that the wire strop and snap hook are outboard of the angel fairlead.

(**8**) Secure a messenger to the wire strop over the guardrail and fake on deck.

(**9**) Using bullropes and the tag line, heave the ship-to-buoy shackle forward and through the bullring, and lower the cable, so that it is suspended 1 to 2 metres above the waterline.

b. **Preparation and Equipment Layout – Roller Shackle Method.**

(**1**) The foul weather alternate method is to use a roller shackle to lower the ship-to-buoy shackle and cable down the picking-up rope.
(**2**) Following the above procedures, range out sufficient mooring cable to allow for six to ten links to pass outside the bullring.
(**3**) Attach the ship-to-buoy shackle to the end of the cable.
(**4**) Fake the picking-up rope fore and aft along the starboard side of the focsle.
(**5**) Pass the picking-up rope through the angel fairlead so that the wire strop and snap hook are outboard of the angel fairlead. A bight of line is brought back through the bullring.
(**6**) The cable is secured to the picking-up rope with a roller shackle. This should be done approximately eight links back from the ship-to-buoy shackle in such a way that the roller shackle will be allowed to ride freely on the picking-up rope.

c. **Slipping from a Buoy.**

(**1**) Rig a bollard strop and senhouse slip onto the forward bollard on the port side.
(**2**) Fake out the slip rope fore and aft on the starboard side inboard to outboard so that the soft eye can be led out through forward fairlead on the starboard side, down through the buoy shackle, and back up through the forward fairlead on the port side, where it is secured to the senhouse slip.

7.14.3 Mediterranean Mooring

a. **General.** Shiphandling when conducting a Med Mooring in HALIFAX Class ships is made more difficult because of the single anchor arrangement, which limits the amount of control the Captain has over the movement of the bow during the sternboard approach to the jetty. In addition, visual appreciation of distance to the jetty astern is very poor due to the flair of the hangar wings. Therefore, it is recommended that the Command Position be re-located aft to the flight deck or the hangar top, with the Executive Officer remaining on the bridge. Conversely, the Executive Officer can proceed aft, and pass conning recommendations via radio to the Captain on the bridge.

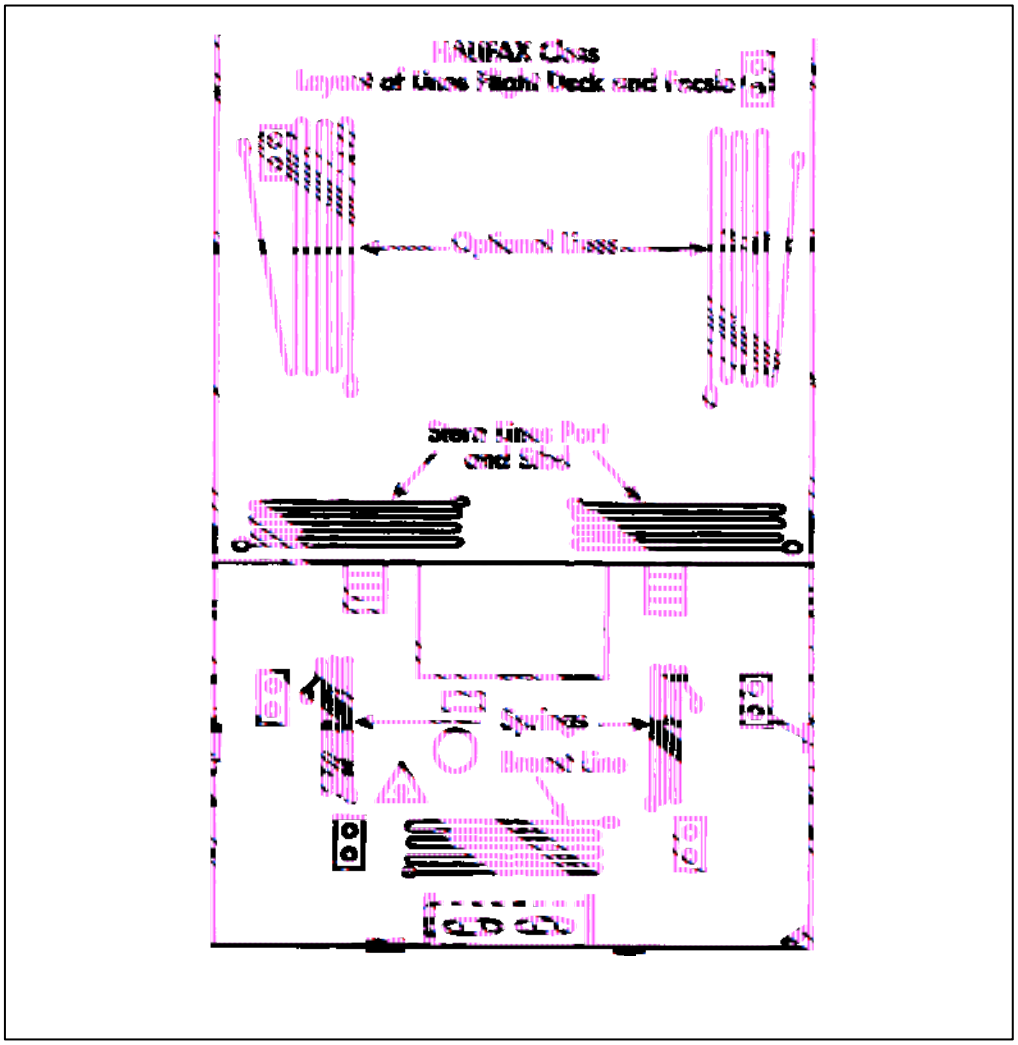


Figure 7.14-7 - HALIFAX Class Mediterranean Mooring Layout

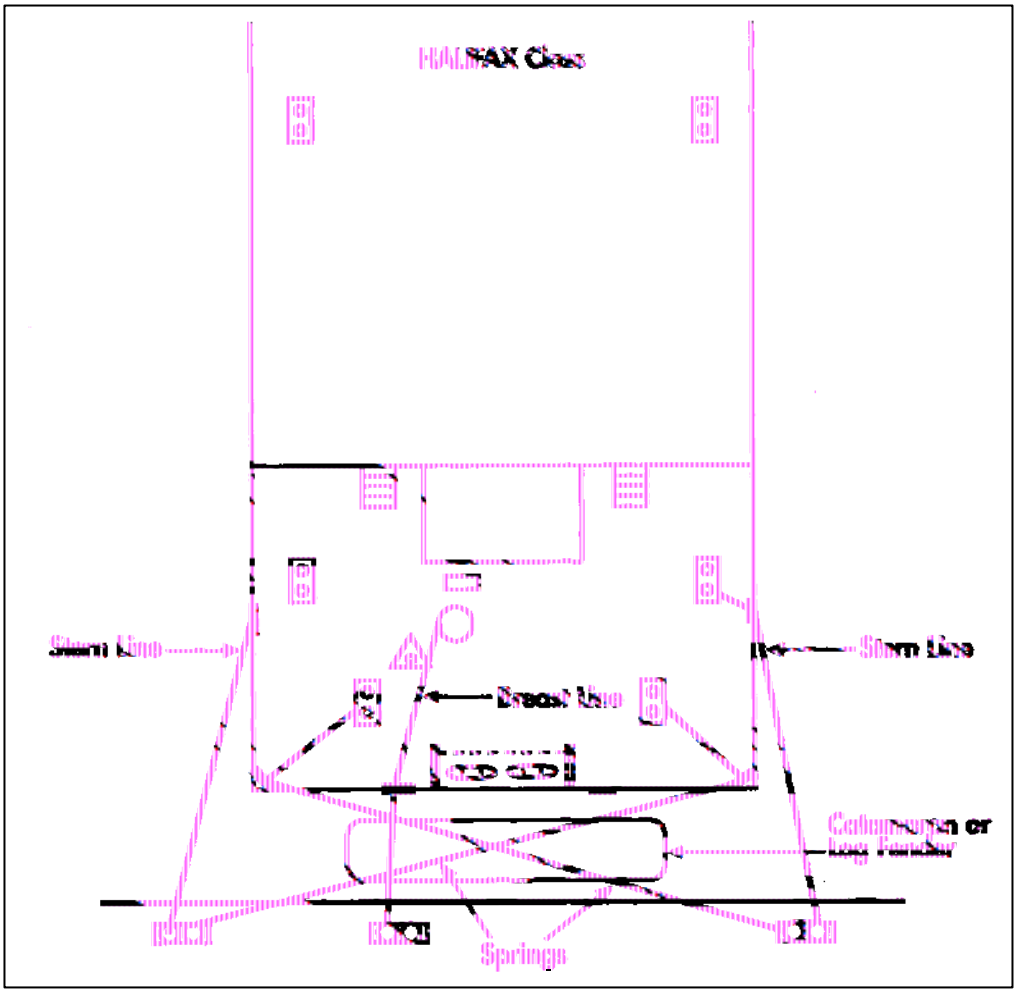


Figure 7.14-8 - HALIFAX Class Mediterranean Mooring Arrangement

b. **Equipment Preparation and Layout.**

(**1**) The focsle is prepared for coming to anchor. If berthing in a nest, hawsers will be required between focsles.

(**2**) Two hawsers are faked out on the after end of the flight deck, two hawsers are faked down fore and aft on the quarter deck, and one line is faked athwartships on the Quarter Deck. If additional springs or breast lines to adjacent ships in a nest are required, two additional hawsers may be laid out on the forward end of the flight deck just aft of the bollards.

(**3**) Depending on the intended location of the brow, remove either one of the .50-calibre HMG mountings on the Quarterdeck, or one of the life rafts adjacent to the ensign staff. This will allow room for the brow.

(**4**) The anchor is let go as per normal circumstances, the intent being to lay it evenly on the seabed as the ship backs toward the jetty.

(**5**) A stern line is taken to the jetty and is heaved in so as to hold the stern onto the jetty.

(**6**) The two lines on the Quarterdeck are passed out the quarter fairleads and crossed as springs to prevent side-to-side movement. The two lines on the after end of the flight deck are passed to the jetty to assist in holding the stern to the jetty.

7.15 PROTECTEUR CLASS

7.15.1 Anchoring and Weighing Anchor General

a. PROTECTEUR Class ships are fitted with a Guillotine system. The class is fitted with two marine fluked stockless anchors.

b. The cable locker is divided into port and starboard compartments. The port anchor cable is ten shackles in length, while the starboard anchor is eleven shackles long.

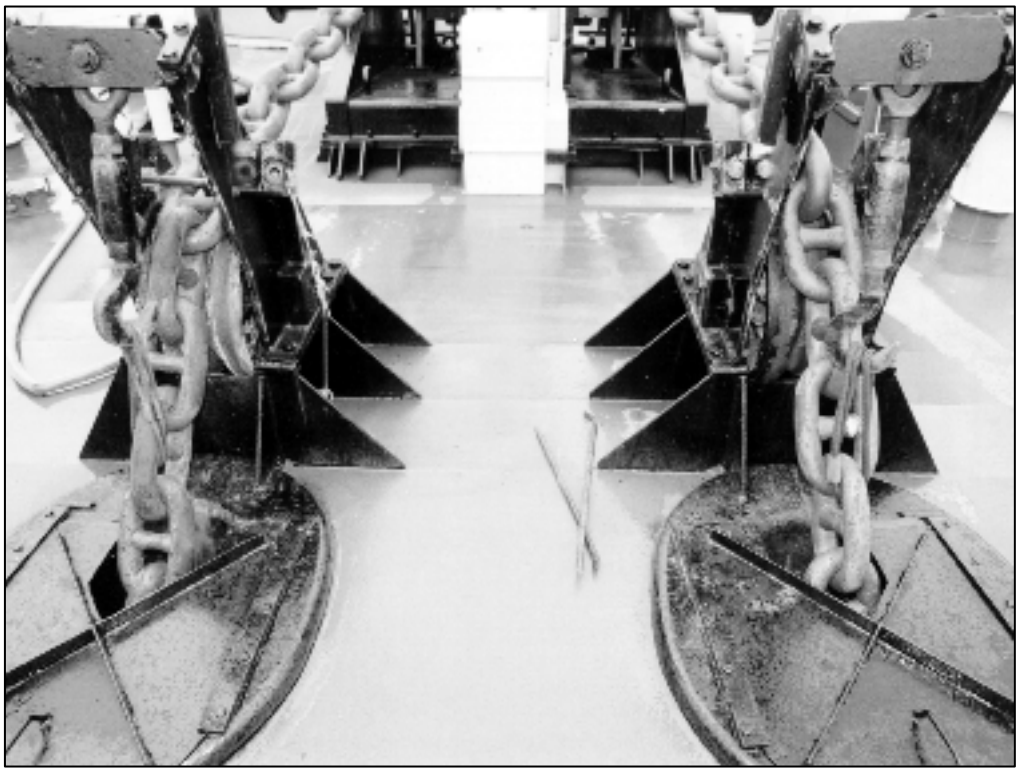


Figure 7.15-1 - PROTECTEUR Class -Roller, Bottlescrew and Hook

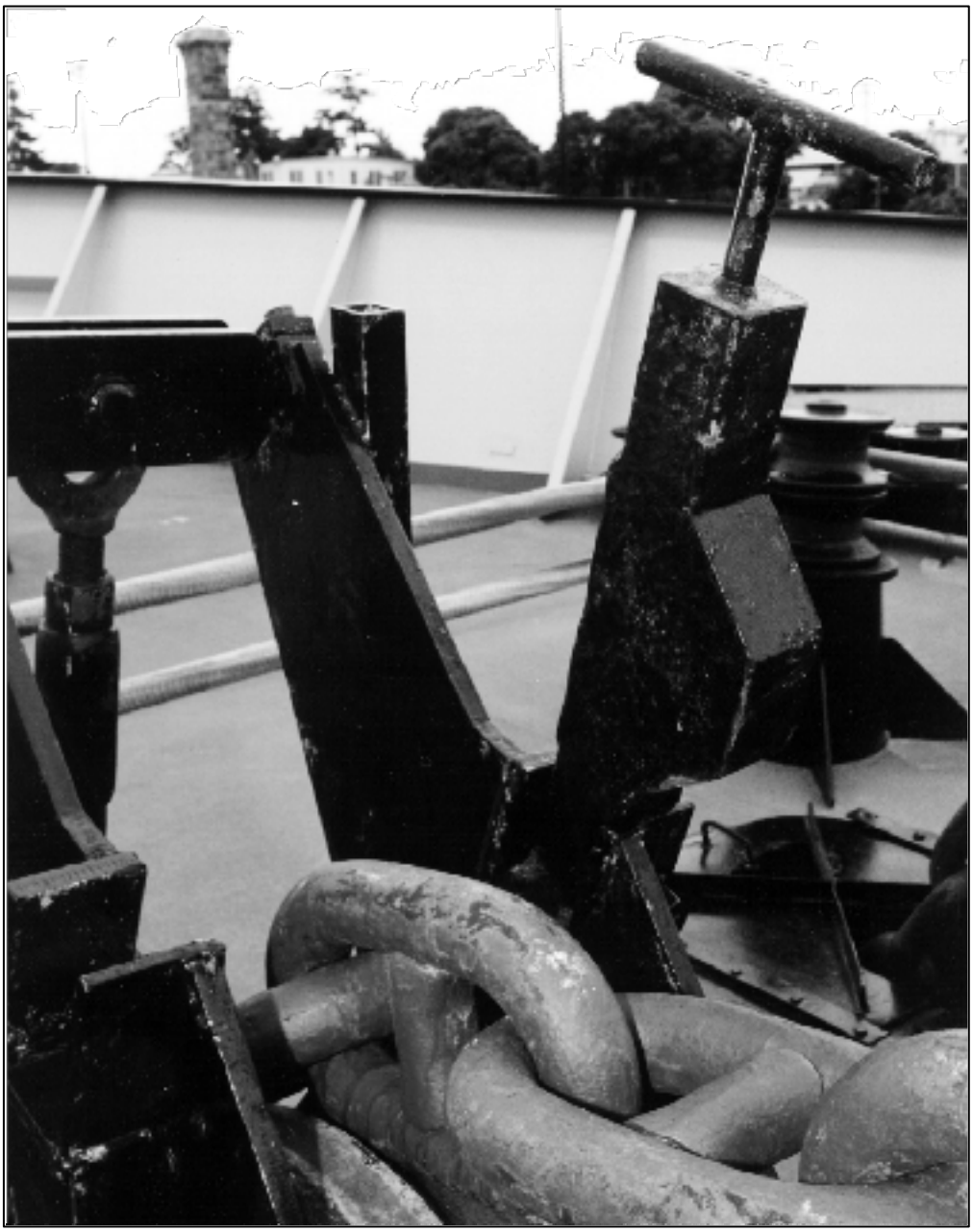


Figure 7.15-2 - PROTECTEUR Class Guillotine

c. **Preparation and Equipment Layout.**

(**1**) Ensure the brake is on.
(**2**) Apply power to the windlass and engage the clutch.
(**3**) Remove the hawse pipe covers and the sea lashings on the bottle- screw slip. Using a tommy bar, remove the bottle-screw slip.
(**4**) Remove the blake slip/guillotine, release the brake, and veer the cable until the anchor is free of the pocket or a'cockbill.
(**5**) The brake is then re-applied, the blake slip/guillotine put on, and the clutch disengaged. The anchor is now ready for "Letting Go". (See Sequence of Events - 7.6-4.)

d. **Preparation and Procedure for Weighing Anchor.**

NOTE: *Guillotine not required to be removed when weighing anchor*

(**1**) A fire hose is laid out and charged.
(**2**) Power is applied to the windlass, and the clutch engaged. Concurrently, the anchor wash is activated (valve located Forward Bosn's workshop).
(**3**) Remove the blake slip/guillotine.
(**4**) The cable is heaved in until the anchor is home and strain comes on the cable.
(**5**) The brake is applied and the blake and bottlescrew slips secured to the cable.

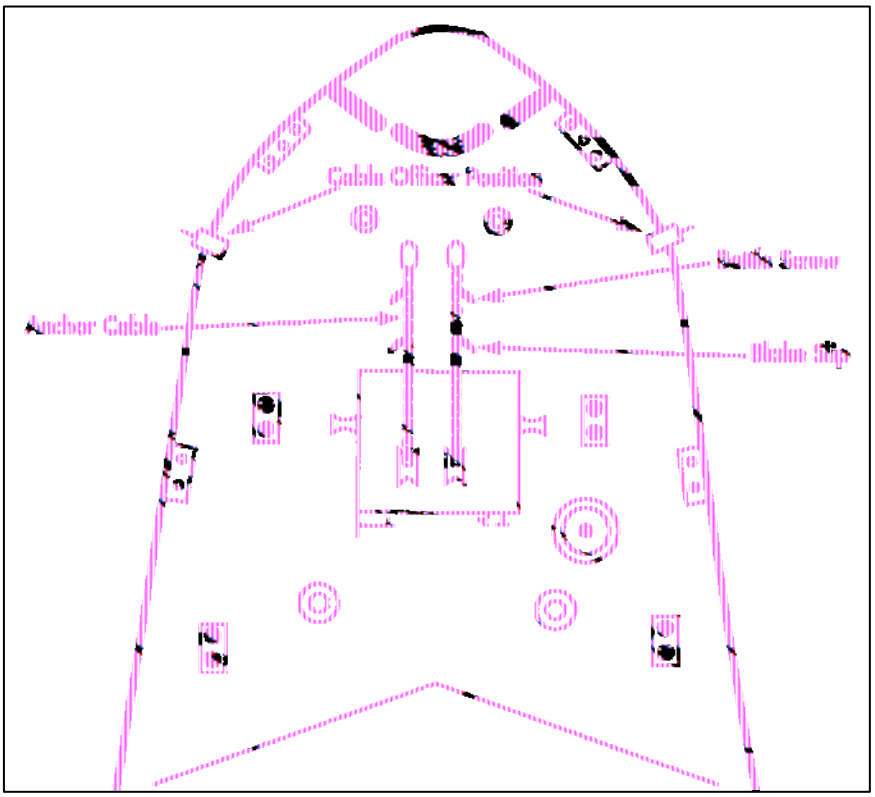


Figure 7.15-3 - AOR Weighing Anchor

7.15.2 Catting the Anchor: PROTECTEUR Class

a. **General**. In order for PROTECTEUR Class ships to come to a buoy, the anchor on the working cable must first be "catted". This is a lengthy evolution, and one that occurs rarely. Essentially, catting the anchor means the anchor is hanging by the catting necklace so that the cable can be broken and used as a mooring cable. In all other classes, this is unnecessary as Blake and bottlescrew slips hold the anchor in place, while the broken cable is led forward through the bullring.

b. **Equipment Preparation, Layout and Sequence of Events.**

(**1**) As this is a unique seamanship evolution, there are some pieces of equipment not normally seen. A complete list of equipment required follows.

Table 7.15-1: Equipment – Catting the Anchor

Catting Pendant	Cable Bag
Catting Necklace	Carpenter Stopper
Shepherd's Hook	Wire Strop Bullropes
Bollard Strop with Blake Slip	Shot Mats

(**2**) Secure the catting necklace to the after eyepad, below the Berger fairlead.

(**3**) Pass the catting pendant through the Berger fairlead from outboard to inboard. Ensure the catting pendant and the picking-up rope are faked down well clear of the working area.

(**4**) Attach a wire strop to the end of the catting pendant.

(**5**) After the boat has been launched, lower the anchor under power until the anchor ring is approximately four feet above the waterline.

(**6**) Lower the catting pendant to the waterline, and bring the boat alongside.

(**7**) The boat's crew attaches the catting strop to the anchor ring. The boat then stands off clear of the area.

(**8**) Slack is taken out of the catting pendant by hand and lead around the top forward deadhead and aft to the warping drum. Twelve turns are placed on the drum. The pendant is then passed around the after deadhead and backed up by ten personnel who are positioned along the breakwater. The anchor is now ready to be catted.

(**9**) Engage the windlass, release the brake, and veer the anchor cable. This will result in the catting pendant being heaved in, thereby raising the anchor. The warping drum turns in an opposite direction to the gypsy for just this purpose.

(**10**) Just before the fitting on the end of the pendant reaches the Berger fairlead, the order "Avast" is given and the brake is applied.

(**11**) Pass the necklace through the anchor ring by lowering the attached line through the anchor ring and then hooking it with a shepherd's hook and pulling it up. Secure the necklace to the forward padeye below the Berger fairlead.

(**12**) The brake is released and the cable is heaved in. Concurrently, the catting pendant is veered until all weight is on the necklace.

(**13**) The brake is re-applied and the bottlescrew slip secured to the cable. The catting pendant is transferred from the warping drum to the after bollard, with all slack removed.

(**14**) The brake is released and the cable is veered (bullropes will be required) until the joining shackle reaches the shot mat.

(**15**) The brake is re-applied. The cable is now ready to be broken in preparation for coming to a buoy.

c. **Recovering The Anchor.**

(**1**) Release the brake, and heave in on the ship's cable until the end with the joining shackle is on deck over the shot mat. Re-apply the brake and remove the ship-to-buoy shackle in preparation for re-attaching the two ends of the anchor cable. Ensure that the anchor cable has no twists.

(**2**) Release the brake, and heave in, so as to take the slack out of the cable aft of the bottlescrew slip. Re-apply the brake.

(**3**) Transfer the catting pendant from the bollard to the warping drum. (Same procedure as for raising the anchor).

(**4**) Release the brake and veer the anchor cable so that the catting pendant is heaved in. Continue until the weight is off the necklace.

(**5**) Apply the brake and slip the necklace.

(**6**) Release the brake and heave in on the anchor cable so that the catting pendant is veered. Lower the anchor to approximately four feet above the water line. Re-apply the brake.

(**7**) Bring the boat alongside so that the boat's crew can remove the catting strop from the anchor ring.

(**8**) Remove the catting pendant and strop and secure the gear. Bring the anchor home using standard procedures and secure for sea.

NOTE: *If a power loss occurs at anytime during this evolution a carpenter stopper will be required on the catting pendant, with the chain bridle being secured to the after Pedestal Fairlead.*

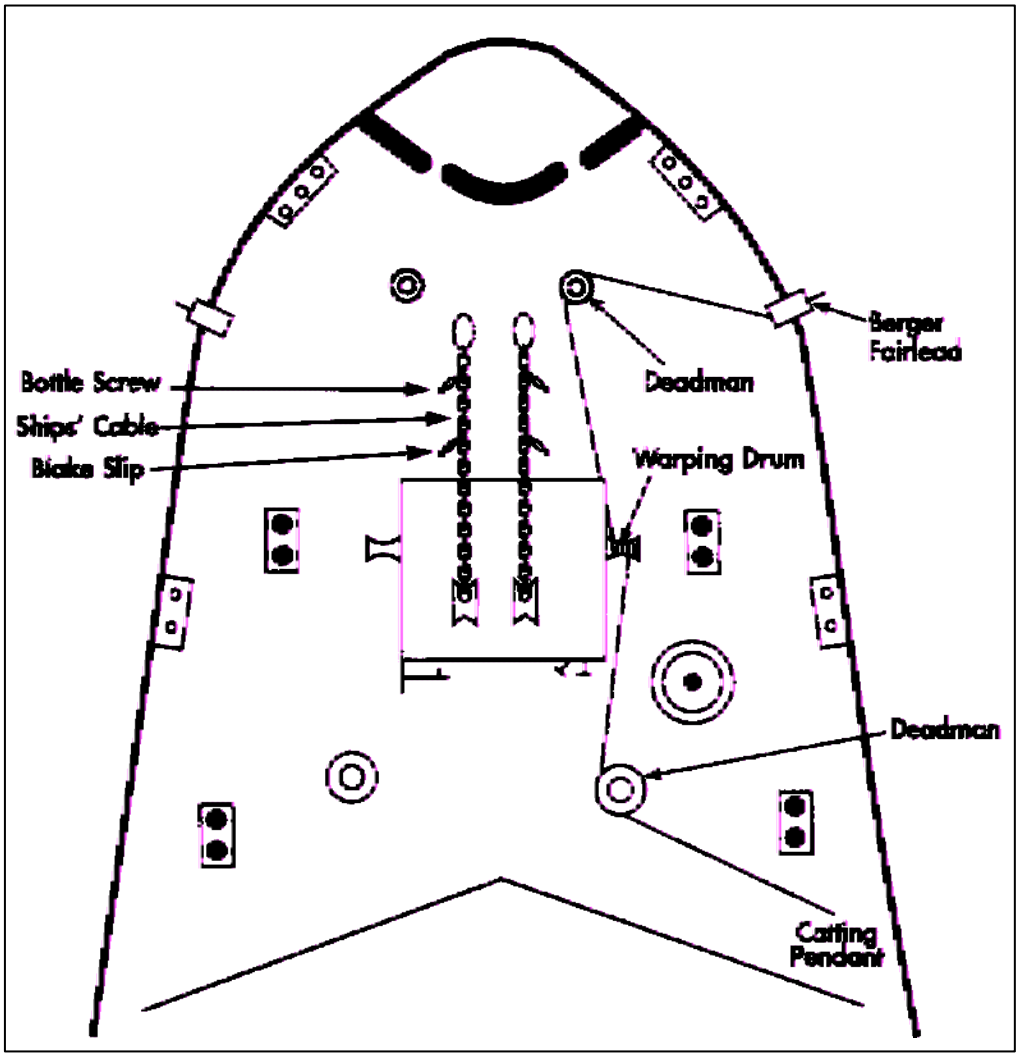


Figure 7.15-4 - Catting the Anchor – PROTECTEUR Class

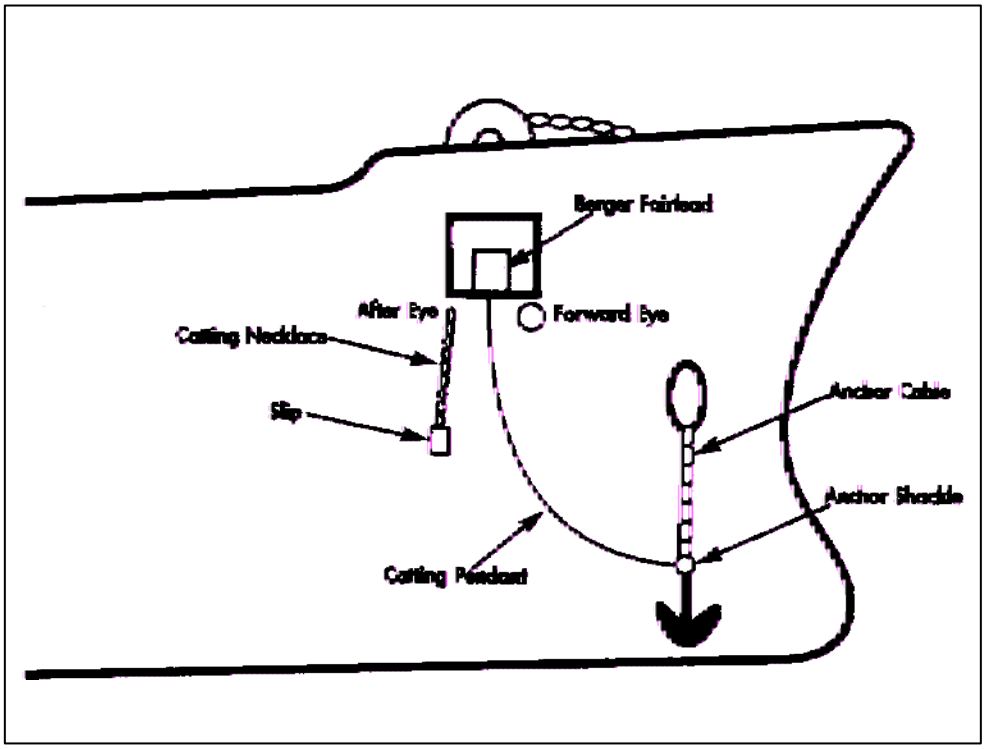


Figure 7.15-5 - Catting the Anchor

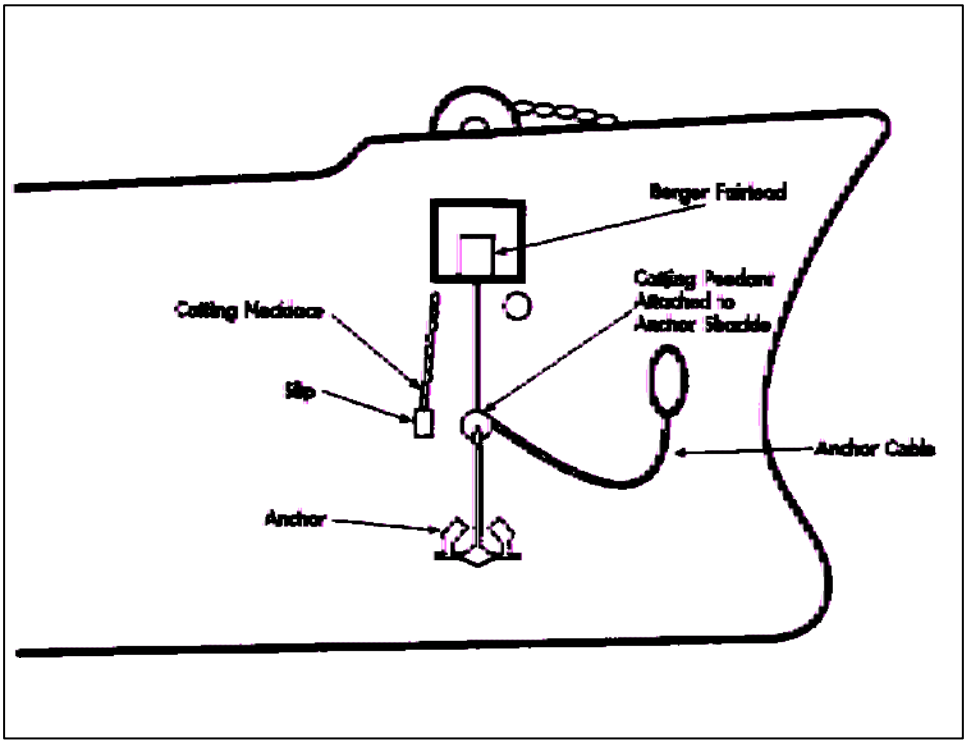


Figure 7.15-6 - Catting the Anchor

7.15.3 Coming to a Buoy: PROTECTEUR Class

a. **Equipment Preparation and Layout - Hanging Judas.**

(**1**) In preparation for coming to a buoy, it is first necessary to cat the anchor following the procedures described in article 7.15.2.

(**2**) Once the anchor has been catted, a ship-to-buoy shackle is fitted to the outboard end of the mooring cable (either port or starboard). A 30-foot length of one-inch line is attached to the ship-to-buoy shackle as a tag line to assist the buoy jumpers.

(**3**) The picking-up rope is faked down fore and aft alongside the windlass on the working cable side of the focsle.

(**4**) The light messenger is faked down fore and aft outboard of the picking-up rope with the outboard end led out through the forward roller fairlead.

(**5**) With the clutch engaged, release the brake and veer sufficient cable to feed it down the hawsepipe until the ship-to-buoy shackle is suspended approximately six feet above the waterline. Re-apply the brake.

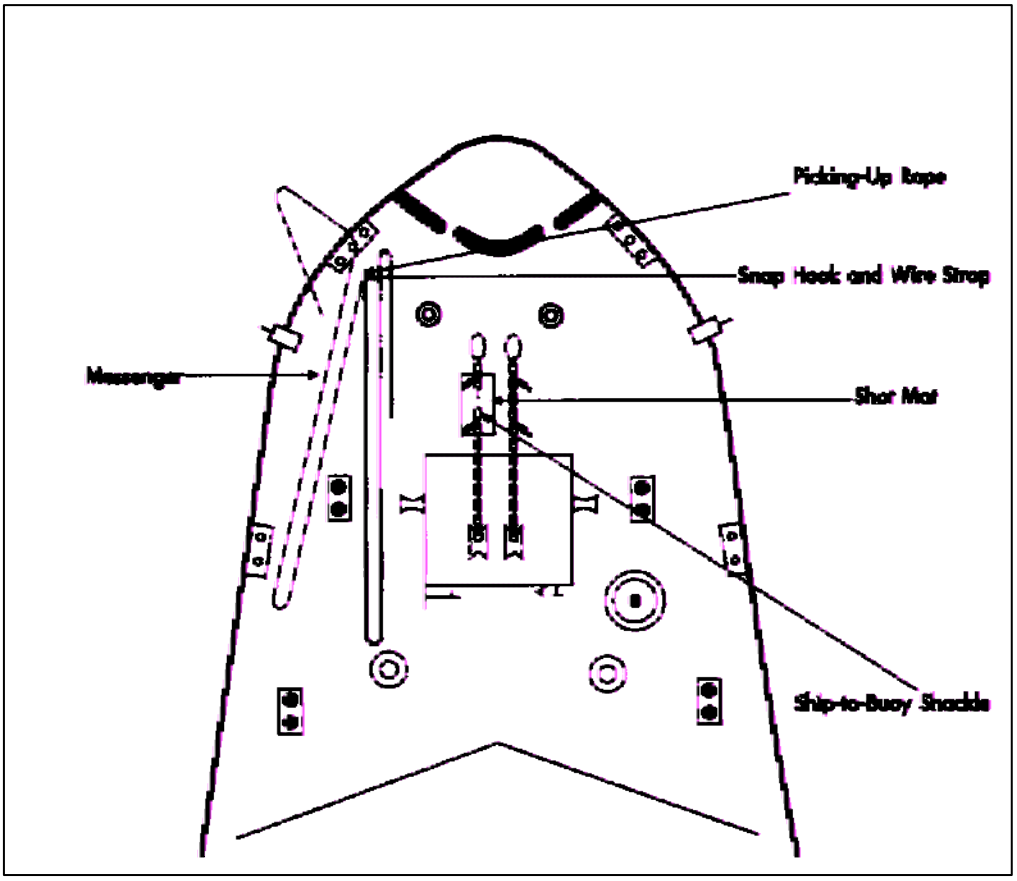


Figure 7.15-7 - Layout Coming to a Buoy – PROTECTEUR Class

b. **Slipping from a Buoy.**

(**1**) Rig a bollard strop and senhouse slip onto the forward bollard on the port side. Fake out a slip rope fore and aft on the starboard side inboard to outboard, so that the soft eye is led out through the starboard roller fairlead to the buoy and up through the port roller fairlead.

(**2**) Once the buoy has been slipped, the anchor will have to be uncatted.

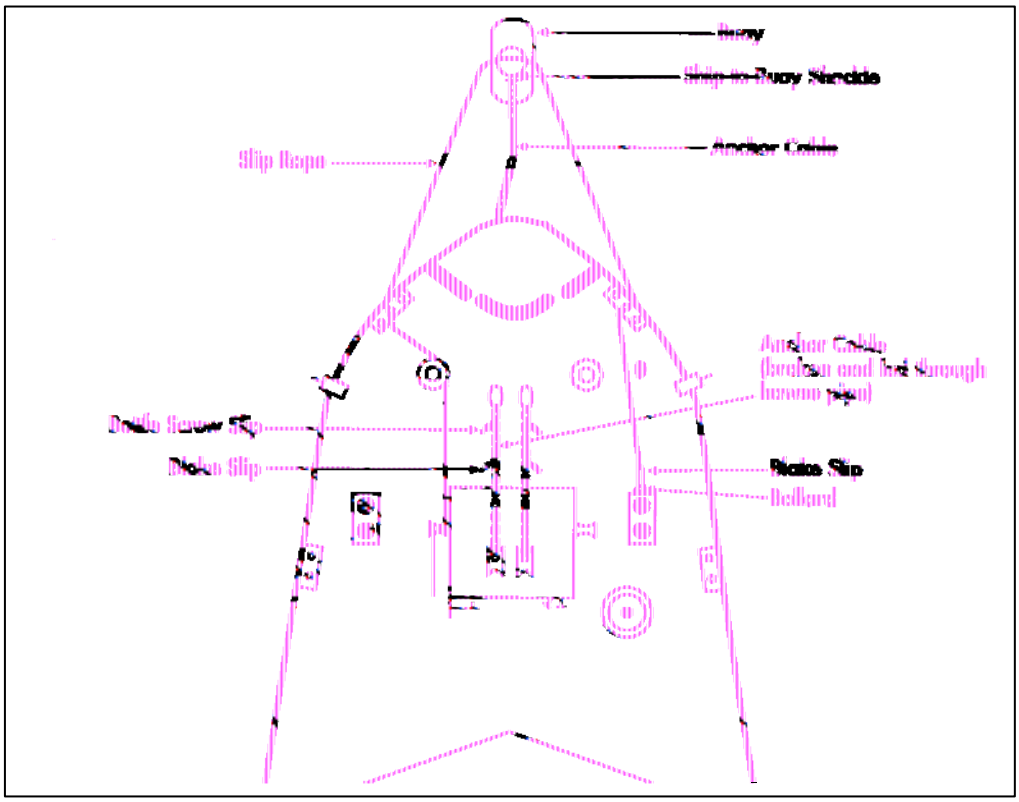


Figure 7.15-8 - Layout for Slipping from a Buoy– PROTECTEUR Class

7.15.4 Mediterranean Mooring

a. Shiphandling when conducting a Med mooring in an AOR is very difficult due to the limited manoeuvrability of the ship. The single screw arrangement, coupled with the high freeboard make the ship highly susceptible to wind when manoeuvring. Tugs will definitely be required as the ship twists towards the second anchorage, and then conducts the sternboard approach to the jetty.

b. **Equipment Preparation and Layout.**

(**1**) The focsle is prepared for coming to anchor. Both anchors will be required. If berthing in a nest, hawsers will also be required between focsles.

(**2**) The RIB is made ready for launch in the event that it is intended to pass the messenger for the first sternline ashore by boat vice heaving line.

(**3**) A jumping ladder is rigged in preparation for embarking a harbour pilot.

(**4**) Three hawsers are brought up to the Quarterdeck. Two are faked down fore and aft forward of the port and starboard towing fairleads. Once passed to the jetty, they will be crossed to prevent side-to-side movement of the ship. The third hawser is faked down athwartships forward of the after centreline fairlead. It will be the first line ashore and will provide a direct lead to the jetty to assist in holding the stern in.

(**5**) Two hawsers are faked down fore and aft at the port and starboard fairleads aft of the breezeways to be used as breasts.

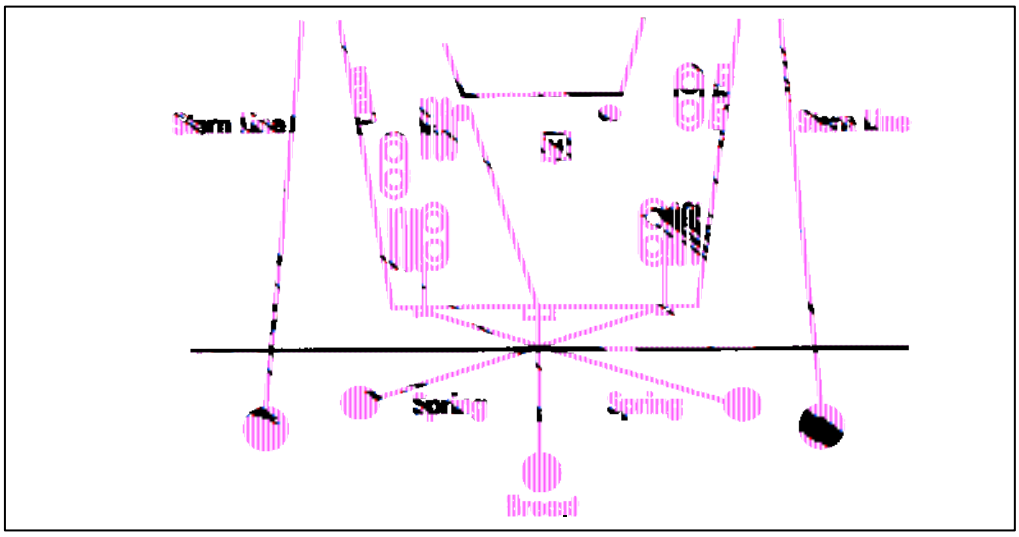


Figure 7.15-9 - Mediterranean Mooring Layout – PROTECTEUR Class

7.16 KINGSTON CLASS

7.16.1 Anchoring and Weighing Anchor

General. KINGSTON Class ships are fitted with a the Roller Bow Stopper and the Devil's Claw.

a. **Roller Bow Stopper.** The cable rides through the roller bow stopper prior to entering the hawse pipe. The Stopper is engaged in order to hold the cable fast. This is achieved by the tongue of the Stopper resting on the horizontal link and pressing against a vertical link.

b. **Devil's Claw.** This is a two-pronged claw attached to a bottlescrew, which grasps the vertical links. Its function is the same as the bottlescrew slips on larger warships.

Figure 7.16-1 – Anchor and Cable Arrangements - KINGSTON Class

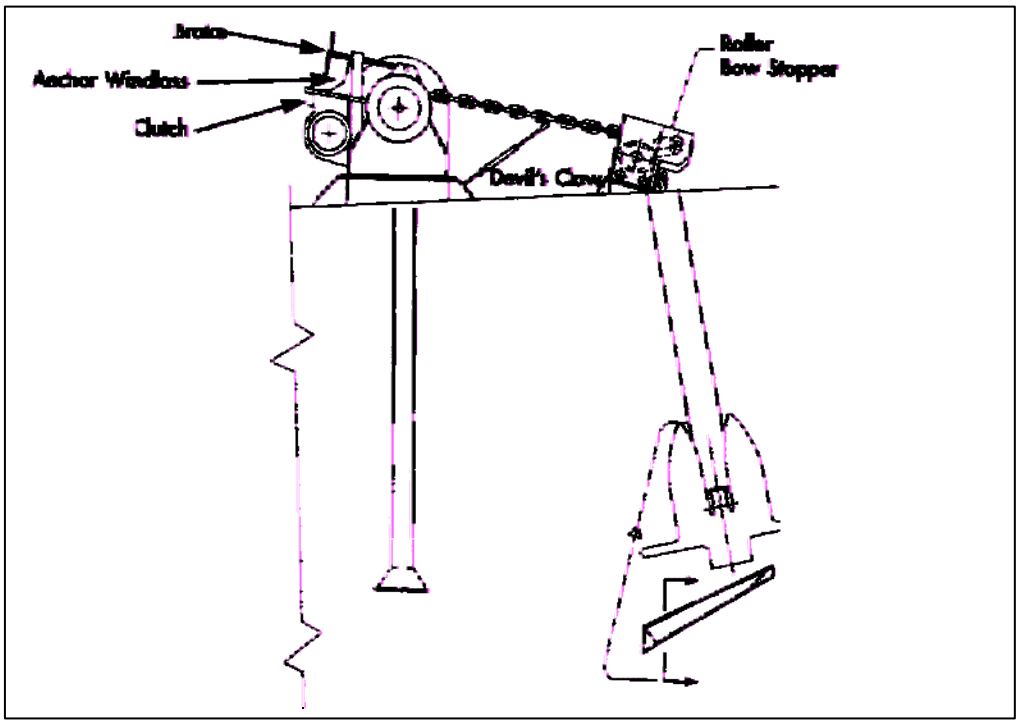


Figure 7.16-2 - Devil's Claw Arrangement

c. **Personnel Requirements.**

(**1**) Safety Officer
(**2**) I/C
(**3**) Brake Operator
(**4**) Cable workers

d. **Equipment Preparation, Layout and Sequence of Events**

(**1**) Establish communications with Command via the Deck/Weapons Net.
(**2**) In order to ensure that there is sufficient power (600v) available to start the windlass, permission must first be obtained from the Engineering Officer of the Watch. Once done, apply power, engage the clutch and veer anchor A'cockbill.
(**3**) Clear away both anchors by removing the devil's claw.
(**4**) Remove the roller bow stopper on the working cable.
(**5**) The brake and roller bow stopper are then re-applied, and the clutch is disengaged.
(**6**) The I/C reports to Command: "Bridge focsle, both anchors cleared away, port/starboard anchor a'cockbill riding on brake and roller bow stopper."
(**7**) At "Stand By", or when ordered by Command, the roller bow stopper is removed.

NOTE: *On closing up, the I/C must ensure that the roller bow stopper is not locked. If there is too much weight riding on the roller bow stopper it becomes locked and the tongue will not release.*

Figure 7.16-3 - Cable Arrangement – KINGSTON Class

e. **Weighing Anchor.**

(**1**) Power is applied to the windlass and the clutch engaged (ensure that 600v power is available).
(**2**) The anchor wash system is activated by opening the valve in rope stores.
(**3**) The brake is released and the cable is heaved in until the anchor is home and strain comes on the cable.
(**4**) The brake is applied and the roller bow stopper and devils claw secured to the cable. The clutch is then disengaged and power shut off.
(**5**) Cable wash is turned off.

7.16.2 Coming to a Buoy

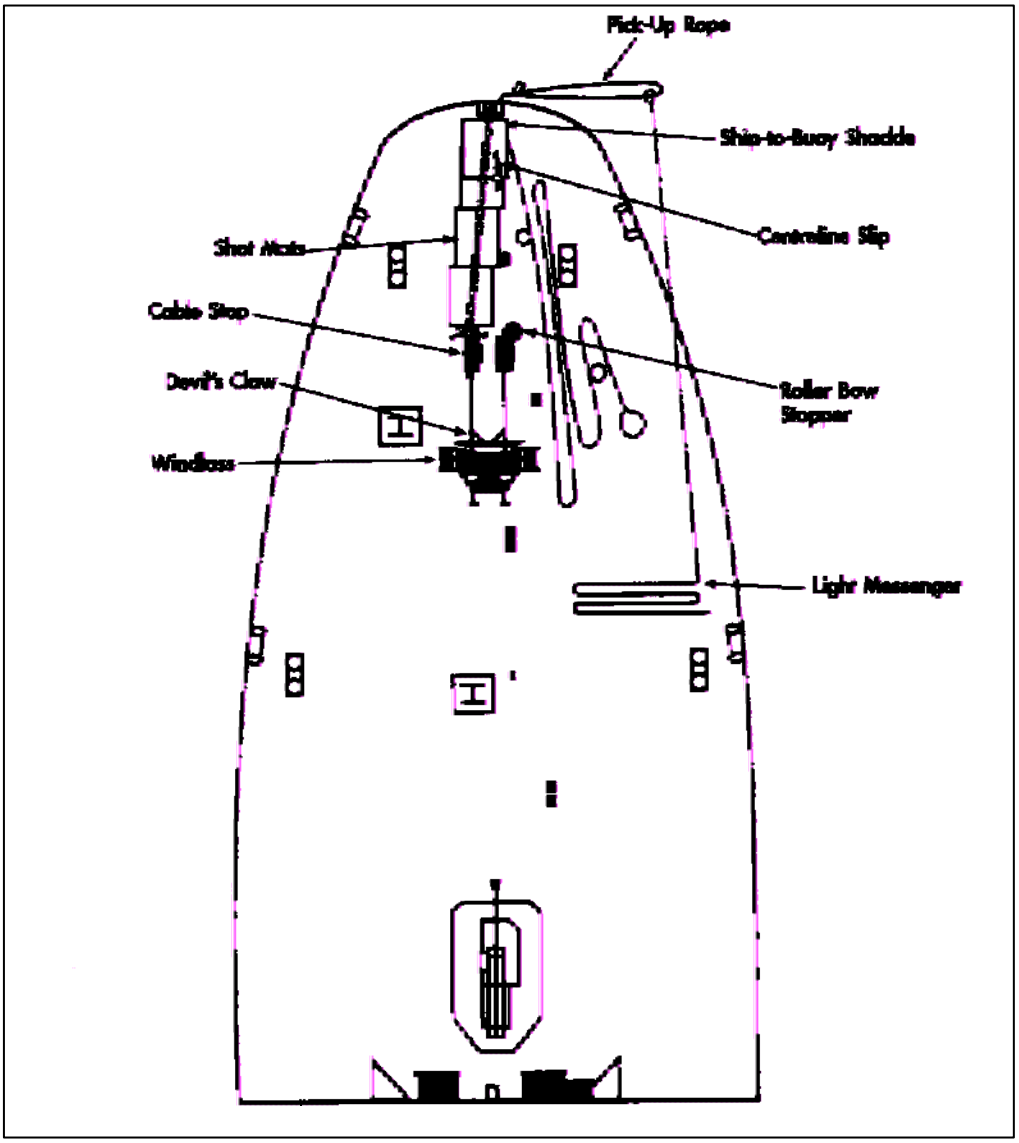


Figure 7.16-4 - KINGSTON Class Coming to a Buoy Equipment Layout

Preparation and Equipment Layout

(**1**) In order to ensure that there is sufficient power (600v) available to start the windlass, permission is obtained from the Engineering Officer of the Watch. Once done, power is applied and the clutch engaged.

(**2**) The blake slip is secured to the centreline deck clench.

(**3**) Shot mats are placed on the deck from the centerline deck clench forward to the bullring and under the Devil's Claws, in order to protect the deck.

(**4**) The brake is released and the mooring cable is veered until the joining shackle is on the deck. The brake is reapplied. A cable bar is inserted through a link of cable between the windlass and naval pipe.

(**5**) The mooring cable is broken at the lugless joining shackle.

(**6**) The brake is released and bullropes are used to assist in ranging sufficient cable out on deck to allow for the ship-to-buoy shackle to hang 4 to 6 feet above the waterline once it is passed through the bullring (Hanging Judas). The brake is re-applied.

(**7**) The ship-to-buoy shackle is secured to the end of the mooring cable with a lugless joining shackle.

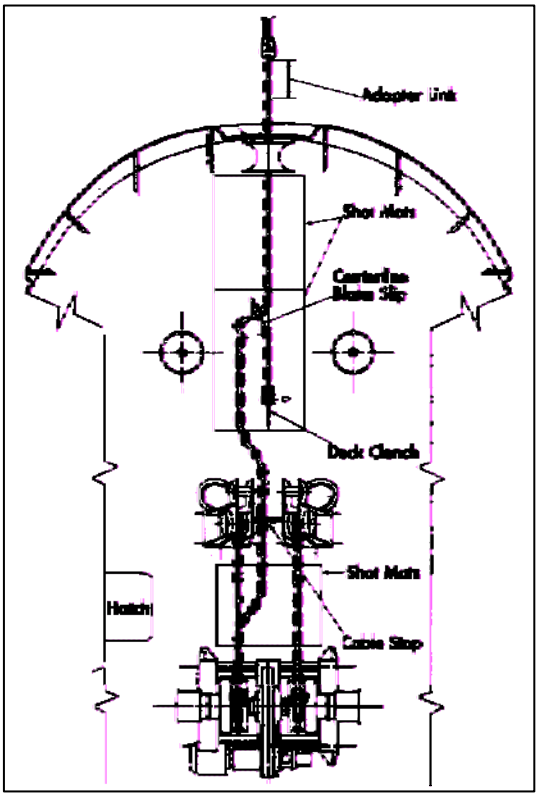
(**8**) A four-foot tag line is attached to the cable 4 links inboard from the ship-to-buoy shackle.

(**9**) The brake is released. Using bullropes and the tag line, the ship-to-buoy shackle is heaved forward and through the bullring, and lowered so that the cable is riding on the brake, suspended 4 to 6 feet above the waterline. Note: positive control of the cable must be maintained.

(**10**) The picking-up rope is faked down fore and aft on the starboard side of the focsle. The outboard end is passed through the bullring such that the wire strop and snap hook are outside of the bullring.

(**11**) The light messenger is faked down athwartships on the starboard side of the focsle and tied on to the picking-up rope.

Figure 7.16-5 - KINGSTON Class Cable Arrangement for Coming to a Buoy



7.16.3 Mediterranean Mooring General

a. Of all classes of ship in the Canadian Navy, the KINGSTON Class is best-suited to conduct a Med Moor due to the twin anchor arrangement, and the excellent view aft from the bridge. Still, it is unlikely that a Med Moor will become a frequent occurrence, as the KINGSTON Class rarely deploys to those areas where Med mooring is common.

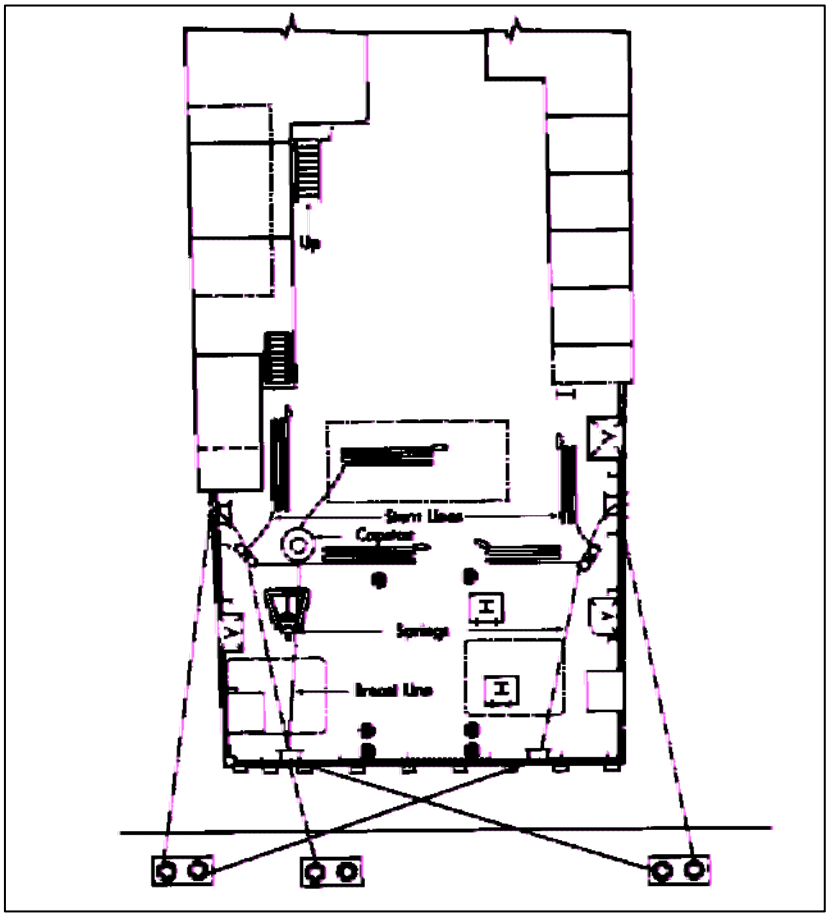


Figure 7.16-6 - KINGSTON Class Mediterranean Mooring Arrangement

b. **Preparation and Equipment Layout.**

(**1**) Due to the scope of the many concurrent tasks inherent to the conduct of a Med moor, all off-watch personnel are required to close up as line handlers.

(**2**) The focsle is prepared for coming to anchor. If berthing in a nest, hawsers will be required between focsles.

(**3**) Berthing hawsers are brought up from the Z-Drive Compartment and an extra line is brought aft to the Sweep Deck from the focsle.

(**4**) Two hawsers are faked down fore and aft on the Sweep Deck forward of the bollards on either side. They will be crossed once passed to the jetty via the after fairleads to prevent side-to-side

movement. The location of the lines may have to be shifted if a payload package is embarked, e.g., Mechanical Mine Sweeping (MMS) package.

(**5**) Two hawsers are faked down athwartships aft of the MMS winch platform. They will be led through the after quarter fairleads and used as foresprings.

(**6**) A fifth hawser to be as a breast line, is faked down athwartships on the MMS winch platform. This will be the first line passed ashore with a direct lead aft to assist in holding the stern onto the jetty.

7.17 VICTORIA CLASS

Figure 7.17-1 - Blake and Screw Stoppers

TBP

Figure 7.17-2 - VICTORIA Class Upper Deck Fittings

TBP

Figure 7.17-3 - Arrangement of Capstan and Anchor Gear in Casing TBP

7.17.1 Anchoring

a. **Personnel Required.**

(**1**) Casing officer
(**2**) SCRATCHER
(**3**) Dickie
(**4**) Communications number
(**5**) Swimmer

b. **Equipment Required**

(**1**) General casing bag
(**2**) Capstan & windlass control bar
(**3**) Rescue bag and reel
(**4**) Casing jewellery as required
.

c. **Procedure**

(**1**) Personnel will man the casing. The anchor compartment flap is then removed and the anchor made ready for letting go. Ceremonial gear is erected and anchor lights rigged if required. Communications are established with the bridge by voice, PRC, or hand signals. The anchor is made ready for letting go as follows:

(a) off compressor,
(b) clutch in,
(c) veer the anchor out until it is a'cockbill,
(d) on brake and Blake slip,
(e) clutch out, and
(f) report anchors a'cockbill riding on the brake and Blake, ready for letting go.

7.17.2 Weighing Anchor

a. **Personnel Required.**

(**1**) Casing officer
(**2**) SCRATCHER
(**3**) Dickie
(**4**) Communications number
(**5**) Swimmer
(**6**) One man to operate cable wash down

b. **Equipment Required.**

(**1**) General casing bag
(**2**) Capstan & Windlass control bar
(**3**) Rescue bag and reel

c. **Procedure.**

(**1**) When the cable party closes up, the windlass is connected up with the brake on.
(**2**) When the casing officer receives the order to weigh anchor or shorten in, he will, in turn, give the order heave in and switch on cable wash.
(**3**) When the anchor leaves the water, the speed of heaving in must be decreased to allow the anchor to tumble and be in the correct position to enter the anchor pocket.
(**4**) The anchor should be prepared for letting go and not secured until the order to do so is received from the OOW/Captain.
(**5**) Secure the anchor for sea as follows:
(a) heave in the anchor fully home with the windlass,
(b) on guillotine,
(c) on blake slip,

(d) out clutch,
(e) lash cable, bottlescrew and, blake slip,

7.17.3 Coming to Buoy

Figure 7.17-4 - VICTORIA Class Coming to a Buoy

a. **Personnel Required.**

(**1**) Casing officer
(**2**) SCRATCHER
(**3**) Dickie
(**4**) 2 M/S and below
(**5**) Swimmer

b. **Equipment Required.**

(**1**) General casing bag
(**2**) Capstan & windlass control bar
(**3**) Ship-to-buoy shackle
(**4**) No. 1 Line
(**5**) Man overboard bag & reel
(**6**) Casing Jewellery as required

Procedure.

(**1**) When the picking-up rope (No. 1 Line) is faked out ready on the casing. The buoy jumper wears a full safety harness attached to a tended line. Either a bollard strop or Blake slip is rigged over the forward bollards and the forward fairlead is put into position.
(**2**) When the submarine is close enough to the buoy, the order will be given "BUOY JUMPER TO THE BUOY". Once he is on the buoy, the picking-up rope is passed to him and he passes it through the buoy shackle.
(**3**) Buoy jumper returns to the casing.
(**4**) The other end of the picking-up rope is taken to the capstan.
(**5**) Heave in until the buoy is under foot.
(**6**) Buoy jumper returns to the buoy with cable bag.
(**7**) Once on the buoy, the cable is passed to the buoy jumper, who then secures it to the reducing link on the buoy using the ship to buoy shackle.
(**8**) Buoy jumper returns to the casing.
(**9**) Heave in on the cable, and slacken off on the picking-up rope.
(**10**) Buoy jumper returns to the buoy and removes the picking-up rope and returns to the casing.
(**11**) Veer the cable to the required length so that the submarine is safe to swing around the buoy.
(**14**) Secure casing.

7.17.4 Slipping from a Buoy

a. **Personnel Required**

(**1**)Casing officer
(**2**) SCRATCHER
(**3**) Dickie
(**4**) 2 M/S and below
(**5**) Swimmer

b. **Equipment Required.**

(**1**) General casing bag
(**2**) Capstan & windlass control bar
(**3**) Ship-to-buoy shackle
(**4**) No. 1 Line
(**5**) Man overboard bag & reel

c. **Procedure.**

(**1**) To slip from a buoy, the picking-up rope is used as a slip rope by using the soft eye end.
(2) Pass the soft eye, end down, through the starboard mooring pipe and back on to the casing. The hook end is then taken to the capstan.
(**3**) In clutch.
(**4**) Off compressor.
(**5**) Off brake.
(**6**) Heave in on the cable until the buoy is under foot.
(**7**) When ordered, "Buoy jumper to the buoy".
(**8**) Pass the soft eye end of the picking-up rope to the buoy jumper, who will pass it through the buoy shackle and back through the starboard mooring pipe.
(**9**) Pass the soft eye through the starboard mooring pipe and secure it to the Blake slip.
(**10**) Buoy jumper returns to the casing.
(**11**) Heave in on the slip rope until the slip rope has the strain.
(**12**) Veer on the cable until there is enough slack on the cable to take off the ship-to-buoy shackle. Buoy jumper returns to the buoy to slip the ship-to-ship buoy shackle.
(**13**) Bring the cable and shackle back onto the casing.
(**14**) Buoy .jumper returns to the casing.
(**15**) Veer on the capstan until the buoy is clear of the bow, turn up on the capstan (or bollards).
(**16**) Remove the ship-to-buoy shackle.
(**17**) Heave in on the cable and guide it back through the hawse pipe and under the casing.
(**18**) Using the lugless shackle connect up the cable again to the anchor.
(**19**) On the order "Slip" knock off the Blake slip and heave in the slip rope.
(**20**) Depending on the situation, prepare the anchor for letting go or secure the anchor for sea.
(**21**) Secure the casing.

7.18 ORCA

7.18.1 Anchoring

PERSONNEL: a. 1 I/C Cable Party (minimum QL5/QL2 ORCA qualified BOATSWAIN)
b. 1 cable worker

EQUIPMENT: two hard hats, two sets of safety glasses, PRC, clutch handle, windlass controller, small sledge hammer, pry bar, hose for anchor built-in wash down system, flashlight

FITTED EQUIPMENT

1. A Pool TW type 270 kg high holding anchor is mounted in the anchor pocket on the starboard side between frames 28 and 29. The anchor is connected to 165 meters of 17.5mm U2 stud link chain (541 feet or 6 shackles) and is raised and lowered using the VRC 11000 vertical anchor windlass.

2. A chain stopper is installed at the mouth of the hawse pipe on the raised main deck. The hawse pipe is equipped with a built-in wash down system for washing the anchor and chain upon recovery.

3. The deck locker is located on the starboard waist at frame 9 and is equipped with stowage racks for storing hawsers, mooring and towing lines and equipment required to support anchoring, mooring/berthing operations.

VERTICAL WINDLASS DETAILS

1. The VRC 11000 vertical anchor windlass is located to port of the centerline at frame 28. A hatch to the port side of the windlass leads to the chain locker below. The anchor chain is fed from the chain locker, through a hawsepipe to the deck level and to the anchor pocket on the starboard side of the vessel.

2. The windlass is powered by an electric motor through a single stage drive reduction and has a recovery speed of 12 m/min. The windlass consists of a single gypsy and a single capstan mounted on a stainless steel drive shaft supported by low friction bearings, mounted on a bronze base plate.

3. The capstan is keyed directly to the drive shaft and the gypsy is driven through the windlass clutch. The chain gypsy can be free wheeled by inserting the clutch handle into the capstan head and disengaging the clutch. The brake band is then used to control the run of the anchor and chain.

WARNING: The winch must be motionless whilst the windlass clutch is engaged or disengaged.

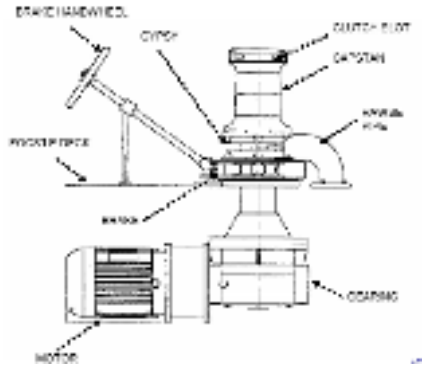


Figure 7.18-1

On hearing the pipe for Special Sea Dutymen, cable party closes up. The CBM proceeds to the forward cabin and ensures the power is on to the capstan.

PROCEDURES FOR GOING TO ANCHOR

1. Ensure power is on to capstan controller;

2. Plug in hand held controller for capstan;

3. Ensure brake is engaged;

4. Disengage clutch on capstan using clutch handle and inserting into clutch slot located top of the capstan. (you may have to heave in or veer to allow the capstan clutch to disengage from the of the gypsy). Fully disengage the capstan from the top of the gypsy to ensure gypsy is free for running.

5. Cable I/C reports to bridge **"**THAT THE ANCHOR IS READY FOR LETTING GO RIDING ON THE BRAKE AND CHAIN STOPPER."

6. Upon hearing that the ship is one cable back from the anchorage position lift the chain stopper; chain stopper is installed at the mouth of the hawse pipe on the raised main deck. Cable I/C reports to the bridge "ANCHOR IS RIDING ON THE BRAKE READY FOR LETTING GO". At the 1 cable mark cable I/C will ensure that cable party is wearing eye protection.

7. Upon hearing the command "LET GO" from the bridge Cable I/C shouts "OFF BRAKE" cable worker releases brake and the anchor pays out under control using the brake to control the speed of the anchor cable paying out from the cable locker around the gypsy. Cable I/C reports to the bridge every time he sees a shackle mark passes around the gypsy and pays out shackles as directed.

8. If the Bridge wants Cable I/C to snub the cable at a particular shackle on deck he will order the cable worker manning the brake "ON BRAKE" as directed. The cable I/C will report to the Bridge "1,2,3 *ETC* SHACKLES SNUBBED ON DECK SIR" The cable I/C will report the state of the anchor cable to the Bridge. Cable I/C reports " "CABLE GROWS (UP AND DOWN or SHORT STAY FWD/PORT/STARBOARD or AROUND THE BOW or LONG STAY FORWARD/PORT/STARBOARD)." Bridge will order "LET GO" the predetermined number of shackles on deck. Cable I/C will order "OFF BRAKE" cable worker will release brake and pay out the cable under control to the required amount of cable in on deck. Once the cable I/C sees the appropriate cable marking he will report "ON BRAKE, 1,2,3, *ETC* SHACKLES ON DECK."

NOTE: Cable I/C must ensure that shackle mark is located around the gypsy and the lugless joining shackle is a position inside of the cable stopper. This will allow the cable I/C to brake the lugless joining shackle, and leave the anchor on the seabed if the ship experiences problems with anchor windless.

9. The cable I/C will continually report the state of the cable to the bridge. Once he sees that the ship has her anchor he will report to the bridge "SHIP HAS HER CABLE."

10. Bridge will secure the cable party and have the cable watch report the state of the anchor cable every 15 minutes.

11. Cable I/C will ensure brake is on and engage the capstan clutch. Cable I/C will order "OFF BRAKE, (VEER/HEAVE IN) HANDSOMELY." The cable I/C will middle the weight between the chain stopper and the brake. Once the weight is middled between the brake and the chain stopper cable I/C will order "ON BRAKE." Cable I/C will report to the bridge "1,2,3 *ETC* SHACKLES ON DECK ANCHOR IS MIDDLED BETWEEN THE BRAKE AND CHAIN STOPPER READY FOR LETTING GO. PERMISSION TO SECURE THE CABLE PARTY." OIC/2IC orders "SECURE CABLE PARTY." Once the cable party is secured by the bridge the cable I/C will disengage the capstan in case the ship has to pay out more cable on short notice.

12. Cable party I/C secures the cable deck and turns over the state of the cable to the cable watch and briefs them on when the bridge wants the state of the cable reported usually every fifteen minutes.

Ship is at anchor and cable watch will remain closed up for the duration of the anchorage, reporting the state of the anchor every 15 minutes to the bridge which is also manned for the duration of the anchorage.

7.18.2 Weighing Anchor

PROCEDURES FOR WEIGHING ANCHOR

Upon hearing the Pipe "SPECIAL SEA DUTYMEN CABLE PARTY CLOSE UP" cable party I/C will ensure power is on the capstan winch.

1. Cable party will report to the FX and get a turn over from the cable watch on the state of the anchor. Once he has got a turn over from the cable watch he will report to the bridge "CABLE PARTY IS CLOSE UP AND READY TO WEIGH ANCHOR."

2. Bridge will order, "WEIGH ANCHOR" cable I/C will engage clutch and order "OFF BRAKE, HEAVE IN" as soon as the weight of the cable is off the chain stopper he will rotate the chain stopper off of the anchor cable and continue to heave in. The Cable worker will man the cable wash down hose and hose down the cable as is brought back onboard. The cable I/C will report every shackle mark to the bridge every time he sees a shackle mark pass around the gypsy to the bridge. Cable I/C will report to bridge as soon as the anchor is aweigh from the seabed and when the anchor is in sight. Once the anchor is at a-cockbill he will order, "AVAST". At this time the cable I/C will ensure that the cable worker cleans any mud or debris off the anchor and the cable I/C will report to the Bridge "ANCHOR IS CLEAR". Once the cable I/C is happy the anchor is clear he will continue to heave in. The cable I/C will heave in the anchor until it is pulled fully into the anchor pocket then order "AVAST, ON BRAKE."

NOTE: There is only one speed for recovery of the anchor cable on ORCA class vessels. The winch is designed to recover the anchor cable at rate of 12 meter per minute or 2.5 minutes per shackle.

3. The cable I/C will ensure the chain stopper is engaged and the brake is on. The cable I/C will secure the cable party and associated gear and report to the bridge, and the state of the anchor to the OOW. Cable I/C will report, "OOW, SIR, CABLE I/C. ANCHOR SECURED FOR SEA RIDING ON THE BRAKE AND CABLE STOPPER." OOW will respond, "VERY GOOD."

NOTE: When underway the CBM must ensure that the capstan clutch is engaged at all times. With

the capstan engaged this will ensure that the anchor will not release from the anchor pocket if the brake is accidentally released.

Additional guidance for ORCA Class can be found in MOG 4's ORCA SOPs.

CHAPTER 8

Towing

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8.1 INTRODUCTION

Towing provides a means of moving ships to safety when they become disabled HMC ships can be called upon at short notice to render assistance to other vessels and are equipped to supply or receive a tow either forward or aft. They also carry equipment that is compatible with ships of other navies. Under normal circumstances the towing ship will supply the tow, but each situation will dictate the requirements. Equipment, procedures and instruction relating to ship-to-ship towing between NATO warships is covered in ATP 43 Ship-to-Ship Towing. ATP 43 also addresses methods of towing structurally damaged ships. Commanding Officers and senior seamanship personnel should refer to ATP 43 and the Canadian Navigation Manual for additional information on towing operations.

8.2 APPROACH

The approach on a disabled vessel is dependent on many factors. Wind and current affect the drift and yaw rate, and how the vessel is oriented. Usually a disabled ship will be approached from the windward side. This eliminates the risk of the disabled ship drifting down upon the towing ship during the final phase of the approach. The towing ship aims to pass close abeam to facilitate firing of the gunline, and then stops with her stern 100-150 feet from the disabled ship. At this range, the gear can be passed quickly and safely.

8.3 TOWING SPEED

a. The speed of a tow depends on the power of the towing ship, the strength of the towing hawser, the tonnage and type of ship under tow and circumstances and conditions prevailing at the time. The towing power of a tug is usually expressed as bollard pull and the strength of a tug's towing hawser will usually match its maximum bollard pull. However, the power of a warship will usually be capable of exceeding the breaking strain of her towing hawser, so it will only require comparatively low propulsion power to conduct a tow for which she has provided the towing hawser. Examples of the approximate pull required in a tow to achieve a given speed for a ship of a given type and displacement are shown in Fig 8.3.2. These examples assume the tow is conducted in calm weather and the bottom of the towed ship is clean.

b. To calculate a safe loading on a towing hawser a factor of safety should be applied based on the urgency of the tow, duration of the tow, state of the casualty, weather conditions, etc. For long distance tows, a high factor of safety should be applied to reduce the safe towing pull that should be used. This factor of safety, usually between 3 and 8, is a divisor of the towing hawser's breaking load. For example, if a towing hawser has a breaking load of 40 tons and a factor of safety of 4 is considered appropriate, the towing hawser should not be subjected to a load greater than 10 tons. Fig 8.3.1 provides safe towing pulling loads with safety factors for various sized hawsers. Fig 8.3.2 and Fig 8.3.3 provide towing speeds achieved with specific towing pulls on various types of ships.

c. To use the graphs in Figs 8.3.2 and 8.3.3:

(i) Choose a factor of safety between 3 and 8;
(ii) Determine the safe towing pulls based on hawser diameter using Fig 8.3.1

(iii) Select the safe tow speed from Fig 8.3.2 or 8.3.3

For example using a FOS of 7 with 64mm diameter nylon rope, the allowable tow force is 10 ton, which translates to 11.5 kts speed when towing a 3000 ton frigate with 2 propellers trailing.

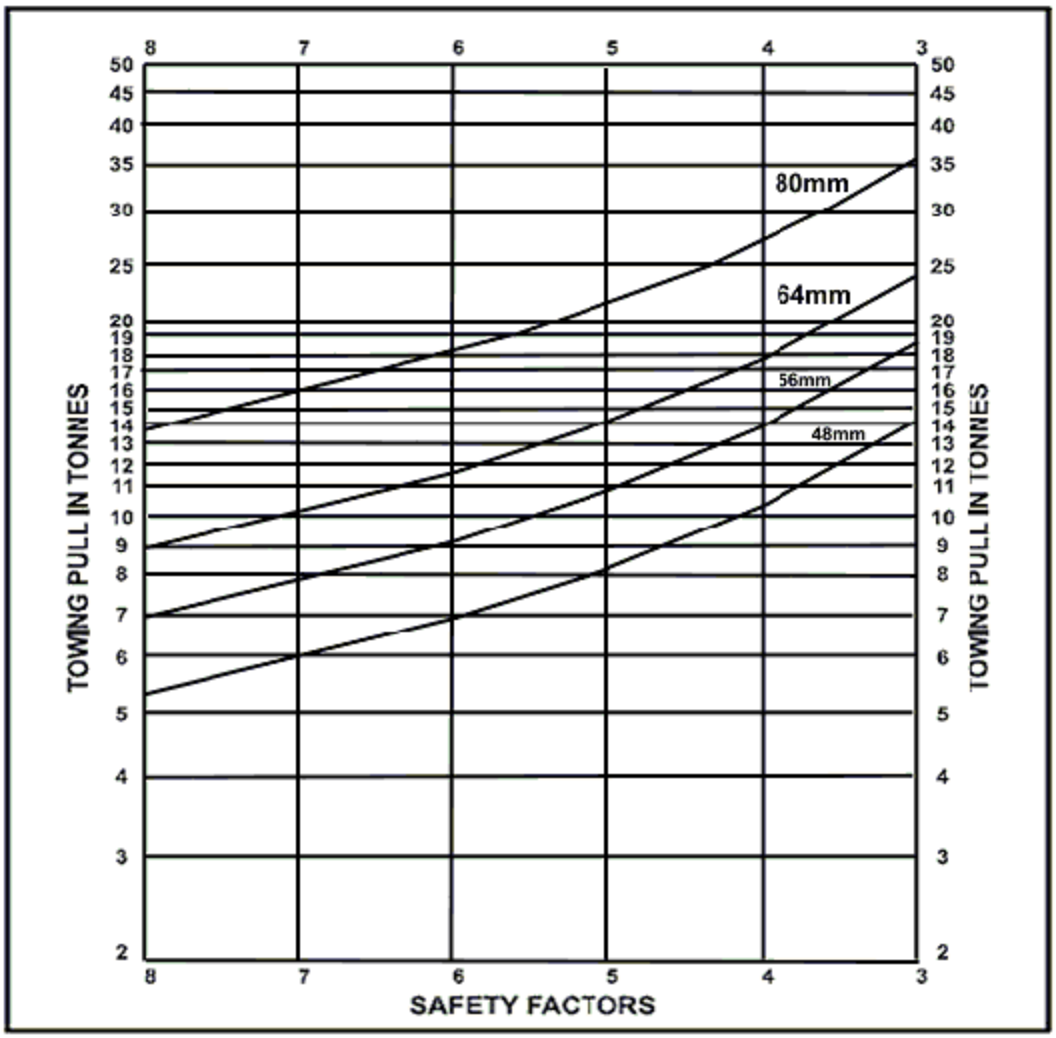

Figure 8.3.1 – Safe Pulling Loads for Polyamide (Nylon) with Safety Factors

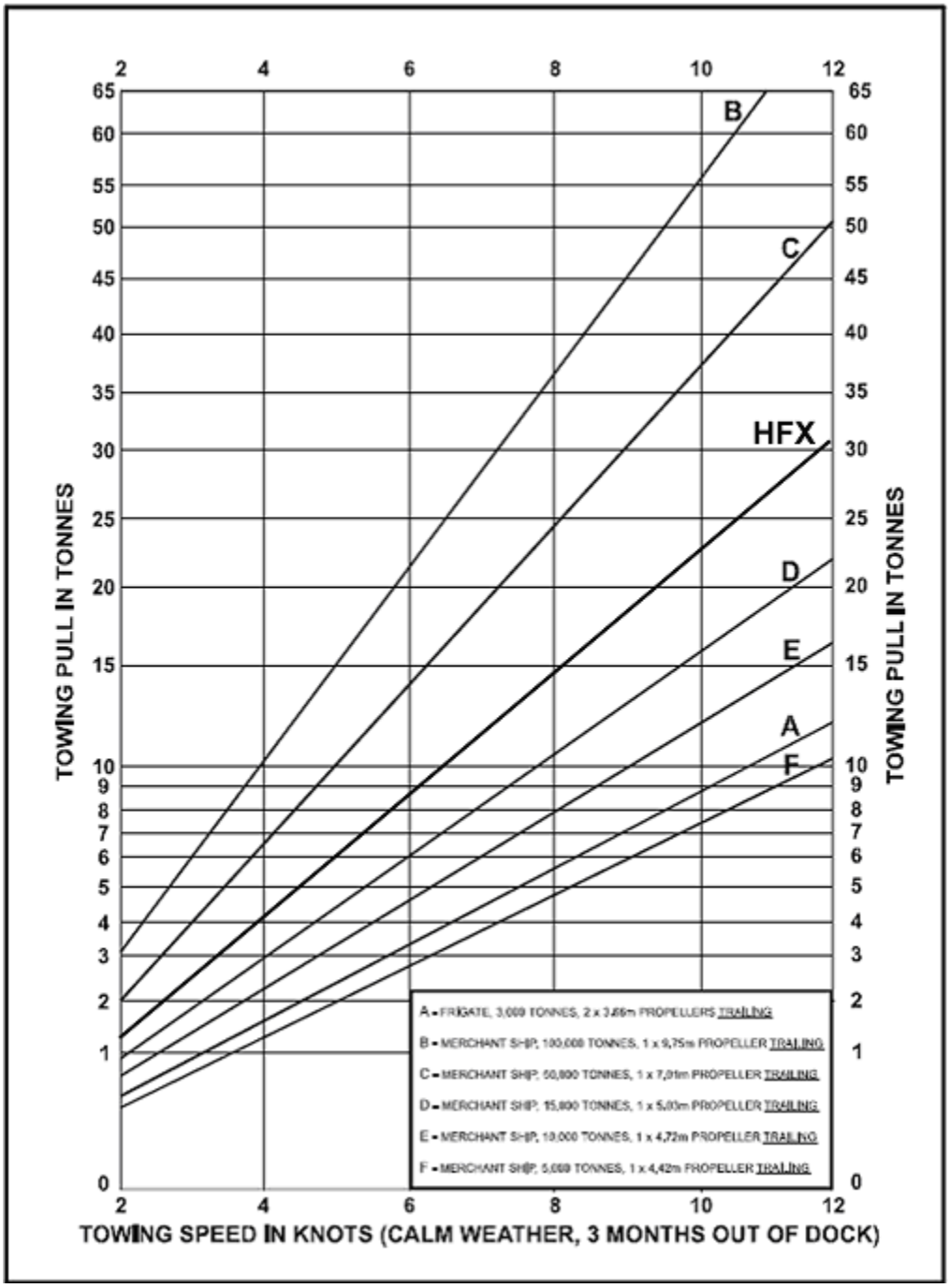

Figure 8.3.2 –Towing Speeds Achieved with Specific Towing Pulls on Various Types of Ships with Propellers Trailing

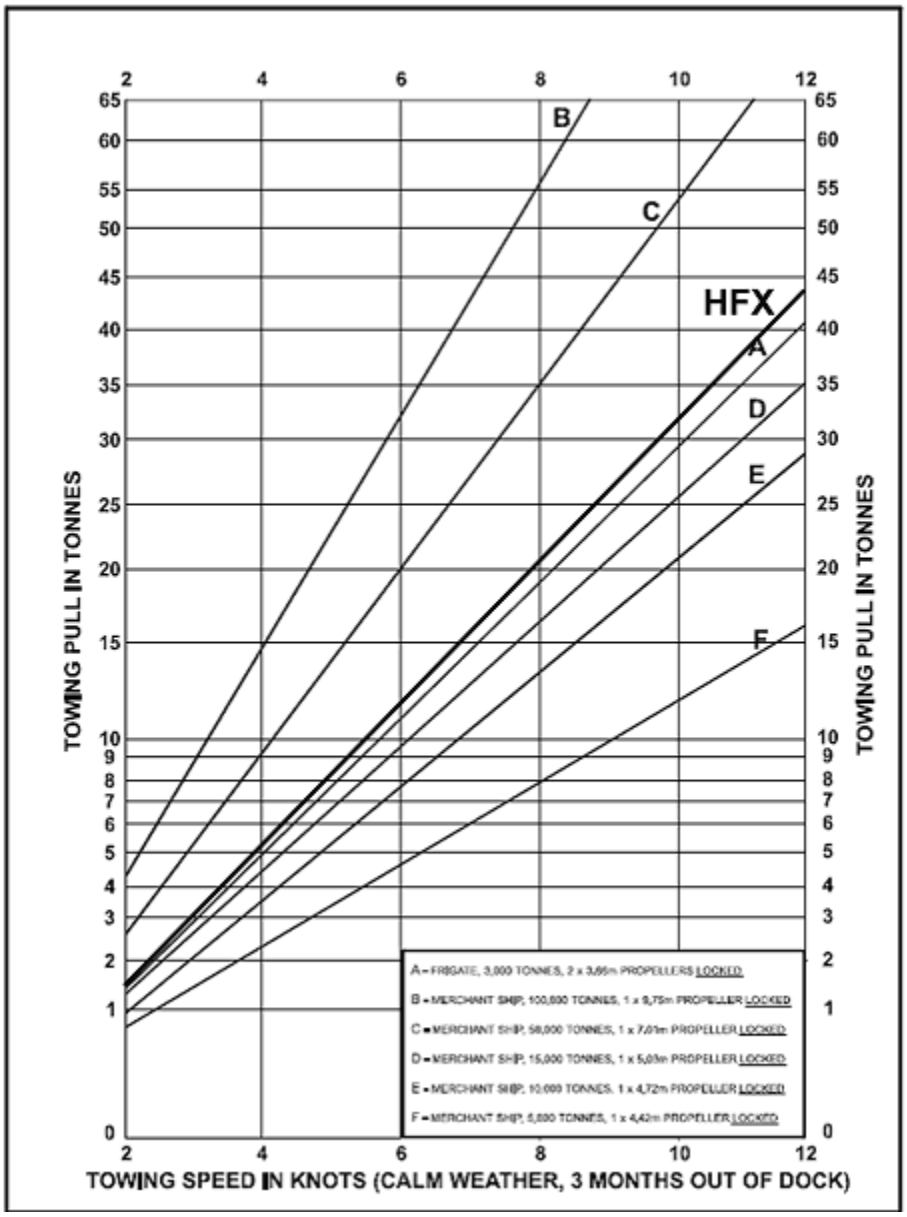

Figure 8.3.3 - Towing Speeds Achieved with Specific Towing Pulls on Various Types of Ships with Propellers Locked

8.4 COMMUNICATIONS

a. **External**. A disabled vessel should, if possible, communicate with the towing vessel using radio, flashing light or flag hoist. Information such as the disabled ship's heading, rate of drift and yaw, and any relevant engineering information are helpful to the Commanding Officer of the towing ship. The disabled vessel should also signal when she is ready to be towed. Communications between personnel on the quarterdeck of the towing ship and on the focsle of the disabled vessel while passing the gear are accomplished using standard replenishment communication equipment and signals. Commanding Officers should ensure that communications are established and maintained throughout the tow between the disabled vessel and the towing vessel.

b. **Internal.** When towing another vessel, reliable communications between the quarterdeck and the bridge are vital. The Executive Officer is stationed on the quarterdeck in order to provide the Captain with a command appreciation of the relative movements of the ships, and to provide recommendations for engine orders. The Executive Officer communicates with the bridge using the ship's internal communication system and a PRC as secondary Comms. During the approach, and while the gear is being passed, the Commanding Officer relies upon reports from the quarterdeck on the overlap and range to the disabled vessel. As the gear is being passed, the quarterdeck must report the location of the messengers and towing hawser. The quarterdeck and bridge must work together, controlling the rate at which the gear is passed and any use of engines required to manoeuver in order to avoid fouling the propellers. Once it is established, the quarterdeck must monitor the tow carefully, assessing the strain on the towing hawser, and making recommendations to the bridge as speed is increased.

8.5 METHODS OF ESTABLISHING CONTACT

There are a variety of methods used to establish contact with a vessel which requires towing. Establishing contact for a grounded vessel or a vessel drifting on to a lee shore will be different than for a vessel dead in the water on the high seas. A calm weather contact will differ from a foul weather one. The primary method of establishing contact is by gunline or bolo. Other methods are by boat, by streaming the messengers astern on a float, or even by helicopter. Command, with recommendations from the CBM/Deck O, will determine the method to be used. Whichever method is used, it is imperative that the tow is passed as quickly and as safely as possible.

Figure 8.4-1 - IROQUOIS Class Receiving Heavy Messenger Forward

8.6 TOWING EQUIPMENT USED BY HMC SHIPS

The following is a list of common towing equipment found on HMC ships. Weight and size of the equipment will vary depending on the class and tonnage of the vessel:

a. **Towing Slip.** The towing slip is located on the quarterdeck and is fixed to the towing cleat.
b. This provides a means of slipping the tow at a moment's notice in the event of an emergency.

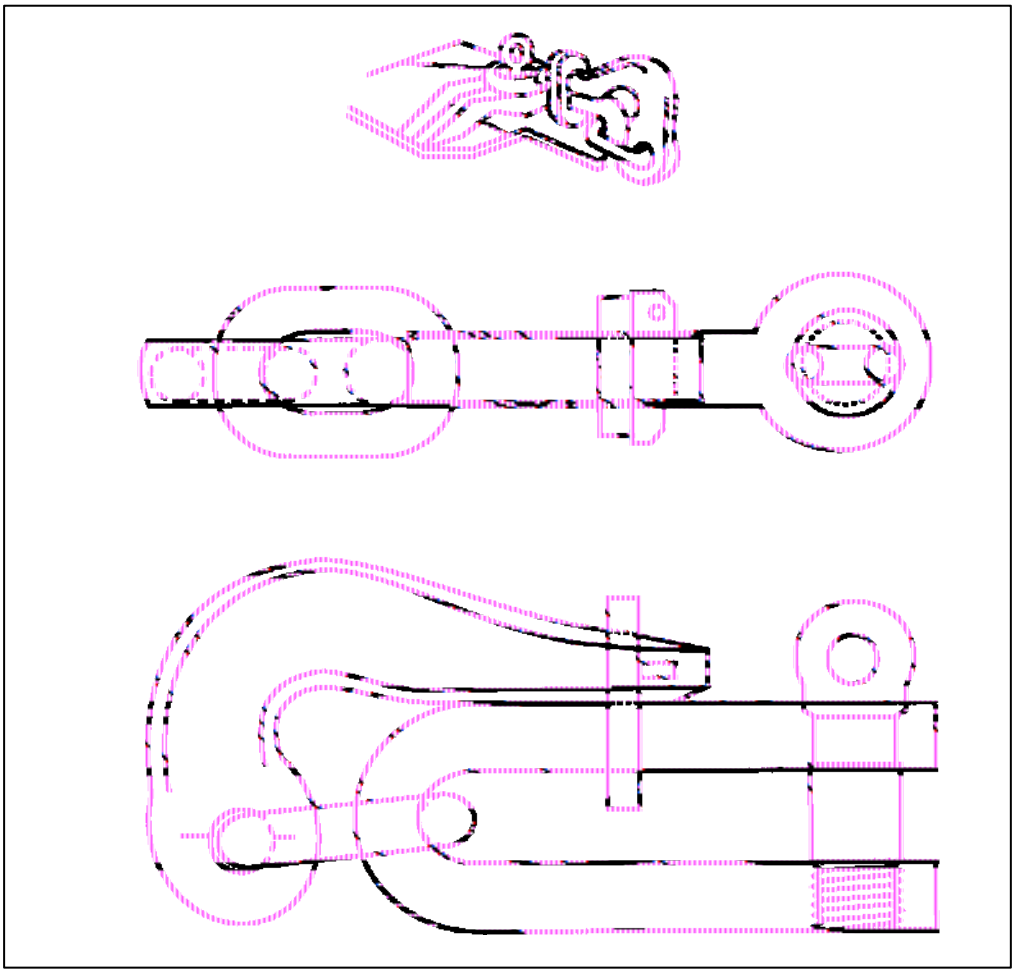

Figure 8.6-1 - Towing Slip

b. **Towing Pendant**. The towing pendant, used to counter chafing, is a wire pendant with hard eyes spliced at both ends. One end is shackled to the towing hawser by a Baldt anchor shackle. The other end uses a towing shackle and a NATO link, to connect the towing pendant to the towing slip.

c. **Towing Shackle**. The towing shackle is a lugged joining shackle. It is used to secure the towing pendant to the towing slip, or the towing hawser to the ship's cable.

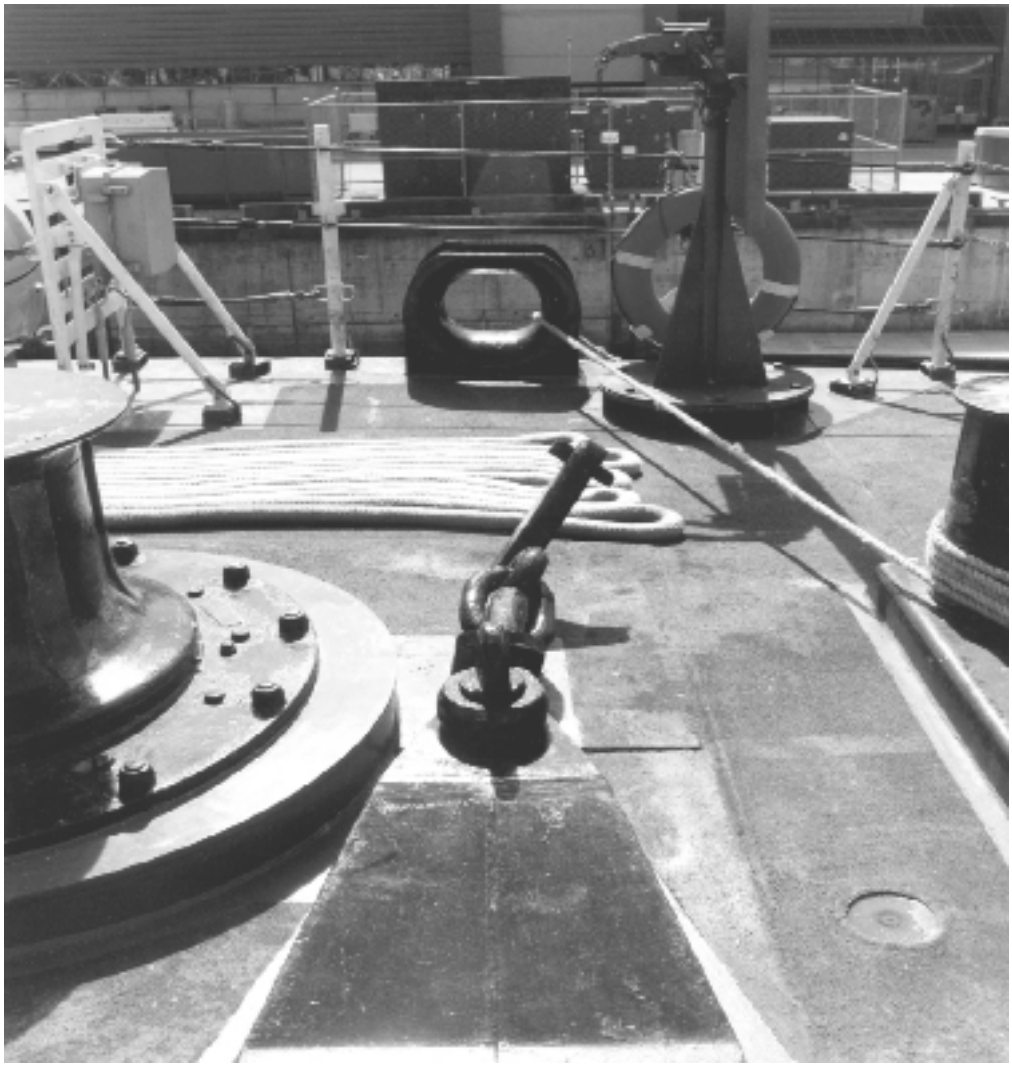

Figure 8.6-2 - Towing Slip HALIFAX Class

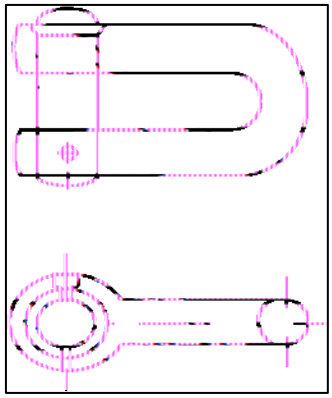

Figure 8.6-3 - Towing Shackle

d. **Towing Hawser**. The towing hawser is a double-braided nylon line. It varies in size and length depending on the class of ship. (See Table 8.6-2).

e. **Baldt Anchor Shackle**. The Baldt anchor shackle is used to attach the towing hawser to one of the following: the ship's cable, NATO link or towing pendant.

f. **Lugless Anchor Shackle**. The lugless anchor shackle may be used to attach the towing shackle to the towing pendant and the pendant to the towing hawser.

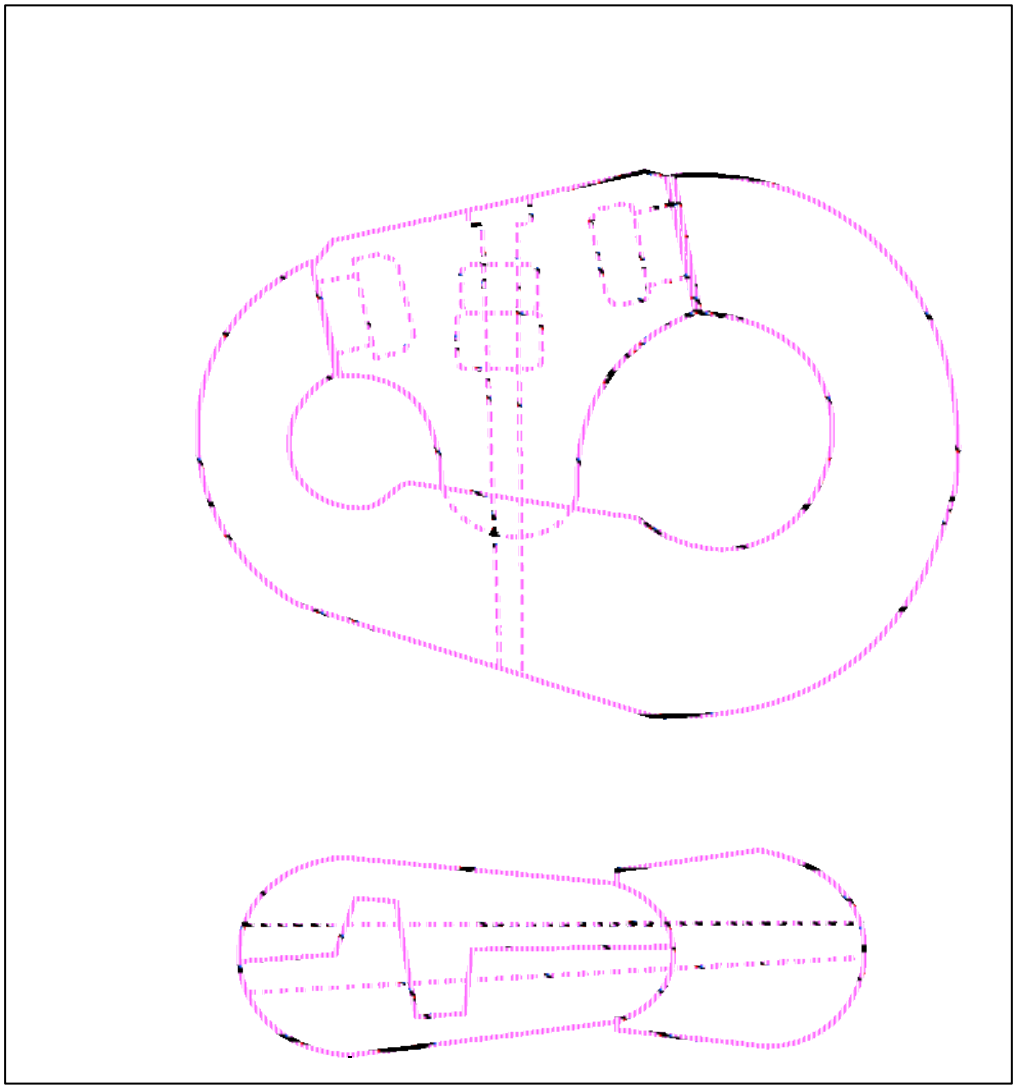

Figure 8.6-4 - Baldt Anchor Shackle

Figure 8.6-5 - Baldt Shackle

g. **NATO Link**. The NATO link is used to improve interoperability between the ship being towed and the ship towing. This link was manufactured to fit any cable equipment regardless of class of ship or country of origin. Its purpose is to connect the towing hawser to the cable of the ship being towed. If the ship being towed is also providing forward, then the NATO link will not be required. During towing exercises between two Canadian ships where the towing ship is providing aft, the NATO link is to be used in order to progress training.

Figure 8.6-6 - NATO Link

h. **Center Line Blake Slip.** The centreline blake slip is used to middle the weight of the cable between the brake and the blake slip. It should be placed on the cable forward of a lugless joining shackle so the tow can be slipped quickly in an emergency.

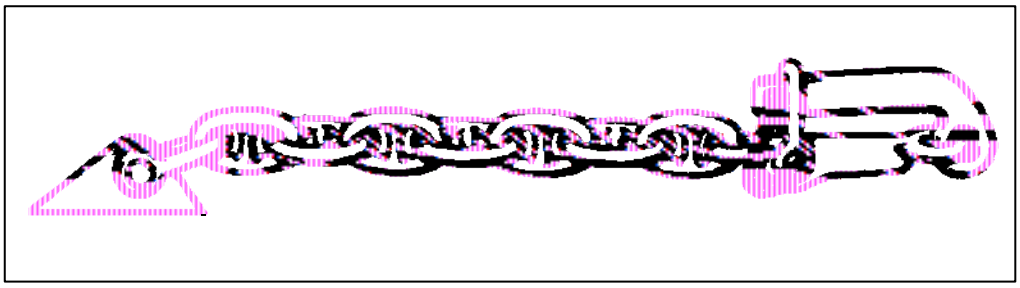

Figure 8.6-7 - Centerline Blake Slip

i. **Recovery Messenger.** The recovery messenger is a polypropylene line attached to the towing hawser when supplying aft. It is used to recover the towing hawser by creating a bight in the hawser.

j. **Common Associated Equipment Used in Towing.** The following table lists common miscellaneous non-fitted equipment that is required or necessary for towing evolutions, regardless of ship class.

Table 8.6-1 - Equipment	
Two line-Throwing Guns	Axe/4x4
Pry Bar	Comm Set
Bolo/Gunline Projectiles	Sledgehammer
Mousing Line/Wire	Paddles/Wands/Vests
Shot Mats	Bolt Cutters
Knife/Spike	Binoculars
Hard Hats	Grappling Hook
Cable Bag	Cable Jack
Ranging Line	Snatch Block
Bull Ropes	Tommy Bars
Safety Harnesses	Bollard Strop (509/510 only)
Chemlites	Bollard Slip (509/510 only)
Centerline Slip	Hazardous Duty Lifejackets

k. **Lines Used for Towing.** The following table lists the types and characteristics of all lines used during Canadian towing operations.

Table 8.6-2 - Lines Used during Towing			
Type	**Length in Meters**	**Diameter in Millimeters**	**Make**
Light Messenger	65	12	Polypropylene
Heavy Messenger	110	24	Polypropylene
Recovery Messenger	50	24	Polypropylene
Ranging Line	65	24	Polypropylene
Towing Hawser	**Length in Meters**	**Diameter in Millimeters**	**Make**
HALIFAX	336	64	Double-braided nylon
IROQUOIS	360	64	Double-braided nylon
KINGSTON	180	48	Sampson Polytron
PROTECTEUR	336	80	Double-braided nylon
VICTORIA	100	40	Double-braided nylon
ORCA	TBP	TBP	TBP
Towing Pendant	**Length in Meters**	**Dia in Millimeters**	**Make**
HALIFAX	7	38	FSWR
IROQUOIS	11	38	FSWR
KINGSTON	9	22	FSWR
PROTECTEUR	6.4	48	FSWR
VICTORIA	N/A	N/A	N/A

ORCA	TBP	TBP	TBP

*The PROTECTEUR Class towing hawsers are marked at the inboard end at the point where they are turned up on the bollard.

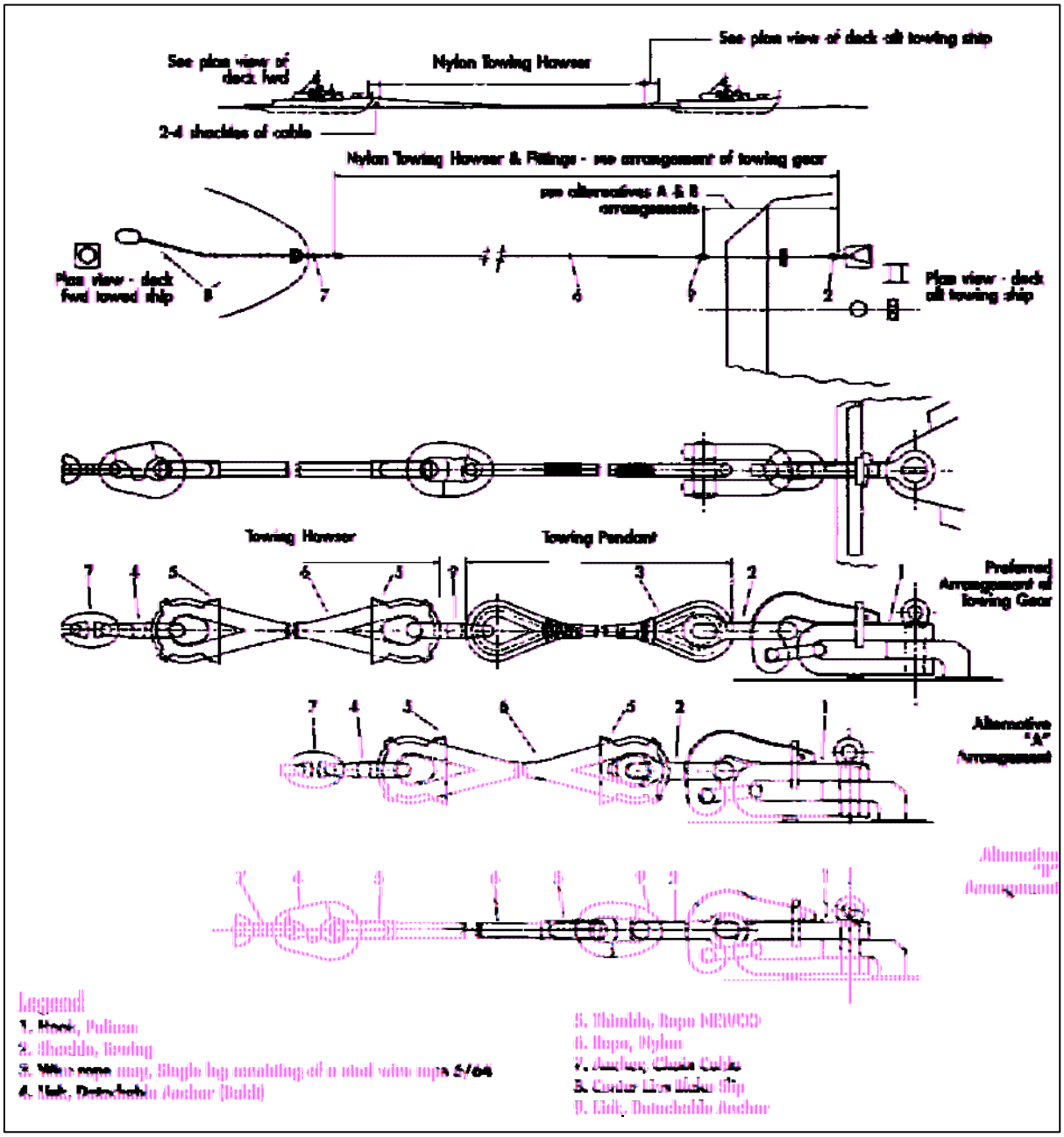

Figure 8.6-8 - General Towing Arrangement

8.7 PERSONNEL REQUIRED

In the HALIFAX and IROQUOIS Classes, RAS Team No. 1 is required for towing. In PROTECTEUR class, all off-watch Deck Department personnel are required to rig for towing and supplying the gear. Lower decks must be cleared to recover the tow. In the KINGSTON and ORCA classes, towing is an all-ship evolution.

8.8 SEQUENCE OF EVENTS SUPPLYING FORWARD AND RECEIVING AFT

Note: The towing ship will always pass the gunline.

Supplying Ship			Receiving Ship		
Order	**Signal**	**Action**	**Order**	**Signal**	**Action**
Show Red	One blast on whistle (Given)	Red paddle is held aloft and one blast is given on the whistle to indicate ready to fire gunline.	**Show Red**	Two blasts on whistle (Acknowledged)	Red paddle is held aloft and two blasts are given on the whistle to indicate ready to receive gunline and that personnel have taken cover.
		Gunline fired.			Gunline Received.
Avast	Avast (Given)	Gunline is attached to light messenger.	**Avast**	Avast (Acknowledged)	Gunline is taken in hand.
Check Away	Heave In (Given)	Light and heavy messenger are paid out hand over hand. The towing hawser is paid out as required.	**Heave In**	Check Away (Acknowledged)	Gunline is heaved in hand over hand until the light messenger is in hand. The messenger is then passed through the towing fairlead.
			Heave in the Heavy Messenger		Heavy messenger is walked in by forming a continuous circle until the towing shackle is on board.
Avast	Avast (Acknowledged)		**Avast**	Avast (Given)	The towing shackle is attached to the towing slip, then pinned and moused. Lashings are removed if required.

Supplying Ship			Receiving Ship		
Order	**Signal**	**Action**	**Order**	**Signal**	**Action**
			Check Away on the Heavy Messenger		Heavy Messenger is checked away to transfer the weight to the towing slip. Light and heavy messengers are coiled down in preparation for slipping.
	Hooked On (Acknowledged)		**Show Hooked on**	Hooked On (Given)	Hooked on is passed to indicate that all rigging complete.
Veer the Cable		Ship's cable is veered to desired number of shackles as ordered by Command.			Quarterdeck and aft end of flight deck cleared of non-essential personnel.
Pass the Center Line Blake slip		Center line blake slip is passed forward of the lugless joining shackle. Pin is inserted and moused.			
Veer the Cable		Cable is veered to middle the weight between the brake and blake slip.			
Show Hooked on	Hooked On (Given)	Hooked on is passed to indicate that all rigging is complete. Non-essential personnel are cleared aft of the breakwater.		Hooked On (Acknowledged)	
When commencing the tow, the XO and station supervisor will ensure that the towing hawser does not become fouled in the screws and that no undue strain is placed on the towing hawser as the ship starts to make way. While towing, the XO and station supervisor will watch for strain on the towing hawser and any irregularities in the rigging. The ship will secure the tow when the ship being towed is turned over to another vessel, is out of danger, or has rectified its engineering failure.					
Secure	Secure (Acknowledged)		**Secure**	Secure (Given)	
Heave In on the Cable		Ship's cable is heaved in so that the centerline blake slip can be removed.			

Supplying Ship			Receiving Ship		
Order	**Signal**	**Action**	**Order**	**Signal**	**Action**
Off Centreline Blake slip		Centreline blake slip is removed.			
Heave In on the Cable		Ship's cable is heaved in until sufficient towing hawser can be taken in hand.			
Give Prepare to Slip	Prepare to Slip (Given)	Towing hawser is taken in hand		Prepare to Slip (Acknowledged)	Three turns of the heavy messenger are taken around the bollard and backed up. Station workers remove mousing and pin and stand by with hammer to slip.
Slip	Slip (Given)		**Slip**	Slip (Acknowledged)	Towing pendant is slipped and eased out hand over hand.
Heave In	Check Away (Acknowledged)	Towing hawser is walked in by forming a continuous circle. Heavy and light messengers are recovered in the same manner.	**Give them Heave In**	Heave in (Given)	Heavy and light messengers are checked away hand over hand. When the strain is off the messengers, they are removed from the bollard and the bitter end of the light messenger is walked to the fairlead.
The bitter end of the light messenger is tossed over the stern and the supplying ship continues to heave in until the light messenger is on board.					

8.9 SEQUENCE OF EVENTS SUPPLYING AFT AND RECEIVING FORWARD

Supplying Ship			Receiving Ship		
Order	**Signal**	**Action**	**Order**	**Signal**	**Action**
Show Red	One blast on whistle (Given)	Red paddle is held aloft and one blast is given on the whistle to indicate ready to fire gunline.	**Show Red**	Two blasts on the whistle (Acknowledged)	Red paddle is held aloft and two blasts are given on the whistle to indicate ready to receive gunline and personnel have taken cover.
		Gunline fired.			Gunline received
Avast	Avast (Given)	Gunline is attached to light messenger.	**Avast**	Avast (Acknowledged)	Gunline is taken in hand.
Check Away	Heave in (Given)	Station workers check away light and heavy messengers hand over hand, keeping them clear of the screws.	**Heave In**	Check Away (Ackowledged)	Gunline is heaved in hand over hand until the light messenger is in hand. The messenger is then passed through the bullring.
		Towing hawser is paid out under control, keeping it clear of the screws.	**Heave In**		Light and heavy messengers are walked in by forming a continuous circle until the Baldt shackle is on board.
Avast	Avast (Acknowledged)		**Avast**	Avast (Given)	Baldt anchor shackle is secured to ship's cable, pinned and leaded.
			Check Away on the Heavy Messenger		Heavy messenger is checked away to transfer the weight to the ship's cable.
Hooked On	Hooked On (Acknowledged)		**Show Hooked On**	Hooked On (Given)	
			Remove the Heavy Messenger		Heavy messenger is removed. Light and heavy messengers are coiled down in preparation for slipping.
			Veer the Cable		Ship's cable is veered to desired number of shackles as ordered by Command.

Supplying Ship			Receiving Ship		
Order	**Signal**	**Action**	**Order**	**Signal**	**Action**
			Pass the Centreline Blake slip		Centreline blake slip is passed forward of the lugless joining shackle. Pin is inserted and moused.
			Veer the Cable		Cable is veered to middle the weight between the brake and blake slip.
	Hooked On (Acknowledged)		**Show Hooked On**	Hooked On (Given)	Hooked on is passed to indicate that all rigging complete.
When starting the tow, the XO and station supervisor will ensure that the towing hawser does not become fouled in screws and that no undue strain is placed on the towing hawser as the ship starts to make way. While towing, the XO and station supervisor will watch for strain on the towing hawser and any irregularities in the rigging. The ship will secure the tow when the ship being towed is turned over to another vessel, is out of danger, or has rectified its engineering failure.					
Secure	Secure (Given)		**Secure**	Secure (Acknowledged)	
			Heave In on the Cable		Ship's cable is heaved in so that the centreline blake slip can be removed.
			Off Centreline Blake slip		Centreline blake slip is removed.
			Heave In on the Cable		Ship's cable is heaved in until towing hawser is on board.
			Attach the Heavy Messenger		Heavy messenger is attached to the NEWCO thimble with a bowline. Three turns are taken on the bollard and backed up.
			Veer the cable		Cable is veered to transfer the strain from the cable to the heavy messenger.
Take the Recovery Messenger in Hand			**Break the cable**		Ship's cable is broken to remove it from the towing hawser.

Supplying Ship			Receiving Ship		
Order	**Signal**	**Action**	**Order**	**Signal**	**Action**
		Recovery messenger is taken in hand.			
Heave In	Check away (Acknowledged)	Recovery messenger is heaved in until the towing hawser can be taken in hand. The towing hawser is then walked in by conforming a continuous circle. Heavy and light messengers are recovered in the same manner.	**Give Them Heave In**	Heave In (Given)	Heavy and light messengers are checked away hand over hand. When the strain is off the messengers they are removed from the bollard and the bitter end of the light messenger is walked to the bullring.
The bitter end of the light messenger is tossed overboard and the supplying ship continues to heave in until the light messenger is on board.					

8.10 EMERGENCY BREAKAWAY

In the event that the towing ship must jettison the towing hawser in an emergency, the following actions will take place.

a. The ship will reduce speed to take some strain off the towing gear.

b. The towing pendant is then slipped from the towing slip and eased out of the towing fairlead by checking away on the heavy/recovery messenger. Once clear of the ship, the heavy/recovery messenger can be cut, if necessary.

c. The ship being towed can also jettison the towing hawser by breaking the joining shackle aft of the centreline blake slip and then tripping the slip.

d. When conducting non-standard tows, the vessel under tow should have a means of releasing the tow in an emergency (e.g. axe and chopping block).

NOTE: *Both of the above methods are extremely dangerous and personnel must be fully aware of the danger zone produced by the snap back or whipping of the cable. All non-essential personnel shall remain well clear.*

8.11 SEAMANSHIP BRIEFING

A tow can either be an evolution conducted in an emergency or a deliberate exercise conducted for

training. In either case, prior to conducting a tow, a Command brief shall be held. The following personnel will, as a minimum, be in attendance: Executive Officer, Deck Officer, Safety Officer, Chief Bosn's Mate, Senior Naval Communicator, and Station Supervisor.

The following briefing format will apply to most scenarios:

a. (OWN SHIP) will be conducting a tow with (SHIP) at (TIME). (OWN SHIP) will tow/be towed by (SHIP). (OWN SHIP) will receive/provide forward/aft.

b. (PORT/STARBOARD) watch Special Sea Dutymen and RAS Team No. 1 (or as required) will be required to close up at (TIME) at which time the station will be rigged.

c. The dress for this evolution will be (DRESS).

d. The Station Supervisor for this evolution will be (NAME) and the Safety Officer will be (NAME).

e. The sequence of events for the tow will be as follows: (DESCRIBE PASSING OF GEAR. IF WORKING WITH A NON-CANADIAN UNIT, PROVIDE DETAIL ON ANY DEPARTURES FROM STANDARD CANADIAN RIGGING AND TOWING SOPs).

f. Due to the inherently dangerous nature of this evolution, Station Supervisors are to thoroughly brief all personnel upon closing up on their duties and the sequence of events. The Safety Officer will pay close attention during the evolution for safety infractions.

g. In the event of an emergency, the aim is to disengage as quickly as possible without endangering life and with minimum damage to equipment. (DESCRIBE EMERGENCY BREAKAWAY PROCEDURE FOR THE STATION.). Lines that are or may become fouled must be cut.

h. If required, a debrief will be conducted on completion of the evolution. Place and time to be promulgated.

i. Are there any questions?

j. The Chief Bosn's Mate will now brief the safety-related aspects of the evolution.

8.12 TOWING SAFETY BRIEFING

It is imperative that the Station Supervisors give a thorough safety briefing to all personnel involved in the tow prior to the evolution starting. The Safety Officer is to ensure all points are covered. In addition to the general shipboard safety items listed in Chapter 4, the following safety points must be covered:

a. All personnel will take cover and remain under cover until the gunline is fired.

b. Personnel must pay particular attention to where they place their hands and feet because lines faked out on deck can pay out very quickly.

c. As most towing equipment is very heavy, personnel are to ensure they use proper lifting techniques.

d. Safety glasses must be worn by the station workers removing and inserting the lead pellets.

e. Never straddle the cable or take short cuts across it.

f. All non-essential personnel are to be cleared from the focsle/quarterdeck before the towing ship puts strain on the towline.

g. A visual watch shall be maintained on the towing rig and towed vessel.

NOTE: *Safety lessons learned from previous towing exercises should be stressed during the Towing Safety Briefing.*

8.13 IROQUOIS CLASS

8.13.1 Towing Forward – Supply (Preparation and Equipment Layout)

a. The extended length shot mat is laid out to protect the deck.

b. Rig a 12” ranging snatch block on the eyepad farthest forward on the port side of the focsle in line with the cable hatch with a 3/4” shackle.

c. Run the ranging lines through the snatch block, from the capstan, and to the cable deck. Use the ranging lines to bring the centreline blake slip up through the cable hatch and secure it to the midship deck clench on the focsle.

d. Engage the clutch, release the brake, and veer the port cable. Simultaneously, heave in on the ranging messenger to bring sufficient cable up on deck. Re-apply the brake.

e. Attach the towing pendant to the towing hawser using a lugless anchor shackle.

f. Fake out the towing hawser on the starboard side of the focsle so that the towing pendant and

towing shackle are led to the bullring, and the outboard end of the towing hawser pays out from centreline to outboard. Lead the inboard end up around the centreline blake slip and back to the port cable.

g. Connect the inboard end of the towing hawser to the port cable with a Baldt shackle.

h. The inboard end of the heavy messenger is attached to the NEWCO thimble with a bowline and stopped along the towing pendant with tarred marlin up to and including the towing shackle. These seizings are to be approximately 45 cm apart and no less than eight wraps each. Ensure that the last seizing is as close to the end as possible with four extra wraps applied. This will minimize the chances of fouling in the other ship's towing fairlead.

i. The heavy and light messengers are faked out on the port side inboard to outboard. The end of the light messenger is led forward, out through the bullring and back over the guardrail of the engaged side.

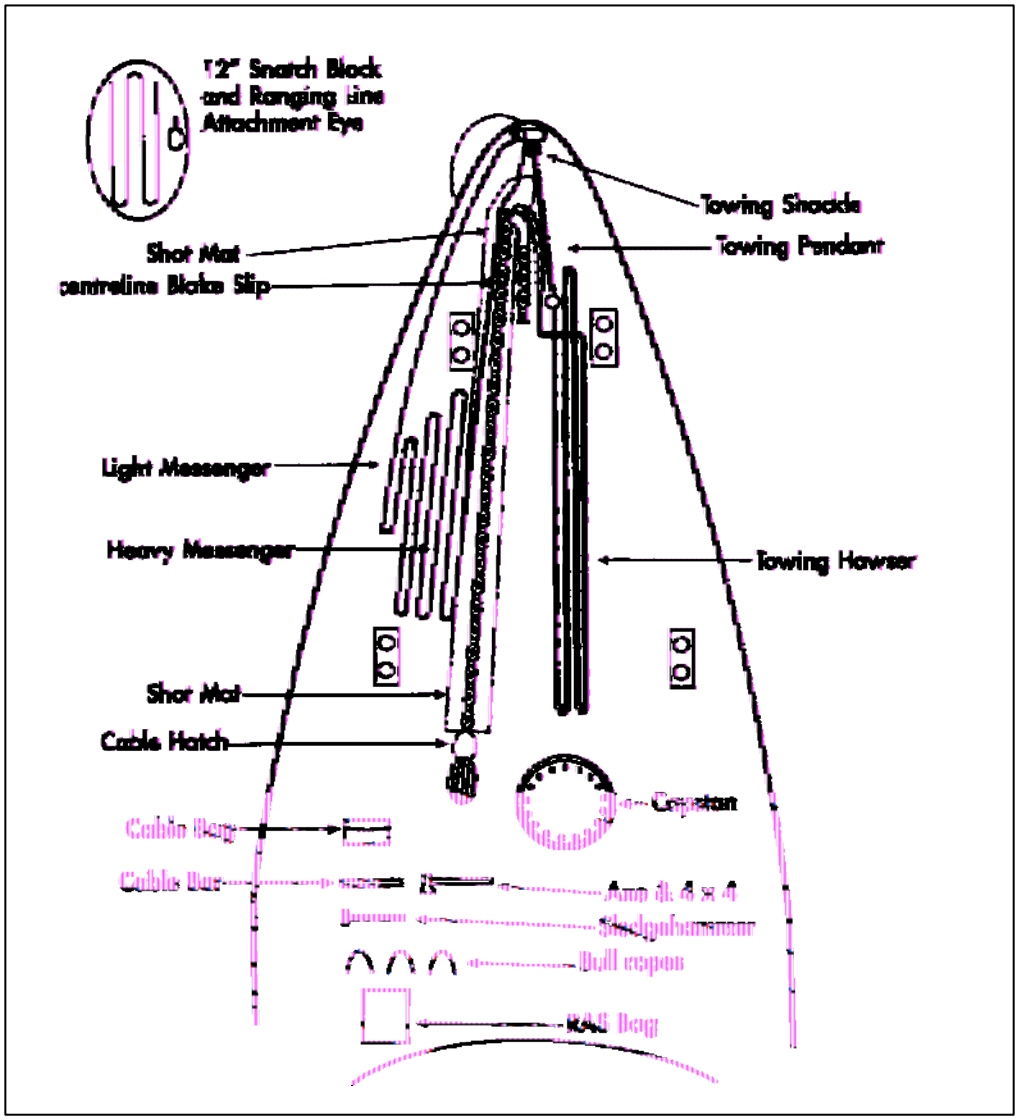

Figure 8.13-1 - IROQUOIS Class Supply Forward Tow

8.13.2 Towing Forward – Receive (Preparation and Equipment Layout)

a. The extended length shot mat is laid out to protect the deck.

b. Rig a 12” ranging snatch block on the eyepad farthest forward on the port side of the focsle in line with the cable hatch with a 3/4” shackle.

c. Run the ranging messenger through the snatch block, from the capstan, and to the cable deck. Use the ranging messenger to bring the centreline blake slip up through the cable hatch and secure it to the midship deck clench on the focsle.

d. Engage the clutch, release the brake, and veer the port cable. Simultaneously, heave in on the ranging messenger to bring sufficient cable up on deck. Re-apply the brake.

Figure 8.13-2 - Towing Receive Forward Layout

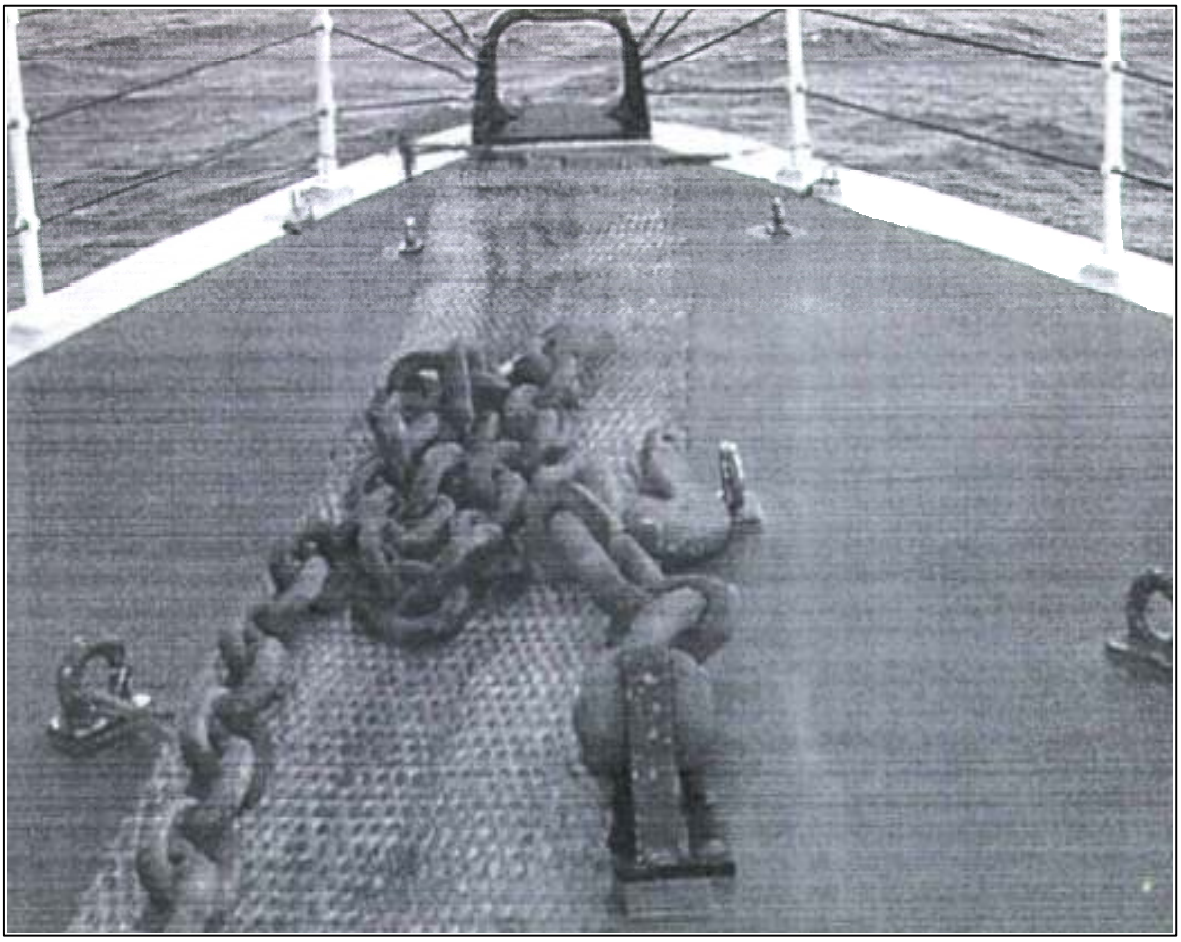

Figure 8.13-3 - Towing Receive Forward Centreline Blake Slip

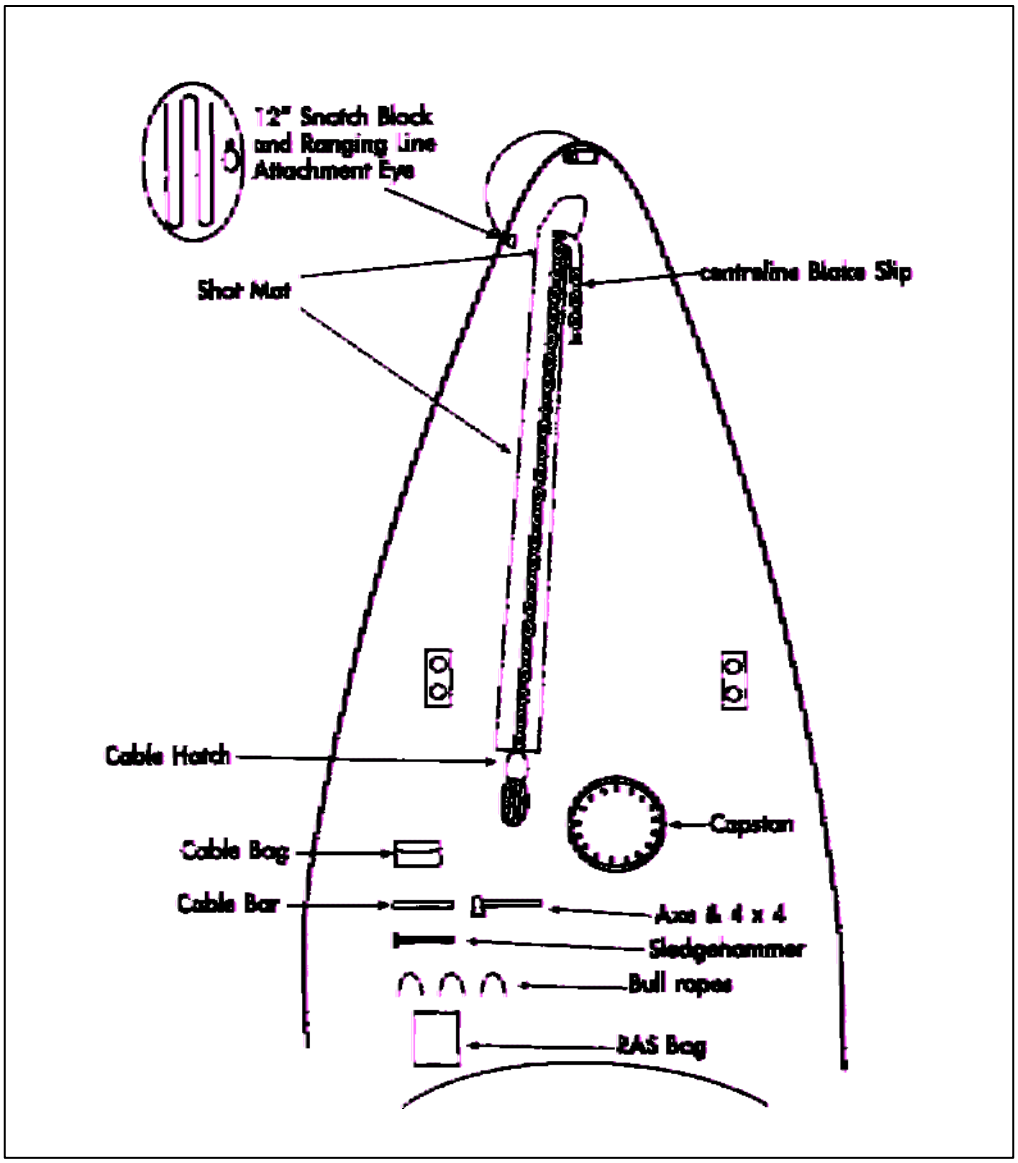

Figure 8.13-4 - IROQUOIS Class Receive Forward Tow

8.13.3 Towing Aft – Supply (Preparation and Equipment Layout)

a. The towing hawser is faked out on the port side of the quarterdeck from inboard to outboard. (The inboard end of the towing hawser is secured to the towing pendant with a lugless anchor shackle.) The NATO link is secured to the outboard end of the towing hawser with a Baldt shackle.

b. The pendant is then attached to the towing slip with a towing shackle. Ensure that the pin in the slip is moused.

c. The heavy and light messengers are then faked out on the port side of the quarterdeck inboard to outboard. Ensure the heavy messenger is led through the towing fairlead to the starboard side.

d. The towing pendant and sufficient towing hawser is lead aft and through the towing fairlead. When the pendant is at its full length, approximately 1 to 2 m will hang down over the transom. This will allow the remainder of the gear to be passed without fouling.

e. Secure the recovery line 15 to 25 m from the inboard end of the towing hawser with a rolling hitch. This will be used to recover the tow.

f. Raise the flight deck netting.

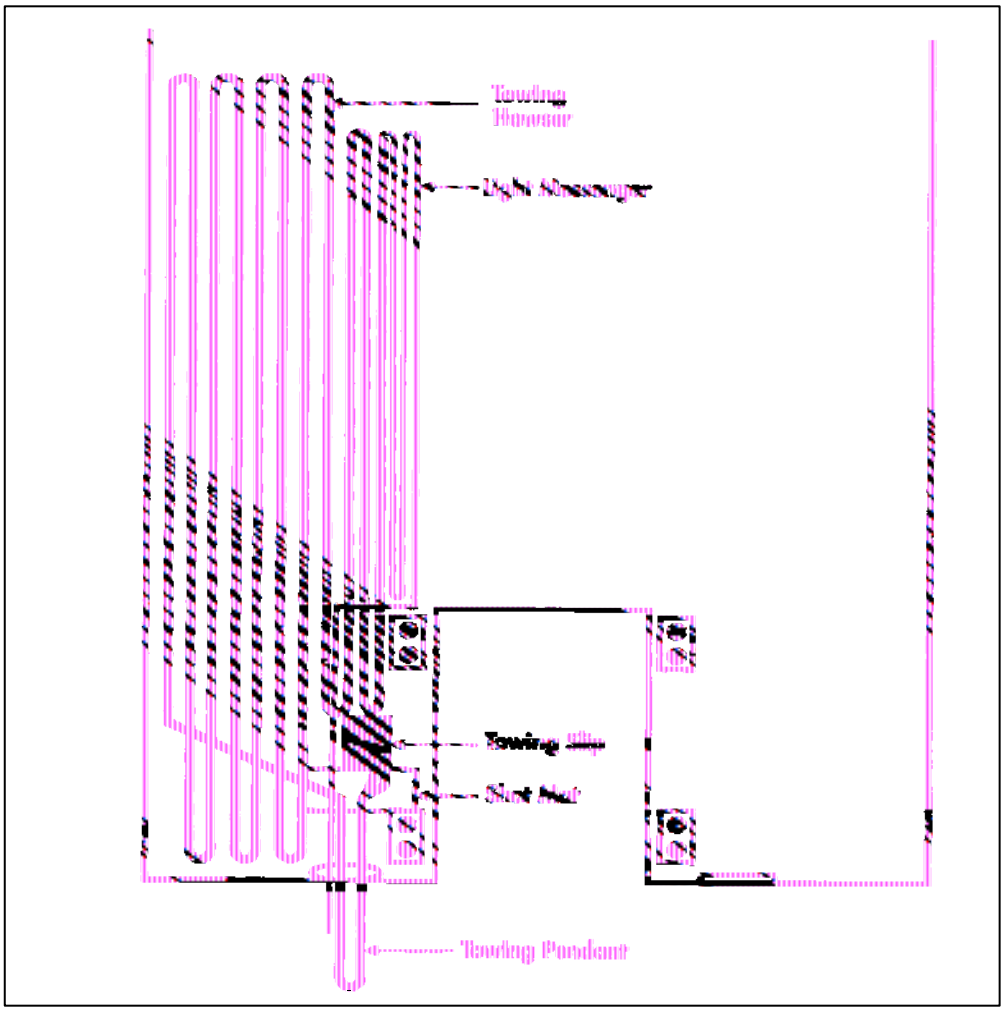

Figure 8.13-5 - IROQUOIS Class Supply Aft Tow

8.13.4 Towing Aft – Receive (Preparation and Equipment Layout)

a. Prepare the towing slip. Ensure that the pin is moused.

b. Rig one shot mat in the dump adjacent to the towing slip and one over the AX hatch.

c. Provide a towing shackle (required only if supplying ship's gear is not compatible).

d. Raise flight deck netting.

8.14 HALIFAX CLASS

8.14.1 Towing Forward – Supply (Preparation and Equipment Layout)

In the HALIFAX Class, the port cable is designed for use in towing and mooring operations. An electric vertical shaft windlass is fitted on the focsle to port of the anchor capstan/windlass for working the towing and mooring cable. The control pedestal is located aft of the breakwater in line with the mooring windlass.

a. Shot mats are laid out to protect the deck. The 12" ranging snatch block is shackled to eyepad No. 2 with a 3/4" shackle. (See Table 3 Ch. 5 for eyepad location.)

b. A centreline blake slip is shackled to the deck clench (eyepad No. 1) forward of the hawse pipe.

c. Disconnect the port cable and attach the ranging line to the end. The ranging line is led forward and passed through the ranging snatch block and back to the capstan.

d. Veer the cable, simultaneously heave in on the ranging line to bring sufficient cable on deck.

e. Attach the towing pendant to the towing hawser using a lugless anchor shackle.

f. Fake out the towing hawser on the starboard side of the focsle so that the towing pendant and towing shackle are led to the bullring, and the outboard end of the towing hawser pays out from centreline to outboard. Lead the inboard end up around the centreline blake slip and back to the port cable.

g. Connect the inboard end of the towing hawser to the port cable with a Baldt shackle.

h. The inboard end of the heavy messenger is attached to the NEWCO thimble with a bowline and stopped along the towing pendant with tarred marlin up to and including the towing shackle. These seizings are to be approximately 45 cm apart and no less than eight wraps each. Ensure

that the last seizing is as close to the end as possible with four extra wraps applied. This will minimize the chances of fouling in the other ship's towing fairlead.

i. The heavy and light messengers are faked out on the port side inboard to outboard. The end of the light messenger is led forward, out through the bullring and back over the guardrail of the engaged side.

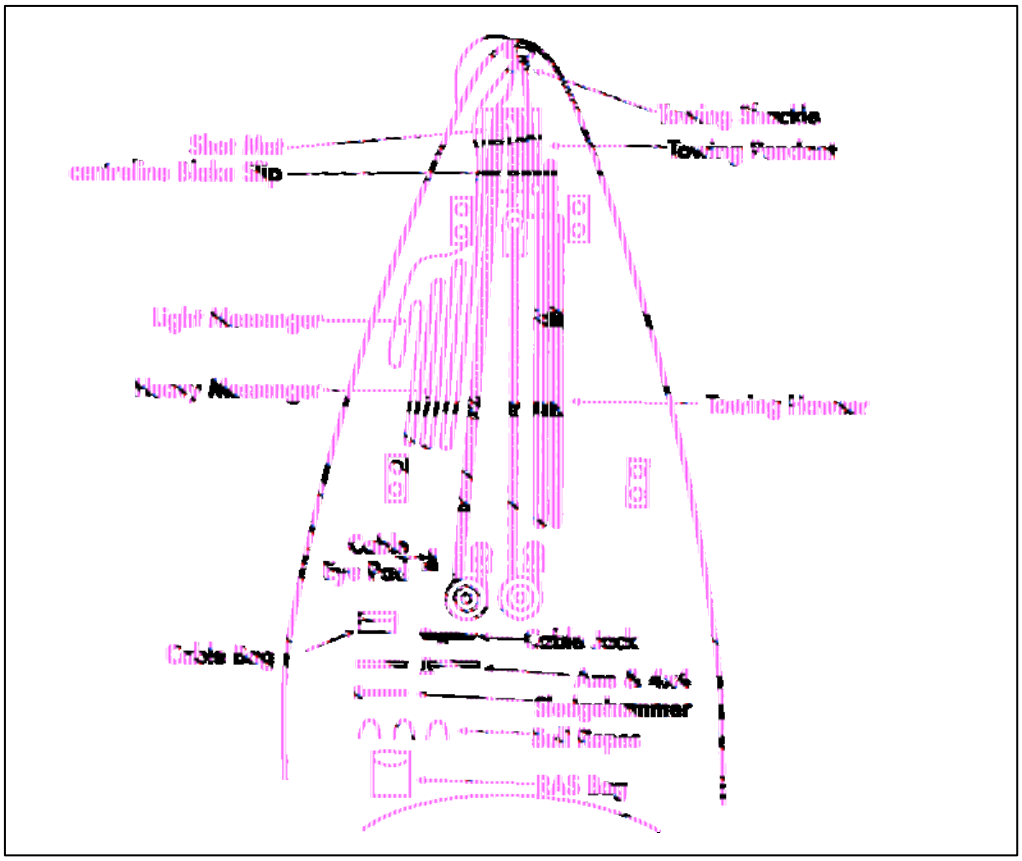

Figure 8.14-1 - HALIFAX Class Supply Forward Tow

8.14.2 Towing Forward – Receive (Preparation and Equipment Layout)

a. Shot mats are laid out to protect the deck. The 12" ranging snatch block is shackled to eyepad No. 2 with a 3/4" shackle.

b. The centreline blake slip is shackled to the deck clench (eyepad No. 1) forward of the hawse pipe.

c. Disconnect the port cable and attach the ranging line to the end. The ranging line is led forward and passed through the ranging snatch block and back to the capstan.

d. Veer the cable. Simultaneously, heave in on the ranging line to bring sufficient cable up on deck.

8.14.3 Towing Aft – Supply (Preparation and Equipment Layout)

a. Lash two shot mats over the port steps leading from the flight deck to the quarterdeck and one over the AX hatch.

b. Lash 4x4 to the helicopter tie downs just abaft the QMs lobby

c. The towing hawser is faked out on the port side of the flight deck from inboard to outboard. Forward bights are to be secured to the 4x4 with a single lashing of tarred marline. The inboard end of the towing hawser is secured to the towing pendant with an anchor lugless shackle.

d. The towing pendant is then attached to the towing slip with a towing shackle. Ensure that the pin in the slip is moused.

e. The towing pendant and sufficient towing hawser is lead aft and through the towing fairlead. When the pendant is at its full length, approximately 1 to 2 m will hang down the transom. This will allow the remainder of the gear to be passed without fouling. Attach a NATO link to the towing hawser with a Baldt shackle.

f. Fake out the light and heavy messenger on top of the towing hawser with the inboard end of the heavy messenger secured to the towing hawser's NEWCO thimble with a bowline, and then stopped along the Baldt shackle, including the NATO link.

g. Once this is completed, a length of towing hawser approximately equal to that of the towing pendant is taken out through the towing fairlead.

h. The light messenger is then passed out through the towing fairlead and lead forward over the flight deck netting on the engaged side.

i. Secure the recovery line 15 to 25 m from the inboard end of the towing hawser with a rolling hitch. This line will be used to recover the tow.

j. Raise the flight deck netting.

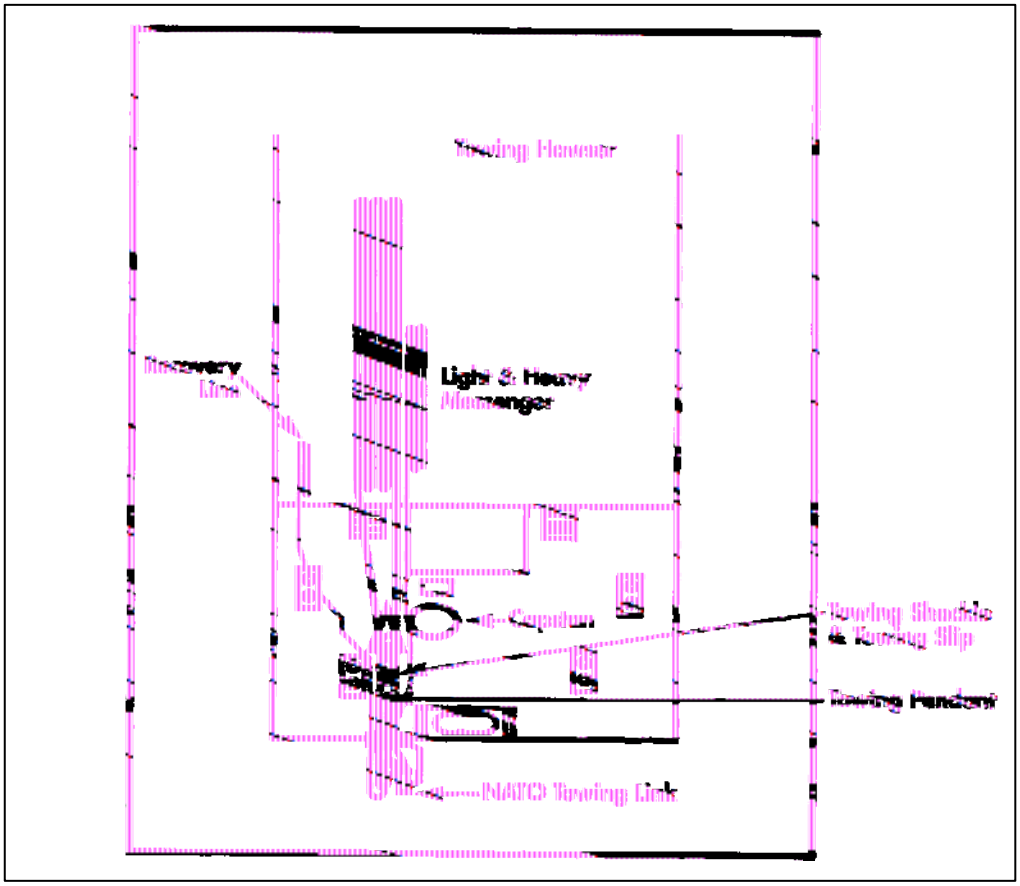

Figure 8.14-2 - HALIFAX Class Supply Aft Tow

Figure 8.14-3 - HALIFAX Class Supply Aft Tow

8.14.4 Towing Aft – Receive

a. Prepare the towing slip. Ensure that the pin is moused.

b. Rig one shot mat in the dump adjacent to the towing slip.

c. Provide a towing shackle and NATO link (required only if the supplying ship's gear is not compatible).

d. Raise the flight deck netting.

8.15 KINGSTON CLASS

To conduct a tow, KINGSTON Class ships use an Adapter Link and a NYLITE Rope Thimble.

a. **Adapter Link:** three links of cable, which enable the towing hawser to be attached to the ship's cable.

b. **NYLITE Rope Thimble:** a plastic thimble in the end of the towing hawser.

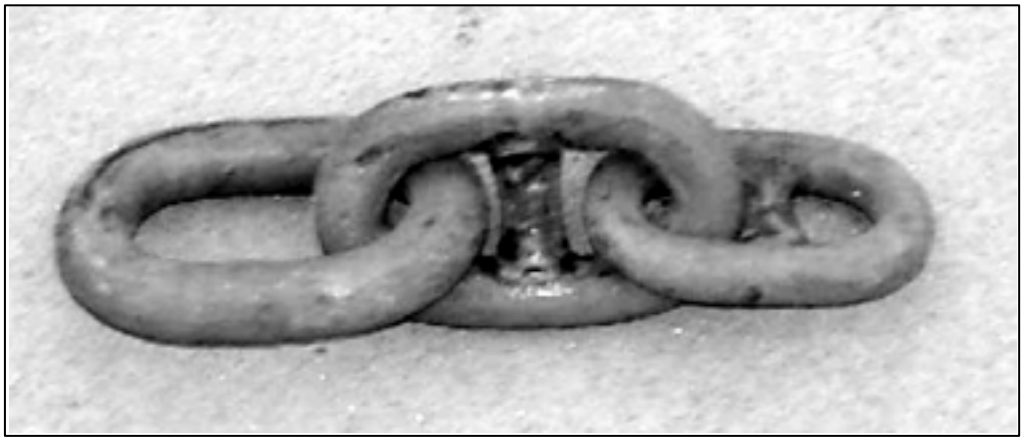

Figure 8.15-1 - Adapter Link

Figure 8.15-2 - Towing Pendant Attached to Towing Hawser

8.15.1 Towing Forward – Supply (Preparation and Equipment Layout)

a. Place shot mats on deck from centreline deck clench to the bullring and under the Devil's Claws.

b. Shackle centreline blake slip to deck clench.

c. Ensure 600v power is available and flash up the anchor windlass.

d. Engage the clutch and release the brake.

e. Leave the Devil's Claws and roller bow stopper engaged.

f. Using bullropes, veer the cable until the joining shackle is on the deck. Place cable bar through the cable at naval pipe.

g. Fake out the towing hawser on the starboard side of the focsle, inboard to outboard, and lead the outboard end forward to the bullring.

h. Break the cable, remove cable bar and using bullropes, veer until end of cable is forward of the centerline blake slip. Reinsert cable bar and attach cable to the outboard end of the towing hawser using the adapter links.

i. Attach the towing shackle to the outboard end of the towing pendant and lead the towing shackle to the bullring. The inboard end of the towing pendant is attached to the inboard end of the towing hawser using the U shackle provided. Fig 8.14.2.

j. Fake the heavy messenger outboard and attach it to the "U" shackle where the towing pendant joins the towing hawser. It is then stopped along the towing pendant with tarred marlin up to and including the towing shackle.

k. Fake the light messenger outboard to inboard and secure it to the heavy messenger. The end of the light messenger is led forward, out through the bullring and back over the guardrail of the engaged side.

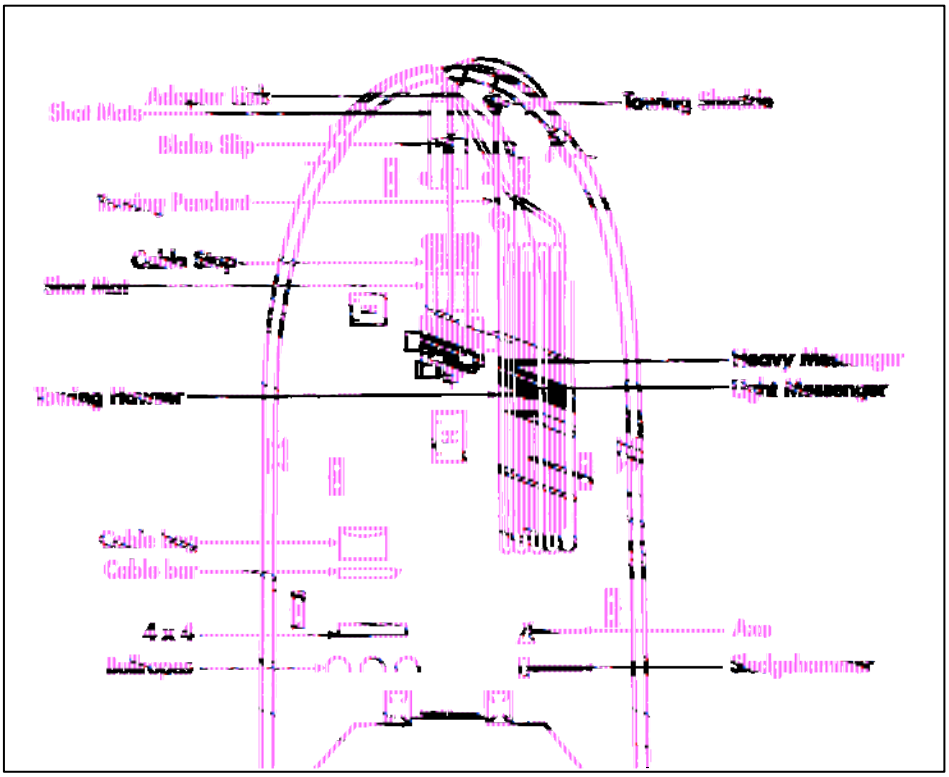

Figure 8.15-3 - KINGSTON Class Towing Forward Supply Equipment Layout

8.15.2 Towing Forward – Receive (Preparation and Equipment Layout)

a. Place shot mats on deck from centreline Blake slip to the bullring and under the Devil's Claws.

b. Shackle centreline blake slip to deck clench.

c. Ensure 600v power is available and flash up the anchor windlass.

d. Engage the clutch and release the brake.

e. Leave the Devil's Claws and roller bow stopper engaged.

f. Veer the cable until the joining shackle is on deck and insert the cable bar at the Naval pipe. Break the cable, remove the cable bar and, using bullropes, veer the cable until the end of the cable is forward of the centerline blake slip. Reinsert the cable bar and attach cable to the towing hawser using the adapter links.

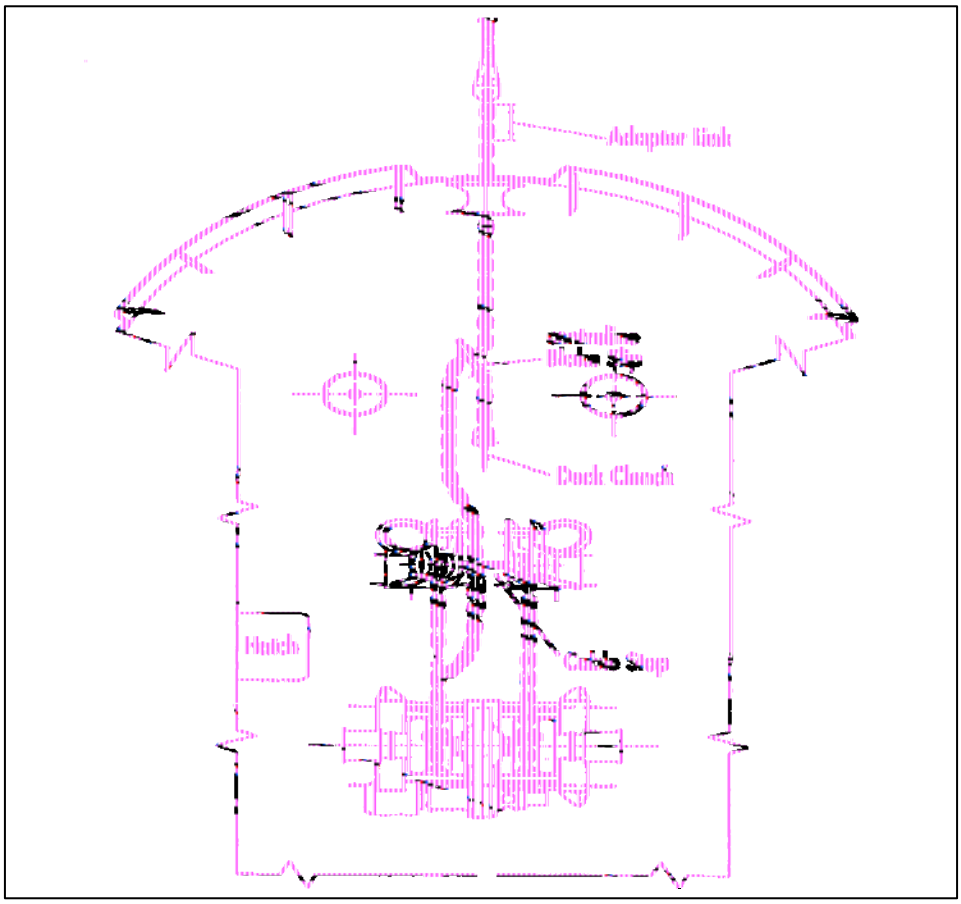

Figure 8.15-4 - KINGSTON Class Towing Forward Receive Equipment Layout

8.15.3 Tow Supply Aft KINGSTON Class Vessels

a. The I/C will give the safety brief, detail off personnel, explain their duties and responsibilities during the evolution.

b A length of 4X4 may be laid forward of the towing hawser, athwart ships and secured. Each fake of the towing hawser is lashed to the 4X4 with tarred marlin.

c. The towing hawser is faked out on the Starboard side of the sweep deck inboard to outboard (towing pennant outboard/Starboard side).

d. The towing pennant is attached to the towing hawser by a “U” Shackle.

e. The standing end of the towing pennant is then passed out the starboard fairlead and lead along the stern and back in through the port fairlead.

f. A shot mat is placed under the towing slip.

g. A towing shackle is attached to the standing end of the towing **pennant** and then placed over the towing Slip. The slip is closed; pin is inserted and moused with wire.

h. The towing pennant and hawser are lashed to the bottom of the guardrail with tarred marlin.

i. The recovery line is lead out the port fairlead and run along the transom to the towing hawser and attached to the Nylite rope thimble with a bowline. It is faked forward of the Capstan, (there is to be no strain on the recovery pennant at any time during the tow).

j. The Adapter Link Assembly is attached to the running end of the towing hawser at the Nylite rope thimble.

k. The heavy messenger is faked out inboard, (or on top of depending on payload and space) the towing hawser, so that it pays inboard to outboard, with the eye inboard.

l. The light messenger is faked inboard to outboard, on the port side of the heavy messenger.

m. The standing end of the heavy messenger is attached to the running end of the towing hawser approx 2M from the Nylite rope thimble using a rolling hitch and then lashed at intervals to the towing hawser with tarred marlin.

n. The adapter assembly is lashed to the heavy messenger with tarred marlin for ease of handling, particularly for the receiving ship; and

o. The standing end of the light messenger is tied off to the heavy messenger using a double sheet bend. The eye of the light messenger is passed out the Starboard fairlead and lashed to the top guardrail, so it can be easily located when the gun line is to be tied off.

Minesweeping Gear Embarked **– Lines and equipment to be laid out center of the sweepdeck astern of the minesweeping winch. Minesweeping wires are to be de-rigged and the stern must be clear of all wet end gear.**

1st Method – Tow Aft KINGSTON Class

2nd Method – Tow Aft KNIGSTON Class

Figure 8.15-5 - Heavy Messenger attached to Towing Hawser

8.15.4 Towing Aft – Receive (Preparation and Equipment Layout)

The only preparation required to receive a tow aft is to place a shot mat at the towing slip position and open the towing slip.

8.16 PROTECTEUR CLASS

8.16.1 Towing Forward – Supply (Preparation and Equipment Layout)

a. The light and heavy messengers are faked out on the focsle on the opposite side from the tow. The lines are faked out from outboard to inboard commencing with the light messenger outboard.

b The inboard end of the heavy messenger is led forward over the bulwarks and around the bow. It is then brought back inboard through the forward roller fairlead and attached to the NEWCO thimble on the towing hawser by a bowline.

c. The towing hawser is faked out on the engaged side inboard to outboard. A 4 x 4 stopper is secured to a strong point on the breezeway deck immediately aft of the towing hawser to which the after bights of the towing hawser are stopped.

d. The inboard end of the towing pendant is secured to the towing hawser with a lugless anchor shackle. Secure the towing shackle to the outboard end of the towing pendant.

> **NOTE.** *A NATO link may be fitted to the outboard end of the towing pendant if the receiving ship's towing slip or fairlead is not compatible with PORTECTEUR class gear.*

e. The heavy messenger is seized to the towing pendant every 45 cm commencing at the inboard end of the towing pendant and working forward to and including the towing shackle.

f. Bring the marked end of the towing hawser to the forward bollards and fill with turns. The lead for the running end must come from the bottom of the bollard.

g. Lead the hawser aft to the after bollard and fill the bollard with turns. Leave a section of hawser approximately 15 m in length in order to freshen the nip during a long tow.

h. Secure the end of the towing hawser to the bollard strop on the roller pedestal.

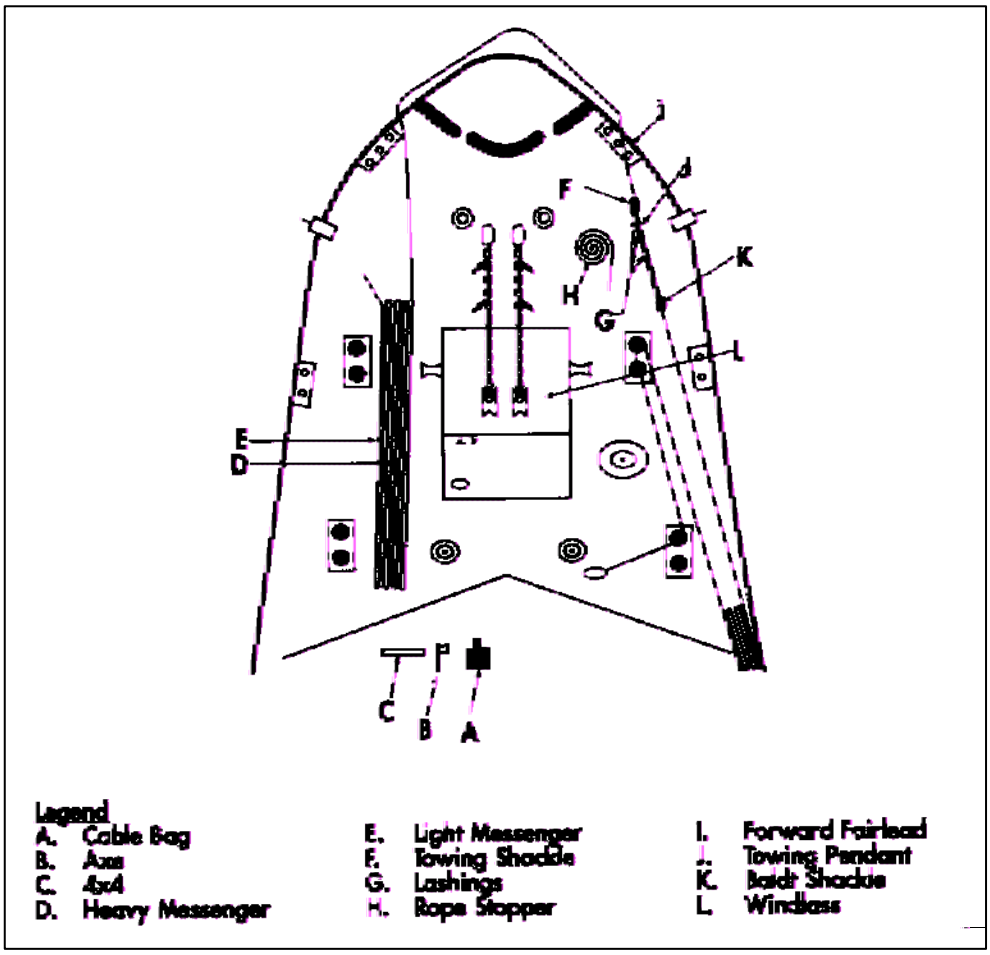

Figure 8.16-1 - PROTECTEUR Class Towing Forward – Supply

8.16.2 Towing Forward – Receive (Preparation and Equipment Layout)

a. This is a simple evolution that merely requires that a bollard strop and slip be rigged on the after bollard of the side on which the tow will be received.

b. The supplying ship closes to a safe working distance and passes a gunline with a light/heavy messenger attached to it. This is led through the forward roller fairlead and heaved in by the line handlers until there is enough towing hawser aboard to fill two bollards plus 15 extra metres.

c. The forward bollards are filled first and then the after bollards. Finally, it is taken to the bollard slip that is secured to the after pedestal roller.

8.16.3 Towing Aft – Supply (Preparation and Equipment Layout)

a. The towing hawser is faked out fore and aft along the starboard breezeway. Forward bights of the towing hawser fakes are secured to a 4 x 4 strong back that has been secured to the deck. Fakes are secured to the 4 x 4 by means of a single turn of tarred marlin.

b. The inboard end of the towing hawser is secured to the towing pendant with a lugless anchor shackle.

c. The inboard end of the pendant is fitted with a towing shackle, which is then secured to the towing slip starboard side aft in line with the towing fairlead. Ensure the pin in the slip is moused.

d. On the outboard end of the towing hawser attach the NATO link to the NEWCO thimble with a Baldt shackle.

> **NOTE**. *A NATO link may be attached to the Baldt shackle if the receiving ship's cable is incompatible with PROTECTEUR/PRESERVERS's.*

e. The heavy and light messengers are faked out on the port side with the light messenger outboard.

f. The inboard end of the heavy messenger is led out over the bulwarks across the stern and back in through the starboard towing fairlead and attached to the outboard end of the NEWCO thimble by means of a bowline and then lashed every 45 cm out to and including the NATO Link.

g. The recovery line is bent on to the towing hawser 15 to 25 m from the inboard end with a rolling hitch. This line will be used to recover the tow.

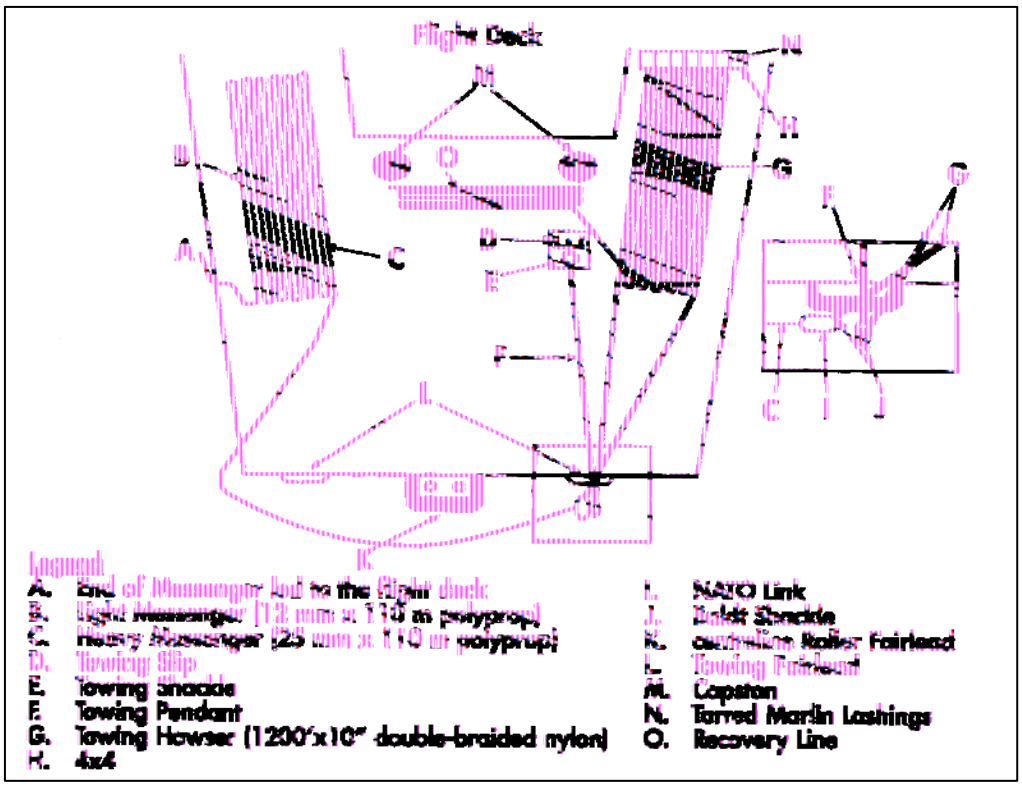

Figure 8.16-2 - PROTECTEUR Class Towing Aft – Supply

8.16.4 Towing Aft – Receive (Preparation and Equipment Layout)

Equipment setup is very simple for this evolution. All that is required is a towing slip with a shot mat rigged beneath it and associated gear laid out close at hand.

8.17 VICTORIA CLASS

8.17.1 Towing Forward – Receive

a. Personnel Required:

(**1**) Full casing party; and

(**2**) Swimmer.

b. Equipment Required:

(**1**) General casing bag;

(**2**) Capstan and windlass control bar;

(**3**) Towing shackle; and

(**4**) One 7 m length of 15 mm diameter rope.

c. Procedure:

(**1**) The cable is broken, brought up on deck and rigged with the towing shackle as for going to a buoy. The forward fairlead is raised and the clip rope is attached to it. The other end is rove through the towing shackle and then laid to one side.

(2) The gunline and then light and heavy messengers are passed through the forward fairlead and heaved in by the casing party. If the weight is too great, the capstan can be used. The towing hawser will come aboard and is then shackled to the submarine's cable. The slip rope is now manned by three men and backed up to take the weight of the towing hawser and cable. The heavy messenger is then received and the tow and cable slipped. The cable is veered approximately 1 to 2 inches and secured by the blake, brake and guillotine.

(3) To slip the tow, the cable is heaved in and the slip rope is rigged around the towing hawser eye. The blake will again be veered as the slip rope is heaved in until the towing hawser and cable are on deck. The towing shackle is then removed and the heavy and light messengers reconnected. The lines are then slipped and the towing vessel recovers. The cable must then be reconnected to the anchor.

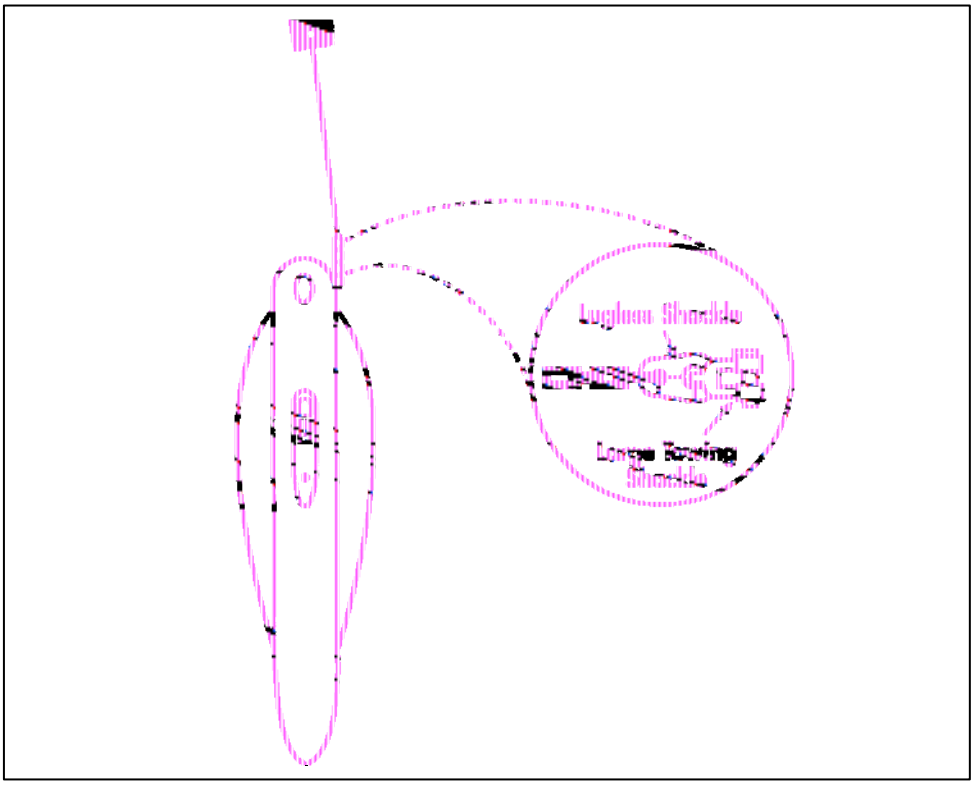

Figure 8.17-1 - VICTORIA Class Towing Using Submarine Anchor Chain

8.17.2 Towing Aft – Supply

Due to the design of a submarine, it is a very poor vessel to conduct a tow. A submarine is not equipped with a towing hawser, so it is always preferable for her to receive. If a submarine must provide, one of her berthing hawsers will be used. The evolution is one that must be well thought out and depends on sea state, distance of travel and size of vessel being towed.

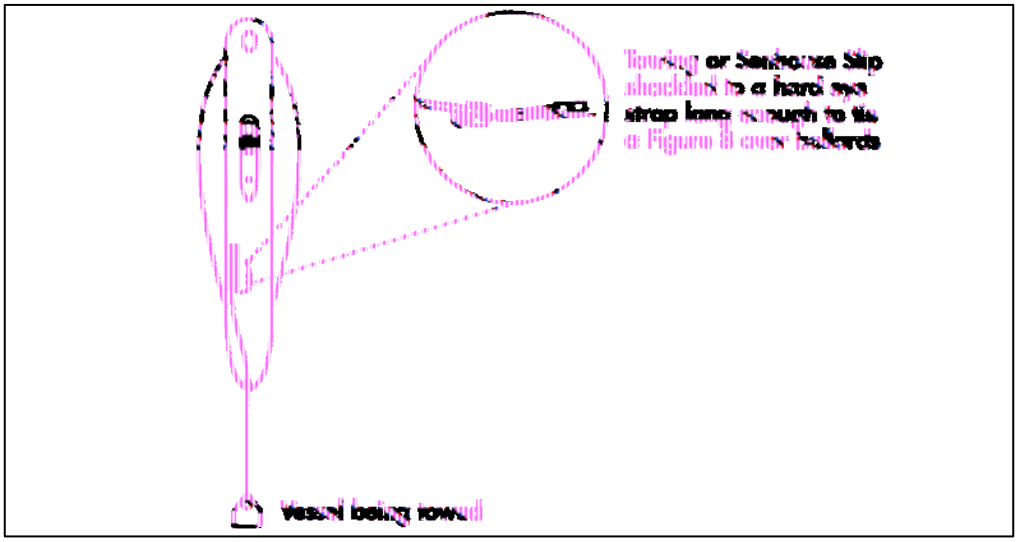

Figure 8.17-2 - VICTORIA Class Towing from Astern

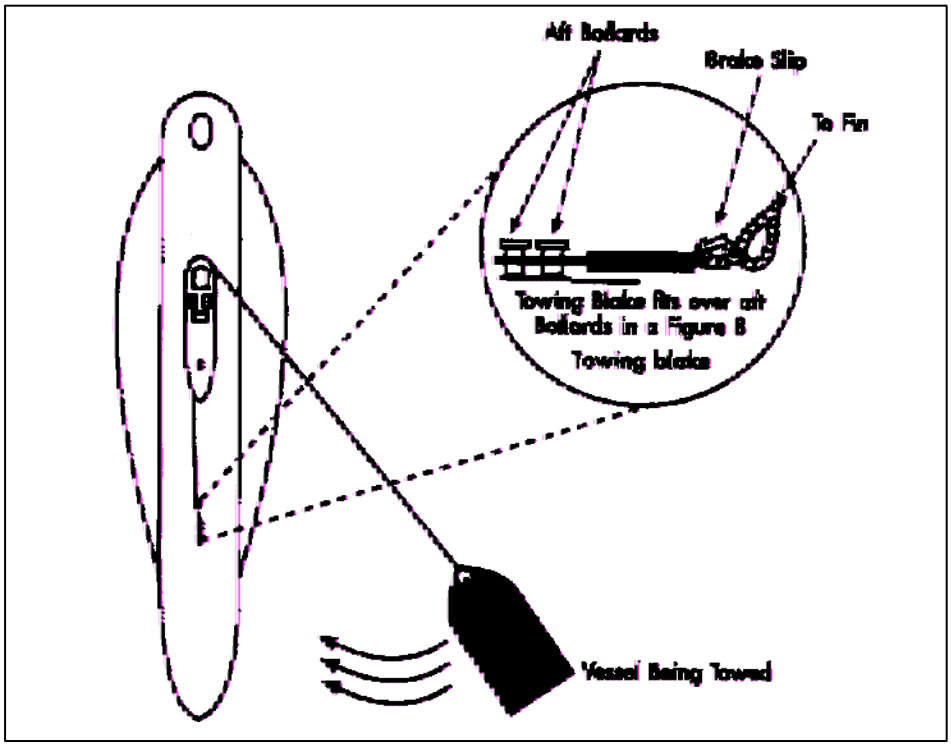

Figure 8.17-3 - VICTORIA Class Towing another Vessel

8.17.3 Emergency Towing:

a. Personnel Required:

(**1**) Casing Officer;
(**2**) SCRATCHER;
(**3**) DICKIE;
(**4**) six to eight OS-LS; and
(**5**) Bridge signalman.

b. Equipment Required:

(**1**) Bridge coaming roller assembly;
(**2**) Bridge snatch block;
(**3**) Control room snatch block;
(**4**) One rope stopper;
(**5**) Towing shackle;
(**6**) General casing bag;
(**7**) Axe;
(**8**) Gunline, rifle and ammo;
(**9**) One roll of polypropylene floating line; and
(**10**) Batons for bridge signalman.

c. Procedure:

(**1**) When the order "STAND BY TO TOW FORWARD" is passed the following action will take place:
  (a) Check towing slip is secured;
  (b) Rig the bridge for transfer (same as light line transfer);
  (c) Remove towing pendant covering plate and free up the eye; and
  (d) Secure towing shackle to pendant.

(**2**) When the gunline is passed, the light and heavy messengers will come across and be rove through the transfer assembly to the control room. The towing hawser will then be heaved across. The eye of the hawser is secured to the towing pendant by the towing shackle. The heavy messenger is then removed. As the strain comes on, the towing hawser will rip the pendant out of its securing points on the fin and starboard casing and pull it out tight until it is towing the submarine.

(**3**) To slip this tow, the slip is operated and the towline is then heaved aboard the towing vessel.

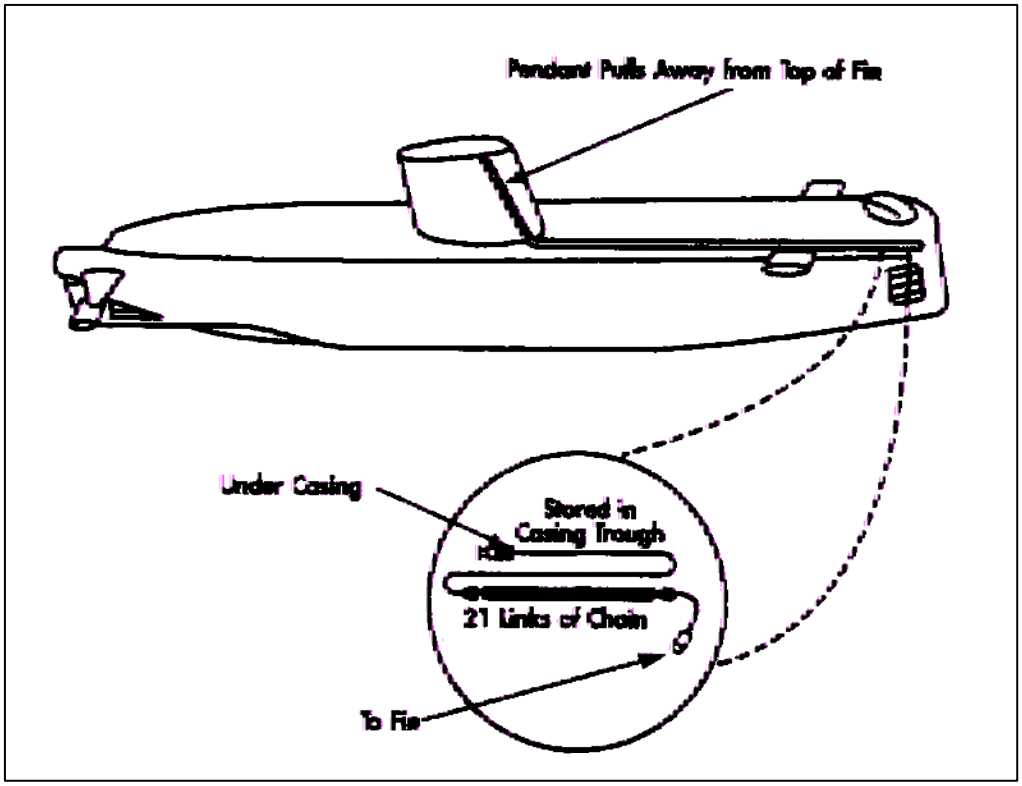

Figure 8.17-4 – VICTORIA Class Emergency Submarine Towing Pendant

8.18 ORCA CLASS

TBP - See MOG 4's ORCA SOPS.

CHAPTER 9

Replenishment at Sea

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9.1 INTRODUCTION

a. In order for a ship to conduct prolonged operations away from shore bases for extended periods, a ship must conduct a RAS (Replenishment at Sea). Underway Replenishment (UNREP) is achieved when a Supply or Auxiliary Oil Replenishment (AOR) Class ship steams a steady course and speed while another, the receiving ship, closes to and maintains station abeam at a distance of 24 - 36 m. In operations using tensioned spanwires or high lines, the distance may be increased to 42 m or more. Any ship can be tasked as a supplying unit; however, for the purposes of this and follow-on articles, the supply ship will be referred to as the AOR.

b. When the receiving ship is in station, the AOR passes the gear required to effect the replenishment. Transfer then takes place and can range from small stores items to pallets of ammunition and barrels of fuels, for both the ship and embarked helicopter(s). It is normally the duty of the receiving ship to maintain station on and correct distance from the AOR.

c. The primary reference to be consulted prior to replenishment operations with NATO countries is ATP 16 (Navy). ATP 16 provides background information and detailed procedures to support CFCD 105 and provides naval forces with a common knowledge base of RAS problems. Areas of concern to seamen include differences in equipment, span-wire/highline tensions, variations in procedures, locations of stations and liquids and heavy transfer capabilities.

9.2 TYPES AND METHODS OF REPLENISHMENT

9.2.1 Methods of Replenishment

There are three principal methods of replenishment: Abeam, Astern and Vertical.

a. **Abeam Replenishment.** By far the most common, the abeam method involves two ships steaming side-by-side at an optimum distance of 24 - 36 m. All commodities, liquids and personnel can be transferred. Often, a three-ship RAS will occur, with the AOR transferring to two ships simultaneously, one stationed on either side.

b. **Astern Replenishment.** With the astern method, the receiving ship takes station astern of the AOR at an optimum distance of 150 m. Only fuel can be transferred, which limits this method's utility. PROTECTEUR class are not capable of supplying via this method and only Halifax class are capable of receiving via this method.

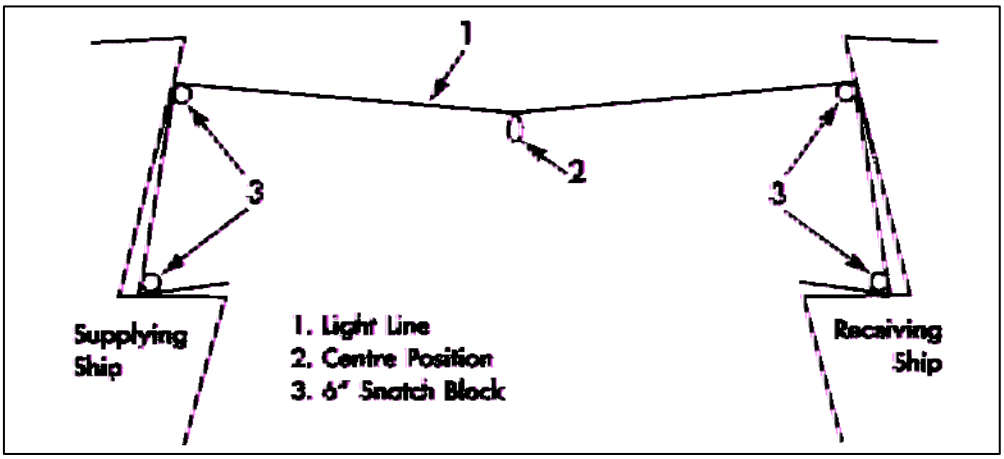
c. **Vertical Replenishment (VERTREP).** VERTREP refers to the use of a helicopter to transfer commodities or personnel between ships, or to and from shore-based units. When a Helicopter Air Detachment (HELAIRDET) is embarked, personnel from the Air Department are responsible for all aspects of VERTREP. However, when no HELAIRDET is embarked, it is the responsibility of the Ships Without Air Detachment (SWOAD) team.

9.2.2 Types of Replenishment

There are six types of replenishment used in the Canadian Navy: Light Line, Light Jackstay, Heavy Jackstay, Liquids Transfer, Consolidation and VERTREP.

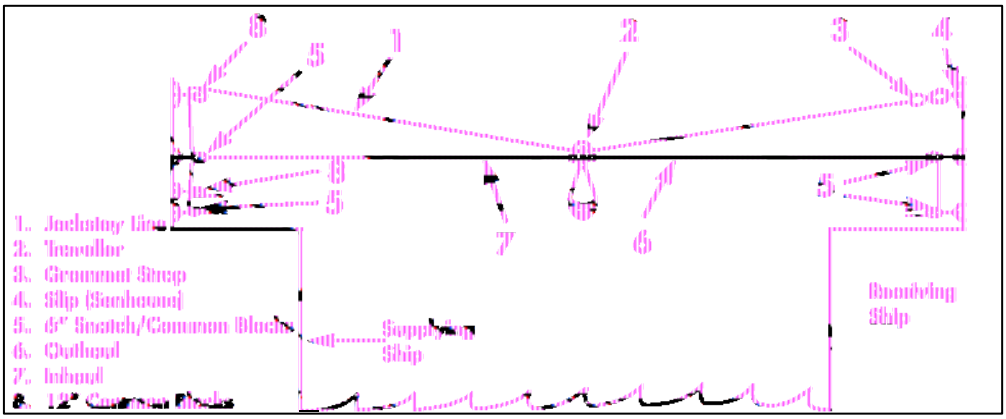
a. **Light Line.** This is a simple evolution used to transfer light stores of up to a maximum weight of 23 kg, e.g., spare parts and mail. When transferring mail ensure it is in a sealed flotation bag. It is a very quick evolution as it involves few personnel and very little preparation is required. A distance line is not normally required.

Figure 9.2-1 - Light Line



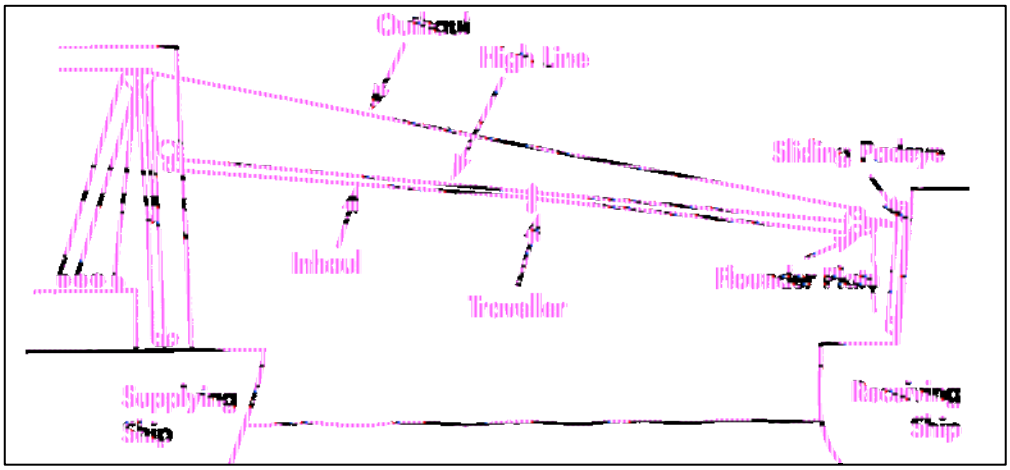
b. **Light Jackstay.** This type of replenishment is used to transfer medium amounts of provisions up to a maximum weight of 227 kg per load. As well, this is the method used to transfer personnel between ships whenever the use of boats or helicopters is deemed to be operationally inexpedient. This is a labour-intensive evolution as the entire transfer is conducted by hand. The jackstay line is manned by a minimum of 20 personnel and the inhaul/outhaul lines by a minimum of six personnel.

Figure 9.2-2 - Light Jackstay



c. **Heavy Jackstay.** This type of replenishment is used to transfer heavy amounts of provisions and ammunition up to a maximum weight of 1365 kg per load. The heavy jackstay comprises a tensioned rig system, with all wires being kept under constant tension by the supplying ship. The load is suspended from a traveler, which is hauled back and forth by winches controlled in the supplying ship.

Figure 9.2-3 - Heavy Jackstay



d. **Liquids Transfer.** This type of replenishment can be conducted either abeam or astern to transfer fuels (distillate/aviation fuel) and water. The abeam method involves the AOR supplying fuelling hoses suspended from a spanwire, with all wires being kept under constant tension by the AOR (with the exception of the slack rigs fitted on some allied AORs). There are three types of fittings used by the Canadian Navy to transfer distillate: the Probe Receiver Assembly, the NATO “B”; and Emergency Breakaway Fueling Coupling with the preferred fitting being the Probe Receiver or the EBFC. There is only one principal type of fitting used to transfer aviation fuel: the NATO standard F44 coupling (Carter Underwing Type). With the astern method, the fuelling hoses are streamed astern of the AOR and the receiving ship hauls the hoses on board and takes on fuel at her forward station. The fitting used for this evolution is the NATO “B”.

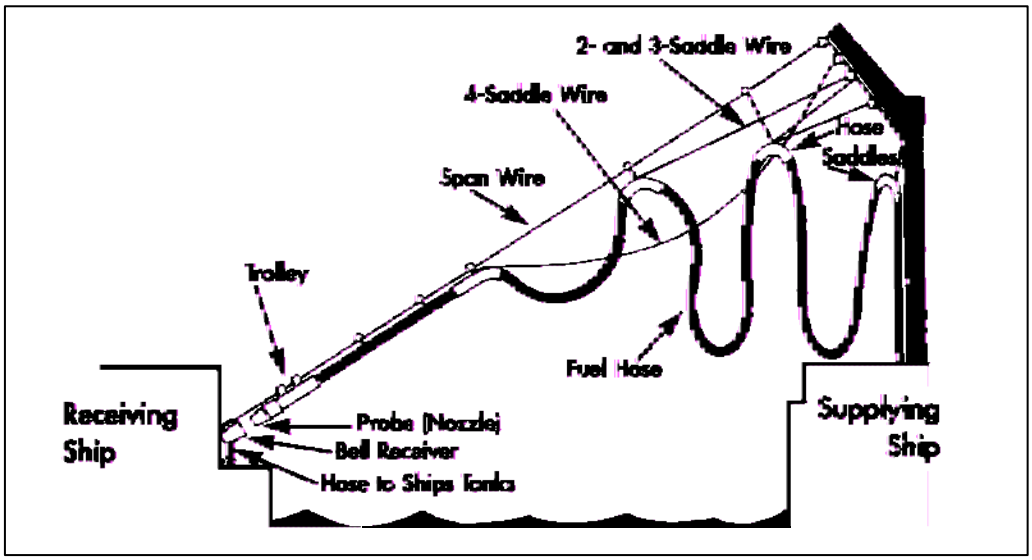


Figure 9.2-4 - Liquid Abeam Method

e. **Consolidation.** This type of replenishment is used for the transfer of provisions or liquids between AORs, and most commonly refers to the re-fuelling of an AOR by a larger AOR with a greater fuel tank storage capacity. One AOR will pass a tensioned rig system to the other via the abeam method and execute the transfer.

f. **VERTREP/Hoist.** This type of replenishment is used to transfer provisions and personnel. The provisions may be suspended below the helicopter (VERTREP) or held within the cargo area with the personnel, in which case a winch is used to hoist the stores. The maximum weight that can be transferred depends on the type of helicopter being used, the number of crew and the type of equipment embarked, as well as the amount of fuel remaining in the helicopter.

9.3 RAS CAPABILITIES OF HMC SHIPS

The following tables list HMC ships by Class, and indicate the RAS stations and commodities that are transferred at each.

9.3.1 HALIFAX Class

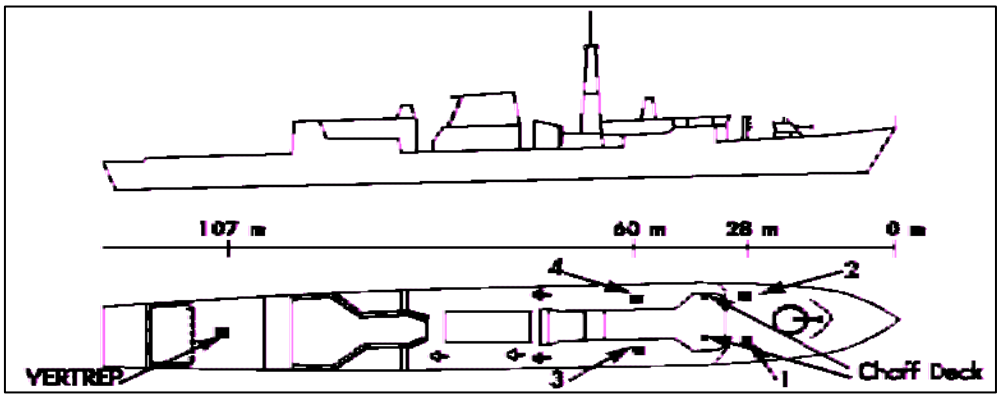


Figure 9.3-1 - HALIFAX Class

Table 9.3-1: RAS Stations HALIFAX Class				
RAS Stations	**1 and 2**	**3 and 4**	**Flight Deck/FX**	**Chaff Deck**
Method	Light Jackstay Heavy Jackstay Liquids	Light Jackstay Heavy Jackstay Liquids	VERTREP	Light Line
Commodity	Personnel Provisions Ammunition Distillate Aviation Fuel Water	Provisions Ammunition Distillate Aviation Fuel Water Personnel	Personnel Provisions Ammunition	Provisions

9.3.2 IROQUOIS Class

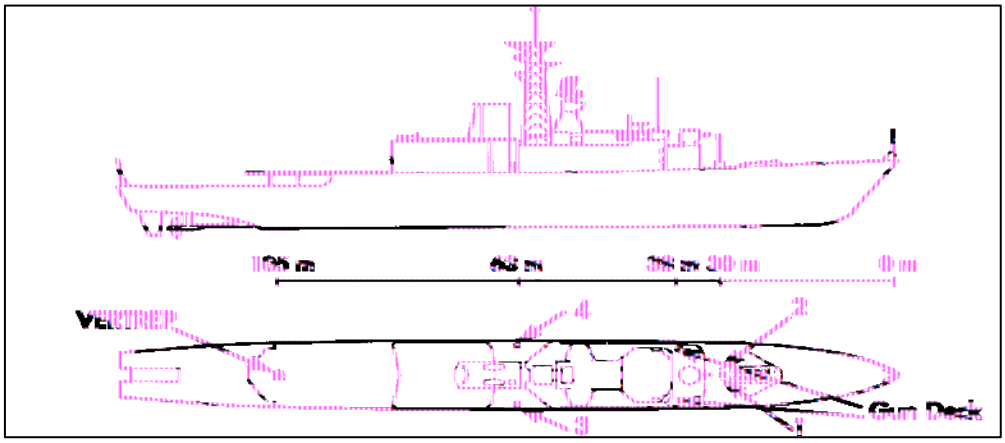


Figure 9.3-2 - IROQUOIS Class

Table 9.3-2: RAS Stations IROQUOIS Class

RAS Stations	1 and 2	3 and 4	Flightdeck/ FX	Gun Decks
Method	Light Jackstay Heavy Jackstay	Liquids	VERTREP	Light Line
Commodity	Personnel Provisions Ammunition Water	Distillate Aviation Fuel Water	Personnel Provisions Ammunition	Provisions

9.3.3 Kingston Class

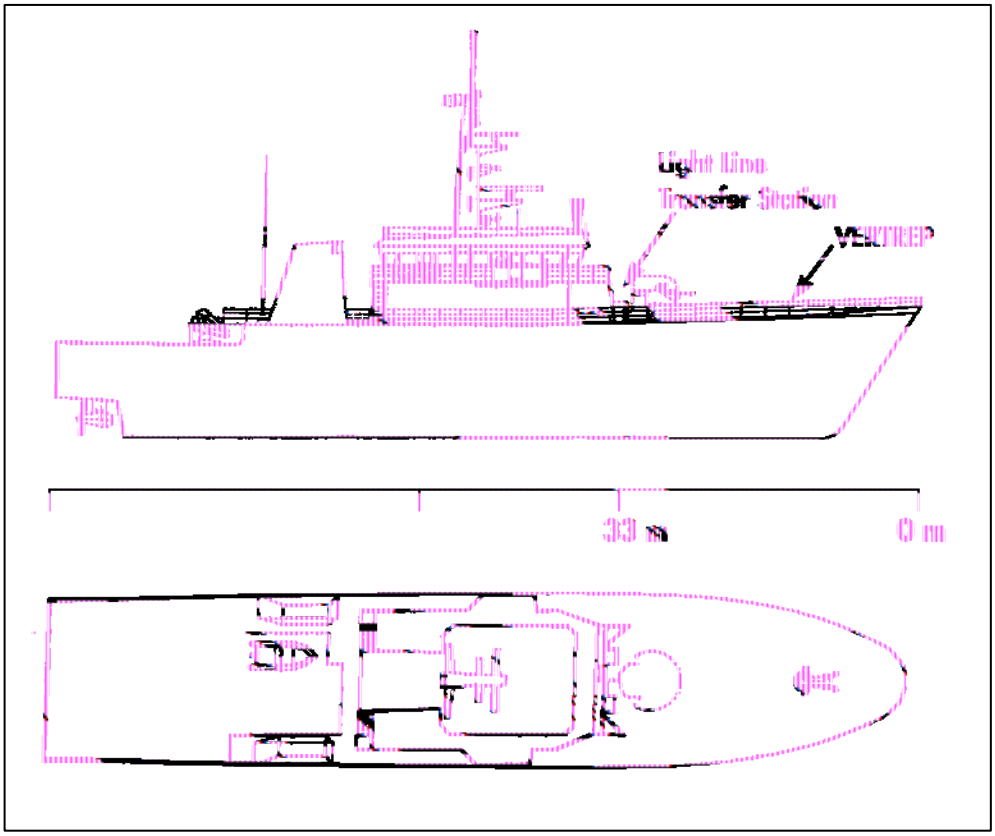


Figure 9.3-3 - KINGSTON Class

KINGSTON Class ships are currently capable of light line transfers of provisions only. VERTREP can be conducted.

9.3.4 PROTECTEUR Class

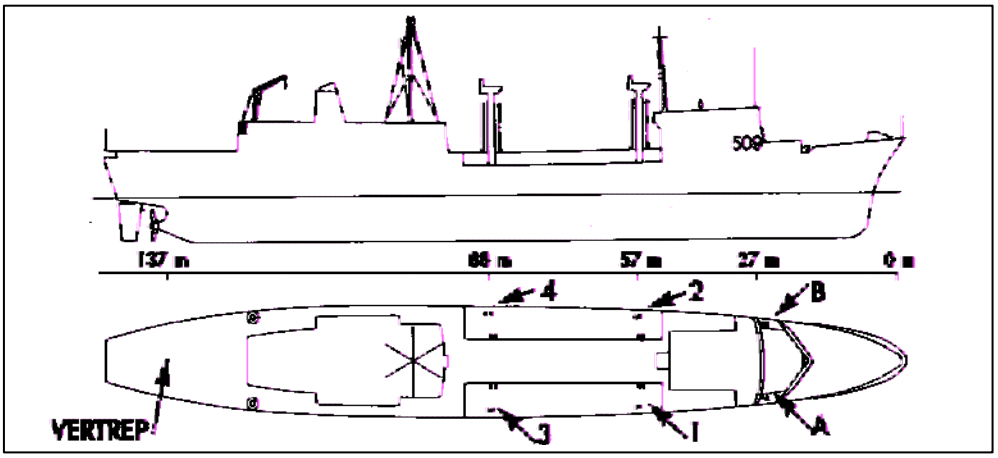


Figure 9.3-4 - PROTECTEUR Class

Table 9.3-3: RAS Stations PROTECTEUR Class				
RAS Stations	**A and B**	**1 and 2**	**3 and 4**	**Flight deck**
Method	Light Line Light Jackstay	Heavy Jackstay Light Jackstay Liquids	Heavy Jackstay Light Jackstay Liquids Consolidation	VERTREP
Commodity	Personnel Provisions Ammunition Water	Provisions Ammunition Distillate Aviation Fuel Water Personnel	Provisions Ammunition Distillate Aviation Fuel Water Personnel	Personnel Provisions Ammunition

9.3.5 VICTORIA Class

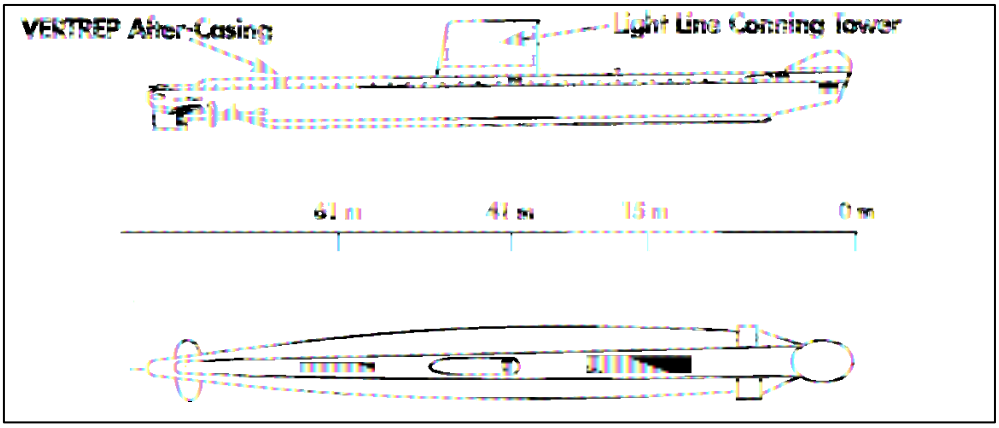


Figure 9.3-5 - VICTORIA Class

VICTORIA Class submarines are capable of conducting light line transfers of provisions from the conning tower, as well as VERTREP over the forward- (preferred) or after-casing.

9.3.6 ORCA Class

Due to their missions and task, if required ORCA Class units will transfer items by boat when underway. Additional info can be found in MOG 4's ORCA SOPs.

9.4 STATION KEEPING

9.4.1 Approach/Departure

Safe approaches can be made from either the beam or quarter station, but under most circumstances the evolution will be accomplished faster from the quarter. Therefore, for tactical reasons, this is the preferred method. Approach speed from the quarter will be approximately 5 knots greater than the signaled RAS speed, with the receiving ship remaining well clear of the AOR's stern pressure interaction zone (approximately 48 m) while moving into station. During the approach, radar antennae should be stopped until gunlines/bolos are passed. If weather conditions require it, the AOR will pass amount of yaw being experienced prior to the approach. Once alongside, the receiving ship will move into 30 - 36 m to pass the gear. Similarly, during the breakaway once the RAS is complete, the receiving ship will avoid the bow interaction zone by moving out initially before increasing speed. Ships are to avoid opening until all lines are in the water enroute to the AOR. This is especially important when breaking away from a light jackstay. Only when the ships are at least 48 m apart and steering diverging courses will the receiving ship increase speed, initially 5 to7 knots greater than RAS speed.

9.4.2 Ship Interaction and Stationing

a. By far the most pronounced source of interaction between ships during RAS operations results from the Venturi effect, when great volumes of water pass between the ships at close quarters. Zones of unequal water pressure are created which tend to either bring ships together or push them away. With Canadian ships, the Venturi effect is generally considered to be negligible at 48 m, noticeable at 30 m and pronounced at 15 m. While alongside at 30 m, a frigate will experience a force of attraction which will tend to draw her into the AOR. Concurrently, the bow will be forced out as a result of counteracting bow pressure zones. It is therefore likely that the frigate will adopt a small angle of yaw outwards and will have to carry some inward helm.

b. The forces generated by the tensioned spanwire(s) must also be recognized and dealt with. Under normal circumstances, **PROTECTEUR Class** will apply 5443 kg tension on their wires. With ships of 3000 tons or more there is no question of "reeling" the ship in, but steering effects are certainly felt, the degree to which is determined by:

(**1**) the amount of tension,
(**2**) the location and height of the attachment points relative to the ship's pivot, and
(**3**) the displacement, draft and trim of the ship.

c. With the fuelling point low and central, no noticeable effect is experienced when the AOR tensions the spanwire unless the receiving ship is very light or is heeled

inward slightly. With the kingpost forward, on tensioning, the receiving ship will initially be heeled inward causing her to tend to turn away, followed by a steady turning pressure slightly forward of the pivotal point, turning her toward. Normally, it will be necessary to compensate by steering away and carrying a few degrees of helm. In any event, once tension is applied, the forces involved are much less noticeable than the forces due to the Venturi effect at normal distances or from sea conditions, and should easily be taken into account by the OOW and the Special Sea Duty Helmsman.

d. Once the hookup of gear on the receiving ship is complete, the following distances are the accepted norms:

(**1**) Initial alongside in fair weather for passing gear and hooking up is 30 m. This should be increased to 36 m in adverse weather conditions.
(**2**) When hookup is complete and delivery started, the receiving ship should ease out to 36 m in fair weather and up to 45 m in adverse weather. For personnel transfers, 24 - 30 m is recommended.
(**3**) During the breakaway sequence, since the AOR spanwire/highline cannot be paid out after the wires are detensioned, the receiving ship should ease toward the AOR 4 - 6 m to ensure that all residual tension due to friction through the running rigging is relieved, and remain there until all gear including the distance line is clear of the ship's side.

e. During replenishment, it is important for the receiving ship to maintain station on the AOR such that the transfer points are abeam one another. In the event that the receiving ship moves ahead or falls back such that the angle between stations exceeds 30 degrees, the replenishment must stop.

9.4.3 Distance/Phone Line

a. For abeam transfers, the distance between ships is measured by a distance line, which has a coloured marker flag every 6 m (see Figure 9.4-1). The zero metre end is secured to a strong point on the guide ship, with the other end being manned and kept taut by the receiving ship. The distance line is positioned so that it is visible from the bridge and is at a right angle to the centre line. The characteristics for the distance line are:

(**1**) Line 103 m of 13 mm 3-strand polypropylene with an Ingle field clip at each end. The core of the line is a ship-to-ship phone cable complete with three terminals, which is for bridge-to-bridge and station-to-station communications.
(**2**) Marker Flags 230 mm canvas rectangles painted sequentially green, red, yellow, blue and white. The numbers, which are painted on both sides of the rectangle, have a minimum height of 75 mm. The numbers on the white and yellow rectangles are black, while those on other rectangles are white.

b. For night-time RAS, the distance line is fitted with coloured chemlites to mark the 6 m intervals. A red chemlite is secured to the receiving ship side of the marker flags with the exception of the 18, 30, 42 and 54 metre marker flags, which are bracketed by blue chemlites.

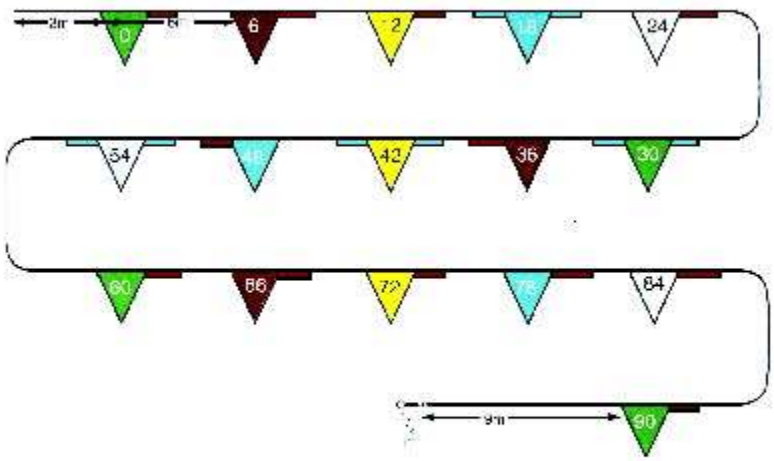


Figure 9.4-1 - Distance Line Showing Position of Day and Night Markings

9.4.4 Marker Buoy

For a liquid astern replenishment, the AOR will stream a marker buoy astern. The receiving ship will maintain station on the rooster tail made by the marker buoy. Slight lateral movement will not greatly affect the replenishment, but if the receiving ship drops too far astern, unnecessary strain will be placed on the hoses and associated equipment.

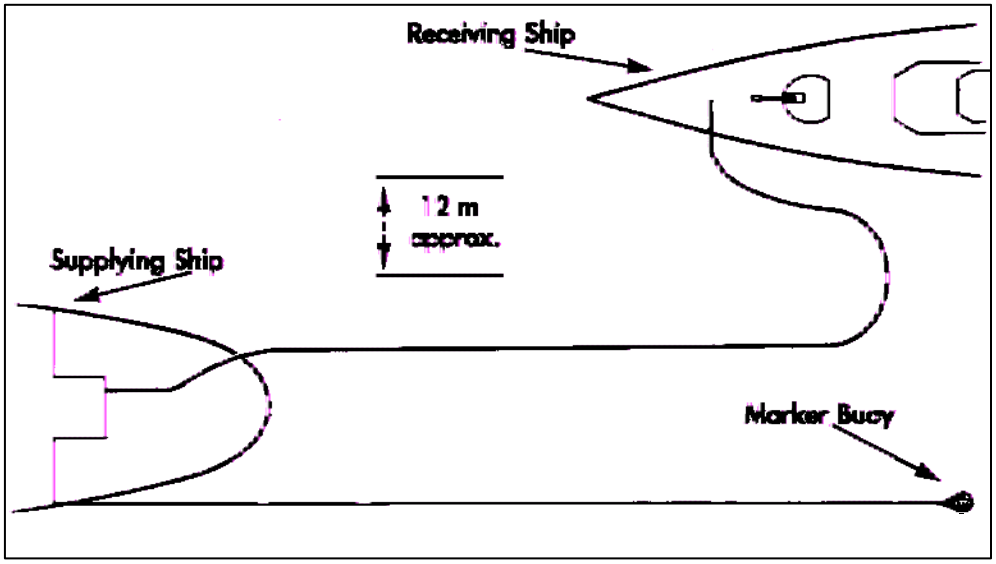


Figure 9.4-2 - Station Keeping Distances for Astern Fuelling

9.5 COMMUNICATIONS AND SIGNALLING

9.5.1 Tactical Communication

a. Effective communications are the key to the conduct of successful RAS evolutions. Prior to a RAS, important direction and information can be gained from reviewing ATP 16, which lists the characteristics of all NATO AORs. In addition, the OPTASK RAS tactical message contains specific directions concerning RAS from the Officer in Tactical Command (OTC) of the Task Group. As well, each ship's OPSTAT UNIT message lists details of RAS stations and capabilities.

b. The ship's whistle is used to communicate the ship's intentions. During a RAS, there is often a requirement to alter course due to the proximity of land and/or shipping, or to maintain the navigation track. This is executed using CORPEN NOVEMBER procedures IAW ATP 1 Vol II, which involves altering together in 5 or 10 degree steps to the ordered course. Each step is initiated on the ship's whistle as follows:

(**1**) One Blast - altering my course to starboard, and
(**2**) Two Blasts - altering my course to port.

9.5.2 Flag Hoists

Before and during a RAS, ships communicate with each other by using different flags and pendants that are hoisted and lowered to various positions on the yardarm by the Naval Communicators:

Signal	Meaning
Romeo  **Displayed on fore yardarm on side rigged**	**Delivering ship (abeam method)** **At the dip:** I am steady on course and speed and am preparing to receive you on side on which this Flag is hoisted. **Close up**: I am ready for your approach. **Hauled down**: When messenger is in hand
Romeo  **Displayed on side hose being used**	**Delivering ship (astern method)** **At the dip**: I am steady on course and speed, and am preparing to stream hose to this quarter. **Close up**: I am ready for your approach. **Hauled down**: Hose is on deck of receiving ship.
Romeo  **Displayed on fore yardarm on side rigged**	**Receiving ship (abeam method)** **At the dip**: I am ready to come alongside. **Close up**: I am commencing approach. **Hauled down**: When messenger to hand.
Romeo  **Displayed on side hose being received**	**Receiving ship (astern method)** **At the dip**: I am ready to close and take hose. **Close up**: I am commencing approach. **Hauled down**: Hose grappled and in hand on deck.
PREP  **Displayed at the outboard yardarm**	**At the dip**: Expect to disengage in 15 minutes. **Close up**: Am disengaging at final station. **Hauled down**: All lines are clear
Bravo  **Displayed where best seen**	**Close up**: Transferring fuel or explosives **At the dip**: Temporarily stopped transfer. **Hauled down**: Transfer completed.

Figure 9.5-1 - Flag Hoists Used during Daylight Replenishment

9.5.3 Thunder Whistles

The station supervisor will signal his/her intentions by the use of a thunder whistle:

(**1**) One Blast by Firing Ship - prepare to receive my gunline/bolo,
(**2**) Two Blasts by Receiving Ship - ready to receive your gunline/bolo, personnel have taken cover, and
(**3**) Three Blasts by Receiving Ship - lines lost. Pass another line (commence cycle again with one blast).

9.5.4 RAS Paddles and Wands

a. For all methods of replenishment, the primary means of station-to-station communication are the RAS paddles by day and the RAS wands by night. The paddles are 30 cm x 30 cm and are individually painted red, green (with one 25 mm white diagonal stripe corner-to-corner), yellow and white. The paddles can be used individually or collectively in various positions or manners to indicate certain actions, or in order to pass information.

b. The color of the paddle or wand, if used by itself or in conjunction with others, signifies a certain meaning:

(**1**) Red - working lines or wires,
(**2**) Green - working fuels (distillate, aviation fuel),
(**3**) Yellow - blow through,
(**4**) White - working water,
(**5**) Green/Green - communications,
(**6**) Red/Yellow - tension/detention, and
(**7**) Red/Green - secure.

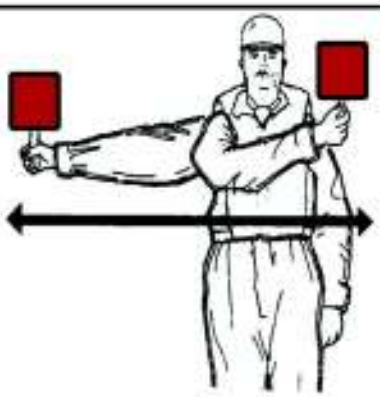
Signal	Remarks
 **Heave In**	Signalman moves red signal device in a continuous complete circle in front of the body. When/where appropriate the other ship answers with the 'Check Away' signal.
 **Avast**	Signalman moves red signal device horizontally in front of the body, meaning for the other ship to avast heaving or checking away as appropriate.
 **Check Away**	Signalman moves red signal device vertically in front of the body, meaning for the other ship to check away the appropriate line, wire or hose until another signal is given.

Figure 9.5-2 – RAS Paddle Signals

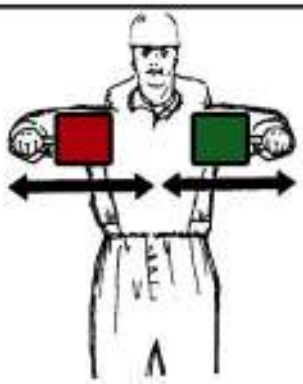
Signal	Remarks
 **Hooked Up or Connected**	Signalman, with red signal device in right hand and green signal device in left hand, touches devices horizontally in front of the body at shoulder height, meaning 'Hooked Up or Connected'. Initiated by receiving ship and acknowledged by delivering ship with same signal.
 **Start Pumping or Commence Transfer**	Signalman moves green signal device in a continuous complete circle in front of the body. This signal, executed by either ship, indicates 'I am ready to start pumping'. When repeated by the other ship, begin transfer and commence signalling with red paddle. If not ready to commence operation, the Avast signal is used.
 **Desire Increase in Pumping Pressure**	Signalman on the receiving ship moves green signal device in a continuous circle over his head to indicate to the delivering ship that an increase in pumping pressure is desired

Figure 9.5-2 (cont) – RAS Paddle Signals

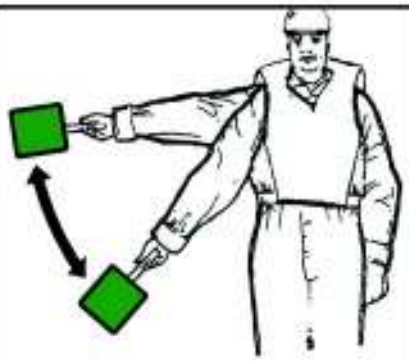
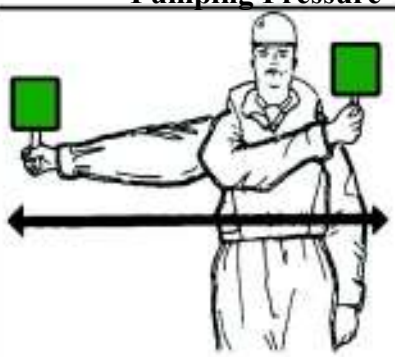
Signal	Remarks
 **Desire Decrease in Pumping Pressure**	Signalman on the receiving ship moves green signal in an arc on his right side from shoulder to knee level to indicate to the delivering ship that a decrease in pumping pressure is desired.
 **Stop Pumping or Cease Transfer**	Signalman moves green device horizontally in front of the body. This signal, executed by either ship, indicates 'Stop pumping' or 'Cease transfer'.
 **Start Blow Through**	Signalman moves amber signal device in a continuous circle in front of the body. The signal, meaning 'Start blow through now', is repeated until the delivering ship acknowledges by repeating the signal, indicating that it has commenced blow through.

Figure 9.5-2 (Cont) – RAS Paddle Signals

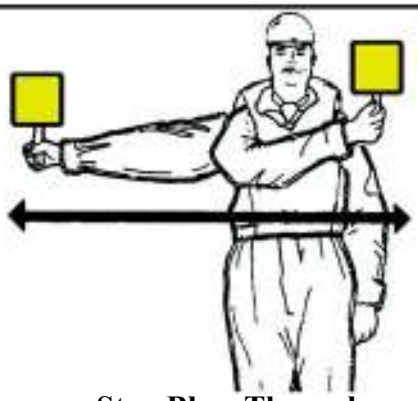
Signal	Remarks
 **Stop Blow Through**	Signalman moves amber device horizontally in front of the body. The signal, given by the receiving ship to indicate 'Stop blow through' is acknowledged by the 'Stop blow through' signal from the delivering ship, indicating that it has stopped blow through.
 **Test S/P Phone Line**	Signalman raises two green signal devices overhead to form a 'Steeple', meaning 'Test your phone/phone lines'.
 **Replace S/P Phone Line**	Signalman waves two green signal devices vertically in front of the body, meaning 'Replace your phone line'.

Figure 9.5-2 (cont) – RAS Paddle Signals

Signal	Remarks
 **Tension Down**	Signalman holds red signal device in right hand and amber signal device in left hand with arms extended over head to form a 'V'. This signal, initiated by receiving ship, means 'I am ready to be tensioned'. When initiated by the delivering ship, it means 'I am tensioning'.
 **Detension**	Signalman, with red signal device in right hand and amber signal device in left hand and with arms extended vertically over head, waves both signal devices vertically in front of the body until acknowledged by other ship. Initiated by receiving ship, signal means 'Detension'. Answered by delivering ship or initiated by delivering ship, signal means 'I am detensioning'.
 **Replenishment Completed at this Station, Commence Unrigging**	Signalman holds red signal device in right hand and a green one in left hand. He crosses both hands and arms over each other above his head. This means 'Replenishment completed at this station, commence unrigging'.

Figure 9.5-2 (cont) – RAS Paddle Signals

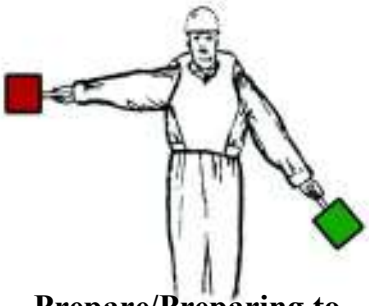
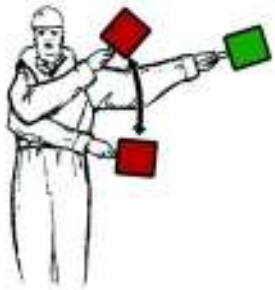
Signal	Remarks
 **Prepare/Preparing to Trip Pelican Hook**	Signalman holds red signal device in right hand, in the horizontal. In left hand he holds green signal device at a 45° angle from the body. Signal given by delivering ship indicates 'Prepare to trip pelican hook.' Signal answered by receiving ship indicates 'I am preparing to trip pelican hook.'
 **Ready to Trip Pelican Hook**	Signalman holds red signal device in right hand, at the vertical. In left hand he holds green signal device at a 45° angle from the body. Signal from both receiving ship and delivering ship indicates 'I am preparing to trip pelican hook.'
 **Trip Pelican Hook**	Signalman holds red signal device in right hand and green signal device in left hand. He makes chopping motion with right arm on left elbow which is raised about shoulder height. Signal given by delivering ship indicates 'Trip pelican hook.' Signal answered by receiving ship indicates 'I am tripping pelican hook.' When pelican hook is tripped, receiving ship signals, 'Heave in.'

Figure 9.5-2 (cont) – RAS Paddle Signals

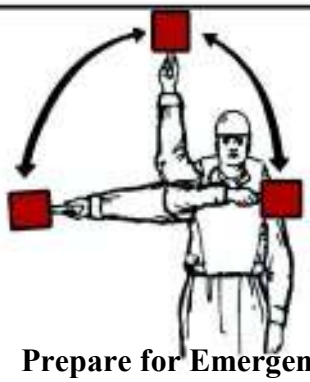
Signal	Remarks
 **Prepare for Emergency Breakaway**	The delivering ship or receiving ship may initiate an emergency breakaway. Signalman of initiating ship rapidly waves red signal device in a semi-circle arc over head, meaning 'Prepare for an emergency breakaway'. Other ship acknowledges by repeating the signal with a red signal device, meaning 'Understood', 'I am preparing for an emergency breakaway'. Once initiated, the delivering ship assumes control.
 **Ready for Emergency Breakaway**	Each ship continues making the prepare signal until ready to execute the emergency breakaway. When ready, each signalman holds the red signal device vertically overhead to indicate 'Ready for emergency breakaway'.
 **Execute Emergency Breakaway**	The signalman of the delivering ship drops the red signal device straight down- wards, meaning 'Execute emergency breakaway now'. The receiving ship acknowledges by repeating the signal.

Figure 9.5-2 (cont) – RAS Paddle Signals

9.6 NIGHT RAS LIGHTING

The correct use of lighting for night-time RAS is essential for proper station-keeping and the safe conduct of the RAS.

9.6.1 Contour Lighting and the Wake Light

Normally, two blue contour lights and a blue wakelight are exhibited by the AOR when she signals that she is steady on the RAS course and speed. Contour lights assist the Captain/OOW of the receiving ship to develop an accurate assessment of the AOR's aspect. These two lights are located at the fore and aft extremes of that portion of the ship's side that parallels the ship's keel (e.g., abeam the forward house and hangar in PROTECTEUR Class). The wakelight illuminates the AOR's wake in order to assist the Captain/OOW in estimating the lateral separation from the AOR during the approach. All three lights are extinguished on the first thunder whistle blast once alongside.

NOTE: *When the wake light is in use, the white stern light is darkened.*

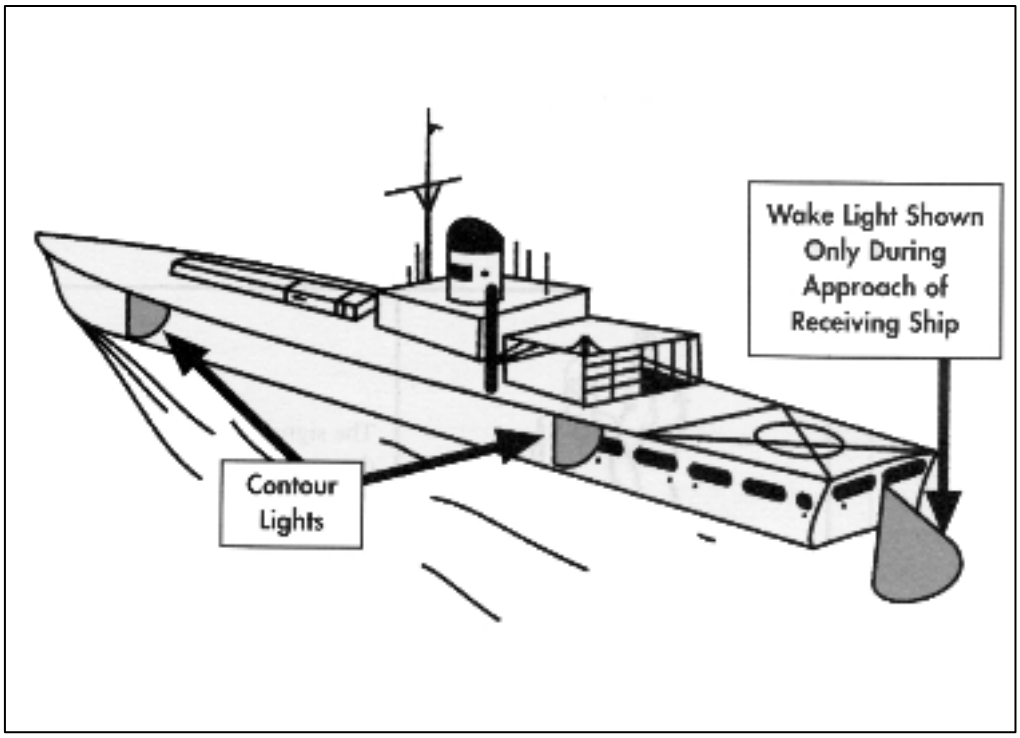


Figure 9.6-1 - Contour and Wake Lights

9.6.2 Dump Lighting

The working areas on deck and in the cargo landing areas shall be illuminated by red lighting only. Lights shall be equipped with shields or shades of sufficient dimension, and positioned so as to avoid illuminating the other ship participating in the replenishment operation. The exterior deck lighting arrangements may be portable.

> **Note**: *Dump lights will be on during rigging preparations, and then extinguished until the receiving ship is alongside and the first thunder whistle is sounded.*

9.6.3 Chemlites

Red chemlites are used to illuminate the moving components of the RAS rigging, i.e., blocks, lines, travellers, hose saddles, probes, the line throwing rifle projectile and bolo, and the markings on the distance line (see 9.4.3, Distance/Phone Line, p. 9-16). Blue chemlites are also used to illuminate the markings on the distance line. Green chemlites are used solely for the safety marking of personnel. All personnel working at a RAS station will have a green chemlite conspicuously attached to their outer layer of clothing (PML type). These are not required to be activated/broken.

9.7 COMMON ASSOCIATED EQUIPMENT USED FOR RAS EVOLUTIONS

a. The following table lists common miscellaneous non-fitted equipment that is required as necessary for RAS evolutions, regardless of ship class:

Table 9.7-1: Equipment - RAS Evolutions

Bolo/Gunline Projectiles	Line Throwing Rifle
Shot Mats	Hard Hats
Hazardous Duty LJ	Safety Harnesses/belts
	Sledge Hammer, Safety Goggles
Fire Axe	Pry Bar
	Chemlites
Knife/Spike	Stirrups
Paddles/Wands/Vests	Easing Out Pendant
Cargo Bags	Length of 4x4 Wood
Common Blocks	Shepherd's Crook
Snatch Blocks	
Mail Bag Flotation Type	Remating line
Mousing	Pallet Jack

b. The following table shows additional miscellaneous non-fitted equipment unique to AORs:

Table 9.7-2: Equipment Unique to AORs	
	AeroQuip Tie Downs
Wire Strops	Salvage Strops
Wire Slings	Cargo Nets
Torpedo Coffin Slings	Torpedo Trucks
Pallet Jack	Safety Pallets
Forklift	

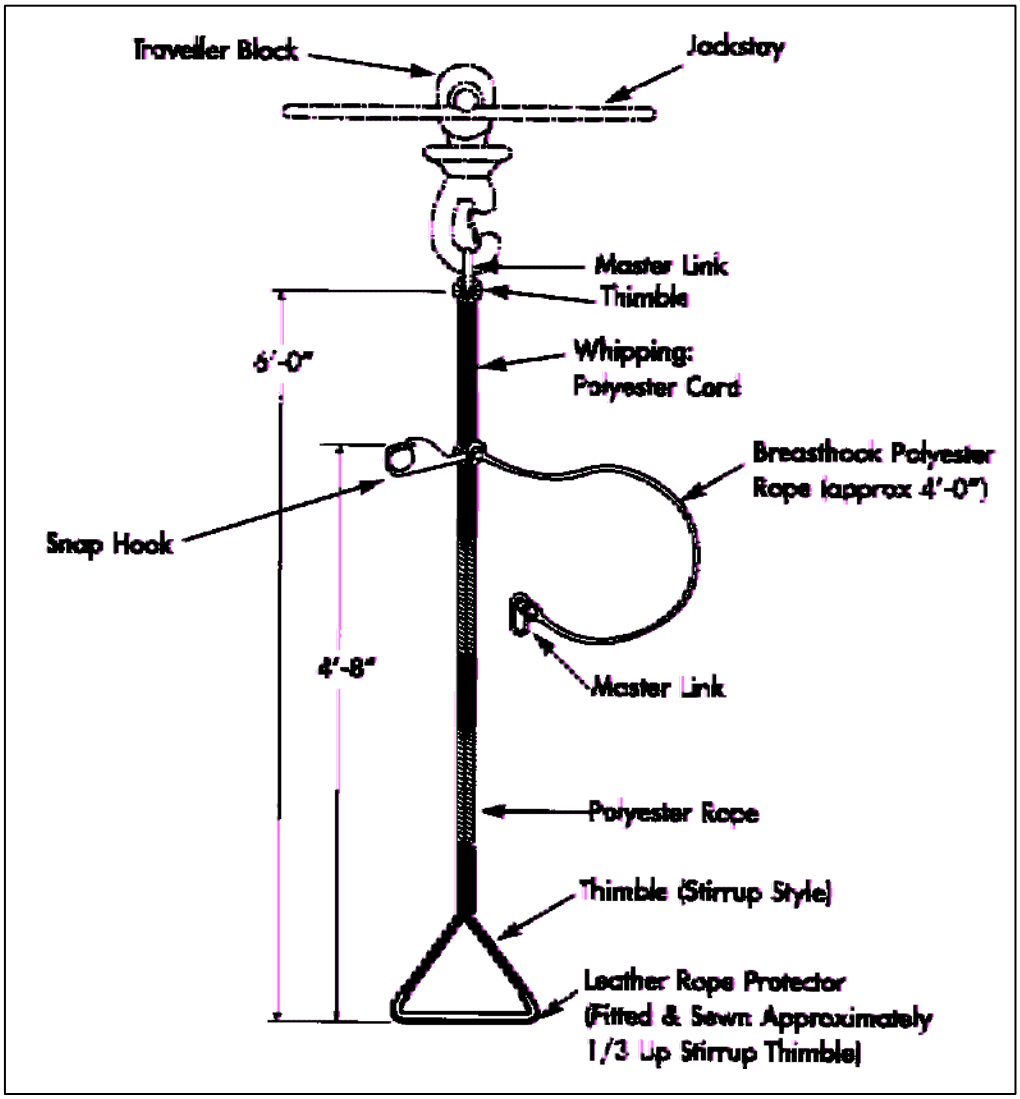


Figure 9.7-1 - Jackstay Transfer Stirrup

9.8 LINES USED FOR REPLENISHMENT

The following table shows the types and characteristics of all lines used during Canadian RAS operations:

Table 9.8-1: Lines - RAS/Seamanship Operations

Type	Length in Metres	Diameter in Millimetres	Make
Distance Line	103	13	3-Strand Polypropylene
Distance Line Messenger	65	12	3-Strand Polypropylene
Light Line	110	18	3-Strand Polypropylene
Light Jackstay	146	32	Braided Polyester
Inhaul	120	16	Braided Polyester
Outhaul	120	16	Braided Polyester
Continuous Messenger	162.6 Heavy Messenger	24	3-Strand Nylon
	60.9 Light Messenger	18	
	18.3 Hose Messenger	12	
Light Messenger (Towing)	65	12	3-Strand Polypropylene
Heavy Messenger (Towing)	110	24	3-Strand Polypropylene
Flounder Plate Messenger	110	18	3-Strand Nylon
Recovery Messenger	65	12	3-Strand Nylon
Hose Messenger	110	18	3-Strand Nylon
Remating Line	20	18	3-Strand Nylon
Easing Out Pendant	Class Specific	9.5	Manilla

Continuous Messenger

a. **General.** The CONTINUOUS messenger is 800 ft (243.8 m) long and incorporates a light messenger, a heavy messenger, a hose/flounder plate messenger and a remating line. The CONTINUOUS messenger may be used for liquid or solid replenishments.

b. **Description.** The CONTINUOUS messenger is made up as shown in Figures 9.23-10 and 9.23-11. Essentially, it is 800 ft (243.8 m) of continuous graduated 3-strand nylon with tapered splices as follows:

(**1**) 200 ft (60.9m) of 1 ½" (12mm dia) 3-strand nylon with a soft eye at the outboard end. The inboard end is spliced into (b);

(**2**) 534 ft (162.6 m) of 3 " (24mm dia) 3-strand nylon. A brummel/englefield hook is spliced into the inboard end of this section; and

(3) 60 ft (18.3m) of 2 ¼ " (18mm dia) 3-strand nylon. The outboard end of this section has a brummel/englefield hook spliced into it. A soft eye is spliced to the inboard end to allow attachment to the probe trolley assembly.

(4) Approx 1" to 2" beckets are spliced into the messenger at distances of 190 ft (57m) from the outboard end and 350 ft (106.6 m) from the inboard end to allow attachment of distance phone lines and the spanwire/highline.

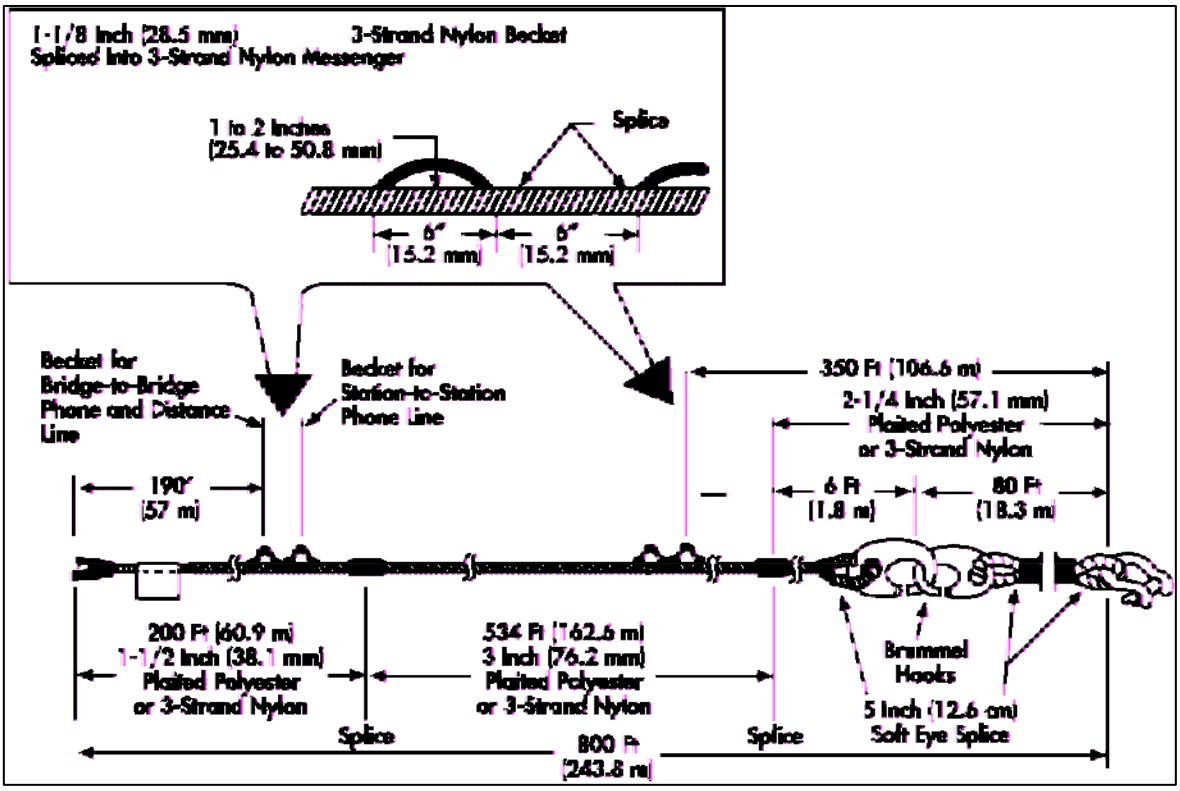


Figure 9-8-1 – Continuous Messenger

9.9 FUELLING FITTINGS

The Canadian Navy uses a variety of hose fittings to transfer fuel between ships. The following is a brief description of the ones most commonly used.

9.9.1 Probe Receiver (Distillate)

The probe receiver is the most common fitting used for transferring distillate.

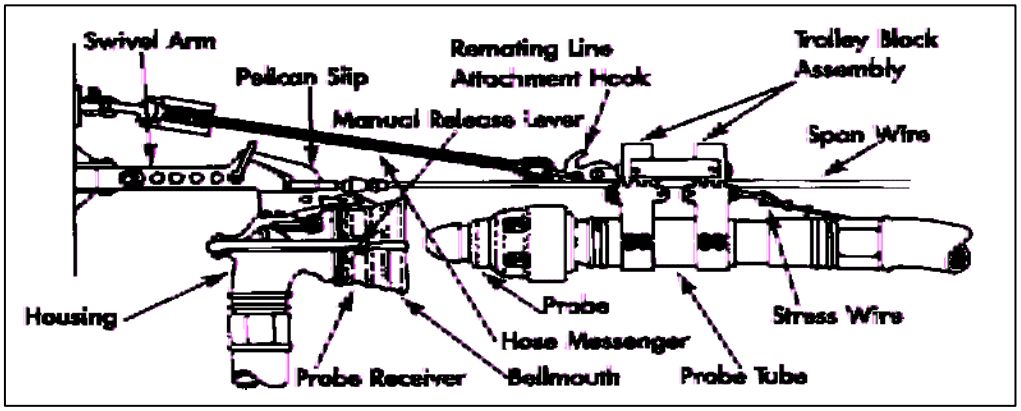


Figure 9.9-1 - Probe and Bell Receiver Assembly

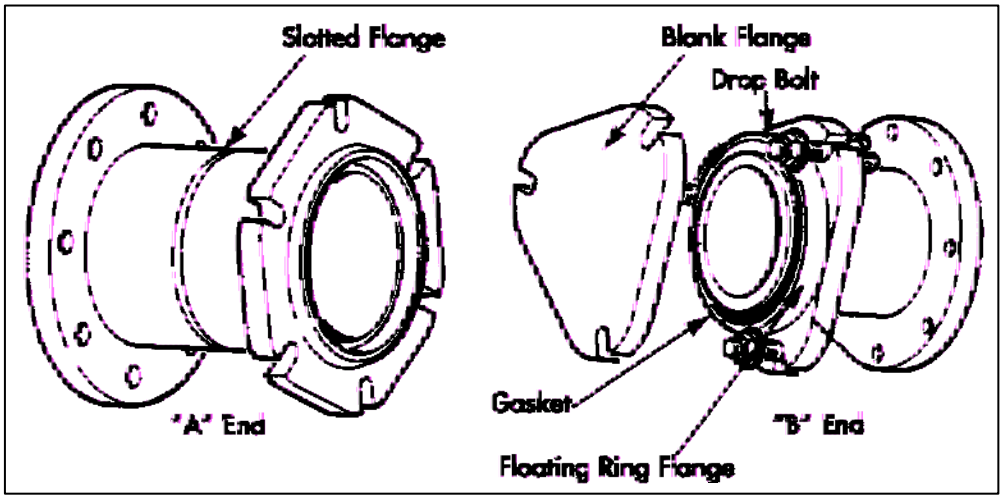
a. **Probe**. The probe assembly consists of three major components: the probe, probe tube and trolley block assembly. The probe is the major component of the three. Its assembly includes six spring-loaded locking mechanisms, which are triggered by six spring-loaded lock arms as the probe is mated in the probe receiver. The trigger-locking mechanisms lock the probe in the receiver. The probe also includes a spring-loaded sliding sleeve valve, which is actuated as the probe is mated and allows the transfer of fuel. The nose of the probe is tapered and provides self-alignment features.

b. **Receiver**. The receiver consists of three major components: a bellmouth, a housing and a manual release lever assembly. The bellmouth has internal tapering surfaces, which provide a self-aligning feature for proper engagement of the probe. It also contains an internal surface for triggering the locking mechanisms of the probe. The next component, the housing, is permanently bolted to the bell- mouth. Its assembly includes two spring-loaded flags, which provide visual indication of proper engagement of the probe and receiver, and a seal to provide a leak-proof connection with the probe. The last component, the manual release lever assembly, is bolted to the housing and may be installed on either side of the housing. Its assembly includes a plunger, which is actuated by the lever to disengage the probe and also seals to prevent leakage.

9.9.2 Hose Coupling NATO (Distillate)

The Hose Coupling NATO was designed to allow NATO navies the capability of replenishing one another. All NATO warships carry the “A” end of the coupling, which is a breakable spool, and all NATO AORs carry the “B” end of the coupling, which is a flanged adapter assembly. This method of fuelling is commonly referred to as NATO “B”.

Figure 9-2-2 NATO B COUPLING



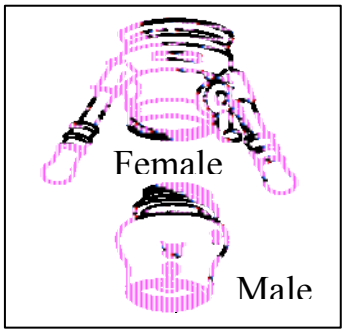


Figure 9.9-3 - Nato Standard F44 Coupling

a. **"A" End**. The NATO breakable spool "A" end consists of a cast-iron spool with a standard hose flange on one end and a slotted flange on the other. A machined groove around the spool weakens it to permit it being broken easily in an emergency by a blow from a sledgehammer.

b. **"B" End**. The "B" end is a flanged adapter assembly consisting of a hose flange on one end and a special floating ring flange with drop bolts on the other. The floating ring flange can be rotated to bring the drop bolts into line with the slots in the "A" end. A gasket mounted in the outboard side of the "B" end provides an oil tight fit. A blank flange is attached to prevent spilling when passing the gear.

9.9.3 NATO Standard F44 Coupling (Carter Underwing Type)

The NATO Standard F44 Coupling consists of male and female couplings. It is commonly used for Helicopter In-Flight Re-Fuelling (HIFR) and is poised to become the NATO standard fitting. The female coupling is supplied by the AOR and the receiving ship supplies the male coupling.

9.9.4 Emergency Breakaway Fuel Coupling

This fitting is currently used by the Candian Navy only. The Emergency Breakaway Coupling is a 7 inch quick connect and disconnect fuel coupling system that features an emergency breakaway function. The Protecteur Class ships supplies the male fitting and the female copling is carried by Iroquois and Halifax class ships.

SEQUENCE OF EVENTS FOR PASSING THE EMERGENCY BREAKAWAY FUELING COUPLING

1. _____All personnel are fallen in prior to coming alongside AOR;
2. One blast of whistle from AOR, personnel are fallen out and take cover;
3. Station Captain gives 2 blast of his whistle;
4. Receive gunline or bolo in hand;
5. Once the gunline has been passed, it is secured to the outboard end of the continuous messenger and is heaved in hand over hand. When sufficient amount of the continuous messenger is heaved onboard, it is connected to the rigged tagline, which has been rove through the lead block on the strong point and through the block at the reversible eye pad on deck. The line handlers take the tagline in hand and heave in hand over hand. Bent on the continuous messenger will be the distance/light line;
6. The distance /phone line is removed from the continuous messenger and attached to the previously rigged tag line to the bridge wing and the continuous messenger is continued to be heaved in until sufficient amount of the 24mm dia section of continuous messenger is onboard.
7. The continuous messenger is heaved in hand over hand. When sufficient amount of the 24mm dia section of continuous messenger is onboard it is taken to the winch (3 turns).
8. Continuous messenger is heaved in under power until the span wire can be attached to the pelican hook.
9. NOTE: The Temporary Guard Rail is Lowered to allow the Span wire aboard and raised again as soon as practical.
10. The Avast signal is given and the span wire is attached to the pelican hook.
11. The continuous messenger is veered until the weight comes off the messenger and taken by the span wire; securing lashings for the continuous messenger are cut.

12. The Hooked On signal is given to indicate that all rigging is complete.

13. The receiving ship gives the Tension Down signal. Station Supervisor must get permission from command before giving the signal to tension down. The immediate area is to be cleared of personnel.

14. The Heave In signal is given by the AOR and the Continuous messenger is heaved in on the receiving ship. All personnel around the fuelling position will don goggles before the rig arrives.
15. NOTE: The Temporary Guard Rail is lowered to allow the Rig aboard and raised again as soon as practical.

16. The station workers secure the hose-hanging pendant to the baby saddle "D" ring.
17. The Hooked On signal is given to indicate that all rigging is complete.

    a. The station workers will unhook the Emergency Breakaway Fuel Coupling Probe and manually connect it to the Emergency Breakaway Fuel Coupling Receiver.

18. The receiving ship gives Hooked On signal.

19. The receiving ship passes start Pumping. Use rematting line that is part of Continuous Messenger or attach rematting line at this time if a secondary commodity is to be transferred. The FWD Dump Worker rigs the Easing Out Pennant.

20. Station workers remove the recovery messenger and attach it to the Continuous Messenger so it can be returned to the AOR.

21. On completion of Liquid Transfer receiving ship passes "Stop Pumping" signal to the AOR. The AOR switches to zero pressure and allows gravity to drain hoses.

22. Secure signal is passed by the AOR and the Station workers disconnect the Emergency Breakaway Fuel Coupling Receiver and connect the fitting back to the rig.
23. The Line Handlers heave in on rematting line until the station workers can release the hose-hanging pendant. The Heave in signal is passed to the AOR and the line handlers check away hand over hand as the rig is brought back to the AOR.

24. NOTE: The Temporary Guard Rail is lowered to allow the Rigs departure and raised again as soon as practical.

25. On completion, the receiving ship will signal the detention and the AOR will signal to slip the span wire. While the "prepare to slip" signal is being given the mousing is removed from the pin in the slip and the easing out pennant is manned. Upon receiving the signal "Slip" the slip is released and the span wire eased over the side with the easing out pennant.

FIGURE 9.9-4

EMERGENCY BREAKAWAY FUELING COUPLING (RIG)

FIGURE 9.9-5
EMERGENCY BREAKAWAY FUELING COUPLING
CONNECTING THE FUEL CONNECTION

FIGURE 9.9-6 EMERGENCY BRAKAWAY FUELING COUPLING MALE –FEMALE CONNECTED SITING ON THE CRADLE.

9.10 Personnel Required (RAS Teams/RAS Board)

a. Personnel requirements for RAS evolutions vary widely, from the labour-intensive multi-station light jackstay forward (supply)/fuelling midships, to the simple light line transfer. All departments and rank levels are involved, with specific or generic skill levels being defined for each position and evolution. Individual assignments are reflected in the departmental Watch and Station Bills and the RAS Board.

b. The RAS Board for HALIFAX/IROQUOIS Class is divided into five teams, with the composition of each team meeting the requirements of specific RASs as follows:

- RAS Team 1 - Light Jackstay (Supply)
- RAS Team 2 - Light Jackstay (Receive)
- RAS Team 3 - Liquids
- RAS Team 4 - Heavy Jackstay
- RAS Team 5 - Light Line

NOTES:

1. *RAS teams are also utilized for other evolutions as the personnel source is already in place, i.e., Towing (see Chapter 8 of this manual).*
2. *RAS Boards are not necessary on the KINGSTON and VICTORIA Classes.*
3. *RAS Boards for AORs are divided into teams based on personnel assignments for each station.*

9.11 SEQUENCE OF EVENTS LIGHT LINE

Supplying Ship			Receiving Ship		
Order	**Signal**	**Action**	**Order**	**Signal**	**Action**
Show Red	One blast on whistle (Given)	Red paddle is held aloft and one blast is given on the whistle to indicate ready to fire gunline.	**Show Red**	Two blasts on whistle (Acknowledged)	Red paddle is held aloft and two blasts are given on the whistle to indicate ready to receive gunline and that personnel have taken cover.
		Gunline fired.			Gunline received.
Note: The supplying ship fires the gunline unless the receiving ship has a helicopter on deck. This is for all seamanship operations.					
Avast	Avast (Given)	Gunline is attached to light line.	**Avast**	Avast (Acknowledged)	Gunline is taken in hand.
Check Away	Heave In (Given)	Light line is paid out hand over hand.	**Heave In**	Check Away (Acknowledged)	Gunline is heaved in hand over hand until sufficient light line is on deck to reeve through blocks.
Avast	Avast (Acknowledged)	Line handlers keep light line out of the water.	**Avast**	Avast (Given)	Station workers pass light line through blocks.
	Hooked On (Acknowledged)		**Hooked On**	Hooked On (Given)	Hooked On signal is passed to indicate that all rigging is complete and ready to commence transfer.
Hook On	Hooked On (Given)	Cargo bag being transferred is hooked on.		Hooked On (Acknowledged)	
Give them Heave In	Heave In (Given)		**Heave In**	Check Away (Acknowledged)	Load is transferred to the receiving ship.
Avast	Avast (Acknowledged)		**Avast**	Avast (Given)	Cargo bag is unhooked.
Note: Permission must be requested for the transfer of cargo from Command before first load.					
Secure	Secure (Given)		**Secure**	Secure (Acknowledged)	Light line is removed from the blocks.

Supplying Ship			Receiving Ship		
Order	**Signal**	**Action**	**Order**	**Signal**	**Action**
Heave In	Check Away (Given)	Light line is heaved in hand over hand until recovered on board.	**Check Away**	Heave In (Acknowledged)	Light line is checked away until bitter end is tossed overboard.

9.12 SEQUENCE OF EVENTS LIGHT JACKSTAY

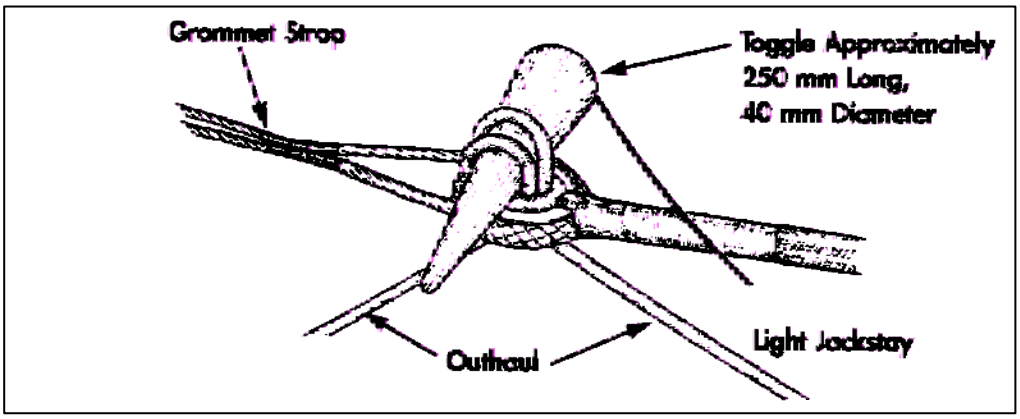


Figure 9.12-1 - Toggle

Supplying Ship			Receiving Ship		
Order	**Signal**	**Action**	**Order**	**Signal**	**Action**
Show Red	One blast on whistle (Given)	Red paddle is held aloft and one blast is given on the whistle to indicate ready to fire gunline.	**Show Red**	Two blasts on whistle (Acknowledged)	Red paddle is held aloft and two blasts are given on the whistle to indicate ready to receive gunline and that personnel have taken cover.
		Gunline fired.			Gunline received.
Avast	Avast (Given)	Gunline is attached to light line.	**Avast**	Avast (Acknowledged)	Gunline is taken in hand.
Check Away	Heave In (Given)	Light messenger is paid out hand over hand.	**Heave In**	Check Away (Acknowledged)	Gunline/light messenger is heaved in hand over hand.
Avast	Avast (Given)	Station workers attach distance line messenger and outhaul to light messenger.	**Avast**	Avast (Acknowledged)	
Check Away	Heave In (Given)			Check Away (Acknowledged)	Outhaul is heaved in hand over hand.
Avast	Avast (Acknowledged)	Line handlers keep outhaul out of the water.	**Avast**	Avast (Given)	Station workers detach distance/telephone line and attach it to tag line leading to command.

Supplying Ship			Receiving Ship		
Order	**Signal**	**Action**	**Order**	**Signal**	**Action**
Check Away on the Outhaul	Heave In (Acknowledged)	Station workers check away the outhaul hand over hand.	**Heave In on the Outhaul**	Check Away	Station workers heave in the outhaul hand over hand.
Avast	Avast (Acknowledged)		**Avast**	Avast (Given)	Station workers pass outhaul through 6" snatch blocks.
Check Away on the Outhaul	Heave In (Acknowledged)	Station workers check away the outhaul hand over hand.	**Heave In on the Outhaul**	Check Away (Given)	Station workers heave in the outhaul hand over hand.
Take the Jackstay in hand		Jackstay workers take the jackstay in hand and check away hand over hand as it pays out.			
Take the Inhaul in Hand		Inhaul workers take the inhaul in hand and check away hand over hand as it pays out.			
Avast	Avast (Acknowledged)	Line handlers keep line out of the water.	**Avast**	Avast (Given)	Station worker passes slip through grommet strop, puts in pin and removes toggle.
	Hooked On (Acknowledged)		**Hooked On**	Hooked on (Given)	Hooked On signal is passed to indicate that all rigging complete and ready to commence transfer.
Haul Taut the Jackstay		The jackstay workers haul taut the jackstay. The rig is inspected to ensure it is correct and that no lines are fouled.			
Heave In on the Inhaul	Check Away (Given)		**Check Away on the Outhaul**	Heave In (Acknowledged)	Traveller is returned to supplying ship.
Avast	Avast (Given)		**Avast**	Avast (Acknowledged)	

Supplying Ship			Receiving Ship		
Order	**Signal**	**Action**	**Order**	**Signal**	**Action**
Walk Back the Jackstay. Check Away on the Inhaul		Jackstay and Inhaul workers check away so that test weights can be hooked onto traveller hook.			
Hook on the Test Weights		Test Weights are hooked on after permission is obtained from Command.			
Show Hooked on	Hooked on (Given)			Hooked on (Acknowledged)	
Haul Taut the Jackstay		Jackstay workers haul taut the jackstay hand over hand. Station workers control the test weights as they are raised.			
Check Away on the Inhaul	Heave In (Given)	Inhaul workers check away hand over hand.	**Heave In on the Outhaul**	Check Away (Acknowledged)	Outhaul workers heave in on the outhaul hand over hand.
Avast	Avast (Acknowledged)		**Avast**	Avast (Given)	
Walk Back the Jackstay					
Note: Station workers will unhook the test weights as soon as the load is safely on deck.					
	Hooked On (Acknowledged)		**Hooked On the Test Weights**	Hooked On (Given)	Test weights are hooked on after permission is obtained from Command.
Haul Taut the Jackstay		Jackstay workers haul taut the jackstay hand over hand.			Station workers control the test weights as they are raised.
Heave In on the Inhaul	Check Away (Given)	Inhaul workers heave in hand over hand.	**Check Away on the Outhaul**	Heave In (Acknowledged)	Outhaul workers check away hand over hand.
Avast	Avast (Given)		**Avast**	Avast (Acknowledged)	
Walk Back the Jackstay		Station workers control the test weights as they are lowered and unhooked.			Outhaul workers keep the outhaul out of the water.
Hook On		Load is hooked on.			

Supplying Ship			Receiving Ship		
Order	**Signal**	**Action**	**Order**	**Signal**	**Action**
Notes: 1. Permission must be obtained from command each and every time personnel are to be hooked on. 2. If just transferring cargo, permission to hook on is requested only once at the start of the transfer.					
	Hooked On (Given)			Hooked On (Acknowledged)	
Haul Taut the Jackstay		Station workers control the load as it is raised.			
Check Away on the Inhaul	Heave In (Given)	Inhaul workers check away hand over hand.	**Heave In on the Outhaul**	Check Away (Acknowledged)	Outhaul workers heave in on the outhaul hand over hand.
Avast	Avast (Acknowledged)		**Avast**	Avast (Given)	
Walk Back the Jackstay		Jackstay workers check away on the jackstay.			Station workers control the load as it is lowered and unhooked.
			Hook On		Station workers hook on the load.
	Hooked On (Acknowledged)			Hooked on Given)	
Haul Taut the Jackstay		Jackstay workers haul taut the jackstay hand over hand.			Station workers control the load as it is raised.
Heave In on the Inhaul	Check Away (Given)	Inhaul workers heave in hand over hand.	**Check Away on the Outhaul**	Heave In (Acknowledged)	Outhaul workers check away hand over hand.
Avast	Avast (Given)		**Avast**	Avast (Acknowledged)	
Walk Back the Jackstay		Station workers control the load as it is lowered and unhooked.			Outhaul workers keep the outhaul out of the water.
Note: This procedure continues until the transfer of cargo is complete and the order "Secure" is given from Command.					
Secure	Secure (Given)		**Secure**	Secure (Acknowledged)	
Haul Taut the Jackstay		Jackstay workers haul taut the jackstay hand over hand.			
Check Away on the Inhaul	Heave In (Given)	Inhaul workers check away hand over hand.	**Heave In on the Outhaul**	Check Away (Acknowledged)	Outhaul workers heave in hand over hand.
Avast	Avast (Acknowledged)		**Avast**	Avast (Given)	Traveller is pulled tight to NEWCO thimble by the outhaul to take the load off the grommet strop.

Supplying Ship			Receiving Ship		
Order	**Signal**	**Action**	**Order**	**Signal**	**Action**
Walk Back the Jackstay		Jackstay workers check away on the jackstay.			
Stand by to Slip	Stand by to Slip (Given)		**Out Pin**	Stand By to Slip (Acknowledged)	Station worker removes mousing and pin. With hammer in hand, waits for the order to trip senhouse slip.
Slip	Slip (Given)		**Slip**	Slip (Acknowledged)	Station worker trips senhouse slip.
Heave In on the Inhaul. Heave In on the Jackstay	Check away (Given)	Station workers assist in bringing traveller over the guardrail.	**Check Away on the Outhaul**	Heave In (Acknowledged)	Outhaul workers check away on the outhaul hand over hand.
Avast	Avast (Acknowledged)		**Avast**	Avast (Given)	Station workers remove outhaul from snatch blocks.
Heave In on the Outhaul	Check Away (Acknowledged)		**Check Away on the Outhaul**	Heave In (Given)	Outhaul workers check away on the outhaul hand over hand.

Notes:
1. The bitter end of the outhaul is tossed over the side and the supplying ship keeps heaving in until it is recovered on board.
2. The light messenger is removed and returned earlier during the transfer of loads.
3. During a "CORPEN NOVEMBER", the transfer of stores may continue at the CO's discretion, but at no time shall personnel be transferred.

9.13 SEQUENCE OF EVENTS HEAVY JACKSTAY

Supplying Ship			Receiving Ship		
Order	**Signal**	**Action**	**Order**	**Signal**	**Action**
Show Red	One blast on whistle (Given)	Red paddle is held aloft and one blast is given on the whistle to indicate ready to fire gunline.	**Show Red**	Two blasts on whistle (Acknowledged)	Red paddle is held aloft and two blasts are given on the whistle to indicate ready to receive gunline and that personnel have taken cover.
		Gunline fired.			Gunline received
Avast	Avast (Given)	Gunline is attached to continuous messenger.	**Avast**	Avast (Acknowledged)	Gunline is taken in hand.
Check Away	Heave In (Given)	Messenger is paid out hand over hand.	**Heave In**	Check Away (Acknowledged)	Gunline/continuous messenger is heaved in hand over hand.
Note: 12mm portion of messenger is to be taken through the blocks at this point, but **NEVER** taken to the winch.					
Avast	Avast (Given)	Station workers attach distance line messenger to continuous messenger.	**Avast**	Avast (Acknowledged)	
Check Away	Heave In (Given)			Check Away (Acknowledged)	Messengers are heaved in hand over hand.
Avast	Avast (Acknowledged)	Line handlers keep messenger out of the water.	**Avast**	Avast (Given)	Station workers unhook distance/telephone line and attach distance line messenger to tag line leading to Command.
Check Away	Heave In (Acknowledged)	Messenger is paid out hand over hand.	**Heave In**	Check Away (Given)	Messenger is heaved in hand over hand until sufficient line is on board to take 3 turns on the winch.
Avast	Avast (Acknowledged)	Line handlers keep messenger out of the water.	**Avast**	Avast (Given)	3 turns are taken on the winch.

Supplying Ship			Receiving Ship		
Order	**Signal**	**Action**	**Order**	**Signal**	**Action**
Check Away on the Outhaul	Heave In (Acknowledged)	Messenger is paid out hand over hand until transferred to highline, and then the highline is veered.	**Heave In Roundly**	Check Away (Given)	Messenger is heaved in under power until the Pelican slip attached to the highline is in position to be hooked onto the elongated link.
Note: Temporary guardrail is lowered to allow highline and Pelican on board and is then raised on completion.					
Avast	Avast (Acknowledged)		**Avast**	Avast (Given)	Pelican slip is attached to elongated link on the sliding padeye.
			Veer		Messenger is veered until weight comes off the messenger. The continuous messenger is removed from the highline.
			The continuous messenger is coiled down and stopped off with lashing.		
	Hooked On (Acknowledged)		**Hooked On**	Hooked On (Given)	Hooked On signal is passed to indicate that all rigging complete.
			Up Padeye		Padeye is raised.
Tension Down	Tension Down	Cage operator heaves in on the highline and places it in tension.	**Tension Down**	Tension Down	Station Supervisor must get permission from Command before giving the signal to tension down.
Up "D" Ring		"D" ring is raised to allow gravity to help send flounder plate across.	**Down Padeye**		Padeye is lowered to allow gravity to help bring flounder plate across.
	Heave In (Given)	Flounder plate is sent to receiving ship.	**Heave In**	Check Away (Acknowledged)	Flounder plate messenger is heaved in to bring flounder plate across.

Supplying Ship			Receiving Ship		
Order	**Signal**	**Action**	**Order**	**Signal**	**Action**
Avast	Avast (Acknowledged)		**Avast**	Avast (Given)	Station workers attach the swivel snap hook of the flounder plate to the link on the bottom of the Pelican slip. The flounder plate messenger is removed and faked out on deck.
	Hooked On (Acknowledged)		**Hooked On**	Hooked On (Given)	
			Up Padeye		Padeye is raised.
		Outhaul winches are put in tension (the inhaul is already in tension).			
Send the Traveller Across	Heave In (Given)	Traveller is sent across to test equipment and rigging.		Check Away (Acknowledged)	
Avast	Avast (Acknowledged)		**Avast**	Avast (Given)	
Down "D" Ring		"D" ring is lowered to help receiving ship hook on the load.	**Down Padeye**		Padeye is lowered to allow station workers to hook on messenger.
					Station workers hook on messenger to traveller.
Up "D" Ring		"D"ring is raised to help receiving ship lift load off the deck.	**Up Padeye**		Padeye is raised to lift load off the deck.
Heave In	Check Away (Given)	Cage operator brings traveller home.		Heave In (Acknowledged)	
Avast	Avast (Given)			Avast (Acknowledged)	
Down "D" Ring		"D" ring is lowered to lower the load onto the deck.	**Down Padeye**		Padeye is lowered to help supplying ship lower load to the deck.

Supplying Ship			Receiving Ship		
Order	**Signal**	**Action**	**Order**	**Signal**	**Action**
Notes: 1. This procedure continues until the transfer of cargo is complete and the order "Secure" is given from Command. 2. The temporary guardrail is lowered as the load nears the ship and is then raised as soon as the load is on board.					
Secure	Secure (Given)		**Secure**	Secure (Acknowledged)	
Up "D" Ring			**Up Padeye**		Padeye is raised slightly.
Switch Outhaul to Speed		Done automatically by AOR.			
	Heave In		**Down Padeye**	Check Away	Station workers attach the flounder plate messenger, then heave in until the flounder plate swivel snap hook can be removed, then pass the easing out pendant.
Heave In Outhaul	Check Away (Acknowledged)	"D" ring is kept in the raised position to prevent the wire from "bird caging" as the flounder plate is recovered.	**Give Heave In**	Heave In (Given)	Padeye is kept in the lowered position to prevent the wire from "bird caging" as the flounder plate is recovered.
			The flounder plate messenger is checked away hand over hand through the upper block.		
			Up Padeye		Padeye is raised slightly.
Detension	Detension (Given)	Cage operator detensions the highline and keeps it clear of the water.	**Detension**	Detension (Acknowledged)	Station Supervisor must get permission from Command before giving the signal to detension.
	Stand by to Slip (Given)		**Out Pin**	Stand by to Slip (Acknowledged)	Station worker removes mousing and pin from Pelican hook and stands by with a hammer.
Slip	Slip (Given)	Heave in the highline.	**Slip**	Slip (Acknowledged)	Station worker trips the Pelican hook.

Supplying Ship			Receiving Ship		
Order	**Signal**	**Action**	**Order**	**Signal**	**Action**
			Up Padeye		The padeye is raised as the easing out pendant is checked away to clear the deck.
			Check Away the Easing Out Pendant		Station worker eases the highline over the side, and then releases the easing out pendant.
Note: Supply ship recovers the highline.					

Notes: 1. In order to hasten heavy jackstay transfers, a pallet jack can be sent with the first load of the heavy jackstay on request of the receiving ship. When transferring to IROQUOIS Class ships, the pallet jack **MUST** be sent on the first load.

2. The easing out pennant may be rigged prior to tensioning down. It will be coiled and secured to the sliding padeye cleat. This applies to heavy jackstay and fuellings.

9.14 SEQUENCE OF EVENTS LIQUIDS TRANSFER (PROBE)

GENERAL

Once in station, ships will establish contact with the gunline and commence passing lines. A continuous messenger is utilized which incorporates a light messenger, heavy messenger and remating line. NOTE When operating with Candian ships. Receiving ships may use there own remainting line size 24 mm. A distance/phone line is attached to beckets on the continuous messenger. This line is removed from the messenger and tended at an appropriate position to indicate distances between ships. The continuous messenger is hove in, normally by winch, until the spanwire is aboard and hooked on. Once the spanwire is tensioned down, the probe is allowed to descend the spanwire under control and the slack in the continuous messenger is taken up by hand. When the probe has seated, the continuous messenger is "broken" at the brummel/englefield clips, leaving the 18m section attached to the probe. The remainder of the messenger is then returned.

Supplying Ship			Receiving Ship		
Order	**Signal**	**Action**	**Order**	**Signal**	**Action**
Show Red	One blast on whistle (Given)	Red paddle is held aloft and one blast is given on the whistle to indicate ready to fire gunline.	**Show Red**	Two blasts on whistle (Acknowledged)	Red paddle is held aloft and two blasts are given on the whistle to indicate ready to receive gunline and that personnel have taken cover.
		Gunline fired.			Gunline received
Avast	Avast (Given)	Gunline is attached to messenger.	**Avast**	Avast (Acknowledged)	Gunline is taken in hand.
Check Away	Heave In (Given)	Messengers are paid out hand over hand.	**Heave In**	Check Away (Acknowledged)	Gunline/ messenger is heaved in hand over hand.
Note: 12 mm messenger is to be secured to tag line and then be taken through the blocks at this point, but **NEVER** taken to the winch.					
Avast	Avast (Given)	Station workers attach distance line messenger to messenger.	**Avast**	Avast (Acknowledged)	
Check Away	Heave In (Given)			Check Away (Acknowledged)	Messengers are heaved in hand over hand.

Supplying Ship			Receiving Ship		
Order	**Signal**	**Action**	**Order**	**Signal**	**Action**
Avast	Avast (Acknowledged)	Line handlers keep messenger out of the water.	**Avast**	Avast (Given)	Station workers unhook distance/telephone line and attach to tag line leading to Command.
Check Away	Heave In (Acknowledged)	Messenger is paid out hand over hand.	**Heave In**	Check Away (Given)	Messenger is heaved in hand over hand until sufficient 24 mm line is on board to take 3 turns on the winch.
Avast	Avast (Acknowledged)	Line handlers keep messenger out of the water.	**Avast**	Avast (Given)	Station workers take 3 turns on the winch.
Check Away	Heave In (Acknowledged)	Messenger is paid out hand over hand until transferred to spanwire.	**Heave In Roundly**	Check Away (Given)	Messenger is heaved in under power until the weak link can be attached to the swivel arm.
Note: Temporary guardrail is lowered to allow spanwire on board and is then raised on completion.					
Avast	Avast (Acknowledged)		**Avast**	Avast (Given)	Weak link is attached to Pelican hook on the swivel arm assembly.
			Veer Handsomely		Messenger is veered until weight comes off the messenger. The continuous messenger is removed.
			The messengers are coiled down and made ready to return to the supply ship.		
	Hooked On (Acknowledged)		**Hook On**	Hooked On (Given)	Hooked On signal is passed to indicate that all rigging complete.

Supplying Ship			Receiving Ship		
Order	**Signal**	**Action**	**Order**	**Signal**	**Action**
Tension Down	Tension Down	Cage operator heaves in on the spanwire and places in tension.	**Tension Down**	Tension Down	Station Supervisor must get permission from Command before giving the signal to tension down. Immediate area is cleared of personnel.
			Up Temporary Guardrail		
	Heave In (Given)	Probe is sent to receiving ship.		Check Away (Acknowledged)	Slack is taken up on the continuous messenger by hand as the probe descends the spanwire
Note: If, due to excessive separation between ships, difficulty is experienced in seating the probe, messengers are to be heaved in to assist in seating the probe. In certain circumstances, it may be necessary to utilize the line-handling winch to accomplish this. Caution must be exercised to ensure undue strain does not come on the messenger. Under normal circumstances the probe shall be allowed to descend the spanwire as slack in the messengers is taken up by hand.					
			On Goggles		All personnel around the fuelling position will don goggles before the probe arrives.
	Hooked On (Acknowledged)		**Hook On**	Hooked On (Given)	Hooked On is given if probe is properly seated and indicator flags are up
4 Saddle in Tension		Cage operator heaves in and puts 4 saddle in tension			
Start Pumping	Start Pumping (Acknowledged)		**Start Pumping**	Start Pumping (Given)	Rig easing out pendant.
			Pumping will continue until the ship has received the required amount of fuel.		

Supplying Ship			Receiving Ship		
Order	**Signal**	**Action**	**Order**	**Signal**	**Action**
SECONDARY COMMODITY: If a second commodity is to be passed, such as JP5 or water, an extra length of 4" hose (pig tail) is hooked under the probe. Note: A second commodity can only be transferred once the fuelling rig is properly hooked on. The continuous messenger is attached to the hook on the probe trolley. It is passed through the lead blocks ensuring that there is a .6 – 1 m slack after which four turns are placed on the winch. This is to prevent weight from coming down on the secondary hose should the probe pull out. The continuous messenger is then used to reseat the probe. To connect the secondary hose (JP5): a. unclip from main hose point; b. unscrew cover cap and connect to ship's service; and c. connect male and female fittings. Note: The signalman must ensure that he points aft with his/her green paddle/wand for JP5 and forward for distillate when he is signaling Start or Stop Pumping. The remating line may be removed after the second commodity transfer is completed.					
			Remove the recovery messenger		Station worker removes the recovery messenger and attaches it to the messenger.
Heave In	Check Away (Acknowledged)	Station workers recover the lines.	**Check Away**	Heave In (Given)	Station workers return the messenger.
Stop Pumping	Stop Pumping (Acknowledged)		**Stop Pumping**	Stop Pumping (Given)	
Note: The AOR switches to zero pressure and allows gravity to drain the hoses.					
Secure	Secure (Given)	Once the hoses are flat.	**Secure**	Secure (Acknowledged)	Once hose are flat.
4 Saddle in Speed		Cage operator puts slack in saddle wire.			
			Release the probe		Station workers release the probe.
Heave In	Check Away (Acknowledged)	Probe is brought home.	**Give Heave In**	Heave In (Given)	

Supplying Ship			Receiving Ship		
Order	**Signal**	**Action**	**Order**	**Signal**	**Action**
Detension	Detension (Given)	Cage operator detensions the spanwire and keeps it clear of the water.	**Detension**	Detension (Acknowledged)	Station Supervisor must get permission from Command before giving the signal to detension. Immediate area is cleared of personnel.
			Down Temporary Guardrail		Temporary guardrail is lowered in preparation for slipping.
	Stand By to Slip (Given)		**Out Pin**	Stand By to Slip (Acknowledged)	Station worker removes mousing and pin from Pelican hook and stands by with a hammer.
Slip	Slip (Given)	Heave in the spanwire.	**Slip**	Slip (Acknowledged)	Station worker trips the hook.
			Check Away the Easing Out Pendant		Station worker eases the spanwire over the side and then releases the easing out pendant.
Note: Supply ship recovers the spanwire.					

9.16 SEQUENCE OF EVENTS STERN FUELLING

Supplying Ship			Receiving Ship		
Order	**Signal**	**Action**	**Order**	**Signal**	**Action**
Commence Streaming		Marker buoy is paid out to a distance ordered by command.			
Positioned Streamed to between 121-146 metres		Cable is veered to distance ordered.			
Stream the Hose		Veer until the hose is fully deployed.			
Note: When the fuelling assembly is being paid out through the stern fairlead, caution is to be exercised as damage can occur to the fuelling assembly, and the risk of injury to personnel is highest. Veering at that point must be at dead slow speed.					
			Grapnel the Messenger		The messenger picked up and the float assembly hauled on deck.
			Heave in Handsomely		Hose messenger heaved in until hose hanging pendant in line with flounder plate.
			Avast		Hook on hose hanging pendant, connect up hoses.
Start Pumping	Start Pumping	Pumping commenced at a slow rate.	**Start Pumping**	Start Pumping	Receive fuel
Stop Pumping	Stop Pumping	Engine room to stop cargo pump.	**Stop Pumping**	Stop Pumping	Fuelling TX stopped.
Start the Blow Through	Start Blow Through	15 second blow through.	**Start the Blow Through**	Start the Blow Through	Either excess fuel is blown through, sucked back or gravity fed.
Stop the Down Through	Stop Blow Through		**Stop the Blow Through**	Stop the Blow Through	Pressure is taken off hoses.
Secure	Secure		**Secure**	Secure	Ship prepares to return gear.
Prepare to Slip		Receiving ship prepares to slip.			Fuel hose capped off.
Slip	Slip	Receiving ship lowers gear into water.	**Slip**	Slip	All gear lowered into the water/ then rec. ship slows down.

Supplying Ship			Receiving Ship		
Order	**Signal**	**Action**	**Order**	**Signal**	**Action**
Recover Fuel Hose		Heave in dead slow, then half speed.			
Heave in Dead Slow		When fuelling assembly is in sight at approximately 30 metres.			
Secure Fuelling Station					

9.17 EMERGENCY BREAKAWAY

a. An emergency breakaway may be initiated by either ship in response to any emergency. The sounding of six short blasts on the ship's whistle will most probably be the first indicator that an emergency breakaway is being initiated. A verbal order from Command to the RAS deck will be made simultaneously. Emergencies could result from RAS equipment failure, steering gear or main propulsion breakdowns, or when an imminent risk of collision exists. The aim is to disengage as quickly as possible without endangering life and with minimum damage to equipment. Lines are not to be thrown overboard, but should be returned as quickly as possible. Lines that are or become fouled must be cut.

b. An emergency breakaway is essentially an accelerated return of gear with minimal signals. The following items must be taken into consideration:

(1) Light Line. If the load is in transit, the run is completed; on arrival, the load is removed.
(2) Light Jackstay:
  (a) If the traveller is in transit, the run is completed; on arrival, the load is unhooked.
  (b) If the traveller is on either ship the load is unhooked.
  (c) If the traveller is on the Supplying ship the Receiving ship will pass a bight to the outhaul through the NEWCO thimble of the support line and secure it in place with the wooden toggle.
(3) Heavy Jackstay:
  (a) The initial action is for the AOR to recover the traveller (and the load if it is hooked on). This may involve stopping the traveller on an outboard run.
  (b) If the traveller is on deck on the Receiving ship, the load is unhooked. The padeye is then raised and the 'Heave In' signal given before continuing with the 'Prepare for Emergency Breakaway' signal.
(4) Fuelling (Probe). If distillate and aviation fuel are being transferred concurrently, the AOR must ensure that the Receiving ship removes the remating line and the aviation fuel fitting before releasing the probe.
(5) Fuelling NATO "B". The breakable spool should be broken.
(6) EBFC. use the quick release method.
(7) Distance/Telephone Line. Returned as soon as the telephone connections are disconnected.

9.18 RAS BRIEFING

a. Prior to all RAS evolutions, a Command briefing will be conducted. This briefing to the Captain will normally take place on the bridge in the wardroom or in another suitable location, and will occur as early as the day prior to the RAS, and as late as 15 minutes prior to the RAS Teams and Special Sea Dutymen being piped to close-up. The following personnel will, as a minimum, be in attendance: Executive Officer, Deck Officer, Engineering Officer, Supply Officer, Safety Officer, Chief Bosn's Mate, Senior Naval Communicator and Station Supervisor.

b. The following is a briefing format to be followed:

(1) (OWNSHIP) will be conducting a (TYPE OF RAS) with (AOR) on our (PORT/STARBOARD) side (FORWARD/MIDSHIPS) at (TIME). In accordance with the Task Group Commander's intentions promulgated by message this morning, (OWNSHIP) will be the third of three ships replenishing. It is anticipated that (OWNSHIP) will be ordered into Lifeguard Station during the first two ships' RAS. The (PORT/STARBOARD) Rescue Watch will be closed up at that time. This in-scale diagram shows (OWNSHIP) alongside (AOR) and the stations that will be used for replenishing.

(2) (PORT/STBD) watch Special Sea Dutymen and RAS Team(s) (NUMBER) will be required to close up at (TIME), at which time the station will be rigged.

(3) The dress for this evolution, as discussed with the Executive Officer, will be (DRESS).

(4) The Station Supervisor for this evolution will be (NAME) and the Safety Officer will be (NAME).

(5) The following commodities will be received/passed:

(a) (PERSONNEL),

(b) (PROVISIONS/AMMUNITION), and

© (FUEL/WATER).

(6) The sequence of events for the RAS will be as follows:

(DESCRIBE PASSING OF RIG AND SEQUENCE OF TRANSFER. IF WORKING WITH A NON-CANADIAN AOR, PROVIDE DETAIL ON ANY DEPARTURES FROM STANDARD CANADIAN RIGGING AND RAS SOPs).

(7) Station Supervisors are to thoroughly brief all personnel upon closing up on their duties and the sequence of events. The Safety Officer will pay close attention during the evolution for safety infractions.

(8) In the event of an emergency breakaway, the aim is to disengage as quickly as possible without endangering life and with minimum damage to equipment. Lines are not to be thrown overboard, but should be returned as quickly as possible. Lines that are or become fouled must be cut. The AOR will initiate the order to slip.

(9) If required, a debrief will be conducted on completion of the evolution. Place and time to be promulgated.

(10) This completes the briefing. Are there any questions?

(11) The Chief Bosn's Mate will now brief personnel on the safety-related aspects of the evolution.

9.19 REPLENISHMENT SAFETY BRIEFING

It is important that the Chief Bosn's Mate and the Station Supervisors give a thorough safety briefing to all personnel involved in the replenishment prior to the evolution starting. As well as the general shipboard safety items listed in Chapter 4, the following safety points must be covered:

a. General:

(**1**) All personnel will take cover and remain under cover until the gunline is fired.
(**2**) Minimum personnel are to be placed aft of the rigging. If required aft, they are to clear the area upon completion of the task.
(**3**) Station Supervisors must take positive control of dump workers and order them into and out of the dump area as required and when safe to do so.

b. Tensioned Rigs:

(**1**) Always remain clear and under cover if possible when the rig is being put in tension or detensioned.
(**2**) Never pass under a rig whether in tension or not. The only exception is under the direction of the Station Supervisor during special transfers.
(**3**) Personnel are to remain clear of upper platform directly above fuelling station when tensioning and detensioning.
(**4**) Never turn your back to the rig.

NOTE: *The padeye must be in the upper position when this action is authorized during a heavy jackstay.*

c. Station Workers:

(**1**) Never turn your back to the load.
(**2**) Never stand outboard of the load.
(**3**) Never stand under the load.
(**4**) If possible, do not place yourself between the load and the bulkhead and/or rigging.
(**5**) Remain clear of temporary guardrails.
(**6**) When directed, station workers are to wear tethered safety harnesses/belts when working in the dump area with a temporary guardrail rigged.
(**7**) All dump workers must wear Hazardous Duty lifejackets.

d. Fuelling:

(**1**) Goggles are worn by all personnel in the fuelling area and any personnel aft of the rig.
(**2**) One layer of clothing must be worn by all at the fuelling position, taking care to ensure that as much skin as possible is covered.
(**3**) Action in the event of a fuel spill.

> **NOTE**: *Safety lessons learned from previous replenishments should be stressed during the RAS Safety Briefing.*

9.20 VERTREP/HOIST

a. **Acronyms:**

SAC - Shipborne Aircraft Controller
FDD - Flight Deck Director
FLYCO - Flight Deck Co-Ordinator
VCO - VERTREP Control Officer
SWOAD - Ships Without Air Det

b. VERTREP/Hoist may be conducted when a HELAIRDET is not embarked, in accordance with SHOP Chapter 9, provided the following conditions have been satisfied:

(**1**) FLYCO is manned by the Senior Firefighter.
(**2**) (**3**) Positions normally manned by the Air Department personnel will be manned by the ship's staff.
(**3**) The following personnel are required and must be SWOAD

Table 9.20-1 : Personnel - VERTREP

Personnel	Position	Qualification
Senior Firefighter	FLYCO	SGT/MCPL
Bosn	FDD	PO/MS
Bosn	Deck Crew	LS/OS
Bosn	Deck Crew	LS/OS

Note ATR'S may be used for Kingston and Victoria class. All personnel must be SWOAD qualifed IAW with SHOPS

c. **Dress.** The personnel involved in the VERTREP/Hoist will wear NCDs with sleeves rolled down and the following safety items: head protection (with chin strap drawn), goggles, ear defenders, life jackets and leather gloves (for handling wires and loads).

The following equipment is required: red and green paddles or wands, a grounding rod, and nylon or steel cargo slings.

d. **Sequence of Events.**

(**1**) Ship will close up as per Flying Stations.
(**2**) FLYCO will close up and establish normal communication with the bridge and pass pertinent information, i.e., load density, type and weight.
(**3**) The bridge will pass the flying course, relative wind, true wind, altimeter setting and RADHAZ Safe to the helicopter.
(**4**) When ready, the VCO will give "Signal Charlie" for VERTREP. The trafficators will be turned to green and the helicopter will make its approach.
(**5**) The FDD will hold up the green paddle to let the helicopter know the deck is clear and ready (the FDD paddles back up the trafficators).
(**6**) When the helicopter is in position, FLYCO by PA system, will direct the FDD to hook or unhook the load. The FDD will send in the two-deck crew. FLYCO will switch the trafficators to amber and the FDD will hold up the red paddle. This indicates to the pilot that the drop zone/deck is fouled (personnel working under the helicopter).
(**7**) The deck crew will ground and hook or unhook the load.
(**8**) The FDD will clear the drop zone/deck of personnel. When the area is clear, the FDD will lower the red paddle and hold up the green.
(**9**) FLYCO will switch the trafficators to green, indicating that the helicopter is clear to depart.
(**10**) FLYCO will inform the bridge of the helicopter's departure (which side) and turn control over to the SAC.

When personnel are being lowered, the hoist wire is to be grounded before they touch the deck. Before hooking on personnel, the hoist wire is also to be grounded.

9.21 IROQUOIS CLASS - REPLENISHMENT AT SEA

9.21.1 Light Line Transfer

a. There are two stations on IROQUOIS Class ships from which light line transfers can be conducted on either side of the gun deck.

b. **Equipment Layout - Gun Deck.** The light line is faked out on deck athwartships so that it will pay out from aft to forward.

> **NOTE**: *During all IROQUOIS RAS operations, 3/4" shackles are used on all 12" blocks with the exception of a 7/8" shackle used on the Kingpost Sliding Padeye.*

IROQUOIS CLASS SAMPSON POST
STANDARD OPERATION PROCEDURE (SOP)
PREPARATION AND EQUIPMENT LAYOUT
LIGHT JACKSTAY (SUPPLY)

Operation Procedures

Control Pendant - the control pendant is a momentary push button type with two push buttons; **Raise** and **Lower** and comes with a 6 meter cable attached.

Equipment Operating Procedures

General - Note that there are no equipment safety controls or limit switches. It is the responsibility of the operator to monitor operation and control the equipment as required.

The Sampson Post hoisting drum should be monitored to ensure correct wire spooling. Careful operation is required when lowering the Sampson Post to ensure the load is always carried by the hoist wire and that no slack occurs at the end of the travel cycle.

Pre-Start Checks

- Ensure that maintenance and lubrication procedures have been done;
- Check that power is available at the bulkhead socket (120 Volts)
- Ensure that the necessary stays, shackles, extension cables, crank handle, lever handles and personnel platform are available for operation; and
- Check that the hoist wire is wrapped tight and even on the drum.

9.21.2 Light Jackstay (Supply) Sequence of Events

- Remove latches and lift hatch. For powered operation, swing hatch completely open. For manual operation, open hatch to about 60˚ past vertical and latch in place with safety bar provided.

- Remove light stays from storage area and place on deck appropriate for port or starboard RAS.
- Remove pendant and extension cord. Plug extension cord into electrical outlet on Gun House bulkhead and Sampson post motor.
- Jog the post up to place load on hoist wire and remove the lock pins from the stowed position.
- Raise the Sampson Post sufficiently to attach the upper ends of the light backstays to the Sampson Post crosshead eyes (only 2 backstays required for light jackstay). Install stays on opposite side of transfer.
- Shackle the upper 12- inch common block to the upper eyepad above the elongated link of the post.
- Shackle the upper 6- inch common block to the lower eyepad below the elongated link of the post.
- Raise the Sampson Post, approximately 2 meters, and attach and lock the personnel platform to the post.
- Raise the Sampson Post 3 meters. The first set of lock pin support holes should align with the lock pins. When the lock pins align, engage the lock pins in position. (Jog up or down to achieve proper alignment)
- Attach turnbuckle clevises to deck as required. NOTE**:** The turnbuckles must be fully open.
- Tighten the turnbuckles on both backstays to support the post. DO NOT OVER TIGHTEN.
- Attach the bottom 12-inch common block to the lower eyepad located on the corner of the missile house.
- Attach the bottom 6-inch common block to the eyepad located on the gun house bulkhead.
- Fake out the Jackstay support line along the guardrail by the breakwater to pay out from inboard to outboard. Fake out the inhaul along the face of the house to pay out from forward to aft. Fake the messenger and outhaul in the dump area to pay out from inboard to outboard.
- A messenger is passed from the bridge to the station to facilitate passing the telephone/distance line to the bridge.

Securing Equipment

- On completion of RAS
- Slacken off backstay and remove from deck fittings.
- Disengage lock pins and pin into position. Jog up to take pressure off lock pins.
- Lower post until personnel platform is conveniently positioned for removal. Remove and stow platform.
- Lower post until conveniently positioned for removal of 6 and 12-inch blocks and backstays.
- When all equipment is removed from the post continue lowering post until the crosshead rests on the support bumpers. DO NOT continue to lower as this will slacken the hoist wire on the drum and cause a birdcage.
- Engage the lock pins and lock in the stowed position.

- Stow the lock pin lever extensions, extension cord, pendant control station and hand crank on the brackets provided inside the Sampson Post combing.
- Stow the stays on the mess support trays inside the combing.
- Close and dog the Sampson Post combing cover.
- Secure jackstay support line and associated equipment.

9.21.3 Light Jackstay Receive–Preparation and Equipment Layout

Retractable Sampson Post Setup Light Jackstay Receive

Ensure that the Pre start checks have been completed and which station is being rigged. When all is safe the following must be done to rig for receiving a Light Jackstay forward:

a. **Lay out Stays:** Remove light stays from the stowage trays and lay out in the appropriate configuration for Port or Stbd Light Jackstay.
b. **Get Power:** Remove pendant and extension cord. Plug extension cord between the electrical outlet on Gun House bulkhead and Sampson post motor.
c. **Remove Ball Locking pins:** Jog the post up to place load on hoist wire and remove the ball locking pins. Next attach lever extension pipes to remove the support locking pins from the stowed position.
d. **Attach Backstays**: Raise the Sampson Post sufficiently to attach the upper ends of the light ½" dia. backstays to the Sampson Post crosshead eyes (only 2 backstays required for light jackstay). Install stays on opposite side of transfer.
e. **Attach Senhouse Slip**: Shackle the Senhouse slip to the elongated link.
f. **Attach upper 6" Inhaul Block:** Shackle the upper 6- inch snatch block to the lower eye pad below the elongated link of the post.
f. **Attach personnel platform:** Raise the Sampson Post, approximately 1 meters. Take the platform and unfold the handrails ensuring the handrail and support braces are against their stops. Attach and lock the personnel platform to the post ensuring that the side forks fully engage with the steps. Insert locking block and ball locking pin to secure in place.
g. **Set post to Light Jackstay Height:** Raise the Sampson Post 3 meters. The first set of support lock pin support holes should align with the support lock pins. When the support lock pins align, engage the support body lock pins in position. (Jog up or down to achieve proper alignment) and insert ball locking pins
h. **Stow Power Cable:** The Sampson post is ready for operation. For safety, and to prevent damage to the power cable, disconnect and stow the extension cord when the Sampson post is in position.
i. **Tighten backstays:** Attach turnbuckle clevises to deck as required. The turnbuckles must be fully open. Tighten the turnbuckles evenly on all sides to support the post. The heavy backstays should be tightened such that the support pins are evenly seated on both sides. Do not over tighten.
j. **Attach lower 6" Inhaul Block:** Attach the bottom 6-inch snatch block to the eye pad located on the gun house bulkhead.
k. **Distance line:** A messenger is passed from the bridge to the station to facilitate passing the telephone/distance line to the bridge.

9.21.4 Stations 1 and 2 Heavy Jackstay Receive Preparation and Equipment Layout.

The forward solids transfer position is designed to receive up to 1364 kg on each transfer The retractable Sampson post is a fixed pad-eye type, for use with a cargo drop reel for heavy jackstay transfer utilizing the NATO standard long link as an attachment point for the highline, when operated in the fully extended position. It is also capable of being operated in the partially extended mode for a light jackstay transfer. The retractable Sampson post replaces the folding Sampson posts and is located in the formally located king post trunking.

1. Prior to even touching the Davit and controls you have to ensure that the ship is RADHAZ safe. Once RADHAZ safe the next step is to confirm that the forward mount is made safe. Once the close up pipe has been made the following pre start checks have to be made:

   a. Retractable Sampson Post hatch: Open the Retractable Sampson Post hatch and fold back until it rests on the deck.
   b. Maintenance: Ensure that maintenance and lubrication procedures have been done.
   c. Power: Check that power is available at the bulkhead socket (120 Volts).
   d. Ensure that the necessary stays, shackles, extension cables, crank handle, lever handles and personnel platform are available for operation.
   e. Hoist wire: Check that the hoist wire is wrapped tight and even on the drum.

2. There are no manual operation interlocks or end of travel limit switches. It is the responsibility of the operator to monitor operation and control the equipment as required. During hoisting and lowering, the winch drum should be monitored to ensure correct wire spooling, that bird caging dose not occur.

When the Sampson post is set up, it uses a fixed position long link for standard RAS operations. To assist passing of messenger lines and attachment of safety harnesses, several pad eyes have been installed on the top of the post in strategic locations.

3: Retractable Sampson Post Setup Heavy Jackstay

Ensure that the Pre start checks are completed and which side. When safe the following must : be done to rig a Heavy Jackstay forward

a. Lay out Stays: Remove heavy and light stays from the stowage trays and lay out in the appropriate configuration for Port or Stbd Light Jackstay.
b. Get Power: Remove pendant and extension cord. Plug extension cord into electrical outlet on Gun House bulkhead and Sampson post motor.
c. Remove Ball Locking pins: Jog the post up to place load on hoist wire and remove the ball locking pins and attach lever extension pipes to remove the support locking pins from the stowed position.
d. Attach Backstays: Raise the Sampson Post sufficiently to attach the upper ends of the Heavy backstays to the Sampson Post crosshead eyes. Install backstays on opposite side of transfer.
e. Attach Forestays: attach the upper ends of the Heavy forestays to the Sampson Post crosshead eyes. Install fore stays on the side of transfer.

g. **Attach upper 12" Snatch Block**: Shackle the upper 12- inch snatch block to the upper eye pad above the elongated link of the post.
h. **Attach personnel platform:** Raise the Sampson Post, approximately 2 meters. Take the platform and unfold the handrails ensuring the handrail and support braces are against their stops. Attach and lock the personnel platform to the post ensuring that the side forks fully engage with the steps. Insert locking block and ball locking pin to secure in place.
i. **Set post to Heavy Jackstay Height:** Raise the Sampson Post to the second set of support lock pin support holes should align with the support lock pins. When the support lock pins align, engage the support lock pins in position. (Jog up or down to achieve proper alignment) and insert ball locking pins
j. **Stow Power Cable:** The Sampson post is ready for operation. For safety, and to prevent damage to the power cable, disconnect and stow the extension cord when the Sampson post is in position.
k. **Tighten Stays:** Attach turnbuckle clevises to deck as required. The turnbuckles must be fully open. Tighten the turnbuckles evenly on all sides to support the post. The heavy backstays should be tightened such that the support pins are evenly seated on both sides with all stays tight. When this is accomplished slacken off the light forestays about 10mm. Do not over tighten.
l. **Attach lower 12" Snatch Block:** Attach the bottom 12-inch snatch block to the lower eye pad located on the corner of the missile house.
m. **Lay out lines:** Fake out the cheater pennant through the blocks and to the winch.
n. **Distance line:** A messenger is passed from the bridge to the station to facilitate passing the telephone/distance line to the bridge.

Figure 9.21-1 Retractable Kingpost Layout

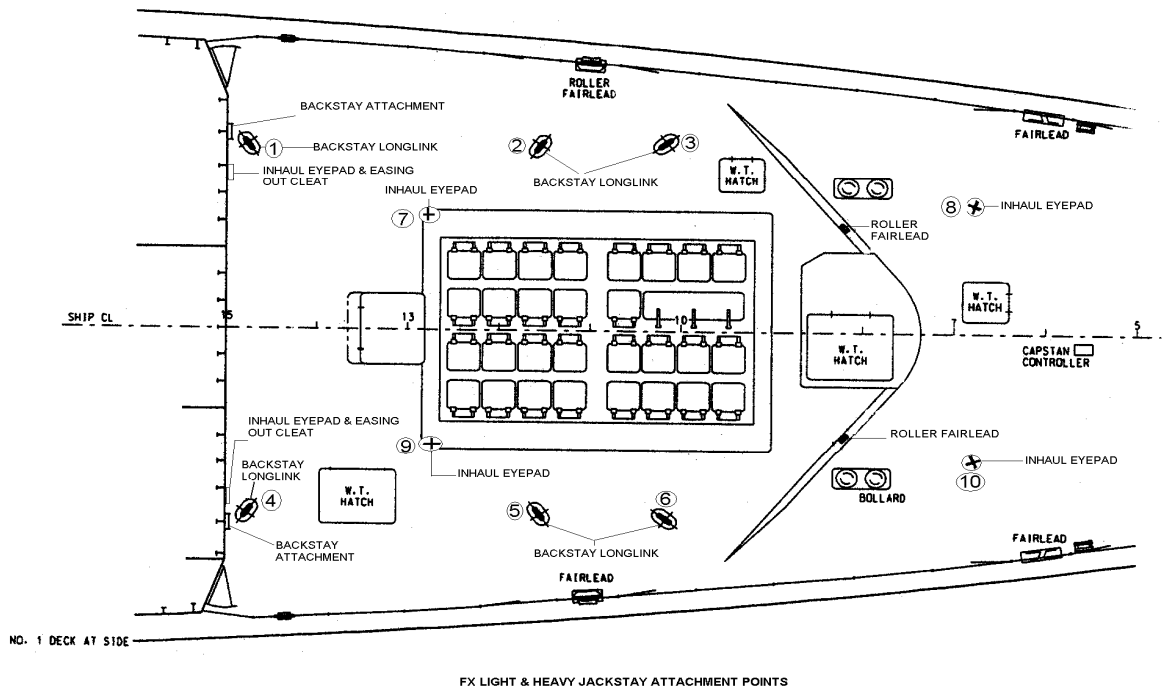


Figure 9.21-1 Retractable Kingpost Layout

Figure 9.21-2 Stowage of Forestays and Backstays

9.21.5 Liquids Transfer

a. **General.** Ships of the IROQUOIS Class are equipped with a water-displaced fuel system. Water displaced by fuel during a replenishment is discharged overboard. The total distillate (F76) capacity is 592 tonnes (752 cubic metres/4730 barrels). The total aviation fuel (F44) capacity is 71.8 tonnes (91.4 cubic metres/574 barrels). Due to the positioning of the boat davit on the port side, top part ship, the preferred location for liquids transfer is on the starboard side.

The two liquid RAS stations are designed to simultaneously receive:

(**1**) DFO at 247 tonnes per hour (215 cubic metres) for the two forward tanks, and 218 tonnes per hour (175 cubic metres) for the after tanks, and
(**2**) JP5 at 21 tonnes per hour (27 cubic metres).

b. Fuelling Station 3 Starboard Preparation and Equipment Layout.

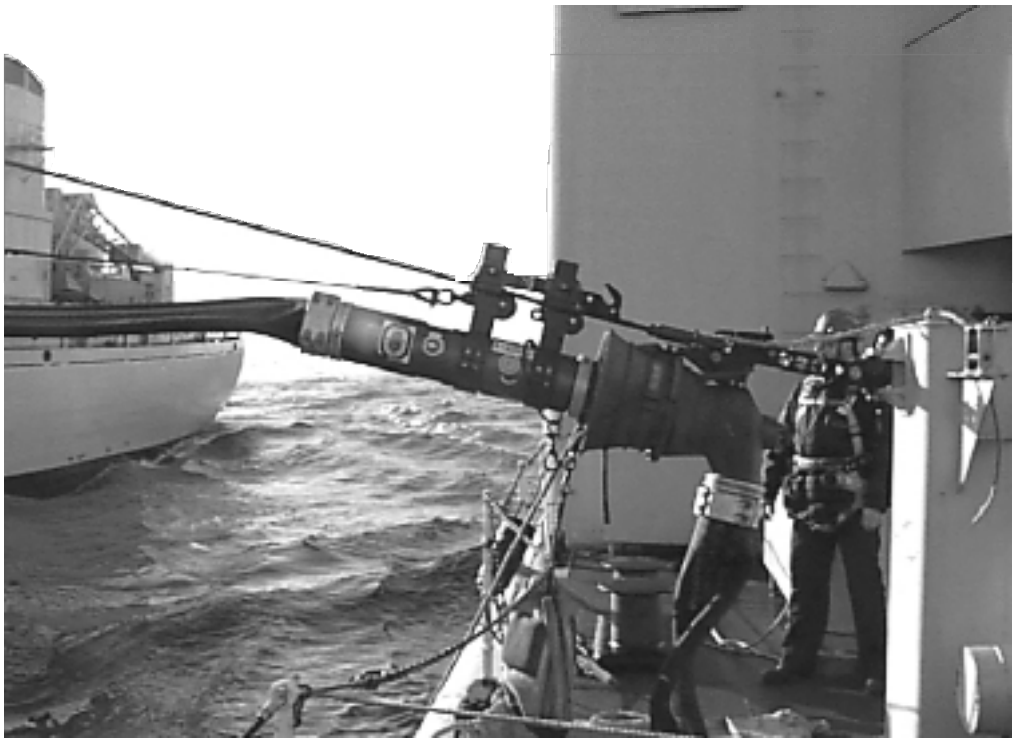
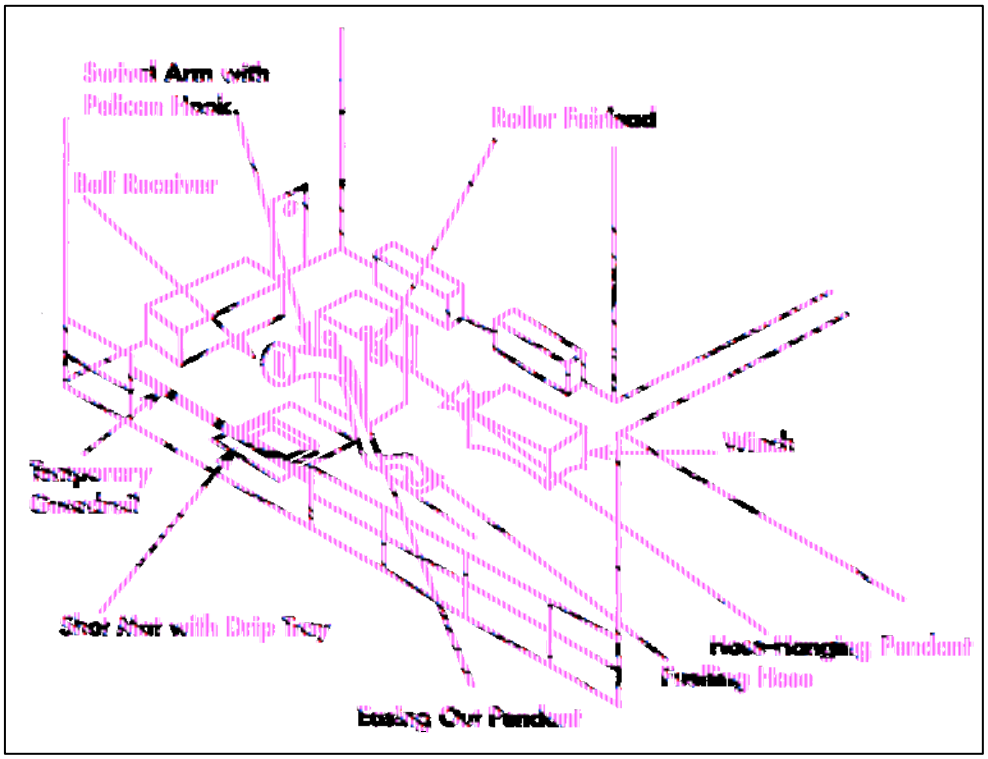


Figure 9.21-3 - Liquid RAS Stbd

Figure 9.21-4 - Liquid RAS Layout Stbd



The gear is rigged as follows:

(**1**) A roller fairlead is bolted to the fuelling post, and the heavy messenger rove through the roller fairlead directly to the winch drum.

(**2**) The easing out pendant is rigged through the padeye on the fuelling post.
(**3**) A shot mat with drip tray is positioned on deck under the bell receiver. Another drip tray is placed under the hose connection elbow fitting.
(**4**) The messenger from the flag deck is rigged to the fuelling position in preparation for passing the distance line.
(**5**) The guardrail is removed and replaced with a temporary one.

c. Fuelling Station 4 Port Preparation and Equipment Layout.

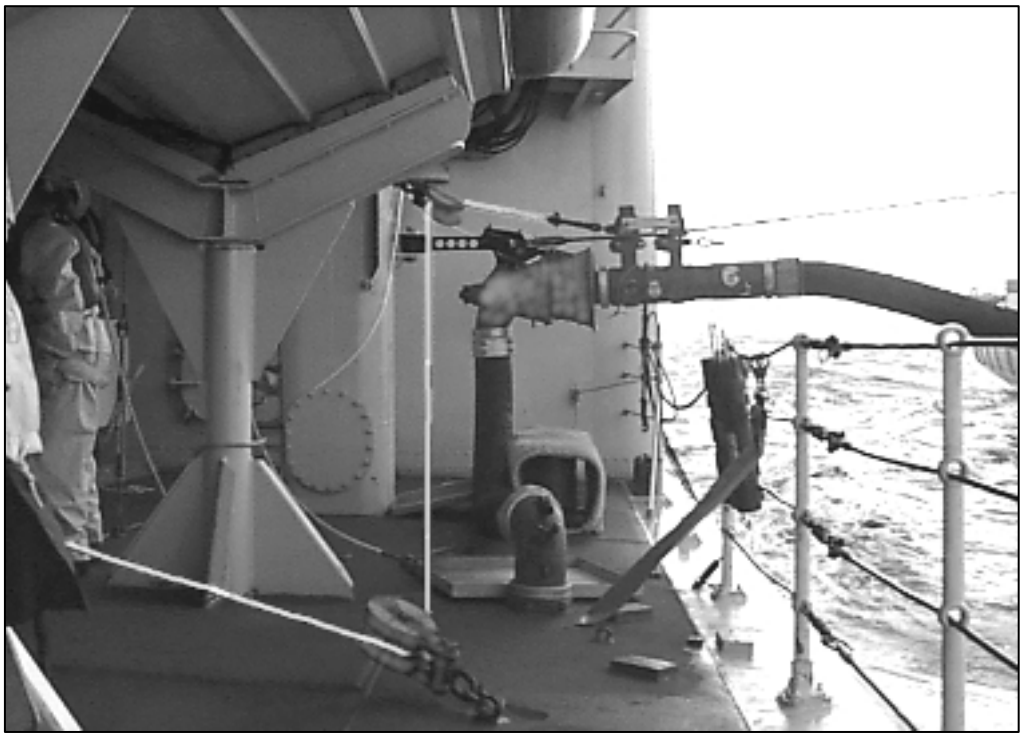


Figure 9.21-5 - Liquid RAS Station 4

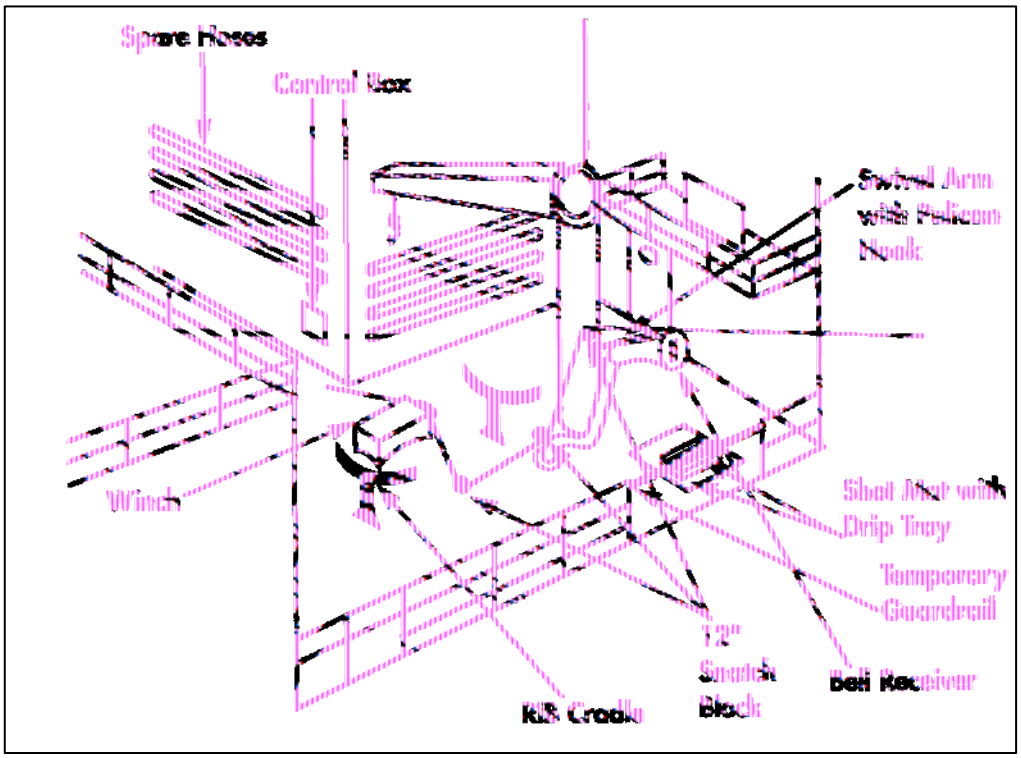


Figure 9.21-6 – Liquid RAS Layout Port

The gear for the three-block arrangement is rigged as follows:

(**1**) The upper 12" snatch block is shackled to the forward padeye above the bell receiver on RIB crane post.

(**2**) The first of the lower 12" snatch blocks is shackled to the padeye on the deck at the base of the RIB crane post. The second lower 12" snatch block is shackled to the padeye on the deck forward of the winch.

(**3**) The easing out pendant is passed through the after padeye on the RIB crane post.

(**4**) A shot mat with drip tray is positioned on deck under the bell receiver, and another drip tray is placed under the hose connection elbow fitting.

(**5**) The messenger from the flag deck is rigged to the fuelling position in preparation for passing the distance line to the flag deck.

(**6**) The guardrail is removed and a temporary one is rigged in its place.

9.21.6 NATO "B" Stations 3 and 4

The preparations for a NATO "B"/ EBFC fuelling are the same as with the probe receiver, except with the rigging at the receiving ship's fuelling point and the associated hose end fittings. Essentially, the swivel arm assembly replaces the probe receiver and a hose hanging pendant (1 m long, ref. class drawing DDDS-00084) is shackled to the padeye on the forward side of the RIB crane post on the port side, and on the RAS post on the starboard side.

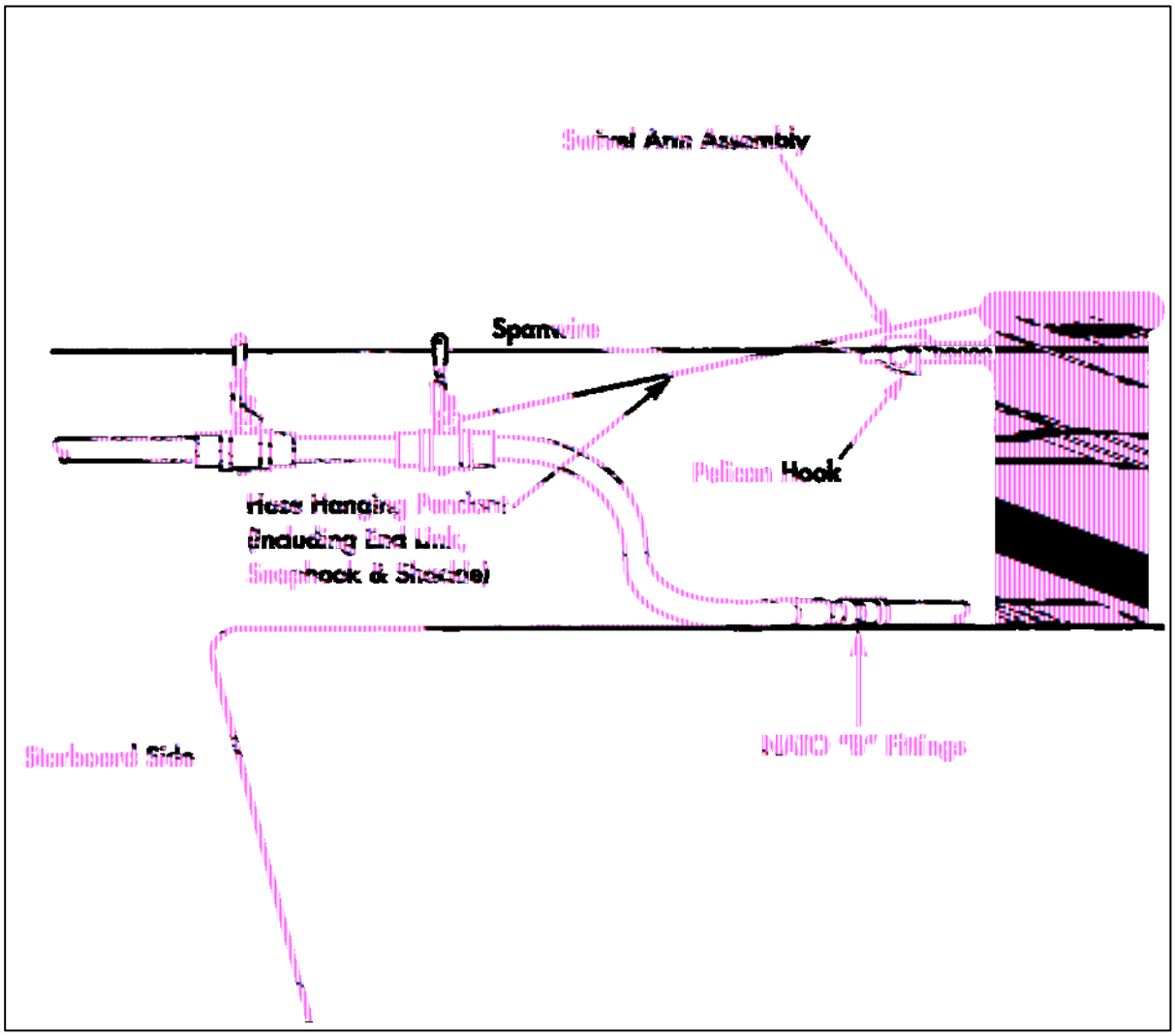


Figure 9.21-7 - Liquid RAS NATO "B"/ EBFC Starboard

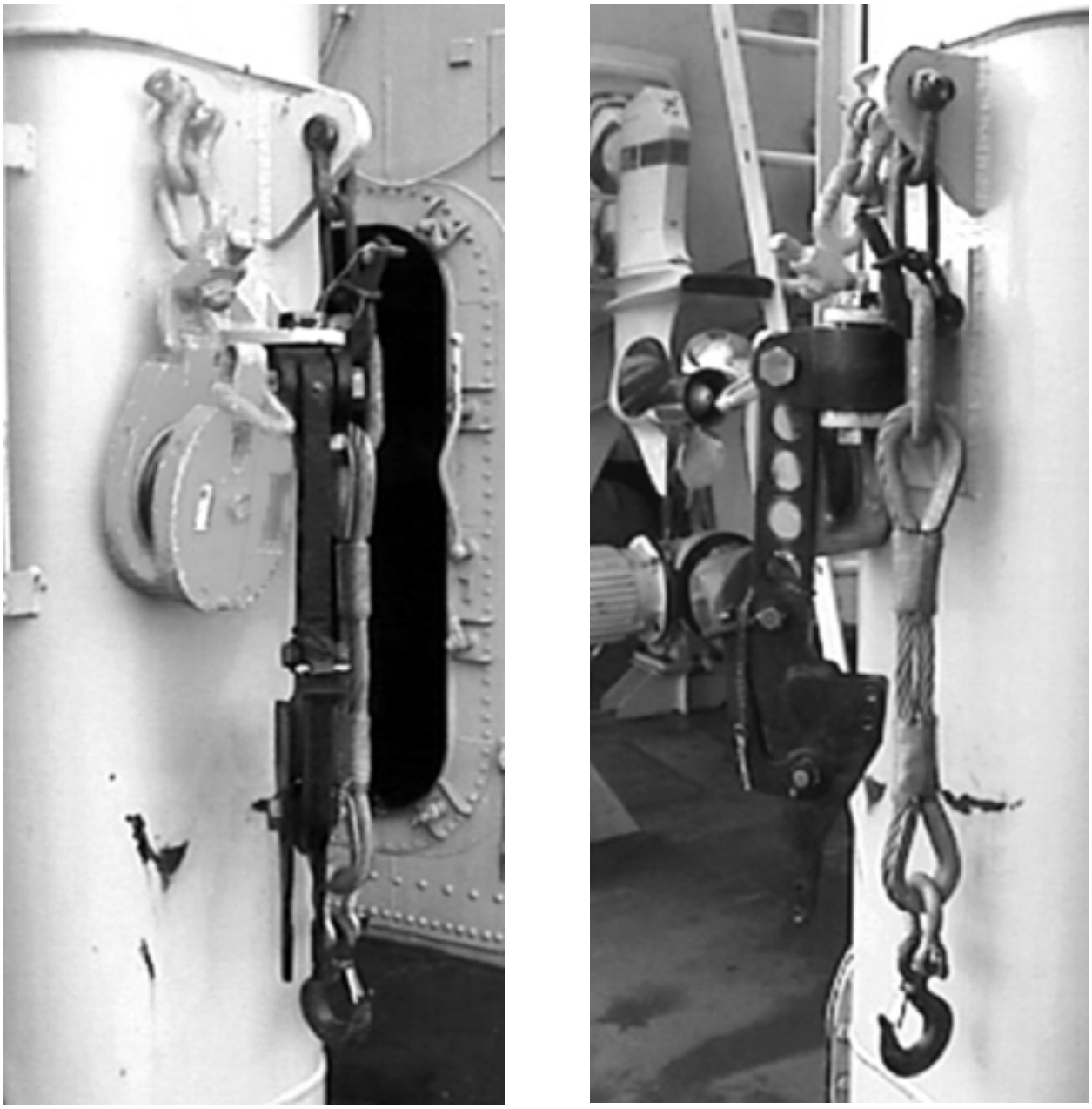


Figure 9.21-8 - NATO "B"/ EBFC Setup Port

9.22 HALIFAX CLASS - REPLENISHMENT AT SEA

> **NOTE**: *All HALIFAX Class fixed and reversible eyepads have been assigned numbers. They are listed in Chapter 5 Tables 3 & 4, and illustrated in foldout. Figure 5.23-1. Refer to these tables/figure in conjunction with descriptions in this section.*

9.22.1 Light Line Transfer

a. **Equipment Layout.** The light line is faked out fore and aft on the Chaff Deck (01 deck aft of the bridge wings). The port station is located over the hatch leading to the port breezeway and the starboard station is located over the forward life raft. Blocks are rigged port-side to eyepads No.6 (P) and No.8 (P), and on the starboard side to eyepads No.5 (S) and No.7 (S).

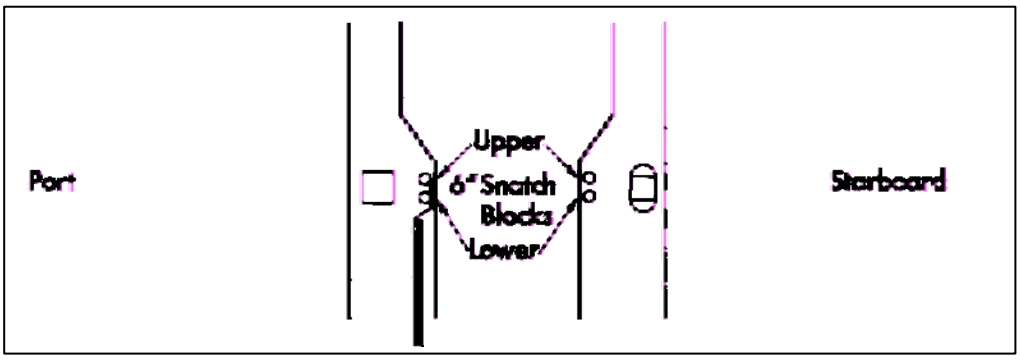


Figure 9.22-1 - Top View Light Line Receive Stbd Supply Port

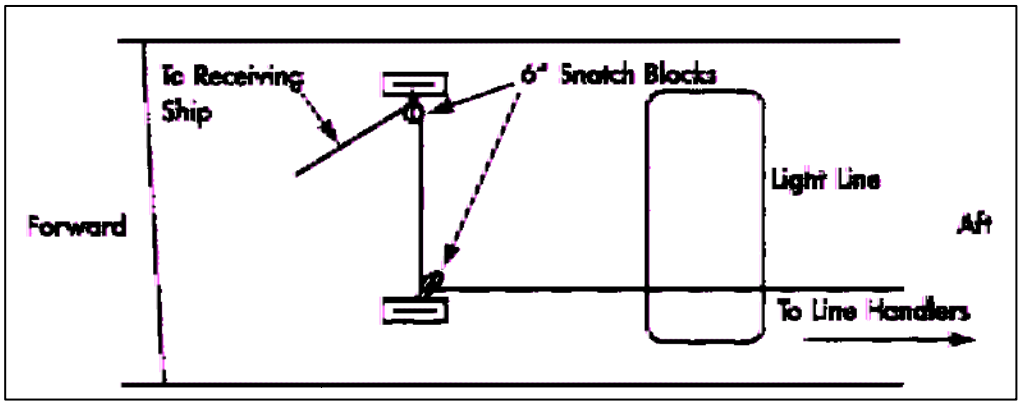


Figure 9.22-2 - Side View Light Line Supply Layout Port

9.22.2 Light Jackstay Supply

The HALIFAX Class is configured to conduct light jackstays at the forward stations and midships.

Preparation and Equipment Layout: Stations 1 and 2

The kingpost is raised in accordance with standard procedures and the gear is laid out as follows:

(**1**) The upper 12" common block of the jackstay is secured to the elongated link on the sliding padeye by a ¾" shackle.

(**2**) The lower 12" common block of the jackstay is shackled to the reversible padeye No. 16 ® or No. 15 ® used for the heavy messenger while conducting solids or liquids replenishment operations.

(**3**) The 6" common block of the inhaul is shackled to the eye which is directly under the elongated link.

(**4**) The lower block of the inhaul is shackled on the padeye of the bollard on the engaged side.

(**5**) The jackstay is faked out on the designated side so that it pays out from the centre line to outboard. The inhaul is faked out athwartship so that it pays out forward to aft. The messenger and outhaul are faked out in the dump area so that they pay out from outboard to inboard.

(**6**) A bight of the outhaul is passed through the eye of the NEWCO thimble on the jackstay and secured in place with a toggle.

(**7**) The stream adapter plate is raised to the top of kingpost.

(**8**) The telephone/distance line is checked ready for use. Confirm communications with the bridge.

NOTE:

1. *Personnel must be familiar with C-28-463-000/MS-000 Sliding Padeye Receiving Unit Bulkhead Mounted and Retractable in order to properly operate the kingpost.*
2. *Shackles connected to the elongated line on the sliding padeye must be 3/4" to fit over the elongated link.*

Figure 9.22-3 - Light Jackstay Supply Station 1

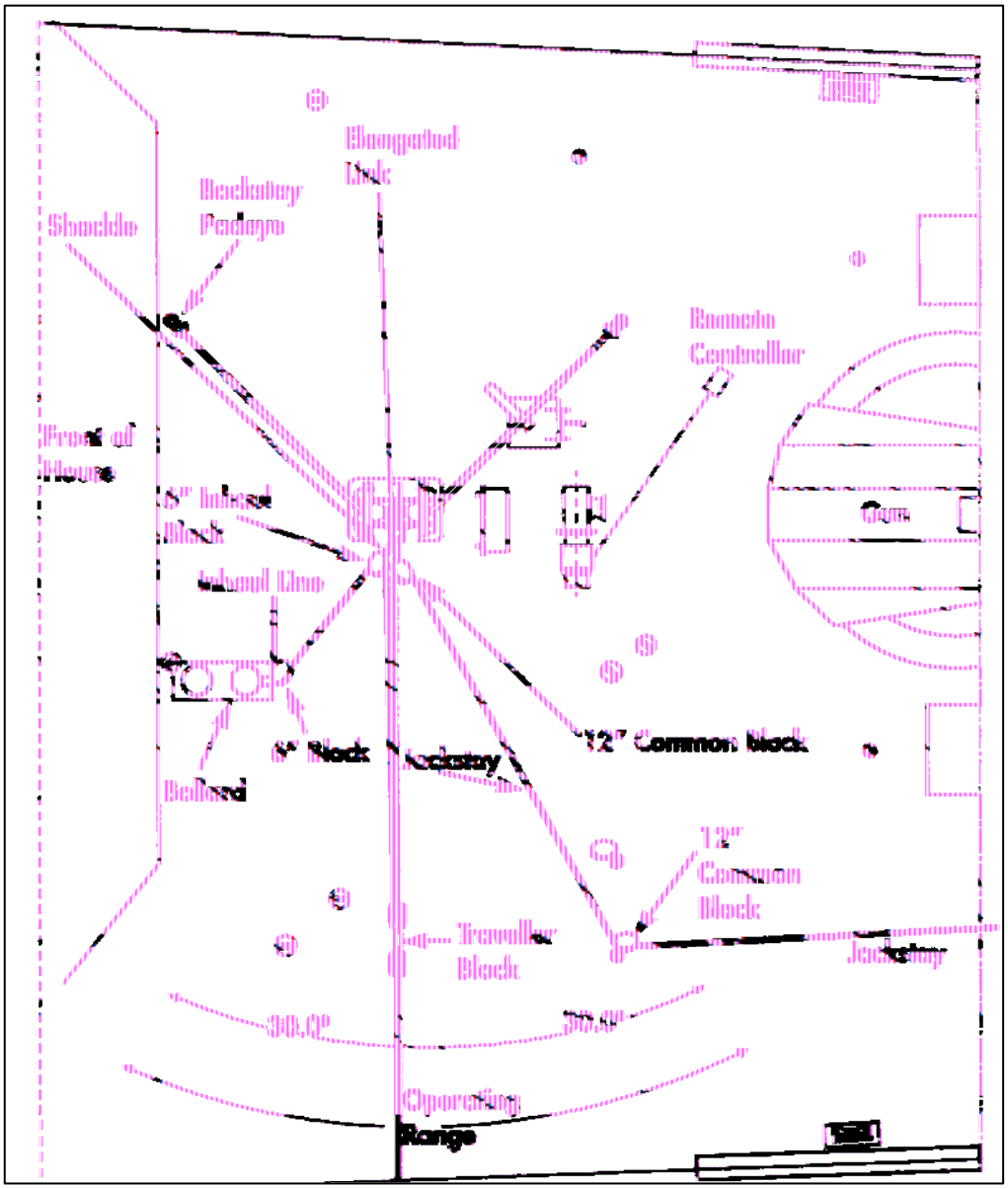


Figure 9.22-4 - Light Jackstay Supply Station 1

9.22.3 Light Jackstay Supply - Preparation and Layout (Stations 3 & 4)

The sliding Padeye is raised in accordance with standard procedures and the gear laid out as follows:

(**1**) Fit the fuel assembly adapter plate to the sliding padeye.

(**2**) The lower 12” common block of the jackstay is shackled to padeye No. 25 ® or No. 28a ®, used for heavy messenger while conducting solids or liquids replenishment operations. The upper 12” common block of the jackstay is secured to the upper eyepad of the FAADP using a ¾” shackle.

(**3**) The 6” common block of the inhaul is shackled to the eye directly under the elongated link by a ¾” shackle.

(**4**) The 6” common block of the inhaul is shackled to the lower eyepad of the FAADP.

(**5**) The jackstay is faked out on the designated side so that it pays out from the centre line to outboard. The inhaul is faked out forward so that it pays out inboard to outboard.

The messenger and outhaul are faked out in the dump area so that they pay out from outboard to inboard.

(**6**) A bight of the outhaul is passed through the eye of the NEWCO thimble on the jackstay and secured with a toggle.

(**7**) The telephone/distance line is checked ready for use. Confirm communications with the bridge.

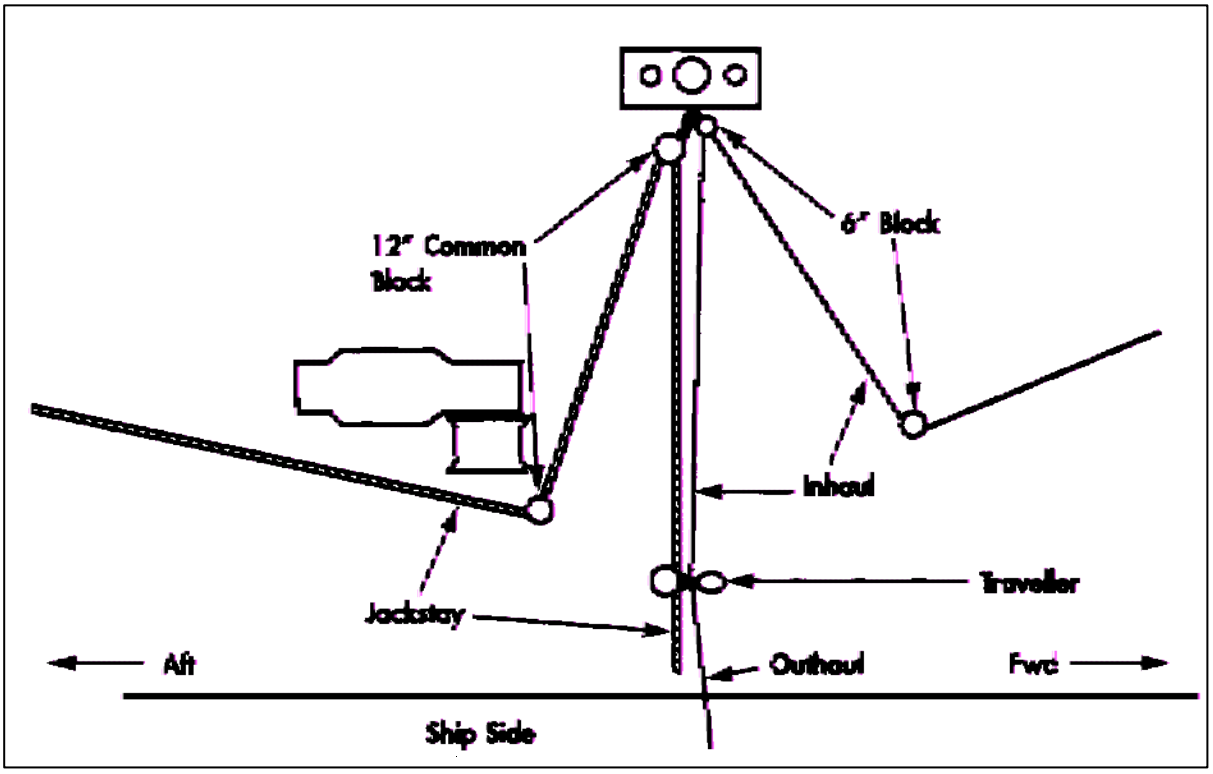


Figure 9.22-5 - Light Jackstay Supply Station 3 Stbd

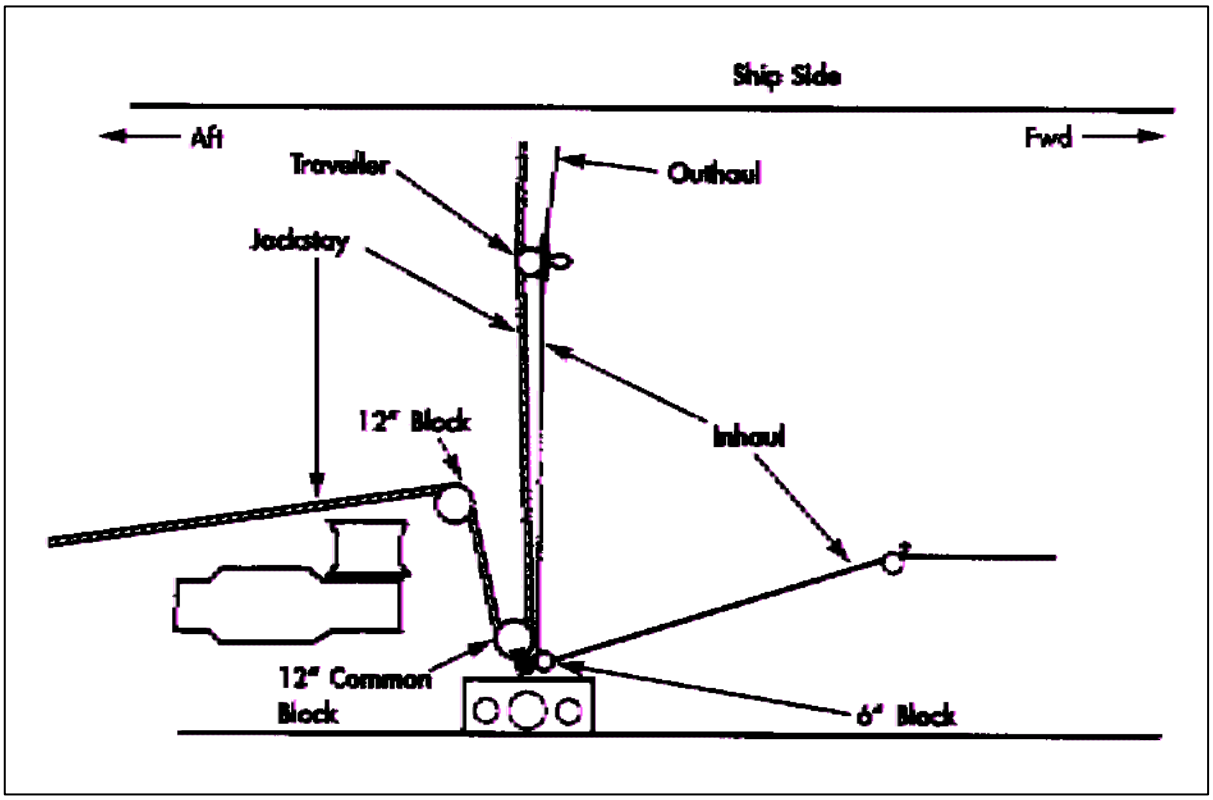


Figure 9.22-6 - Light Jackstay Supply Station 4

9.22.4 Light Jackstay Receive–Preparation and Equipment Layout

The kingpost is raised in accordance with standard procedures (with platform) and the gear laid out as follows:

(**1**) A senhouse slip is shackled to the elongated link on the stream adapter plate.
(**2**) The upper inhaul 6" snatch block is shackled to the eye directly under the elongated link.
(**3**) The lower 6" snatch block is shackled to the Bollard padeye. All shackles are to be moused.
(**4**) The slip on the stream adapter plate will be "laying on its side". The pin on the shackle and the retaining pin on the slip must be passed down from the top and securely moused.
(**5**) Confirm communications with the bridge.
(**6**) Tag line is passed from the station to the bridge to facilitate passing telephone/distance line to the bridge.
(**7**) Once the gear is received and secured to the stream adapter plate the sliding padeye is raised to the top.

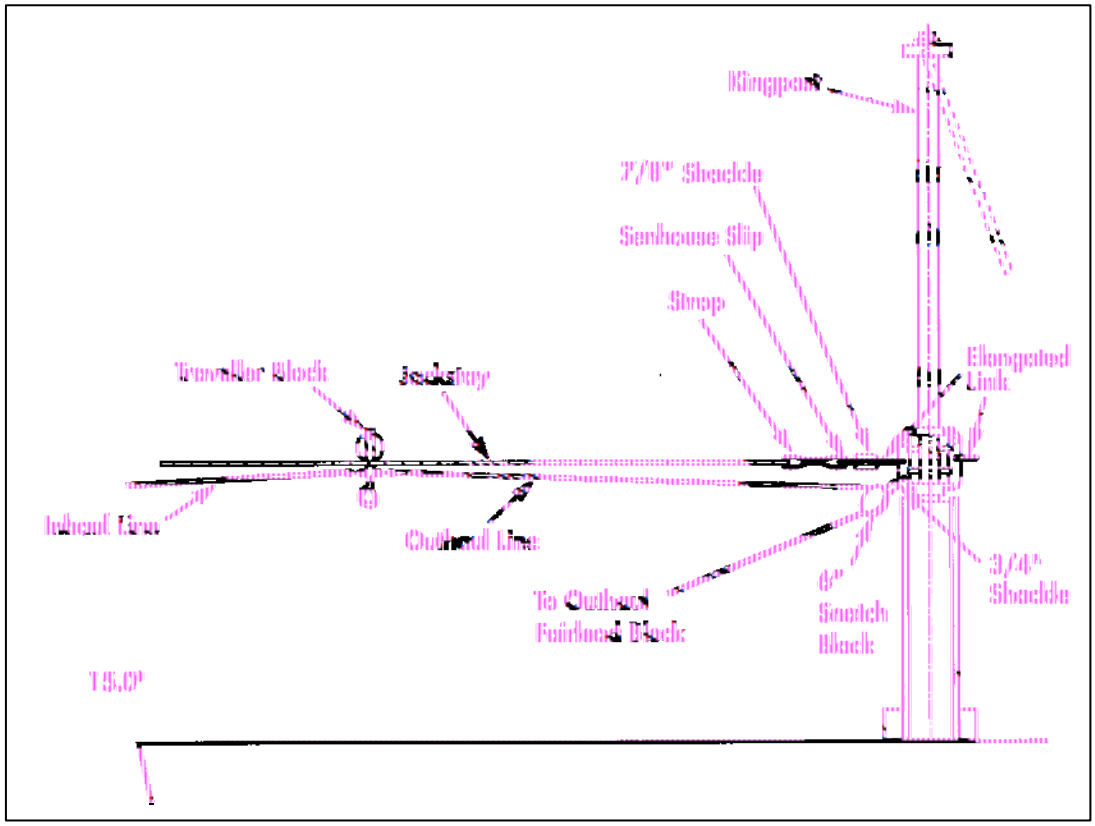


Figure 9.22-8 - Light Jackstay Receive

Figure 9.22-9 - Light Jackstay Receive Station 1

9.22.5 Light Jackstay Receive - Preparation and Layout (Stations 3 & 4)

The Sliding Padeye is raised in accordance with standard procedures and the gear laid out as follows:

(**1**) A senhouse slip is shackled to the stream adapter plate.
(**2**) The upper inhaul 6" snatch block is shackled to the eye directly under the elongated link.
(**3**) The lower inhaul 6" snatch block is shackled to padeye No. 25 ® or No. 26 ®. All shackled are to be moused.
(**4**) The slip on the stream adapter plate will be "laying on its side". The pin on the shackle and the retaining pin on the slip must be passed down from the top and securely moused.
(**5**) Confirm communications with the bridge.
(**6**) A messenger is passed from the station to the bridge to facilitate passing the telephone/distance line to the bridge.
(**7**) Once the gear is received and secured to the stream adapter plate, the sliding padeye is raised to the top.

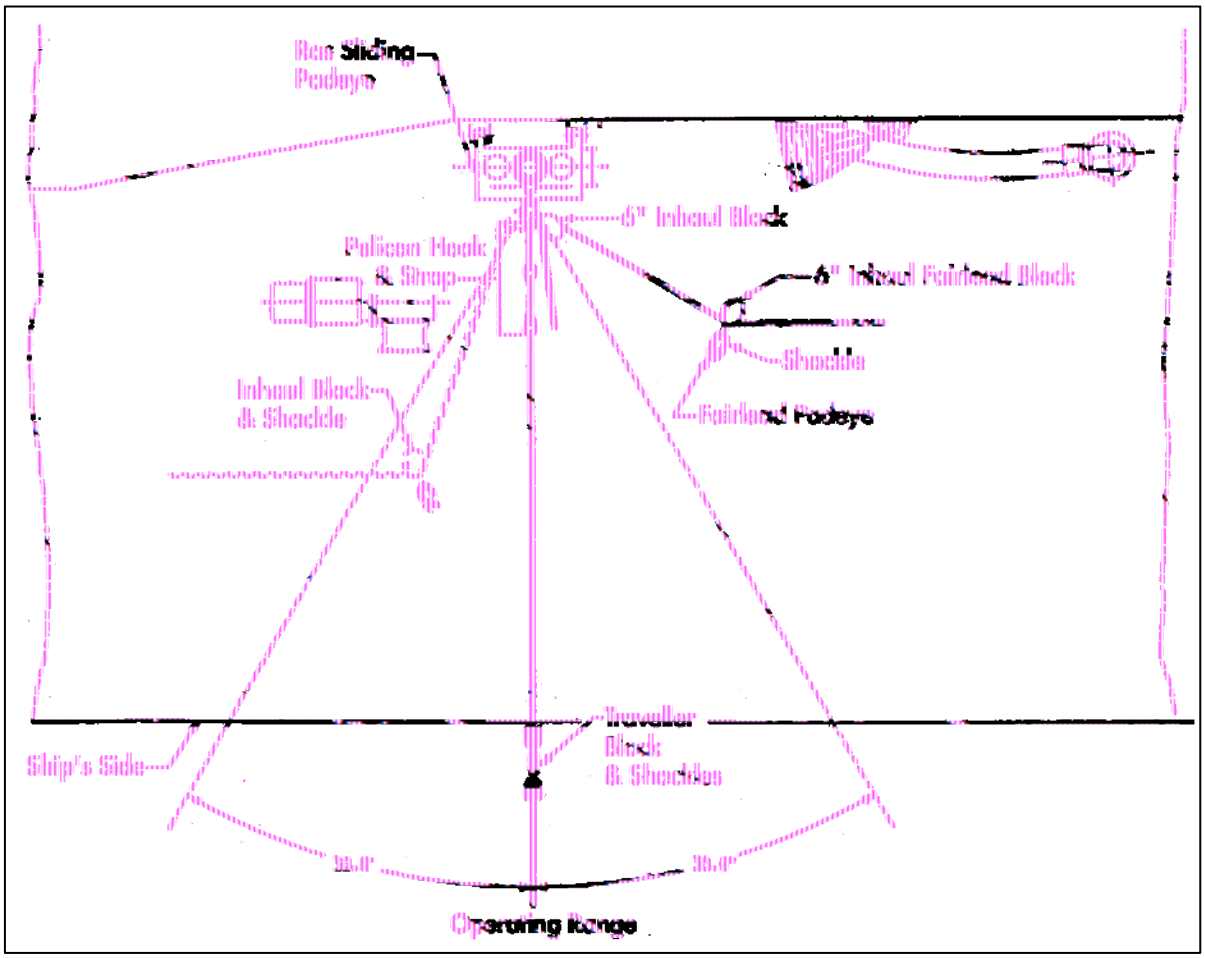


Figure 9.22-10 - Light Jackstay Receive (Stn 3 & 4)

9.22.6 Solids Replenishment

a. **Stations 1 and 2 Heavy Jackstay Preparation and Equipment Layout**. The forward solids

transfer position is designed to receive up to 1364 kg on each transfer. The kingpost is raised in accordance with standard procedures. A portable platform, which can be rigged port or stbd, is used so that dump workers are able to safely connect up or slip messengers and highline. The remaining gear is laid out as follows:

(**1**) The upper snatch 12" block is shackled to the eye directly under the elongated link on the stream adapter plate.

(**2**) The lower 12" snatch block is shackled to reversible padeye No. 16 ® or No. 15 R). It is the lead block for guiding the messengers to the winch.

(**3**) The easing out pendant is secured to the staple on the sliding padeye. When rigged, it is led through the eye of the slip on the highline and secured to the cleat on the stream adapter plate.

(**4**) A tag line is passed from the station to the bridge to facilitate passing the telephone/distance line to the bridge.

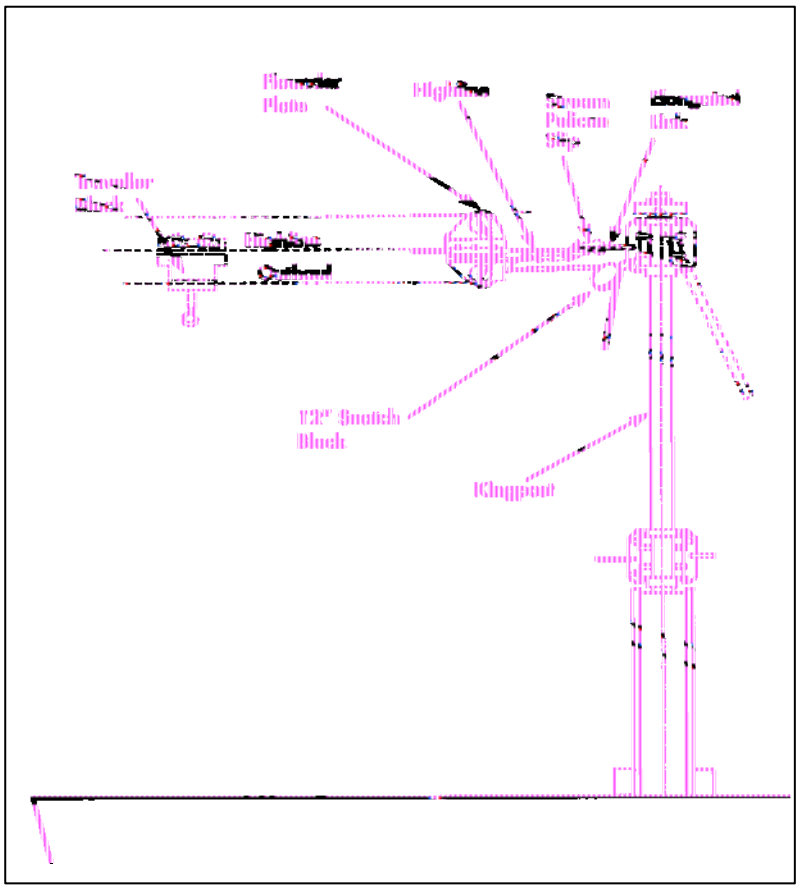
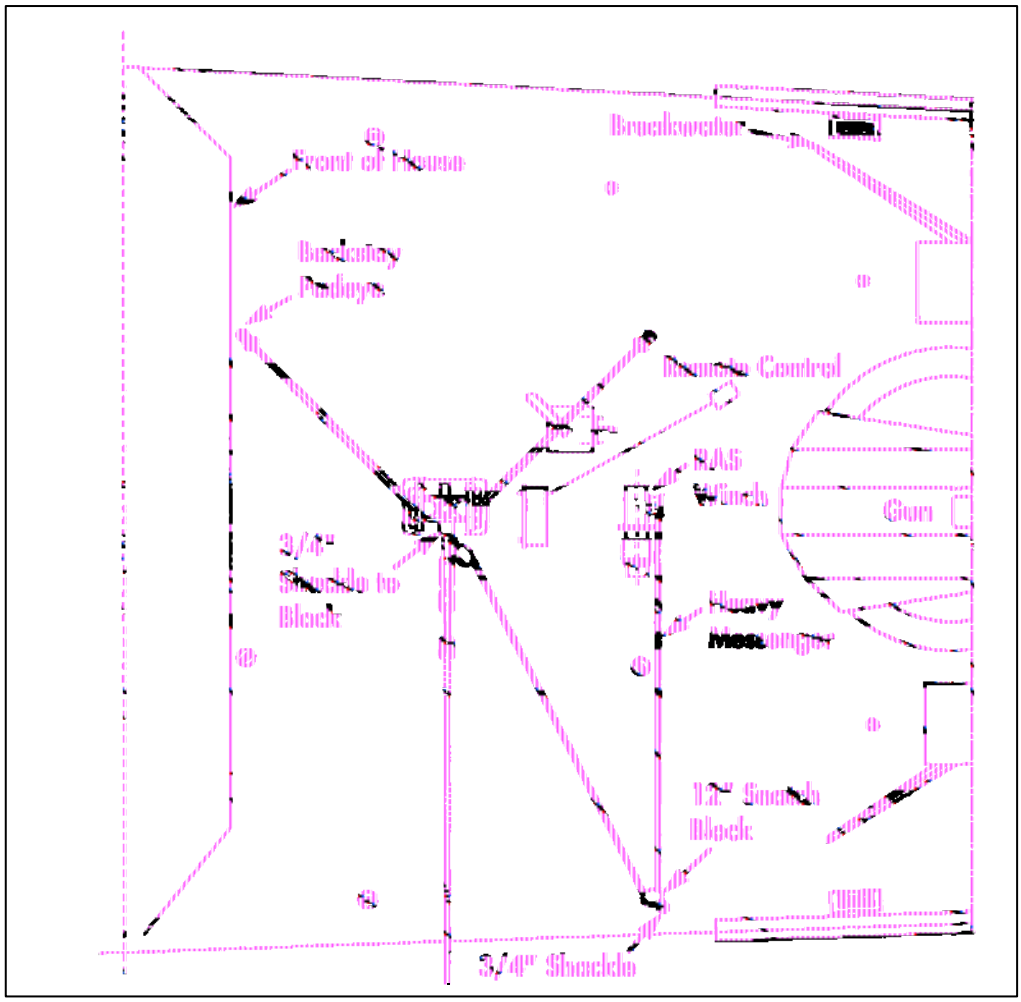


Figure 9.22-11 - Heavy Jackstay Receive Station 1 or 2

Figure 9.22-12 - Heavy Jackstay Layout Station 1



b. **Station 3 Heavy Jackstay General Layout.** The bulkhead mounted sliding padeye receiving unit is located on top part ship. The remaining gear is laid out as follows [see Figure 9.22-13]:

(**1**) The upper 12” snatch block is shackled to the eye directly under the elongated link on the stream adapter plate.

(**2**) The lower 12” snatch block is shackled to reversible padeye No. 23 ® (old), No. 25 ® (new) as indicated in the diagram. [See Figure 9.22-14.]

(**3**) The easing out pendant is secured to the staple on the sliding padeye. When rigged, it is led through the eye of the slip on the highline and secured to the cleat on the sliding padeye.

(**4**) The line-handling winch is located aft of the station. A tag line is passed from the station to the bridge to facilitate passing the telephone/distance line to the bridge.

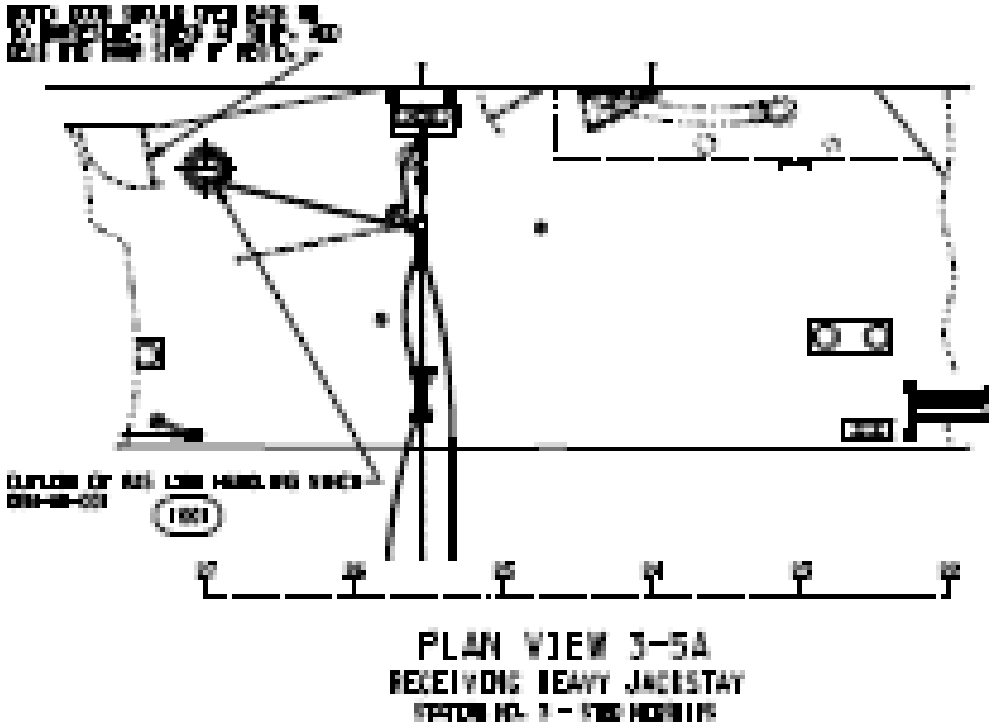


Figure 9.22-13 - Heavy Jackstay Station 3

c. **Station 4 Heavy Jackstay Layout.** The winch is remotely controlled, allowing the winch operator to work away from the line handlers. The bulkhead mounted sliding padeye receiving unit is located on top part ship. The remaining gear is laid out as follows:

(**1**) The upper 12” snatch block is shackled to the eye directly under the elongated link on the sliding padeye.

(**2**) The lower 12” snatch block is shackled to the reversible padeye No. 28 ®.

(**3**) The easing out pendant is secured to the staple on the stream adapter plate. When rigged, it is led through the eye of the slip on the highline and secured to the cleat on the stream adapter plate.

(**4**) The line-handling winch is located aft of the station. A tag line is passed from the station to the bridge to facilitate passing the telephone/distance line.

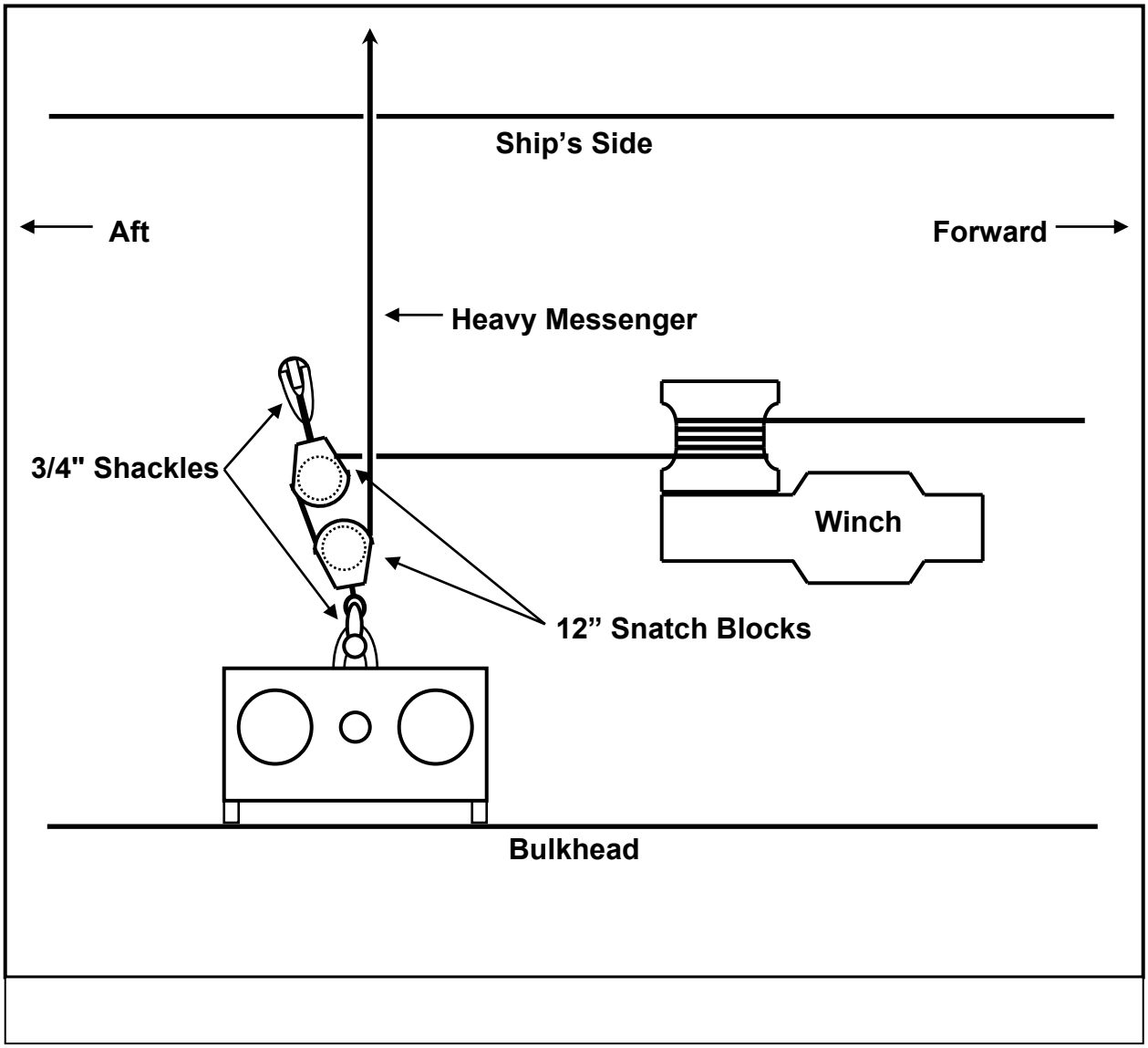


Figure 9.22-14 – Heavy Jackstay Station 4

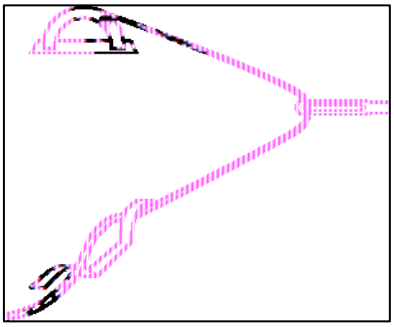
9.22.7 Liquids Transfer

a. **General.** All liquid RAS Stations are designed to simultaneously receive:

(**1**) DFO at 714 tonnes per hour (620 cubic metres);
(**2**) JP5 at 85 tonnes per hour (68 cubic metres); and
(**3**) Water at 60 tonnes per hour (60 cubic metres).

b. **Fuelling Forward Stations 1 and 2 Preparation and Equipment Layout.** The kingpost is raised in accordance with standard operating procedures (with platform). The remaining gear is rigged as follows:

(**1**) Standing on the platform, fit the Refuelling Joint Assembly (RJA) ensuring long end placed on top. A stainless steel pin is passed down through the top of the RJA, with a cotter pin inserted.
(**2**) The upper 12" snatch block is shackled to the upper padeye on the RJA.
(**3**) The lower 12" snatch block is shackled onto reversible padeye No. 15 ®, No. 16 ® located on the deck in line with the line-handling winch.
(**4**) The bell receiver is rigged to the RJA.
(**5**) The easing out pendant is secured to the staple on the sliding padeye. When rigged, it is to be lead through the eye in the weak link assembly on the spanwire and then secured to the cleat on the stream line adapter plate.



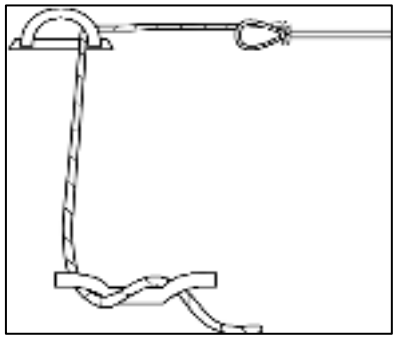


Figure 9.22-15a – Easing Out Pendant

Figure 9.22-15b – Easing Out Pendant

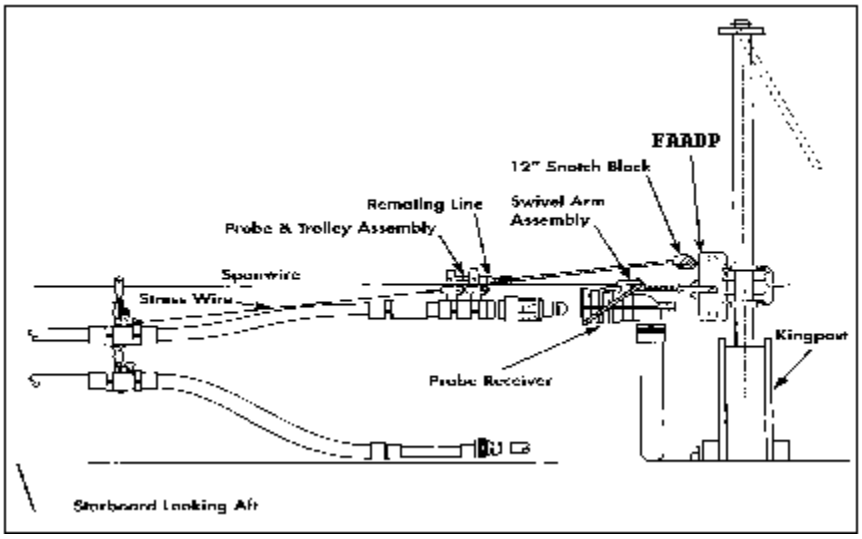
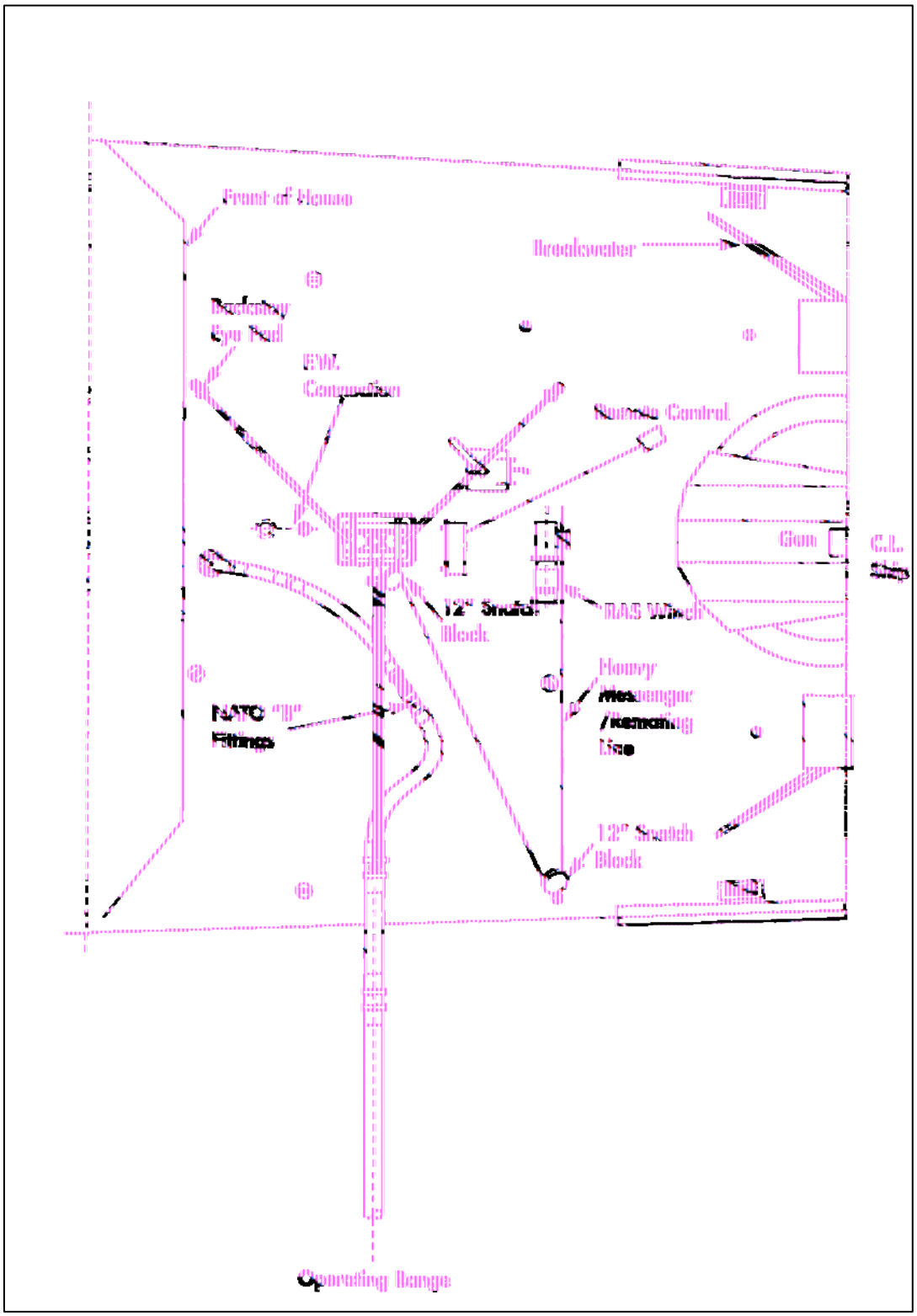


Figure 9.22-16 - Probe & JP5 Coupling Duo Configuration Stations ½ Using Refuelling Joint Assembly

Figure 9.22-17 - NATO ”B”/EBFC Arrangement Station 1



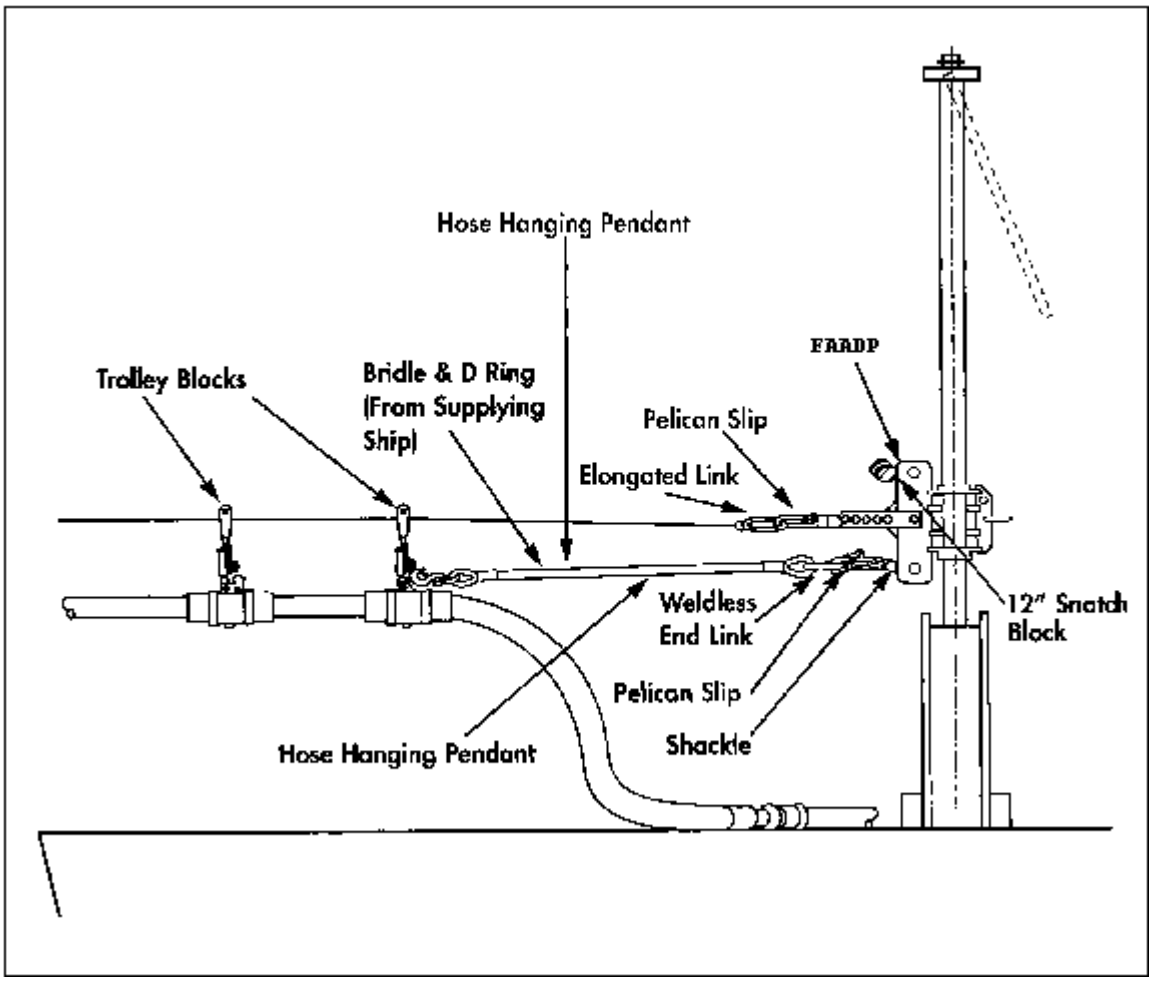


Figure 9.22-18 - NATO "B"/ EBFCArrangement Fwd Using FAADP

c. Fuelling Midships Stations 3 and 4 Preparation and Equipment Layout.

(1) Station 3 Starboard - The gear is rigged as follows:

(a) The bell receiver is mounted on the bulkhead at Frame 24.

(b) The upper 12" snatch block is shackled to the padeye No. 21 (S) located above the bell receiver.

(c) A lower 12" snatch block is shackled on reversible padeye No. 23 ® on the deck aft of Frame 24 in line with the line-handling winch.

(d) The easing out pendant when rigged is to be secured to the staple forward of the fuelling adapter plate and lead through the eye in the weak link on the spanwire, and then secured to the cleat below the staple forward of the fuelling adapter plate.

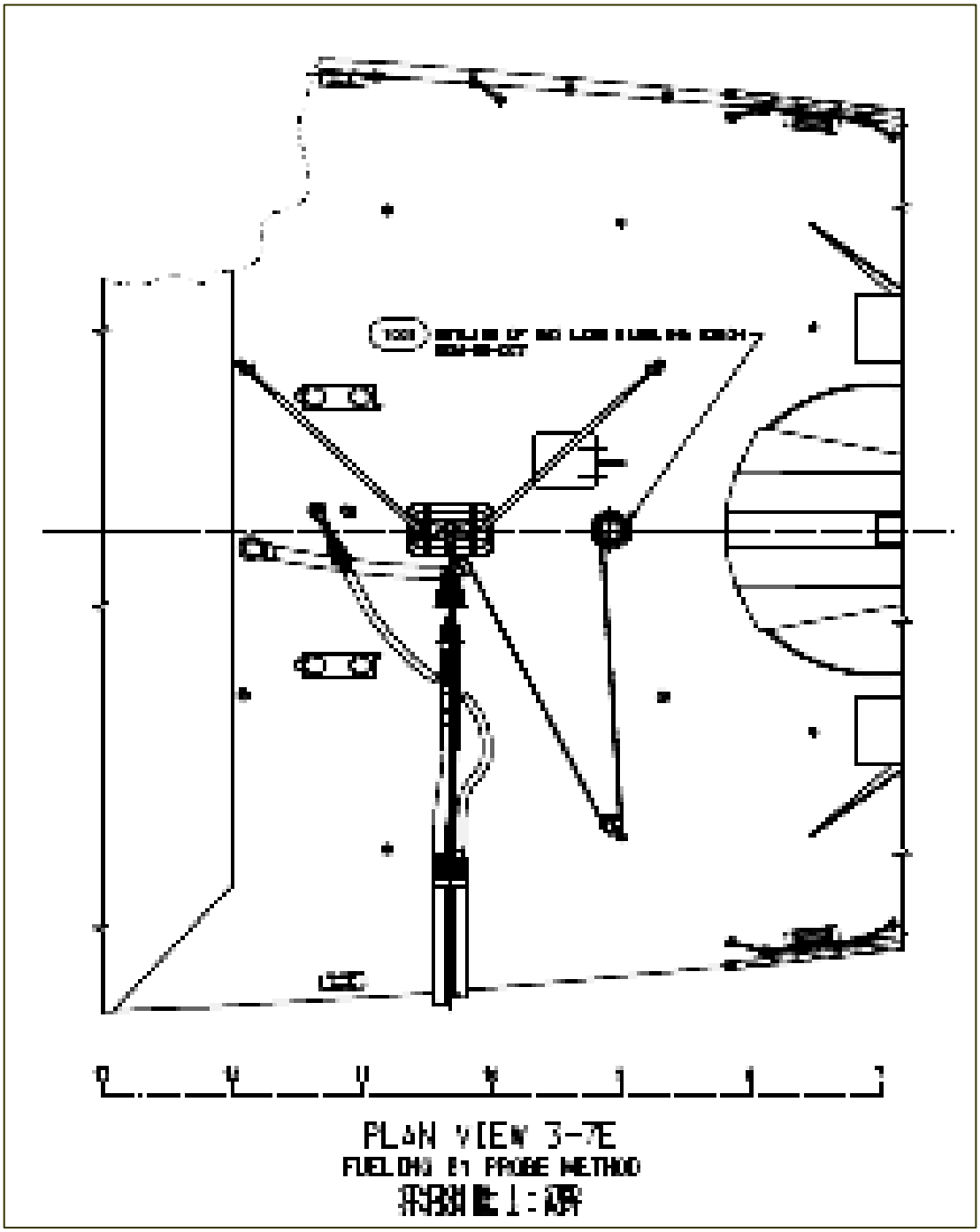


Figure 9.22-19 - Probe & JP5 Arrangement Station 3

(2) Station 4 Port - The gear is rigged as follows:

(a) The bell receiver is mounted on the bulkhead at Frame 24.

(b) The upper 12” snatch block is shackled to padeye No. 22 (P) located above the bell receiver.

(c) The lower 12” snatch block is shackled on reversible padeye No. 24 ® (port - will be re-located but keep No.) between Frames 23 and 24 in line with the line-handling winch.

(d) The easing out pendant, when rigged, is to be secured to the staple forward of the fuelling adapter plate and lead through the eye in the weak link on the spanwire, and then secured to the cleat below the staple forward of the fuelling adapter plate.

(3) On Halifax Class, Station 3 & 4

(a) The Station Captain, when positioned fwd of the dump, is not to proceed aft of the ladder leading to the flag deck. When he is aft of the dump, he is not to proceed fwd of the RAS winch.

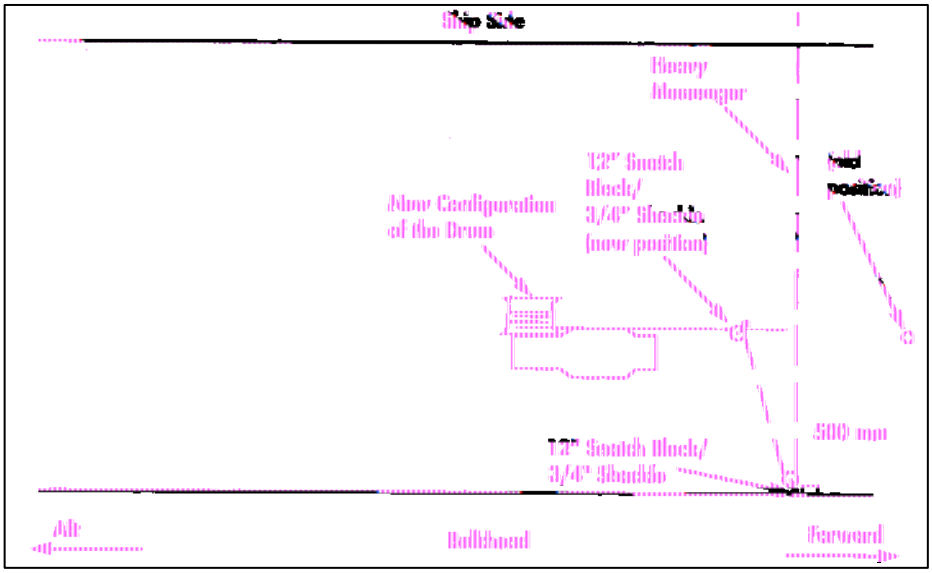


Figure 9.22-20 – Fuelling Arrangement Station 4

9.22.8 Remating Line

Once the fueling probe has been seated, the continuous messenger may be disconnected at the brummel/englefield hooks, leaving an 18 m section of 18 mm line attached to the probe trolley. This section serves as a remating line and shall be utilized when 2 or more commodities are being transferred. This section is led through the messenger blocks to the winch. Approximately .6-1 m of slack is left in the line and four turns are taken up on the drum. Should the probe unseat itself, this will allow the probe to shut off completely without being pulled so far out as to apply strain to and damage the F44 rig. The remating line can then be used to re-seat the probe. Once the transfer of additional commodities (JP5 and/or water) is completed, the remating line may be removed.

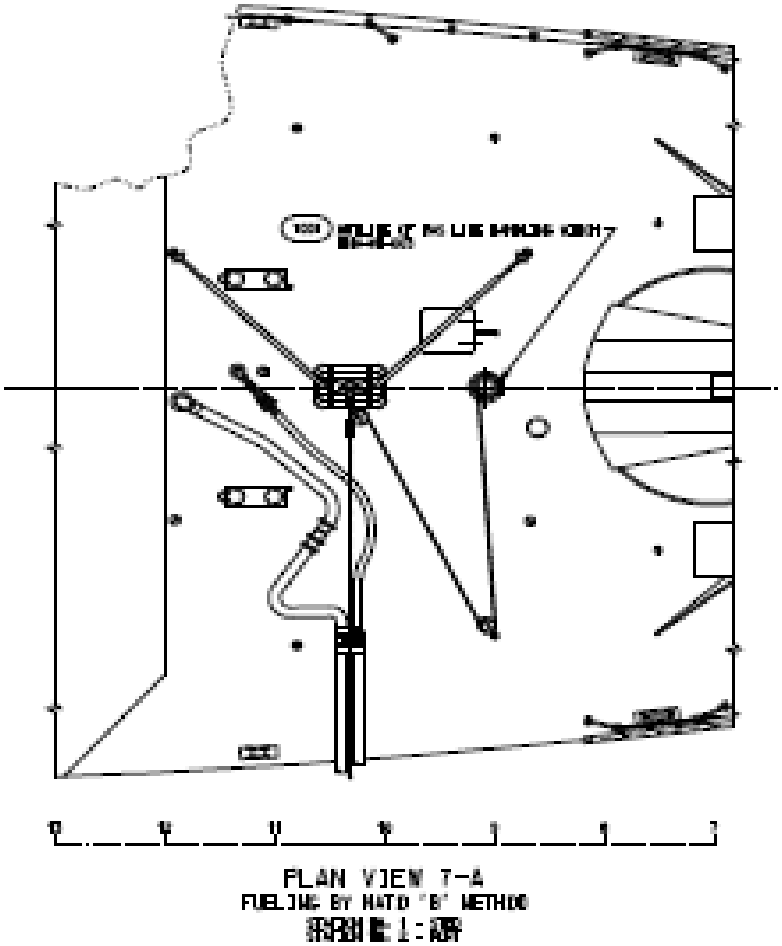
9.22.9 NATO “ B”/EBFC Stations 1, 2, 3 and 4

The preparations for a NATO “B” fuelling are the same as with the probe, except with the rigging at the receiving ship’s fuelling point and the associated hose end fittings. Essentially, the swivel arm assembly replaces the probe receiver, and a hose hanging pendant (either 2.9 m long for forward kingpost or 2.35 m long for focsle astern fuelling and top part ship positioning) is secured to a 5-ton slip directly below

the swivel arm assembly.

> **NOTE**: *The hose requirement for top part ship is one section of 1.1 m and for the FX one section of 1.1 m plus a section of 2.4 m.*

Figure 9.22-21 - NATO "B"/EBFC Arrangement Station 1 Top View



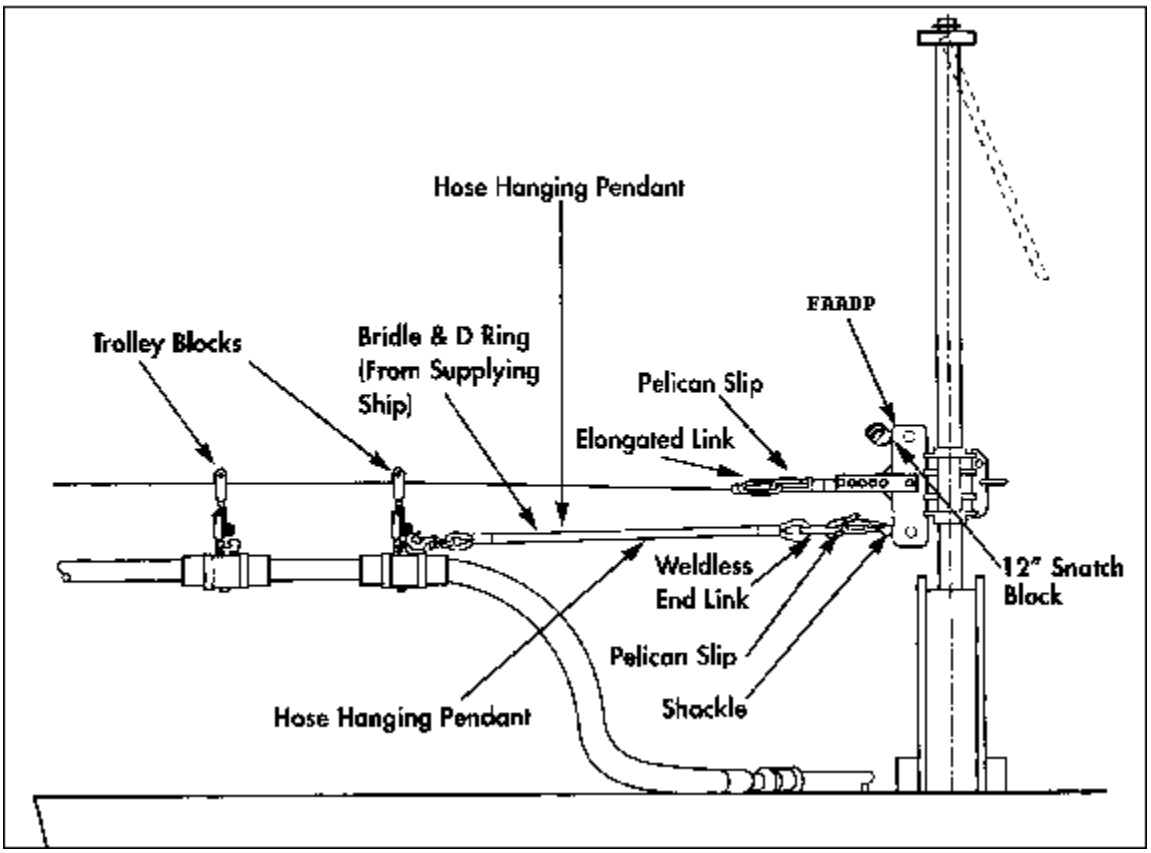


Figure 9.22-22 - NATO "B" Arrangement Station 1 Using Refuelling Joint Assembly

9.22.10 Halifax Class Astern Fuelling

a. Definitions.

Messenger	The line used to bring the fuelling rig on board.
Easing out line	The line used for returning the rig to the water. It is attached to the bridle with a wooden toggle.
Toggle recovery line	The line attached to the toggle. It is long enough to reach the waterline from the focsle and to be turned up on the bollards.
Float assembly	Attached to the end of the messenger.

b. **Equipment Layout.** The forward fuelling position is used for astern fuelling. The roller fairleads for the fuelling hose are located at Frame 7.5 port and starboard. The hose hanging pendant padeye No. 11 ® and No. 12 ® are also located at Frame 7.5, within the breakwater on either side of the 57 mm gun mounting. The messenger lead block reversible eyepads No. 15 ® and No. 16 ® are located in line with the winch drum approximately 5 m from the centre line.

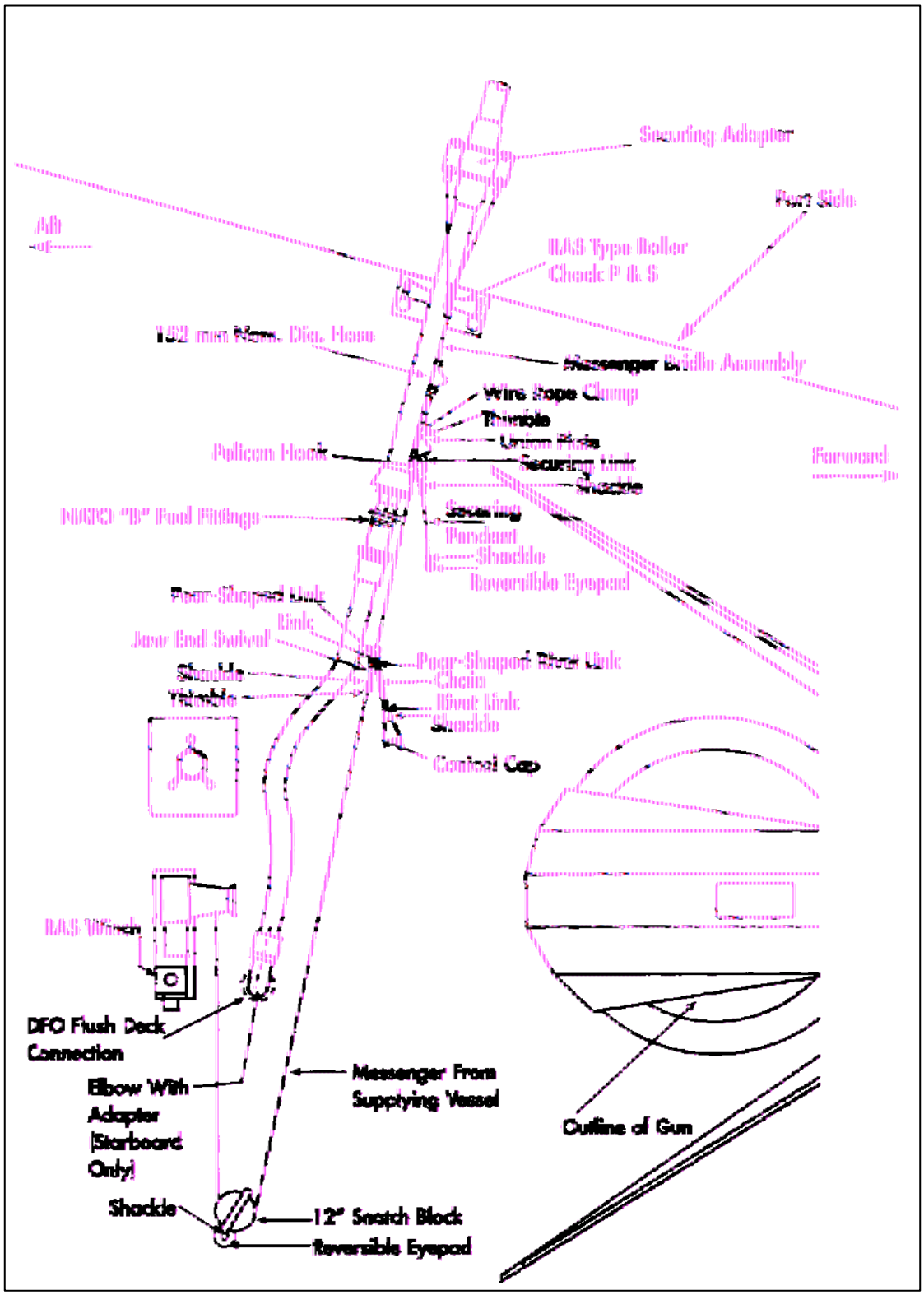


Figure 9.22-23 - HALIFAX Class Astern Fuelling Layout

c. Procedure

(1) General:

(a) The AOR will stream a hose messenger astern with the float assembly attached.

(b) As the ship makes her approach, a grapnel hook is thrown across the hose messenger. The messenger and float assembly are hauled up on deck until both can be taken in hand.

(c) The messenger is disconnected from the float and passed through the roller fairlead on the engaged side. It is then led across the deck to the 12" snatch block rigged to the padeye No. 15 ® or No. 16 ® on the disengaged side and led back to the winch.

(d) The hose messenger is heaved in until the hose-hanging pendant is in line with the bridle flounder plate.

(e) The Pelican hook of the hose-hanging pendant is secured to the flounder plate.

(f) The messenger is veered until the weight is on the hose-hanging pendant. While the Fuelling Party is hooking up the hose, remove the messenger from the block and winch, and then re-attach the messenger to the float.

(g) The messenger and float outboard of the guardrail are secured aft of the roller fairlead, and ready for slipping.

(h) On direction from the Station Supervisor, the Fuelling Party will remove the conical cap from the "B" end of the breakable spool. A 30 mm (1 ½") socket must be used to open the air valve so that the flotation air is bled off. Once the air is bled off, the cap is removed.

(i) The end plate of the "B" fitting is removed. The "basket" is removed and checked for "pigs" (internal plugs designed to prevent fuel spills between successive fuel transfers. If there are any pigs in the basket, they are removed and the basket is placed back in the hose.

(j) The hose is then positioned so that the drop bolts on the "B" fitting can be engaged with the corresponding lugs in the "A" fitting. Once the fittings are secured together, the signals "Hooked On" and "Start Pumping" can be passed to the AOR.

(k) On completion of fuelling, the AOR will open the hose at the supply end and place a pig in the hose. On the order to "Blow Through", the hose will be charged with air, forcing the pig through the hose until it is caught in the basket.

(l) The air is bled off the hose and the fittings are disconnected. If any pigs were removed by the receiving ship, the basket is removed and all pigs are placed back in the hose. The basket, end plate and conical cap are then replaced on the hose.

d. **Procedures for Slipping the Astern Fuelling Rig.** The dump crew rigs the easing out line to the pear-shaped link on the bridle. The end of the original messenger is taken in from outboard and re-shackled to the bridle. The easing out line is secured to the bridle using a toggle with recovery line. It is kept in hand, ensuring that no strain comes on it prematurely. The easing out line is then passed through the lead block to the winch. The weight of the rig is taken up by the easing out line, and the hose-hanging pendant is disconnected. It is then veered and the hose assembly is eased out over the side. Once the hose is at the waterline, the recovery line is turned up on a bollard. The easing out line is veered until the recovery line releases the toggle. The messenger and float are paid out as the ship drops back in station, and then is finally slipped.

9.23 PROTECTEUR CLASS - REPLENISHMENT AT SEA

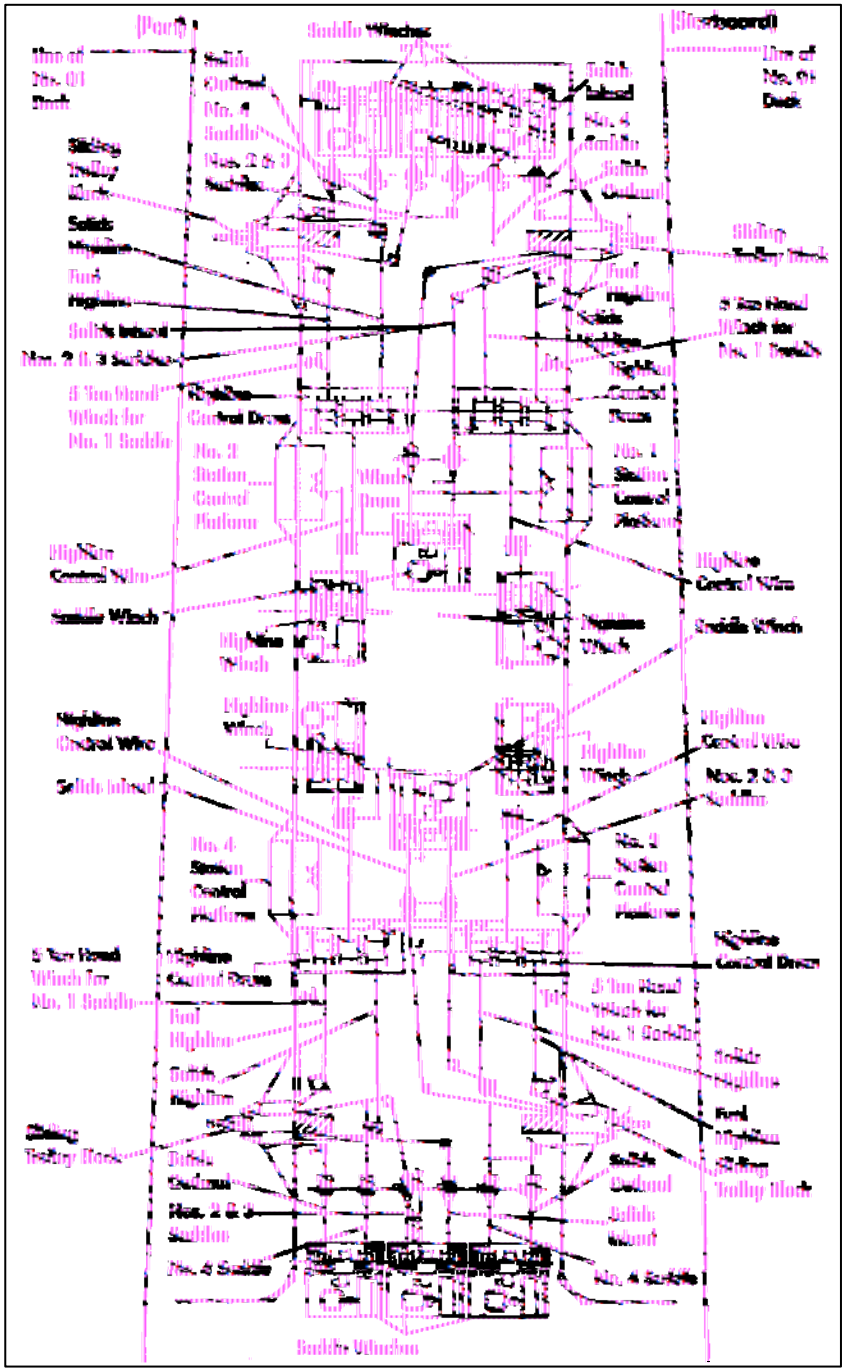


Figure 9.23-1 - Top View Winch Deck Configuration

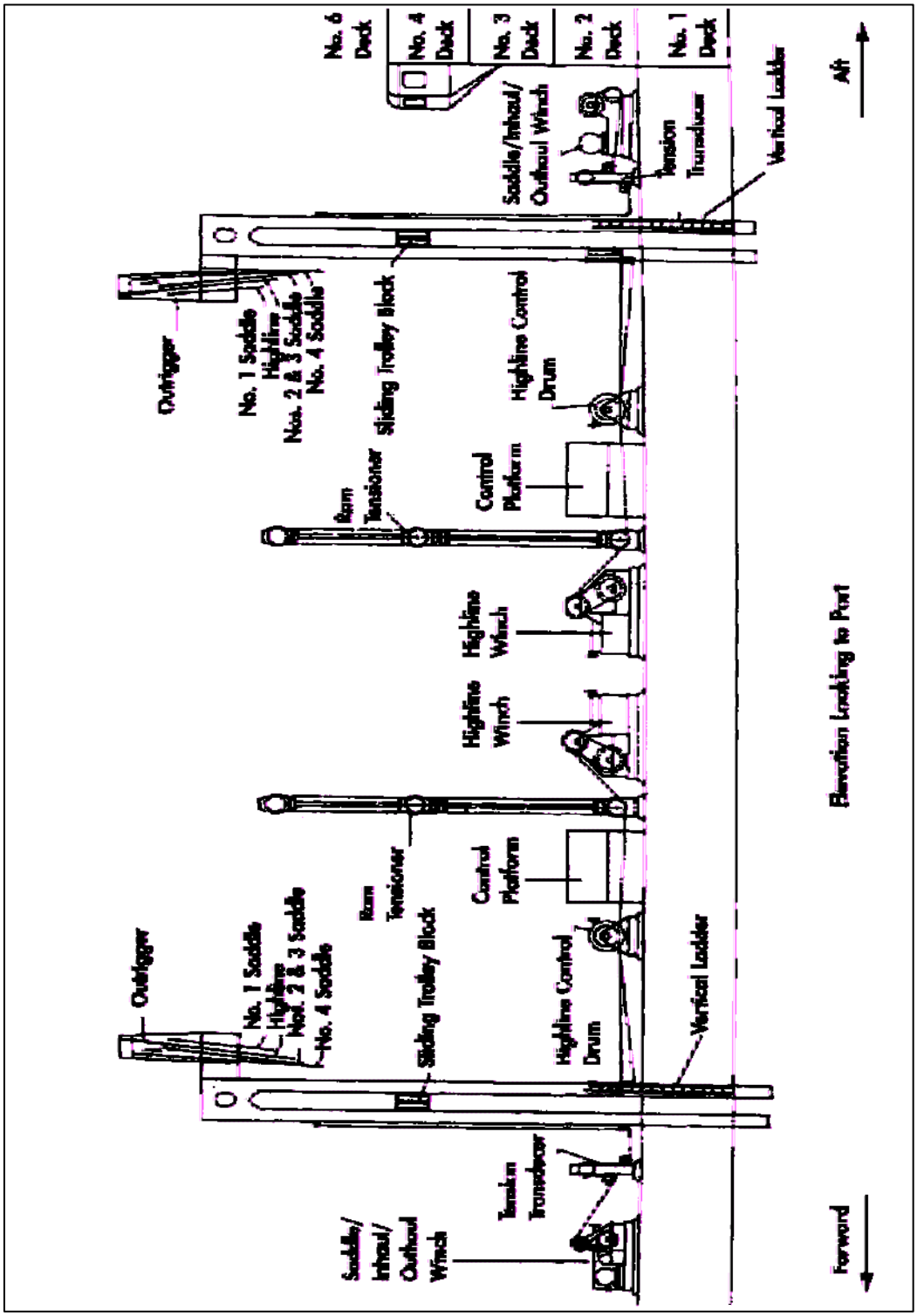


Figure 9.23-2 - Side View Winch Deck Configuration

9.23.1 General

a. PROTECTEUR Class are fitted with a STREAM (Standard Tension Replenishment Alongside Method) rig, allowing replenishment of solids or liquids from up to four stations simultaneously. Each fuelling station is fitted with two 7" hoses in over/under saddles, permitting liquid commodities to be transferred. Fuelling hoses are supported by four hose saddles rigged on a ram-tensioned support line (spanwire). The saddles and spanwire are controlled by winches that have separate controls. The spanwire and saddle wire winches can be controlled automatically or manually.

b. Each station is equipped with 3 winches - Inhaul, Outhaul and Highline/ Spanwire - controlled from a control station. These winches serve dual functions. They are used to transfer provisions between ships and are rerigged to transfer liquids. The highline winch wire at each station is led through a ram tensioner to a control drum. Horizontally mounted drums on either side of the control drum carry the solid highline and liquid spanwire; these are the actual spanwires/highlines which are led through the lead blocks to the top of the kingposts to the Receiving ship. To operate the desired highline, a clutch is engaged to the appropriate drum. Tension is automatically maintained on the highline or spanwire by the ram tensioner and a winch. As the ship rolls, the ram moves up or down to take in or pay out wire as necessary to keep the highline/spanwire at constant tension. Inhaul and outhaul winches are self-contained units consisting of two drums mounted horizontally. Through clutches, brakes and gearing, either the drum for the saddle wires or the drums for the inhaul/outhaul can be selected. To transfer provisions, a traveller transporting the cargo is supported by the tensioned highline and the inhaul/outhaul winches that pull the traveller back and forth between ships.

9.23.2 Light Line Transfer

a. **General.** Gear for light line transfers is normally stored in the upperdeck storage lockers on the port and starboard sides of the forward breezeways. Stations Alfa and Bravo are normally used as the light line transfer points; however, Stations 1 and 2 are commonly used when liquids or solids transfers are simultaneously planned for Stations 3 and 4. In fact, light lines may be conducted anywhere along 01 Deck if need be.

b. Preparation and Equipment Layout.

(**1**) The upper 6" snatch block is shackled to the light jackstay tripod on 02 Deck, and the lower 6" snatch block is shackled to the bulkhead padeye on 01 Deck at Station Alfa or Bravo.

(**2**) The light line and distance line (if used) are normally fed directly from their storage cans but may be faked down fore and aft along the breezeway if desired.

(**3**) If the light line transfer is to take place while fuelling or conducting a solids transfer, then the outboard end of the light line is to be lead aft to the appropriate station. It is then secured to the messenger. In this way, the transfer can take place as part of the passing of the gear for fuelling or heavy jackstay. [Fig. 9.23-3 Light Line]

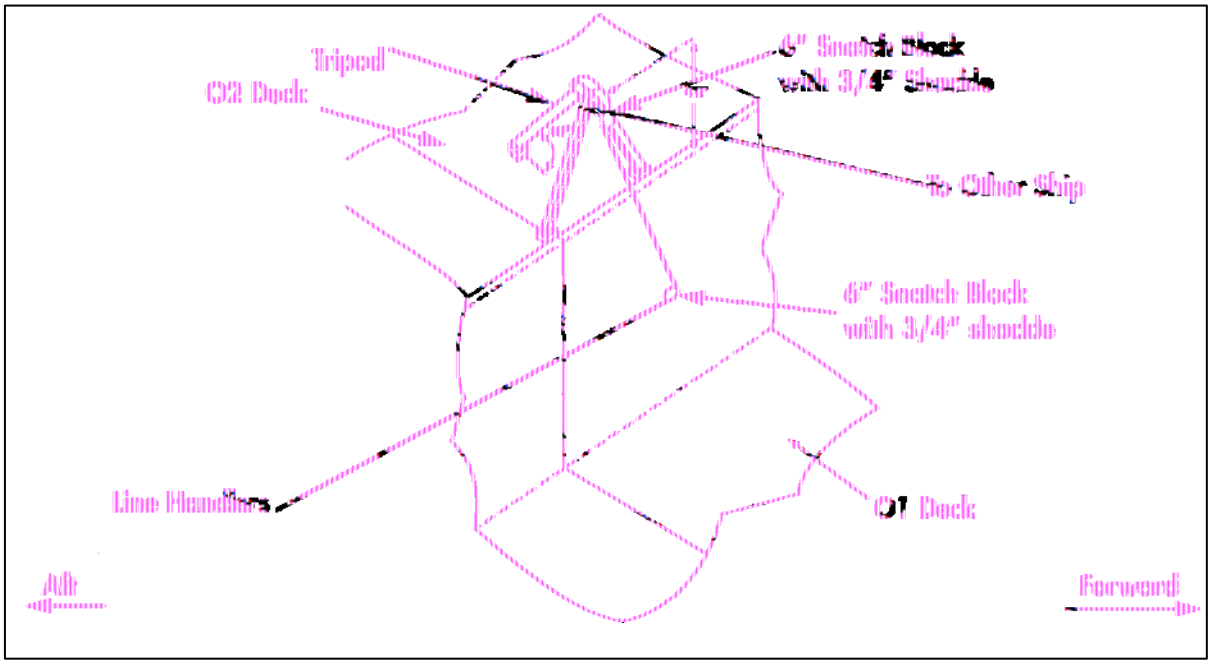


Figure 9.23-3 - Light Line Layout Starboard

9.23.3 Light Jackstay

a. Preparation and Equipment Layout Supply.

(**1**) Stations Alfa/Bravo are designated as the light jackstay stations; however, Stations 1 and 2 are fitted with strong points to allow for rigging light jackstays if necessary.
(**2**) The upper 12” common block of the jackstay is secured to the uppermost tripod padeye with a 7/8” shackle, while the lower 12” common block is secured to the lower bulkhead padeye, also with a 7/8” shackle.
(**3**) The two 6” common blocks on the inhaul are secured with ¾” shackles to the two inner tripod eyepads.
(**4**) The outboard end of the inhaul is shackled to the inboard side of the traveller found on the jackstay. The inboard end of the outhaul is shackled to the outboard side of the traveller.
(**5**) The jackstay is faked out fore and aft, inboard to outboard. The inhaul is faked out fore and aft forward of the station, while the outhaul is faked out fore and aft immediately below the station. The light messenger is faked out fore and aft between the ship’s side and the outhaul.

b. Preparation and Equipment Layout Receive.

(**1**) The Senhouse slip is secured to the uppermost padeye on the tripod with a 7/8” shackle.
(**2**) The two 6” snatch blocks are secured to the next two eyepads down using ¾” shackles.

9.23.4 Heavy Jackstay

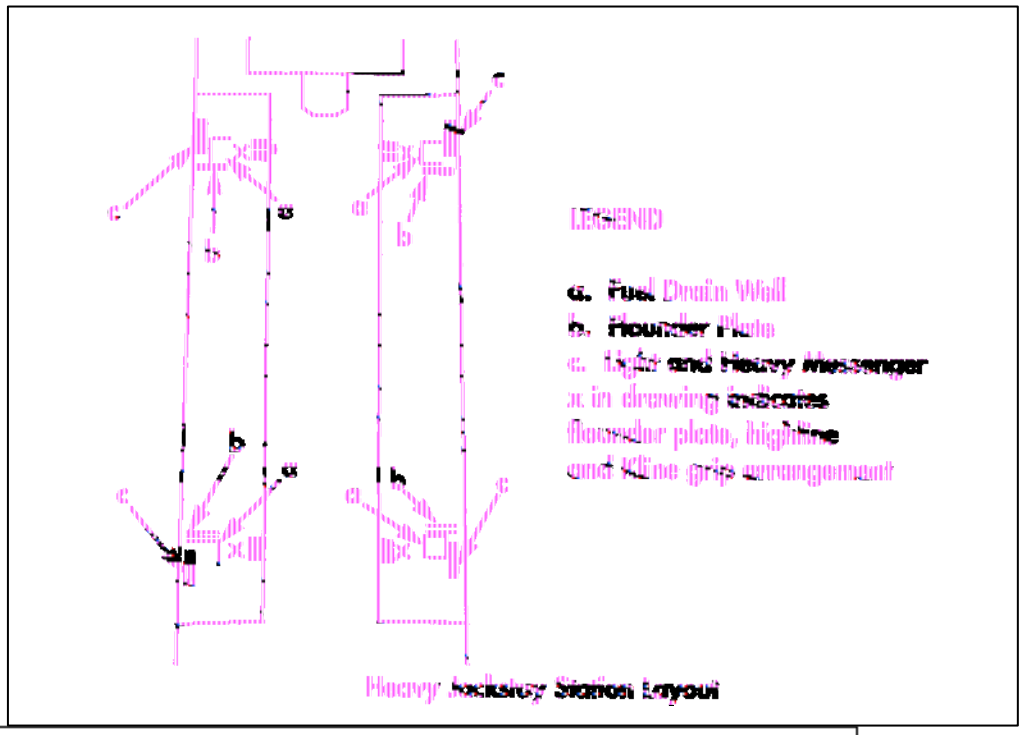
a. Preparation and Equipment Layout.

(**1**) Stations 1, 2, 3 and 4 are designated as solids transfer stations.
(**2**) The continuous messenger is laid out forward to aft, the inboard end shackled to the Flounder Plate. The 60' section is replaced with a longer 200' section, which serves as the Flounder Plate messenger.
(**3**)
(**4**) The RAS deck PO directs the flashing and readying of the winches, and the Station Supervisor orders slack to the highline and the raising of the "D" ring to a height dictated by the size of the load and the requirement for the load to clear the bulwarks and guardrails. The sliding "D" ring is operated by the cage operator.
(**5**) The continuous messenger is lashed to the highline at the proper height for the receiving ship [see Table No.9.23-1].

NOTE: *Shot mats are only required to be laid out if ammunition is being transferred.*

a. Procedures

(1) (1) Once the gunline has been passed, it is secured to the outboard end of the continuous messenger. The messenger is then paid out hand over hand. When the receiving ship has a sufficient amount of the 24mm section onboard, it is taken to a winch and the highline hauled across. Ships not equipped with winches will require a minimum of 20 personnel to haul the highline across.
(2) When the highline is hooked to the receiving ship, it is tensioned down and the remainder of the messenger is passed. The AOR will pay out inhaul/outhaul wires to allow the flounder plate to descend/be hauled across the highline and attached.
(3) Once the flounder plate is attached the continuous messenger is broken at the brummel/englefield hooks and the 200' section retained for use when returning the flounder plate. The remainder of the continuous messenger is returned on the traveler.



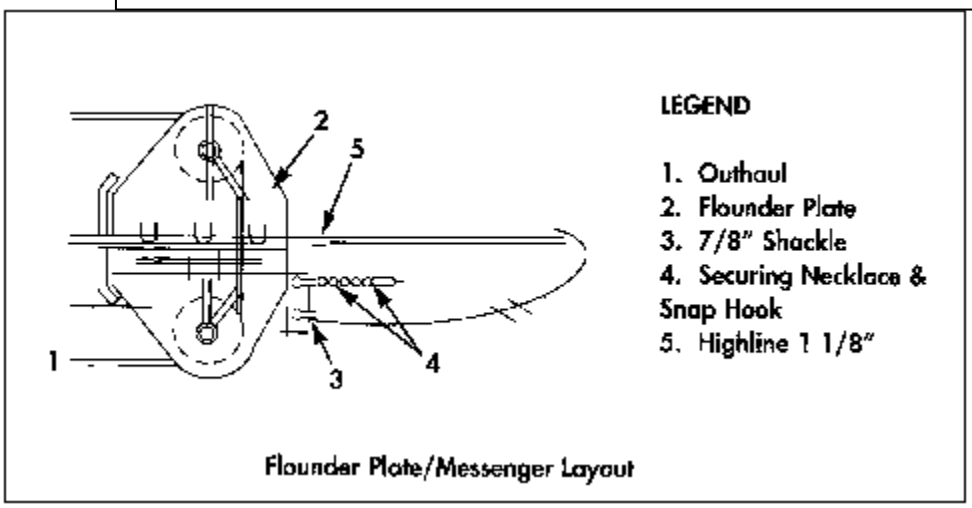
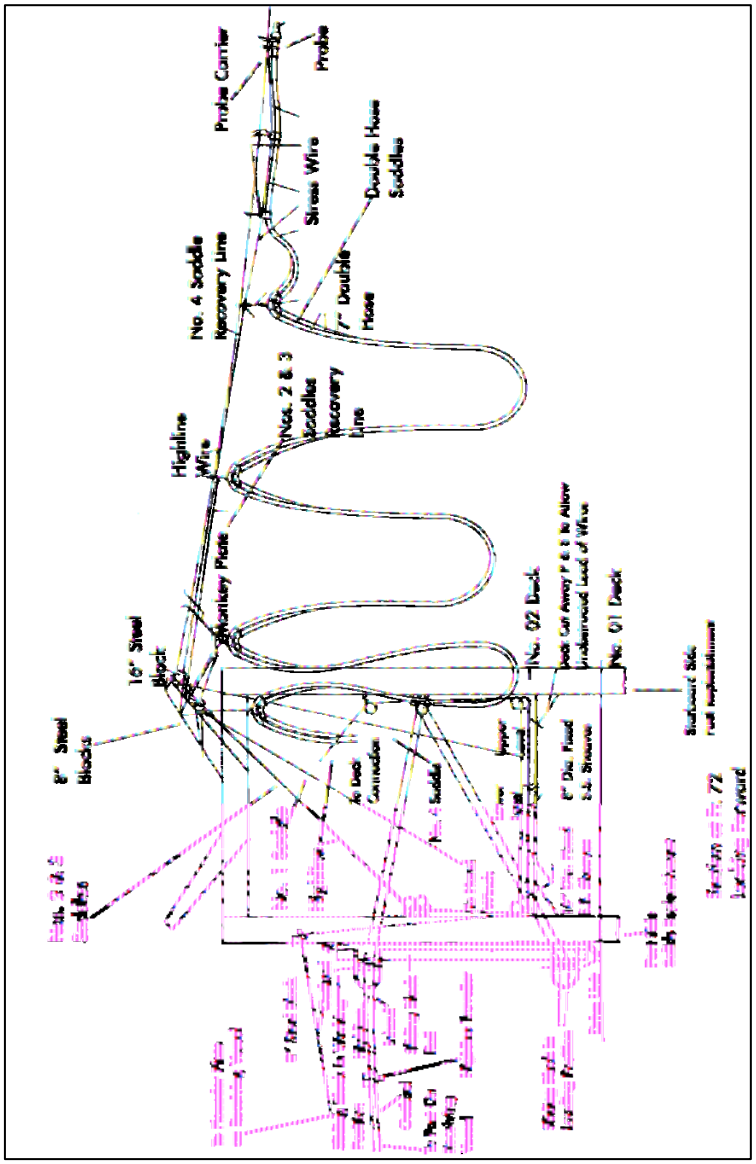
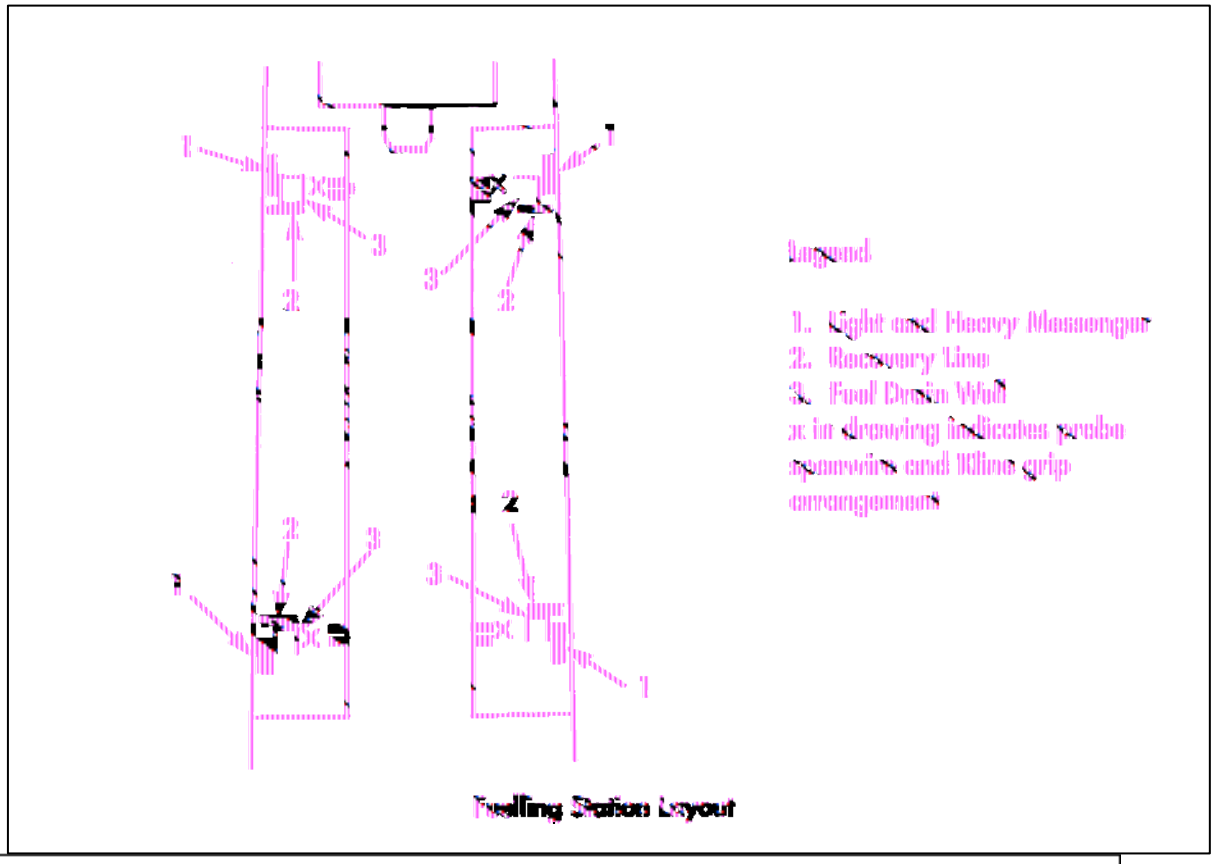


Figure 9.23-4 - Heavy Jackstay Station Rigging Arrangement

9.23.5 Liquids Transfer

Figure 9.23-5 - Liquid and Heavy Stations with Hose Configuration





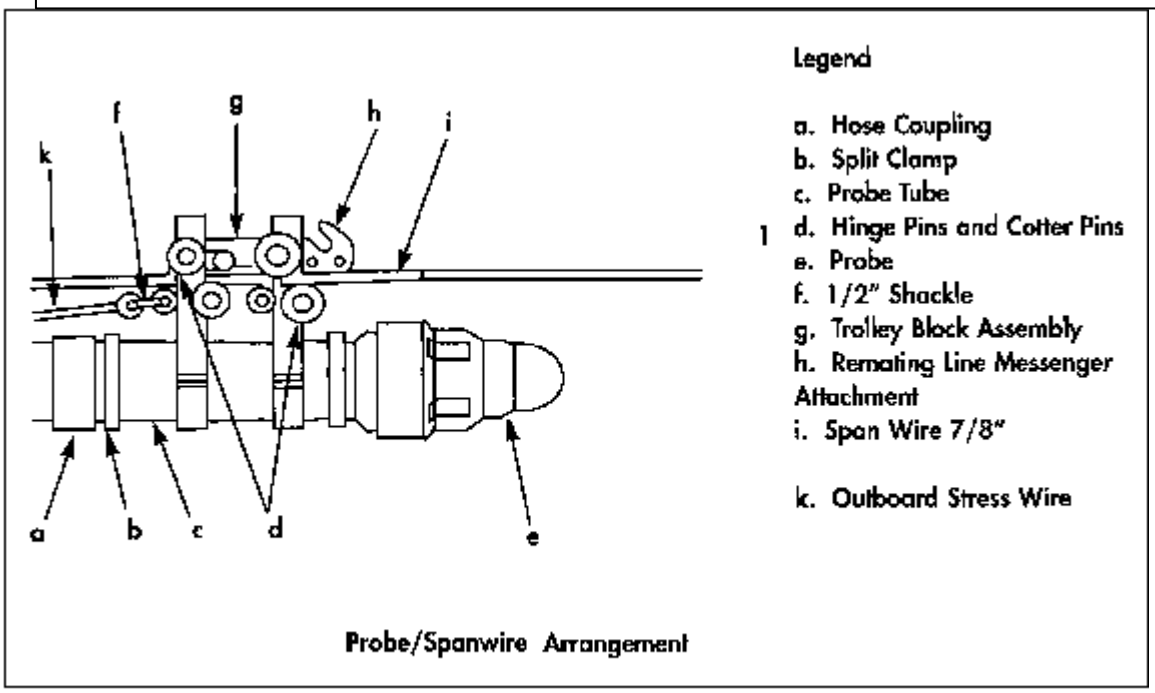


Figure 9.23-7 - Fuelling Station Layout

a. Preparation and Equipment Layout.

(**1**) Stations 1, 2, 3 and 4 are rigged with double hoses for the simultaneous transfer of distillate (F76) and aviation fuel (F44). Station 2 is normally also rigged to transfer water. However, all stations can be used to transfer water if necessary.
(**2**) The continuous messenger is faked out fore and aft outboard of the fuel drain wells
(**3**) The recovery lines and hose messenger lines (when required) are faked out athwartship. The running end of the recovery line is secured to the probe.
(**4**) Once the winches are engaged, the Station Supervisor will order slack in the spanwire so that the continuous messenger can be placed lashed to it, in accordance with the table below. The probe tail is taken outboard, and then led inboard through the fairlead and turned up on the staghorn. This prevents the rig from falling back when the spanwire is slipped from the deck. The hose securing gripes are removed and the station is ready to commence the transfer.

Table 9.23-1: Spanwire "Tail"

CLASS	**HALIFAX**	**IROQUOIS**	**AOR (509/510)**
HEIGHT: (Liquids)	18" - 24"	12"	24"-36"**
HEIGHT: (Solids)	18"-24"	12"	24"-36"**

** **Consolidation RAS - Receive Only**

b. Procedures

(1) Once the gunline has been passed, it is secured to the outboard end of the continuous messenger. The messenger is then paid out hand over hand. When the receiving ship has a sufficient amount of the 24mm section onboard, it is taken to a winch and the spanwire hauled across. Ships not equipped with winches will require a minimum of 20 personnel to haul the spanwire across.
(2) When the spanwire is hooked to the receiving ship, it is tensioned down and the remainder of the messenger is passed. The AOR will pay out saddle wires to allow the probe to descend/be hauled across the spanwire and seated in the probe receiver. The messenger return line is paid out with the probe.
(3) Once the probe is seated, the continuous messenger is removed from the messenger attachment hook and returned with the messenger return line. If required, the continuous messenger may be broken at the brummel/englefield hooks and the 60' (18.3m) section retained for use as a remating line. On completion, it is returned with the probe.

b. Station Layout Liquids - Rigging of End Fittings.

(1) NATO "B"./EBFC
   (a) The probe, probe carrier, outboard stress wire, and the 10' outboard length of 7" hose are removed from the rig.
   (b) A 10' length of 7" hose is connected to the outboard baby saddle. This hose is fitted with a NATO "B" fitting.
   (c) Two teflon highline guide rollers with slips are fitted on the spanwire. The fitted length of hose and the NATO "B" fitting are secured by chain to the slips on the guide roller. One chain is positioned at the midpoint of the fitted 10' hose length of hose, while the second one is positioned around the NATO "B" fitting on the outboard end.
   (d) A two-legged bridle is fitted to the outboard baby saddle, and the pigtail is transferred to the NATO "B"
(2) Aviation Fuel Couplings.
   (a) The F44 NATO Standard Coupling is rigged with a 20 ft, 2 ½" fuelling hose. The inboard end of this short length of hose is rigged with an AeroQuip fitting to facilitate attachment to the 20' length of 4" hose run from the outboard baby saddle by means of a 7" to 4" reducer.
   (b) This short length of hose is suspended under the probe carrier by a chain or lashing secured to a snap hook rigged by chain under the probe or under the outboard baby saddle.

9.23.6 Consolidation RAS

a. PROTECTEUR Class - Supplying Ship. The same gear and layout is employed as in a single ship transfer. The only difference is that the PROTECTEUR Class may supply two liquid rigs, or two solid rigs from Stations 1 and 3 or Stations 2 and 4, depending on circumstances.

b PROTECTEUR Class (Consolidation Ras Sops Seamanship

PRO's primary means of conducting a consolidation RAS is via either of her forward stations, 1 or 2. Given the catnary of the fuelling rig, the removable bulwarks for the forward station must be removed in order to not obstruct the fuelling rig. This is accomplished using a forklift and strops to move the bulwark aside once unbolted. Of note, PRO's after stations do not have removable bulwarks, hence why only PRO's forward stations are suitable for consolidation RAS. In terms of hose configuration, PRO will always attempt to take a double 7" hose from the supplying ship. These hoses are configured as a NATO Probe over Robb Coupling. The probe is taken to PRO's bell while the Robb Coupling (female fitting), taken from supplier, is taken directly to the male fitting of the 15' length of 7" hose fitted with Robb Coupling that PRO provides that is attached directly to the fuelling group tree. Both hoses will be connected prior to fuel being pumped through either hose. The configuration and hook-up procedure for each hose is as follows:

a. NATO PROBE: In similar fashion to which receiving units from PRO receive and hook-up for fuelling, PRO uses three 12" snatch blocks, one over the bell, one at the deck hard point outboard of the applicable fuelling station and one at the deck hard point just forward of the breakwater. A tag line is then rove through the lead blocks

with the running end lead outboard. The heavy messenger for the probe is then rove through these blocks and taken to the appropriate side of the windlass to be heaved in under power. Once the probe is seated, enough slack is provided to the re-mating line so that the probe can fully unseat itself should it be required to, however, turns remain on the windlass. An easing out pennant and appropriate drip pan will be rigged at the bell position.

b. ROBB COUPLING: In similar fashion to how PRO provides a JP-5 hose under the probe trolley, the Robb Coupling hose will be coiled underneath the probe upon delivery to PRO. Once the probe is seated, this hose will be freed and ranged out on the deck leading aft to PRO's hose. Every effort must be made to ensure that that there are no kinks in the hose. Once the Robb Coupling is connected, the coupling itself is placed over a drip pan. As was learned during the KAN consolidation RAS, given the weight of the Robb Coupling hose and the contact this hose makes with the deck and ship's edge, these forces put excessive strain on the probe that are sufficient to unseat it. To avoid this, it is essential to rig a stress rope/line from the last baby saddle of the Robb Coupling hose to the hard point just below PRO's bell receiver.

2. Manning – In addition to the RAS team closed up at the fuelling station, a RAS team will be required on the focsle to operate the windlass and handle lines. Alternately, the spanwire may be hauled across by hand - a minimum of 20 personnel will be required. Given the alignment of PRO's forward stations for any given tanker that will conduct a consolidation RAS with PRO, the distance line will always be located on PRO's focsle located forward of the breakwater. The following table is a breakdown of the personnel, in accordance with ref A, required for a consolidation RAS:

Position	Location	# Pers
Station Supervisor	Stn #1 or #2	1
LS/OS Bosn – Stn Worker Gunline	Stn #1 or #2	1
LS/OS Bosn – Stn Worker	Stn #1 or #2	3
Distance Line	Focsle	3
Station Comms	Stn #1 or #2	1
Bridge Comms	Bridge	1
Focsle Supervisor	Focsle	1
Focsle LS/OS Bosn – Stn Worker Gunline	Focsle	1
Focsle LS/OS Bosn – Stn Worker	Focsle	3
		17

5. Communications – As with any RAS evolution, primary communication between Command on the bridge and the station itself will be via SHINCOM RAS Net. Communication between PRO fuelling dump and PRO focsle is established via voice and hand signals in order to control windlass movements. Depending on the supplying unit, communications from fuelling dump-to-dump may be either sound powered or PRC. Either unit may be tasked to supply these communications as

detailed by the OPTASK RAS (SUPP). Bridge-to-bridge communications primary will be sound powered via the distance line, provided by PRO, and secondary communications established via a PRC channel designated by the supplier.

Liquid Management

3. As with any evolution, communication between parties is essential. In the case of consolidation RAS serials, given the large quantities of fuel being transferred and the potential for lengthy pumping times, every effort should be made to maximize fuel transfer rates in order to minimize time alongside. As mentioned above, the standard hose configuration is for a double 7 inch hose, Probe over Robb Coupling. Depending on the supplier, the pumping rate to these hoses may vary depending on whether the supplier can dedicate a single pump, or group, to each hose in order to achieve optimum pressure to both hoses, rather than a single pump to two hoses. As was the case with KAN, early liaison and PRO's experience from MIDPAC Oiler, highlighted that the Kaiser Class are capable of jumping their fuelling stations in order to provide a dedicated pump to each hose. Utilizing a configuration with two pumps, each dedicated to a separate hose to PRO, the fuelling rate increased to 1700 cums per hour vice the 1000 cums per hour during TGEX 2/07 with one dedicated pump to two hoses. This significantly decreases the pumping time and subsequently reduces the time required for the complete evolution. For future consolidation RAS it is critical to specify the requirement to have a dedicated pump to each hose and suggest that suppliers jump their fuelling stations if at all possible. In addition, the following information is required from the supplying ship: connection type, distance between stations on supplying ship, number of hoses, minimum and maximum pumping rate to each hose, fuel test sheets / fuel specifications and method of communication.
4. Manning - The manning requirements of the Liquid Cargo Section during a consolidation RAS are critical to ensure the safety of PRO. With the significant amount of fuel being transferred during the RAS, all personnel must be alert and knowledgeable in their duties and responsibilities. The minimum personnel required for DFO is 10 pers with one station, 12 pers with two stations and increasing to 13 / 15 with JP-5, effectively utilizing all PRO H Techs. The following table is a breakdown of the personnel required for a consolidation RAS:

Position	Location	# Pers
LCO	Aft LCO	1
Fueling I/C	Aft LCO	1
Aft Board Operator	Aft LCO	1
Station Communicator	Station	1 / 2
Event Recorder/Communicator	Aft LCO	1 / 2
Tank Sentry/Ullager	Closed Jungle Deck	2
HQ1 Roundsman	Forward & Aft	2
Upper deck Sentry (safety number)	Station	1
		10 / 12
Fwd Board Operator	Aft LCO	1
Event Recorder/Communicator (JP5)	Fwd LCO	1

Tank Sentry/Ullager (JP5)	Open Jungle Deck	1
		13 / 15

5. Communications - As communications are vital during a consolidation RAS, PRO should not commence any transfer of fuel until clear communications are achieved between PRO and the supplying ship. PRO station communicator shall be a LS or above Hull Technician with a clear understanding of RAS procedures and communications. Charge at the station will always remain with the Station Captain.
6. Tank Sequence - In order to ensure that proper trim is maintained, an appropriate tank usage plan should be implemented. Suggested tank sequence for the consolidation RAS is stated below, noting that deviation from this sequence may be necessary in order to maintain proper trim and stability during the filling sequence. The LCO is to ensure PRO's trim and list are calculated prior to and monitored during the consolidation RAS to ensure proper stability and sea keeping of the ship throughout evolution.

CONDITION	SEQUENCE
1	7 CL to 50%
2	5 CL to 50%
3	8 CL to 50%
4	6 CL to 50%
5	2 CL to 50%
6	5 W to 60%
7	7 W to 60%
8	3 aft W to 60%
9	8 W to 60%
10	3 fwd W to 60%
11	6 W to 60%
12	4 W to 60%
Repeat condition 1 thru 12 to 90%	

PRO's maximum receiving rate per station group is 10,000 barrels per hour. To ensure sufficient flow and minimum back pressure, at least two tanks should be open to receive fuel during transfer. This may be achieved by utilizing one set of wing tanks. Due to potential increases in pressure, any change or transition between tanks shall be relayed to the supplying ship through the station communicator.

Shiphandling

7. Standby Station - PRO took station 500 yards astern of the supplying vessel, displaced 150 yards vice the recommended 200 yards for a consolidation RAS approach. Considerations for the closer approach were the stable environmental factors, including Sea State 1 and light airs as well as the higher levels of confidence due to having conducted separate serials including approaches for consolidation RAS and a consolidation RAS several months earlier. During the previous Consolidation RAS approach serials, both conducted in November 07, several lessons were learned that were

applied in this RAS. In the first of these previous approaches, PRO conducted the alongside IAW the recommended distances as indicated in CFCD 105, specifically, making the approach at 200 yards displaced and then easing in once alongside. After utilising this method, this approach was deemed to be unnecessarily cautious, having a detrimental effect on the effectiveness of the RAS by increasing the approach time. The subsequent approach was conducted at 150 yards, which was again observed to be more than ample room. The third and final test approach was commenced with 150 yard displacement in the waiting station, and once the approach had been commenced, PRO steered in on the approach in order to ease in to approximately 100 yards while making the final alongside. This final method was found to meet all the safety requirements and the intent of the promulgated instructions, particularly with respect to the forces of interaction between the two vessels, given the small relative speed differential between the vessels. It is advisable to take into consideration the size of the other vessel, increasing this distance for a larger vessel to account for the greater range of effectiveness and strength of hydrodynamic forces affecting PRO.

8. Deceleration Rate – The deceleration rates changes based upon trim and cargo load. It is highly advisable to conduct a deceleration rate trial prior to conducting the Consolidation RAS. The daily deceleration rate was trialed when PRO reduced speed to come into the standby station, proving the shiphandling characteristics for the day and verifying that PRO decelerated at approximately 150 yards per knot when around a 60% cargo load.
9. Approach and Alongside - Once signalled to commence the approach, PRO made her approach, steering in 1 to 3 degrees in order to commence closing the supplying ship to affect a 100 yard displacement by the time that the ship arrived alongside. The approach was conducted by ringing on a four knot advantage of 17 kts to KAN's 13 kts. The speed was taken off when 150 yards astern of KAN's transom, given that PRO did not reach the ordered speed through the water. The deceleration rate was also affected by the stern and bow waves, and when crossing these, a noticeable increase in the deceleration rate was observed when approaching the wave, followed by an easing in the rate as the bow passed through the wave. PRO settled in at 100 yards lateral displacement before easing in to 42 meters to pass gear. The forces of interaction on this final portion of the alongside were significant, and caution was paid in particular to the ship's head, the amount of helm used and the rate of turn, as a strong push-back from the bow wave was experienced. Once gear had been passed, PRO eased out to 48-54 meters for the remainder of the RAS. A distance of 60 meters was considered by KANAWHA to place too much strain on the RAS rig.
10. Human Factors – The largest potential for an accident during a Consol RAS stems from the human error. In particular, fatigue or inattention on the part of the helmsman and OOW could rapidly lead to a dangerous situation from which recovery would be difficult if not impossible. The helmsmen in particular found that the course was challenging to maintain steadily throughout the RAS, as PRO was riding close on the bow wave of KAN, making the ahead and astern position critical to the effect of the push-back from the bow wave. In order to mitigate the effects of the resultant fatigue, three different helmsmen rotated through at one-hour intervals. Generally, once fatigue started to set in the steering became more erratic. A 30 to 45 minute rotation with 4 helmsmen would have been ideal to compensate for this significant human factor.
11. Shiphandling While Alongside - PRO's shiphandling characteristics changed throughout the course of the time alongside, as the draughts increased and the trim changed due to tank loading. These changes were noticeable and had to be adjusted for by remaining

alert throughout the duration of the RAS. Speed was particularly affected by the increase in draught, as more speed was required to maintain the position alongside. Also, the drag from an increased draught made the ship slower to respond to changes in revolutions. The ship generally yawed 1 degree on either side of the ordered course with up to 15 degrees of helm being required at times to maintain course. As the helmsmen began to be affected by fatigue, human errors were induced, and at times the ship yawed up to 3 degrees off the ordered course, and up to 30 degrees of helm was used to maintain the course. These latter situations were rare and quickly dealt with, but care and attention should be maintained at all times in order to mitigate and reduce the possibility of these errors compounding into larger ones. This evolution holds one of the highest potential risk levels for the ship in terms of shiphandling. By frequently changing the OOWs, rotating control between the CO, XO and Navigator, and by ensuring a steady rotation of helmsmen, the human errors were mitigated during the Consol RAS.

12. CORPEN November Procedures – During the RAS, a large alteration of course was required. PRO's experience with USNS units has been to utilise VHF in order to both alleviate confusion and expedite the manoeuvre. This method was utilised for this challenging manoeuvre by means of direct handheld VHF communications between the CO and the master of the KANAWHA, effecting a 25° turn to port in precise, effective 3° increments. The manoeuvre took approximately 12 minutes to execute in its entirety. Command must be aware that this method could be used in the future.
13. Disengagement and Breakaway - PRO closed in to 50 yards to return gear, again experiencing the same increased interaction forces as before. Once gear had been returned and all lines slipped, PRO eased out, opening on the beam of KAN to 150 yards before increasing speed and conducting a standard-helm turn away from the supplying ship 270 degrees to pass safely under KAN's stern and proceed with her tasking.

Conclusion

14. While every consolidation RAS will prove unique, the foundation for a successful and efficient evolution will largely be established through early liaison with the supplying unit in order to confirm PRO's preferences for hose configurations, pumping rates and shiphandling concerns. While a consolidation RAS is a lengthy evolution even at the best of times, communication between departments with regards to manning and timings remains critical in order to optimize efficiency and reduce fatigue. Careful monitoring and management of personnel, particularly in key bridge positions such as helmsman and OOW, are essential in order to ensure the fatigue induced errors are avoided.

c. PROTECTEUR Class - Receiving Ship.

(**1**) **General**. AORs can receive liquids at all stations in much the same manner as other ships.
(**2**) **Personnel Requirements**. In addition to the RAS team closed up at the fuelling station, a RAS team will be required on the focsle to operate the capstan and handle lines. Alternately, the spanwire may be hauled across by hand - a minimum of 20 personnel will be required.
(3) Preparation and Equipment

Probe Receiver

(a) The 7" fuelling hoses are rigged from the probe receiver to the embarkation point.
(b) Emergency breakaway equipment, repair tools and fuel spill gear are prepositioned in the dump area. Drip trays are rigged under the probe receiver and hose connections.
(c) A section of the bulwark is removed and stowed clear of the fuelling position (AOR 509 only). A temporary guardrail is rigged.
(d) One 12" snatch block is rigged above the probe receiver and two 12" snatch blocks are secured to eyepads on deck with 7/8" shackles, allowing messengers to be led to the anchor windlass on the focsle. A tag-line is then rove through the lead blocks and the running end led outboard.
(e) An easing out pendant is rigged from the strong point.

NATO "B"/EBFC

(a) A hose-hanging pendant is rigged from the upper padeye at the fuelling station strong point with a 7/8" shackle. The easing out pendant is rigged from the strong point.
(b) A 1" Pelican slip is secured to the strong point using a 7/8" shackle. Alternately, a swivel arm assembly is used.
(c) The 12" snatch blocks are rigged in the same manner as for receiving the probe.
(d) The 7" fuelling hoses are rigged from the embarkation point to the fuelling station.
(e) Fuel spill response equipment is prepositioned in the dump area.

(**4**) **Procedures.** The procedures as outlined in 9.13, 9.14 and 9.15 are followed.

9.23.7 Cargo Drop Reel Operations

a. Protecteur Class AORs are also capable of delivering stores and ammunition to ships that are not equipped with a sliding padeye. This is accomplished by removing the traveller from the highline and installing the cargo drop reel in its place.
b. When delivering to fixed eyepads, the Cargo Drop Reel (CDR) is used to lower cargo from the tensioned highline to the deck of the receiving ship. The CDR is rated to 2600 kg; however, due to the AOR maximum limit of 1365 kg and the 295 kg weight of the CDR, the maximum load that can be transferred from the AOR and lowered onto the receiving ship's deck is 1070 kg. Loads of up to 70 kg can be lifted from the deck of the receiving ship for transfer to the AOR.
c. The CDR is controlled by an operator stationed in the load-landing area (dump) of the receiving ship. The operator pulls a nylon lanyard to release the brake and lower/raise the loads.

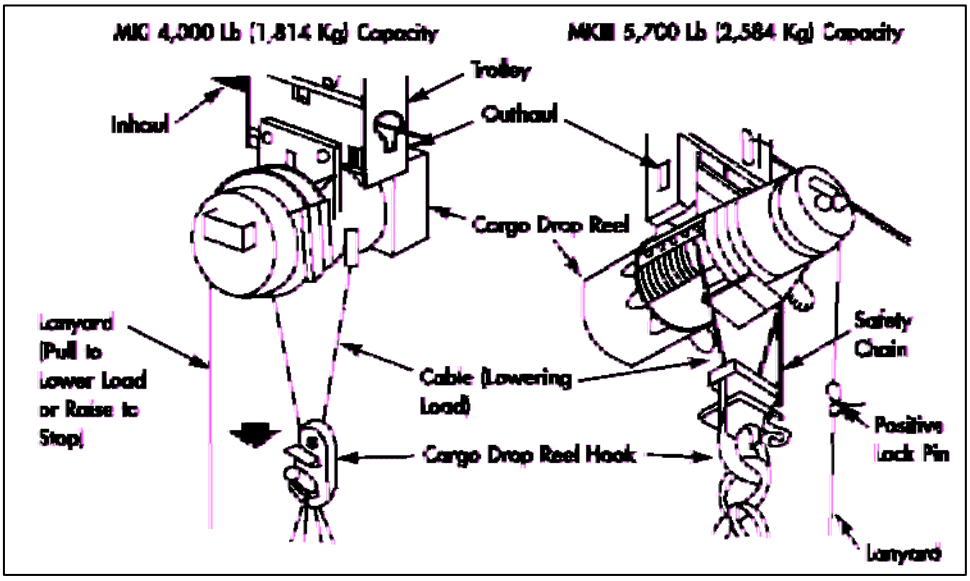
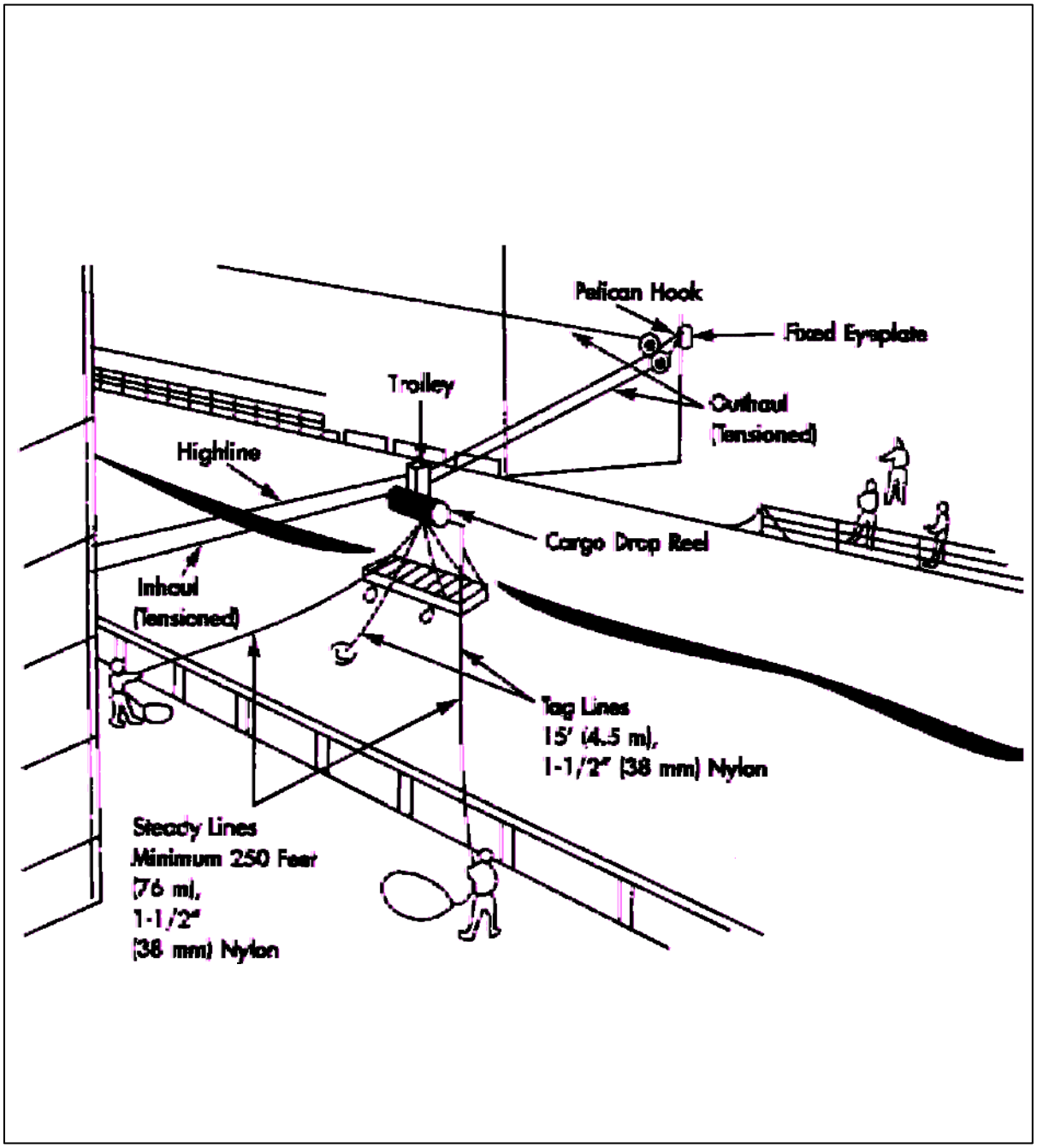


Figure 9.23-8 - Cargo Drop Reel

Figure 9.23-9 - Heavy Jackstay Using Cargo Drop Reel



9.23.8 Cargo Drop Reel Capabilities/Limitations

Maximum working load on hook:	1500 kg
Minimum load lowering capacity:	70 kg
Maximum drop distance:	10 m
Lanyard pull force (approx.):	20 kg

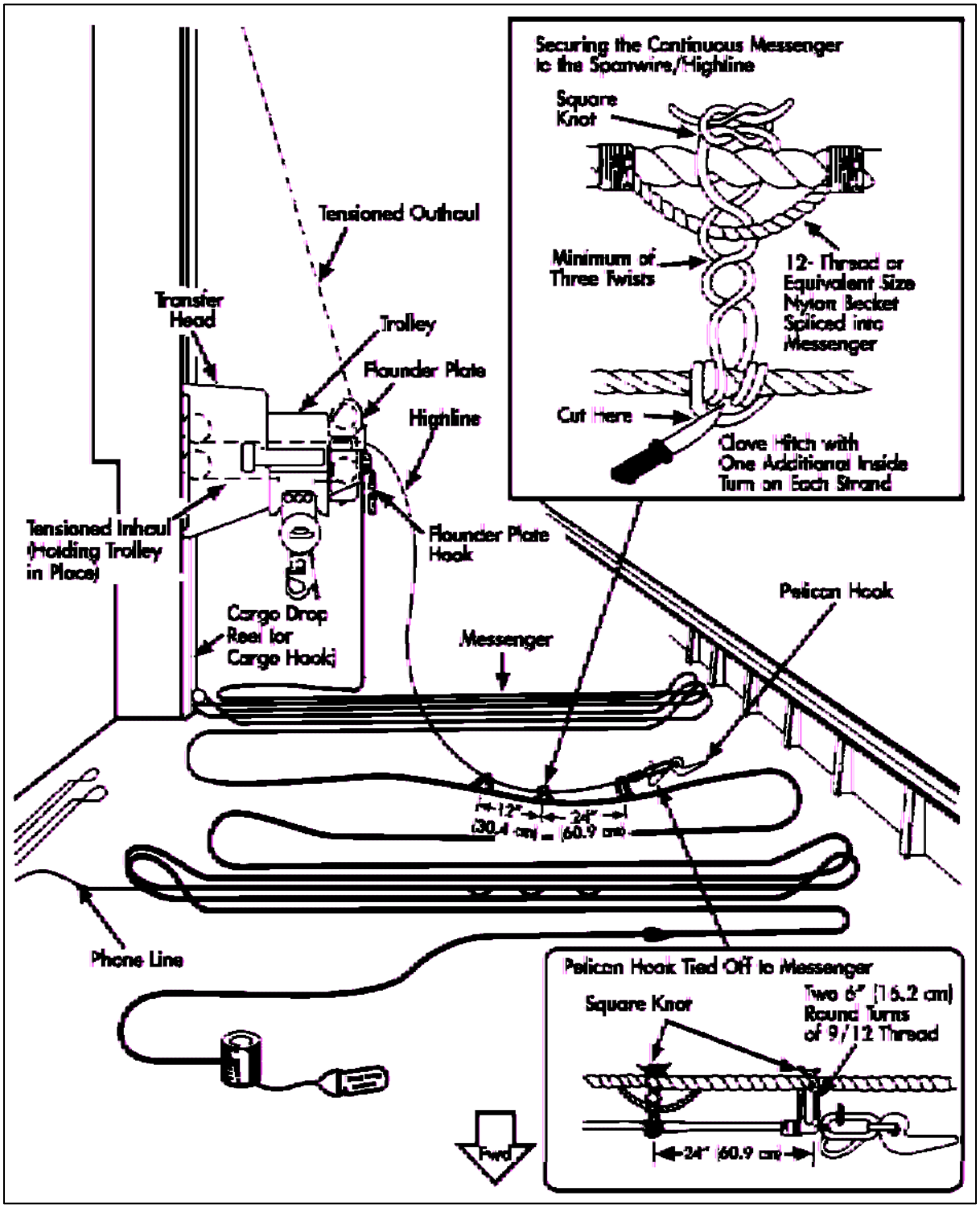


Figure 9.23-11 - Continuous Messenger

9.24 KINGSTON CLASS - REPLENISHMENT AT SEA

9.24.1 Light Line Transfer

a. Personnel Required.

(**1**) 1 Safety Officer - CBM/DECK O.
(**2**) 1 Station Supervisor - MS/LS.
(**3**) 5 Line Handlers - LS/AB/OS.
(**4**) 2 Dump Crew - LS/AB/OS.
(**5**) 1 Paddle Man - LS/AB/OS.
(**6**) 1 Gun Man/Bolo Man - LS/AB/OS.

b. Equipment Required.

(**1**) 2 x 6” snatch blocks, and
(**2**) 2 x bow shackles.

c. Equipment Preparation and Layout. The light line stations are on the most forward portion of the house port and starboard side. The upper 6” snatch block is attached to the top edge of the house with a bow shackle. The lower 6” snatch block is attached to the deck eye immediately below. The outboard end of the light line is passed through the blocks and made ready to be attached to the gun line. The remainder of the light line is faked out fore and aft on the focsle so it pays out inboard to outboard. Shot mats are arranged in the appropriate places on deck in the dump area. A positive buoyancy life jacket is placed in the small cargo bag and all cargo is wrapped in plastic. Communication is established with the bridge.

9.25 VICTORIA CLASS - REPLENISHMENT AT SEA

9.25.1 Light Line Transfer.

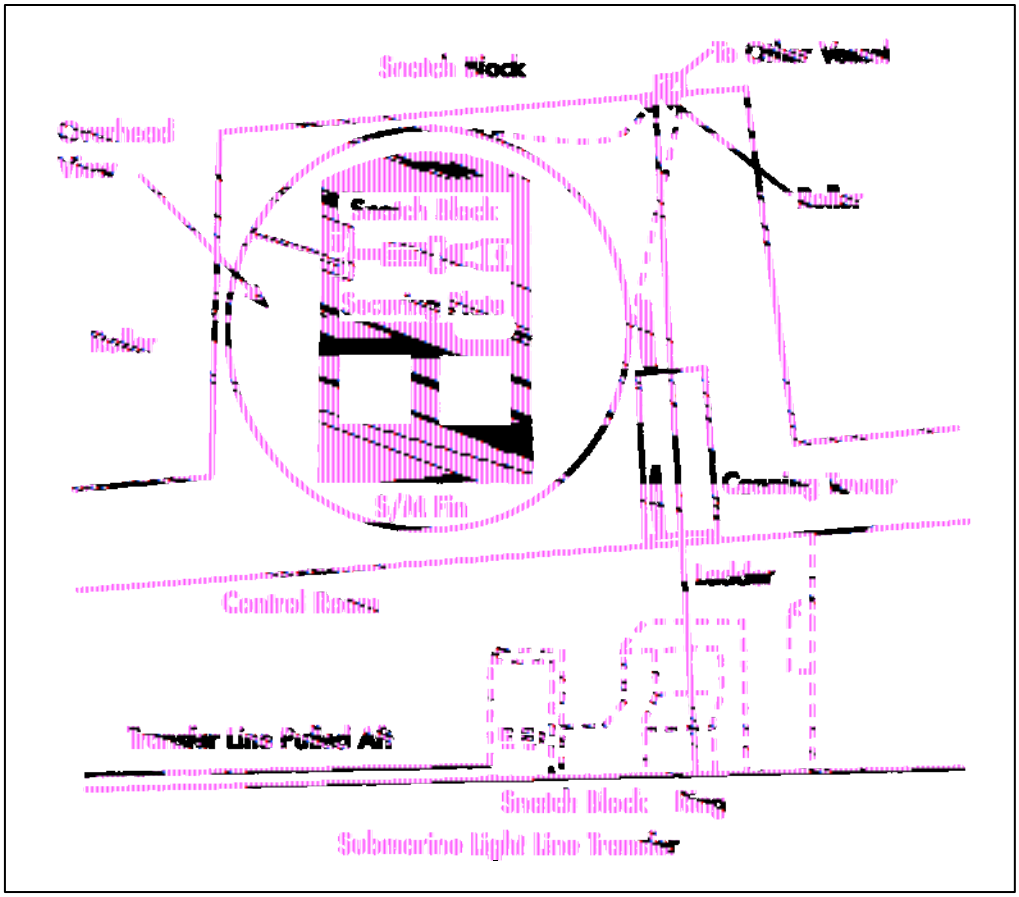


Figure 9.25-1 - Cutout of Submarine Conning Tower

a. Personnel Required**.**

(**1**) Casing Officer.
(**2**) 1 Casing Party 2 I/C.
(**3**) After Casing Supervisor.
(**4**) 6-8 OS LS.

b. Equipment Required.

(**1**) bridge roller assembly,
(**2**) bridge snatch block, and
(**3**) control room snatch blocks.

c. Preparations and Equipment Layout.

(**1**) A system of fixed eyes and removable blocks are provided so that a line may be led vertically downward from the bridge to the control room.

(**2**) The routine for rigging is as follows:

(a) Rig the bridge coaming roller.

(b) Remove blank cover plates in bridge deck.

(c) Rig bridge snatch block.

(d) Rig control room snatch block.

d. Procedures.

(**1**) The light line is brought on board and rove through the bridge roller and snatch block and through the bridge deck. The After Casing Supervisor leads the line down the tower and through the control room assemblies and then the line is manned by the control room personnel.

(**2**) The Casing Party 2 I/C will man the dump area and the Casing Officer will order the control of the light line by the control room staff. One signalman will be required to pass light line control signals with the transfer vessel.

9.26 ORCA CLASS

IAW with it's CONOPS, ORCA Class ships do not RAS.

CHAPTER 10

Buoys and Targets

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10.1 INTRODUCTION

HMC Ships often carry three basic types of targets: the High Speed Plastic Target, and the Inflatable Surface Target, commonly referred to as the Killer Red Tomato. They are used as stationary or moving targets for exercising the ship's combat systems and personnel. Ships also carry a Quick Reaction Marker Buoy and have the capability of streaming a Fog Buoy.

10.2 HIGH SPEED PLASTIC TARGET (HSPT)

Figure 10.2-1 - High Speed Plastic Target

a. **Description**. The HSPT is a large target of fiberglass construction used for gunnery practice. The HSPT measures 14.3 m (L) x 2 m (W) x 1.4 m (H). With the two masts in place, it has a height of 6.7 m. A radar reflector is fitted to at least one mast. Fully rigged, the HSPT weighs between 2450 and 6350 kg.

The towline is 1500 m of double-braided 24 mm diameter nylon. It is marked every 152 m to measure the amount of line passed out. There are two soft eyes spliced in the towline: one at the end which is the towing eye, and the other, spliced 92 m from the end, which is the transfer eye. As this target is very large and heavy, the only ships capable of launching it are the PROTECTEUR Class ships. The target is stowed in the hangar and is launched using the helicopter cranes. After launch, the target can be towed by the launching ship or transferred to another ship for towing.

Table 10.2-1: Equipment Required - HSPT Equipment

Line-Throwing Gun *	Mousing Line
Bolo/Gunline Projectiles *	Knife/Spike

Hard Hats	Comm Set
Axe/ 4 x 4	Paddles/Wands/Vests *
Sledgehammer	Rope Stoppers
Grapnel	Steadying Lines

* These items are only required for transferring the target from one ship to another.

b. **Personnel Required**. Prior to the launching of the target, a RIB must be launched. The following personnel are required for the target launch:

Table 10.2-2: Personnel Required - HSPT	
Flight Deck	
I/C and Crane	PO/MS Bosn
Director	
Crane Operator	MS/LS Bosn
Line Handlers	6 ATR
Comm Number	1 ATR
Quarterdeck	
Station Supervisor	PO/MS Bosn
Line Handlers	4 ATR
Steadying Line	2 ATR
Handlers	
Comm Number	1 ATR
Station Signalman *	LS/OS Bosn
Gunman *	LS/OS Bosn

* These positions are manned only for transferring the target from one ship to another.

If the target is to be transferred to a ship, RAS Team No. 5 will be required on the receiving ship.

10.2.1 Launching the HSPT

a. **Rigging:**

(**1**) The target is moved to the flight deck and positioned under the leeward side helicopter crane.
(**2**) The sail is then attached to the target using the crane and all the stays are secured to the target.
(**3**) The four-legged lifting sling is attached. (The longer legs are shackled to the after end of the target.)
(**4**) The towline is faked out on the leeward side of the quarterdeck.
(**5**) To prevent excessive chafing of the towline, canvas is parcelled around the towline where it passes through the fairlead and served with tarred marlin.
(**6**) The towing eye or transfer eye is placed on the towing slip (pinned and moused) depending on whether or not the AOR will tow the target or transfer it to another ship.

(**7**) The hard eye is passed through the fairlead on the quarterdeck and passed up the appropriate side to the flight deck.
(**8**) The hard eye is shackled to the swivel piece on the towing bridle and moused with wire.
(**9**) The two steadying lines are attached to the target and passed to the line handlers below.

b. **Launching:**

(**1**) The ship must be dead in the water to launch the target.
(**2**) The RIB is launched.
(**3**) The target is hoisted and swung outboard and lowered into the water. The target is controlled by the steadying lines. Note: The whip is veered to ensure that no strain is placed on the lifting gear by the swell.
(**4**) The RIB is called in and the lifting sling is unshackled from the target. Once unshackled, the crane hoists the lifting sling back on board.
(**5**) The steadying lines are detached from the target and hauled back on board.
(**6**) The ship gathers headway and streams the target. The RIB is recovered simultaneously.
(**7**) When the target is fully streamed, the transfer or gunnery exercise can commence.

10.2.2 Transferring the HSPT while Underway

a. **Rigging:**

(**1**) A light messenger (65 m of 12 mm diameter polypropylene) is faked out on deck.
(**2**) One end is passed over the guardrail, through the fairlead and bent onto the towing eye of the towline.
(**3**) The transfer eye is attached to the towing slip.
(**4**) Equipment listed in the Table 3 is brought out and placed on deck.

b. **Transferring**. The PROTECTEUR Class ship streaming the target will be the guide ship and the ship receiving the target will make her approach as if conducting a RAS. Care should be taken during the approach to avoid running over the towline and target. Once in position, the ships should reduce speed to approximately 8 to 10 kts to safely pass the towline.

10.2.3 Sequence of Events for Transferring the Target (HSPT) to another Ship

Supplying Ship			Receiving Ship		
Order	**Signal**	**Action**	**Order**	**Signal**	**Action**
Show Red	One blast on the whistle (Given)	Red paddle is held aloft and one blast is given on the whistle to indicate ready to fire gunline.	**Show Red**	Two blasts on the whistle (Acknowledged)	Red paddle is held aloft and two blasts are given on the whistle to indicate ready to receive gunline and personnel have taken cover.
		Gunline fired.			Gunline received.
Avast	Avast (Given)	Gunline is attached to light messenger.	**Avast**	Avast (Acknowledged)	Gunline is taken in hand.
Check Away	Heave Around (Given)	Light messenger is paid out hand over hand.	**Heave In**	Check Away (Acknowledged)	Gunline is heaved in hand over hand until light messenger is on board.
Avast	Avast (Acknowledged)	Line handlers keep light messenger out of the water	**Avast**	Avast (Given)	Station workers pass light messenger through aft fairlead.
Check Away	Heave Around (Acknowledged)	Light messenger and towline are paid out hand over hand.	**Heave In**	Check Away (Given)	Light messenger and towline are heaved in hand over hand.
Avast	Avast (Acknowledged)		**Avast**	Avast (Given)	
			Hook On		The towing eye is passed through the towing slip. The slip is pinned and moused.
	Hooked On (Acknowledged)		**Show Hooked On**	Hooked On (Given)	
Check Away		Line handlers check away on the towing line streaming all remaining line astern.			

Supplying Ship			Receiving Ship		
Order	**Signal**	**Action**	**Order**	**Signal**	**Action**
Prepare to Slip	Prepare to Slip (Given)	Station workers prepare to slip by removing the mousing and pin, then stand by with the sledgehammer.		Prepare to Slip (Acknowledged)	The quarterdeck is cleared of all personnel until strain is taken by the towline.
Slip	Slip (Given)			Slip (Acknowledged)	
Secure	Secure			Secure (Acknowledged)	
The supply ship will make the departure, as the receiving ship is now the burdened vessel and will become the guide.			Command will increase speed and the Station Supervisor will watch rigging during the shoot. The Station Supervisor will inform command if excessive chafing occurs on the towline.		

10.2.4 Returning the HSPT to the PROTECTEUR Class ship

a. **Rigging:**

(**1**) The towing ship recovers 92 m of the towline, removes the towing eye from the towing slip and attaches the transfer eye. This is achieved by reducing speed to bare steerageway and attaching a recovery messenger (65 m of 18 mm diameter polypropylene) to the towline using a rolling hitch close to the fairlead. The recovery messenger and towing line are then heaved in by hand or by using the capstan.

(**2**) The light messenger and towing line are faked out on deck.

(**3**) One end is passed over the guardrail, through the fairlead and bent onto the towing eye of the towing line.

(**4**) All associated equipment is brought out and placed on deck.

> **NOTE**: *Heaving in by hand will require the closing up of extra personnel.*

b. **Transferring**. The sequence of events for transferring the HSPT from a ship to the AOR is identical to transferring it from the AOR to a ship.

10.2.3 Recovering the HSPT

a. **Rigging:**

(**1**) The crane with the lifting sling is positioned to recover the target.

(**2**) Two steadying lines are prepared.

b. **Recovery:**

(**1**) The AOR prepares to recover the towing line. This is done by reducing speed to bare steerageway and attaching a recovery messenger (65 m of 18 mm diameter polypropylene) to the towing line using a rolling hitch close to the fairlead. The recovery messenger and towing line are then heaved in by hand or capstan.

(**2**) The RIB is launched.

(**3**) The ship must be dead in the water to recover the target.

(**4**) The RIB moves the target to the recovery position.

(**5**) Steadying lines and the four-legged lifting sling are attached (longer legs are shackled to the after end of the target).

(**6**) The target is then hoisted out of the water as quickly and safely as possible to prevent damage to the sail.

(**7**) The target is properly placed on the dolly, de-rigged and secured.

10.3 INFLATABLE SURFACE TARGET

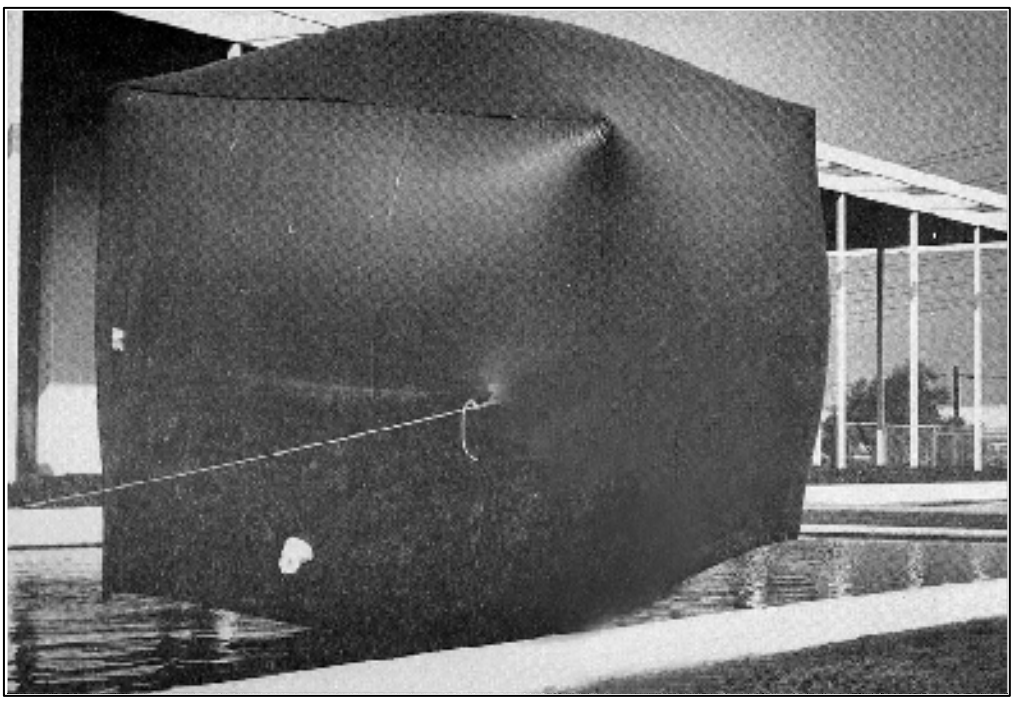

Figure 10.3-1 – Inflatable Surface Target (aka Killer Red Tomato)

a. **Description**. The KRT is a 0.3 m3 (inflated) inflatable rubber gunnery target, international orange in colour. It weighs 16 kg and can be detected on radar at ranges of up to 10 miles (16 km) depending on sea state and radar tuning. It also comes with a repair kit to patch small holes.

The KRT is inflated on the flight deck or in the hangar using a Double Bottom (DB) fan. Once inflated, reflective tape (tin foil) is attached to the KRT to enhance its radar cross section. On each end there are two eyelets that can be used to help lower the KRT into the water. Sea drogues (AFFF cans with holes in them) can also be attached to these eyelets to help reduce drift and to aid in recovery (10 m of 8 mm diameter manila line will be required).

B **Launching**. The KRT is launched from the flight deck by checking away on the lines attached to the eyelets. If the drogues are attached, they are then tossed overboard.

c. **Recovery:**

(**1**) The KRT can be recovered by four to six personnel, usually from the watch on deck, and from the quarterdeck.
(**2**) The ship will approach the KRT from up wind.
(**3**) The Watch on Deck (WOD) will prepare a minimum of two grapnels.
(**4**) The KRT will be grapnelled by throwing the grapnels over the line attached to the drogues.
(**5**) The KRT is then hauled on board. Due to the nature of the target, the material tears easily, and, therefore, care must be taken not to damage it.
(**6**) Once on board, Command is informed and the KRT is deflated and stored for future use.

10.4 BARRACUDA

10.4.1 Launching

(1) Launch the ships RIB/ Zodiac

(2) Drive up to the jumping ladder and embark two additional Barracuda trained personnel

(3) Have RIB/Zodiac stand off.

(4) Boats crews and lowerers launch the Barracuda

(5) Launch Barracuda leaving lots of slack wire for sea state

(6) Have RHIB and or Zodiac come alongside Barracuda and transfer two personnel onboard,

(7) Slip the hook

(8) Start the Barracuda

(9) Slip the strern fast and boat rope then proceed as directed from the ship to raise the mast

(10) When ready, the personnel on the Barracuda transfer back to ships' RIB/Zodiac

(11) Recover the RIB/Zodiac

10.4.2 Recovery

(1) Launch the ships RIB/ Zodiac

(2) Drive up to the jumping ladder and embark two additional Barracuda trained personnel

(3) Have RHIB and or Zodiac come alongside Barracuda and transfer two personnel onboard

(4) Make the Barracuda ready for recovery

(5) Come alongside with the Barracuda and hook up the boat rope and stern fast, mast must be lowered before coming alongside hook on as directed by I/C

(6) Remove personnel from Barracuda to ships RHIB/ Zodiac

(7) Hoist Barracuda onboard when ship RHIB/Zodiac is clear and secure it in the caulks

(8) Remove the extra two pers via RHIB jumping ladder

(9) Recovery the ships RHIB/ ZODIAC.

Note - During the launch and recover phase there is no personnel allowed in the boats due to the SPLL of the barracuda.

10.4.3 Carrying

1. The BARRACUDA is normally carried on the PRO Class. The ship can replace one of it's RIBs with a barracuda or can carry a barracuda in the hanger and launch it from the flight deck using it's 15 ton cranes.

2. Barracudas can be carried on IRO or HAL class but the RIB must be landed. While this can be easily done it is not considered the norm as it results in a reduction in operational readiness for both MIO and SAR response caused by an increase in the launching time and a decrease in sea state limits for launch and recovery.

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BARRACUDA TOWING A TAGET BY REMOTE CONTROL FROM A SHIP Figure 10.4-1

BARRACUDA READY TO DEPLOY Figure 10.4-2

10.5 RADIO CONTROLLED SURFACE TARGET (HAMMERHEAD)

10.5.1 Description.- The Hammerhead is a 19ft Remote Controlled surface gunnery target, Black in colour. It weighs approx 950 kg and has a very low radar cross section utilized to simulate small boat attack. It comes with Trailer (22ft overall) /Cradle for shipboard stowage.

10.5.2 Stowage: The Hammerhead is stowed on Port side Top Part Ship forward of the Deck Crane and current practice is to lash them down with Cargo Strops. A specific launch hook is supplied for this target; it is a standard Cranston Eagle Hook that trips with an upward pull by toggle line lead to the Boat Deck. **Note:** If required a second hammerhead can be stowed aft of the deck crane. Command must then appreciate the lack of Rescue redundancy.

10.5.3 Rigging for launch: Recommended Ships Speed is less than 3 knots. The Hammerhead should be run up for five minutes and its connectivity checked prior to launch, it is rigged for self slipping with tending lines attached forward and inboard aft. The hook is attached with the jaw opening forward.

10.5.4 Launching. The Hammerhead is launched from Top Part Ship by deck crane, slewing out and ensuring the antenna is kept clear of the boom. Once in position "Whip Down" checking away on the self slipping lines attached to the eyelets. As the weight comes off the Hammerhead release the Cranston-Eagle Hook by pulling up on the Toggle and then self slipping the tending lines. On IRO class the Hammerhead would be lauched from one of the after cranes on the AX. PRO Class will use there cargo crane using the same procedure. Given the weight is near the SWL of the Hfx Class Deck Crane the conditions must relatively benign

10.5.5 **Recovery**: No recovery is expected for these targets onboard an IRO or HAL class, due to crane restrictions. A undamaged hammerhead can still be recovered with a KIN crane or a PRO 15 Ton Crane or in certain circumstances could be towed to a ship or jetty for recovery.

Figure 10.5-1
HAMMERHEAD IN LAUNCH POSTION ON HALIFAX Class

NOTES

The Hammerhead weight with fuel is 2160lbs.

10.6 QUICK REACTION MARKER BUOY (QRMB)

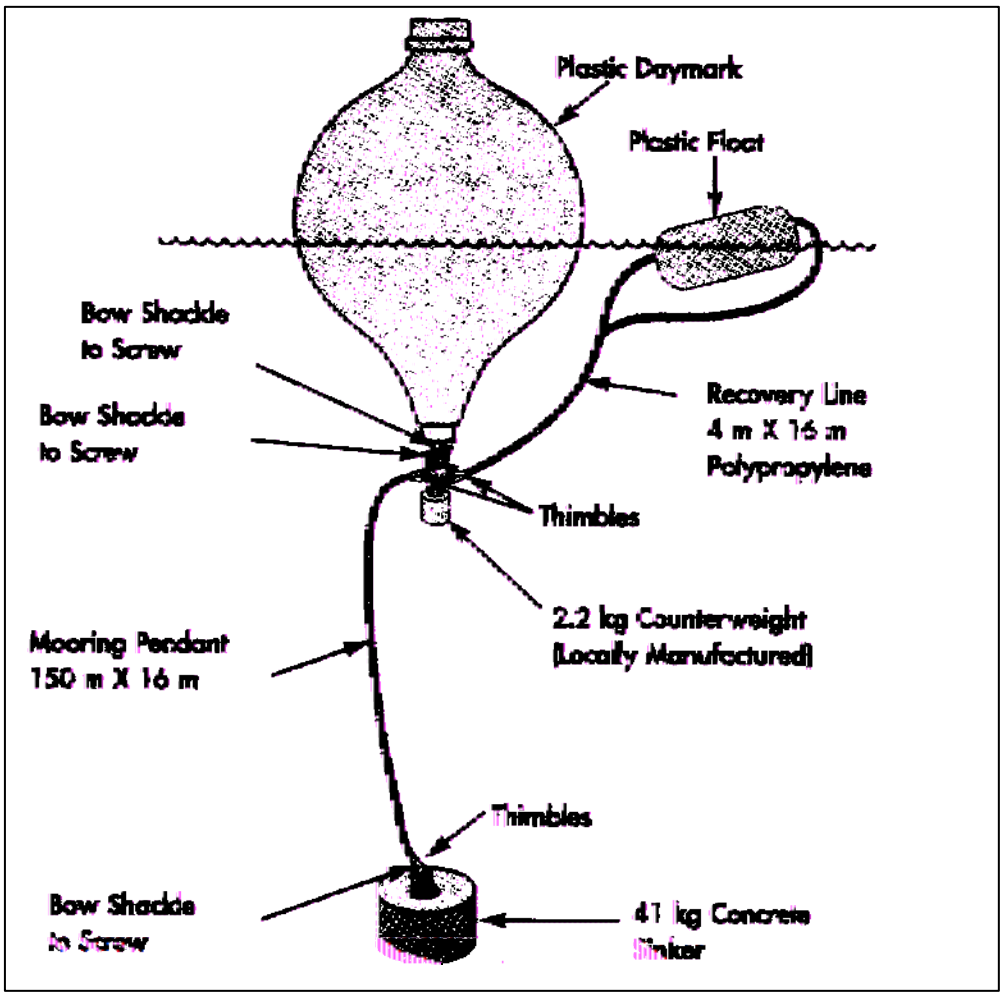

Figure 10.6-1 - Quick Reaction Marker Buoy

a. **Description**. The QRMB is essentially a plastic float attached to a weight by a length of line. It is normally stowed on the quarterdeck lashed to the guardrails. It is very easy to rig and can be quickly deployed by one person (usually the Lifebuoy Sentry). The QRMB is used as a temporary marker to indicate a position of interest, e.g., a sunken submarine or ditched aircraft.

b. **Rigging:**

(**1**) The rigging of the QRMB is very simple. The mooring line is attached to the float, which is then lashed to the guardrail (outboard) with one lashing of sailmaker's twine. This is to prevent the

float from moving but will easily part when strain is placed on it. (Recovery line is shackled to the bottom of the float.)

(**2**) The mooring line is then coiled down in a canister so that the end attached to the float is at the bottom of the canister and the end attached to the concrete sinker is on top.

(**3**) The concrete sinker with the mooring line attached is then placed outboard and over top of the guardrail. It is then lashed in position. Note: If tarred marlin or manila line is used, a knife must be available at all times.

> **NOTE**: *During Flying Stations, the QRM8 must be adequately secured to prevent it from becoming a flight safety hazard.*

c. **Deploying:**

(**1**) The QRMB is deployed by the lifebuoy sentry upon direction from Command via the upper deck broadcast.

(**2**) The lifebuoy sentry will then cut the lashing on the concrete sinker and jettison it overboard.

(**3**) The mooring line will pay out freely from the canister, the strain will part the lashing and the float will fall free.

(**4**) The lifebuoy sentry will then report to command that the QRMB is deployed.

d. **Recovery:**

(**1**) The QRBM can be recovered by four to six personnel, usually the WOD, supervised by the Petty Officer of the Watch. It is recovered at the Diver Recovery Position (DRP).

(**2**) The ship will approach the QRMB from up wind.

(**3**) The WOD will prepare a minimum of two grapnels.

(**4**) The QRMB will be hooked by throwing the grapnels over the recovery line.

(**5**) The QRMB is hauled on board and the mooring line is rove through the DRP blocks.

(**6**) The mooring line is then heaved in, recovering the concrete sinker.

(**7**) Upon recovery, the QRMB is stowed or re-rigged on the quarterdeck.

10.7 FLOATS

Figure 10.7-1 - Floats

Description. Floats come in various sizes, colours and shapes. The names associated with them vary with the manufacturer. They are used as temporary markers for various reasons, e.g., to mark lost equipment or the position of the ship's anchor. They can also be used for diving operations.

10.8 TORPEDO

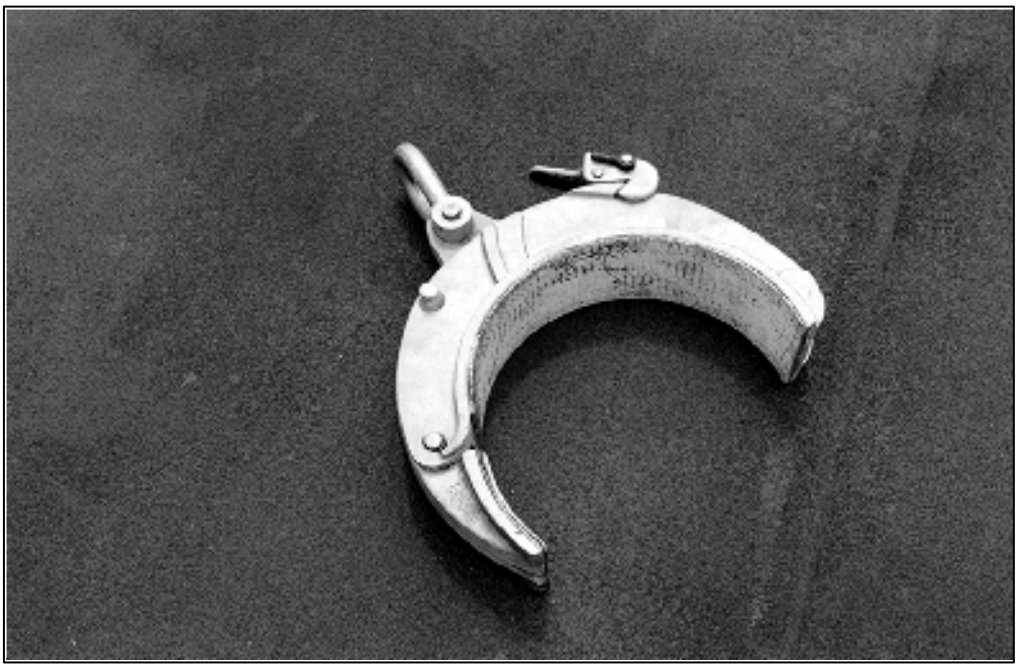

Figure 10.8-1 - Torpedo Recovery Clamp

Torpedo recovery is a joint Deck and CSE Department evolution. The Deck Department is responsible for launching the IRB and retrieving the torpedo. Once the torpedo is alongside, the Naval Weapons Technicians are responsible for hoisting and securing the torpedo. The following sequence describes the recommended recovery method.

(**1**) Boat's crew and lowerers are closed up.
(**2**) The boat's crew is briefed on where to attach the towline to the torpedo and IRB.
(**3**) The IRB is launched as described in Chapter 11.
(**4**) Once the IRB is clear of the ship's hull, two fenders are lowered (to be placed between the ship and torpedo) and the torpedo clamp is attached to the crane.
(**5**) The boat's crew will recover the torpedo and tow it back to the ship so that it is between the ship and boat, resting on the fenders.
(**6**) The boat's crew secures the IRB alongside and the torpedo clamp is lowered and attached to the torpedo.

Figure 10.8-2 - Fenders Placed between the Ship and Torpedo

Figure 10.8-3 - Position where Torpedo Clamp is Secured

(**7**) The IRB is slipped and lays off as the torpedo is hoisted. This is for the safety of the boat's crew. It will also take several minutes to recover the torpedo and get ready to recover the IRB.

(**8**) The IRB is recovered as described in Chapter 11.

Figure 10.8-4 - Torpedo Clamp Secured

CHAPTER 11

Boats and Rescue

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11.1 INTRODUCTION

The employment of small boats is an integral part of naval operations. Boats are used for many purposes including rescue at sea, boarding operations, embarking and disembarking personnel, transferring stores, harbour surveys, harbour defence, and support of diving operations.
This chapter provides a description of small boats being used in the Canadian Navy, and outlines the procedures to be followed in their launch and recovery. The organization for rescue at sea is also described.

11.2 GENERAL SERVICE BOATS

The following boats are used in the Canadian Navy.

11.2.1 Inflatable Rubber Boats Figure 11.2-1 - Six-Man IRB

a. **Six-Man IRB Characteristics:**

Length overall: 4.2 m
Beam: 1.67 m
Fuel Capacity: Portable outboard motor tank(s)
Propulsion: 25 HP Outboard
Speed: 15 kts but dependent on payload and engine
Payload: 6 personnel or 500 kgs
Weight: 86 kgs (boat only)
Ship Class: VICTORIA (alongside only)

Figure 11.2-2 – Ten-Man SR11

b. **Ten-Man SR 11 Characteristics:**

Length overall: 4.5 m
Beam: 2 m
Fuel Capacity: Portable outboard motor tank(s)
Propulsion: 25 or 40 HP Outboard
Speed: 15 kts but dependent on payload and engine
Payload: 1 0 personnel or 1100 kgs
Weight: 175kgs (boat only)
Ship Class: IROQUOIS/HALIFAX/KINGSTON/PROTECTEUR

Figure 11.2-3 - KINGSTON Class RIB 540

c. **RIB 540 Characteristics:**

Length overall: 5.6 m
Beam: 2.15 m
Fuel Capacity: Portable outboard motor tank(s)
Propulsion: 12-volt electrical start outboard (max. 80 HP)
Speed: 30+ kts
Payload: 9 Personnel or 1030 kgs
Lifting Weight: 590 kgs (no crew)
Ship Class: KINGSTON

11.2.2 Rigid Inflatable Boat

Figure 11.2-4 - RIB PC

d. **RIB PC Characteristics:**

Length overall: 7.3 m
Beam: 3 m
Fuel Capacity: 132 litres
Propulsion: 165 HP turbo-charged Volvo Penta AQAD 41 6-cylinder diesel
Speed: 30+ kts
Payload: 18 Personnel or 3420 kgs
Lifting Weight: 1927.8 kgs and 2178 kgs dependant on date of manufacture (no crew)
Ship Class: IROQUOIS/HALIFAX/PROTECTEUR

11.2.3 Landing Craft Vehicle Personnel

Figure 11.2-5 - LCVP

e. **LCVP Characteristics:**

Length overall: 10.9 m
Beam: 3.2 m
Fuel Capacity: 681 litres
Propulsion: 6 cylinder Cummings Diesel
Speed: 11 kts
Payload: Fair: 40 personnel (or 36 combat troops in full fighting order)
Foul: 30 personnel
Emergency: 50 personnel
3674 kgs
Weight: 6495.5 kgs
Ship Class: PROTECTEUR

11.3 BOAT COXSWAIN'S RESPONSIBILITIES

a. The duties and responsibilities of a boat coxswain are many. The manner in which the boat is handled, the smartness and keenness of the crew, and the general seamanlike appearance of the boat are a reflection of the ship and the Navy. When handling a boat, it is important that the coxswain anticipates and plans ahead. Consequently, no matter what the emergency, whether it is a "man overboard", a sudden engine failure, or a parted mooring line, the crew will be able to respond quickly and safely.

In general, the coxswain is responsible for:

(**1**) care and maintenance of the boat and its equipment;
(**2**) proper handling of the boat underway;
(**3**) discipline of passengers and crew; and
(**4**) observance of naval customs and marks of respect.

b. While it is not normally part of the coxswain's duties to carry out major repairs to boats, it is his responsibility to see that the boat is properly equipped at all times and that the equipment is kept in good working order. For this reason, when taking over a boat, the coxswain must ensure that:

(**1**) the boat is clean inside and out;
(**2**) all equipment is properly stowed and in good repair;
(**3**) the navigation lights, horn, compass and fire extinguisher are in good working order;
(**4**) there are enough life jackets for the passengers and crew plus 10%;
(**5**) sufficient fuel is on board, cooling water is available, lubricating oil levels are correct and the bilges are free of water;
(**6**) he has received a thorough briefing from the OOW/OOD on the boat tasking; and
(**7**) the crew has been properly briefed on its duties.

11.4 SMALL BOAT HANDLING

Each type of boat handles differently, depending upon the environmental conditions and the payload. A boat's coxswain must know his boat's capabilities and be able to operate it in all conditions. The golden rule in all matters of boat handling is that the coxswain must anticipate his actions and determine the best approach in good time. When making plans, coxswains should remember that the extra two or three minutes spent in preparing a careful and seamanlike plan will inevitably save time and prevent damage to the boat or personal injury to passengers.

11.4.1 General

a. To properly and safely operate a boat, the coxswain must be qualified in accordance with MARCORD 9-50 and must know the following:

(**1**) the Rules of the Road (International Regulations for the Prevention of Collision at Sea);
(**2**) the buoyage system in use in the operating area;
(**3**) how to navigate;
(**4**) the local harbour/port regulations;
(5) how to operate fitted equipment; and
(**6**) how to operate with a radio.

b. The boat's coxswain will typically operate the boat using 'heads up' navigation. Before leaving the ship or jetty, the coxswain must be familiar with the chart of the area and ensure that the best scale chart is being used. During the passage, the coxswain determines the position of the boat by comparing the chart in the boat to reference points ashore. At sea, when outside of visual range to land, and especially in conditions of restricted visibility, small boats without a fitted navigation system should carry at a portable GPS The ship's Navigating Officer can instruct boat coxswains on the use of GPS.

c. The following are some general points to remember whenever handling a boat:

(**1**) **Safe Speed.** A boat must always be operated at a safe speed. The limits of visibility, presence of other vessels, sea state, and the comfort of any passengers must be considered when operating a small boat.
(**2**) **Dress.** A boat's crew should always be in the same rig. If a specific dress is not ordered by Command, then the boat's coxswain must designate one. The weather, duration and type of mission must be taken into account when choosing the dress.
(**3**) **Personnel Safety.** A personal flotation device (HDLJ with or without a floater coat. must be properly worn at all times. Safety helmets are to be worn by all personnel in the boat whenever it is being lowered or hoisted.
(**4**) **Visual Lookout.** The coxswain is to ensure that a visual lookout is maintained at all times while the boat is underway, primarily to avoid collision with other vessels and floating objects. Even small pieces of debris can cause severe damage to the leg of the boat engine and/or puncture the collar or hull of the boat. This is especially important at night and in reduced visibility as reaction time is diminished.
(**5**) **Never Cut Corners.** When rounding the corner of a vessel or jetty, keep well clear so that there is no danger of colliding with another vessel that may be coming around the corner on a converging course. When rounding the bow of a ship at anchor, stay well clear of the area where the cable enters the water.
(**6**) **Never Approach a Ship/Jetty "Head-On".** A head-on approach relies entirely upon the engine to stop the boat at exactly the right moment. If the engine or reverse gear fails, serious damage to the boat and possibly injury to personnel may occur. Always make an approach at an angle, so that if anything does go wrong, the boat can be turned away from danger.
(7) **Making an Approach.** When going alongside a ship at anchor or secured to a buoy, if possible, initially aim for a point off the quarter of the ship and then make your approach

from astern of the ship's ladder. This approach will minimize the risk of interference from the boat's own wake.

(**8**) **Effect of the Propeller.** The effect of propellers on boats is complex. However, some simple rules do apply. In a single-screw boat, the bow will always tend to turn in the opposite direction to the normal rotation direction of the screw. Service boats have a right-hand screw, which means that their bows will move to port when going ahead and to starboard when going astern.

(**9**) **Altering Course.** Always look astern before altering course to ensure that another boat will not be cut off.

(**10**) **Inform the Crew.** The coxswain must keep the crew informed of his intentions so that they will be able to anticipate his orders and obey them smartly.

11.4.2 Officer of the Watch Boatwork Considerations

a. In the case of a planned boat operations, OOW/OOD preparations should consist, as a minimum, of the following:

(**1**) having identified the task(s) to be completed requiring boat operations, the OOW shall inform the CO, XO, DeckO/POOW and ORO/Operations Room in sufficient time such that personnel and equipment preparations may be commenced and any impact on other ships' operations may be considered by the ORO;

(**2**) the OOW, allowing time for personnel to don the appropriate dress for the environmental conditions and to close up, shall pipe close up the boat's crew and lowerers;

(**3**) the OOW/OOD shall confer with the ORO/Operations Room to ensure RADHAZ safe precautions in accordance with MARCORDs 43-2 and SOPs are implemented prior to boat launch/recovery;

(**4**) the OOW shall assess the state of wind, sea and swell and propose an optimum ship's course/speed to conduct boat work. While the selected course/speed should take into account ship's operations, it must afford a suitable lee and boat sea keeping conditions in order to ensure personnel safety and efficiency through the launch and recovery evolutions and, if necessary, embarkation of personnel or equipment once the boat is away. Normally, a course putting the wind and seas on the ships' opposite bow will afford the best conditions for personnel safety and boat sea keeping. Speeds from 3 to 5 knots should be considered the norm for launch/recovery and alongside embarkation of personnel. Course and speed selection may be complicated in circumstances when the ship is operating in "confused seas" where the sea and swell may be from different directions. In the event there is a prevalent swell, it must be accounted for when selecting a course in order to best balance between providing a lee and lessening the impact of the swell on the boat's movements. If time permits, or if deemed necessary for safety, the ship should be manoeuvered and the selected course/speed assessed for suitability. The OOW, if in doubt, should consult with the CO, XO and CBM and, when ready, recommend to the CO the appropriate course/speed (or unsuitability thereof) to conduct the operation;

(**5**) the boat's coxswain shall receive a briefing form the OOW/OOD on his/her operations that includes a clear understanding of the assigned task(s), the navigation plan for the boat, communications and the anticipated course/speed for the evolutions of launch/recovery/personnel embarkation/etc. Speed, in particular, should be discussed with the boat's coxswain during this pre-briefing and then confirmed just prior to launch/recovery to ensure those in the boat are properly prepared when the boat first touches the water or comes alongside to the recovery position; and

(**6**) having closed up personnel, the appropriate boat is cleared away (for launch), communications are checked and, when appropriate, the Boat Deck I/C will report to Command that they are ready to conduct the ordered evolution (launch, recover, embark personnel, etc). The Boat Deck I/C remains responsible for the safe launch/recovery of the ordered boat.

(7) When ships are alongside normally the deck dept looks after the launching and recovery of boats. The OOD and the duty coxn are kept current as to the state of the boats. During silent hours and when the deck department is not onboard the task of launching boats for MOB or emergency situations comes under the OOD Duty Coxn. The Duty Coxn is normally the I/C.

Launch/Recovery

a Launch and recovery are the boat evolutions with the highest risk to personnel safety. The OOW shall retain charge of the evolution and initiate launch/recovery via the ship's main broadcast using the standard pipes. The OOW shall remain on the appropriate bridge wing during the launch/recovery in order to be in position to react in the event of a mishap. In the event of a mishap such as a man overboard during the launch/recovery, the OOW must manoeuvre the ship to minimize risk to personnel in the water and facilitate recovery by bringing the ship immediately to Rescue Stations, ordering the most appropriate recovery method (rescue swimmer, boat, helo, etc).

b. The XO and/or the CBM shall normally supervise the launch/recovery evolution, positioned abaft the Shield tubes overlooking the boat deck, paying particular attention to safe procedures. As well, the XO/CBM should, as necessary, provide advice to the OOW/Command on the suitability of a ship's course and speed to conduct the evolution.

Other Considerations

c. Both the SR 11 and RIB are, at their upper serviceable limit, can safely operate in heavy seas defined as SS 6 (4 to 6 m seas, Beaufort Scale 7, 28 to 33 kts winds). Beyond these conditions (e.g., in an emergency or rescue situation) a Command-level risk assessment will be necessary, taking into account the criticality of the evolution and other possible methods to achieve the task.

d. Based on existing RIB restrictions with regards to the SPLL (2 pers for launch/recovery), the IRB (assuming the crane winch replacement/certification) is the best selection as the rescue boat as it may be recovered with 3 persons emergency only embarked. Should the RIB be used for rescue operations, recovery of a casualty may require the use of the DRP, Billy Pugh or Stokes Litter.

11.4.3 Hand Signals/Boat Communication

a. Reliable communications between a ship and her boat are important as a ship must know the location of her boats at all times. When leaving the eyes of the ship or out of visual sight of the ship the cox'n must have a radio and ensure that it is in good working order. In the event that the radio fails, a ship can still communicate with her boats by one of the following methods:

(**1**) By day or night:
- (a) a series of short flashes or blasts, steer more to starboard;
- (b) a series of long flashes or blasts, steer more to port; and
- (c) a steady light or blast, steer straight ahead.

(**2**) By night, a steady light may be used to illuminate a man or object in the water. The boat should steer for that spot.

(**3**) By day or night, the boat may be recalled by flashing or sounding the letter "Q" (Morse: – – • –) or the hoisting of flag "Quebec" (solid yellow).

b. Hand signals are used by the boat deck I/C or quartermaster to communicate with boats. A boat's coxswain must know the four signals used and watch for them when approaching a ship.

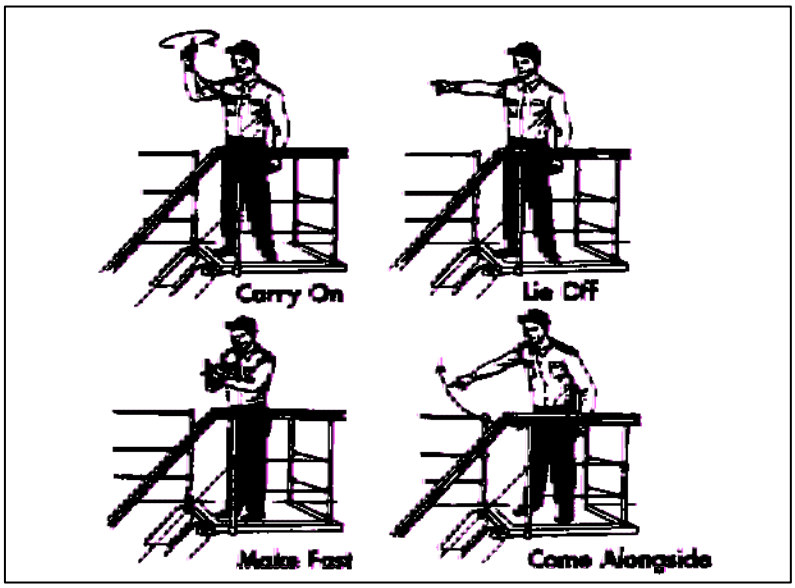

Figure 11.4-1 - Hand Signals

11.4.4 Anchoring

The following describes anchoring considerations and procedures.

a. Each service boat is provided with an anchor suitable for the size of boat. The anchor should be a Danforth type with 3 m of chain and 30 to 45 m of line.

b. If needed, an anchorage position that provides the best protection from the prevailing elements must be located on the chart. To determine the amount of anchor line required, consult the chart for the depth of water and type of bottom.

c. A general rule-of-thumb used to calculate the amount of line required is to use five to seven times the depth of water. Other factors such as current, wind, swinging circle, and the quality of the bottom (mud versus rock) must be considered.

d. The following describes the sequence to be followed when anchoring in a service boat:

(**1**) Ensure that the bitter end of the anchor line is securely attached to a strong point on the boat (i.e., towing bollard, towing bridle, eyepad).
(**2**) Approach the anchorage position by stemming the wind or current.
(**3**) At the desired position, put the boat in neutral and lower the anchor to the bottom.
(**4**) Once the anchor is on the bottom, place the boat in reverse and slowly gather sternway while the anchor line is paid out.
(**5**) Continue going astern slowly until the anchor line is paid out and has become taut (long stay). This will seat the anchor firmly in the seabed.
(**6**) Place the controls in neutral and watch to ensure that the anchor is holding. When satisfied, shut down the engine.

e. The following describes the sequence to be followed when weighing anchor:

(**1**) Start the engine while the bowsman commences heaving in on the anchor line. Slow headway can be used to assist in moving forward but care must be taken not to overrun the anchor line.
(**2**) The engine is put in neutral when the anchor line is up and down. The bowsman then heaves in the remainder of the line and hoists the anchor inboard.
(**3**) Once inboard, secure and stow the anchor and line.

NOTE: *If the anchor is fouled on the bottom, tie off the anchor line and proceed ahead slowly. This should fee the anchor from the bottom.*

11.4.5 Recovering a Man Overboard

The preferred technique for recovery is to:

a. Position the boat directly downwind of the casualty.

b. With the bow pointing directly into the wind, manoeuvre the boat slowly toward the casualty, being careful not to run him over.

c. Bring the casualty alongside the starboard side if possible. Any seas should be on the bow. If the casualty is unconscious, the bowsman (normally a diver or rescue swimmer) must enter the water to help the casualty into the boat.

d. Once the bowsman has control of the casualty, the coxswain must put the motor in neutral and assist the bowsman getting the casualty inboard. Once inboard he must report state of the casualty.

e. The casualty should be hoisted inboard midships to reduce the chance of the bow being pushed around, possibly over the casualty, and to keep the casualty away from the propeller. Once inboard, the casualty must be immediately protected from hypothermia.

f. If the casualty is missed on the first attempt, the boat should circle, keeping the casualty on the inside of the circle. This keeps the propeller away from the casualty.

g. The Coxn must ensure that the casualty's head is aft and that the sling is free to come alongside.

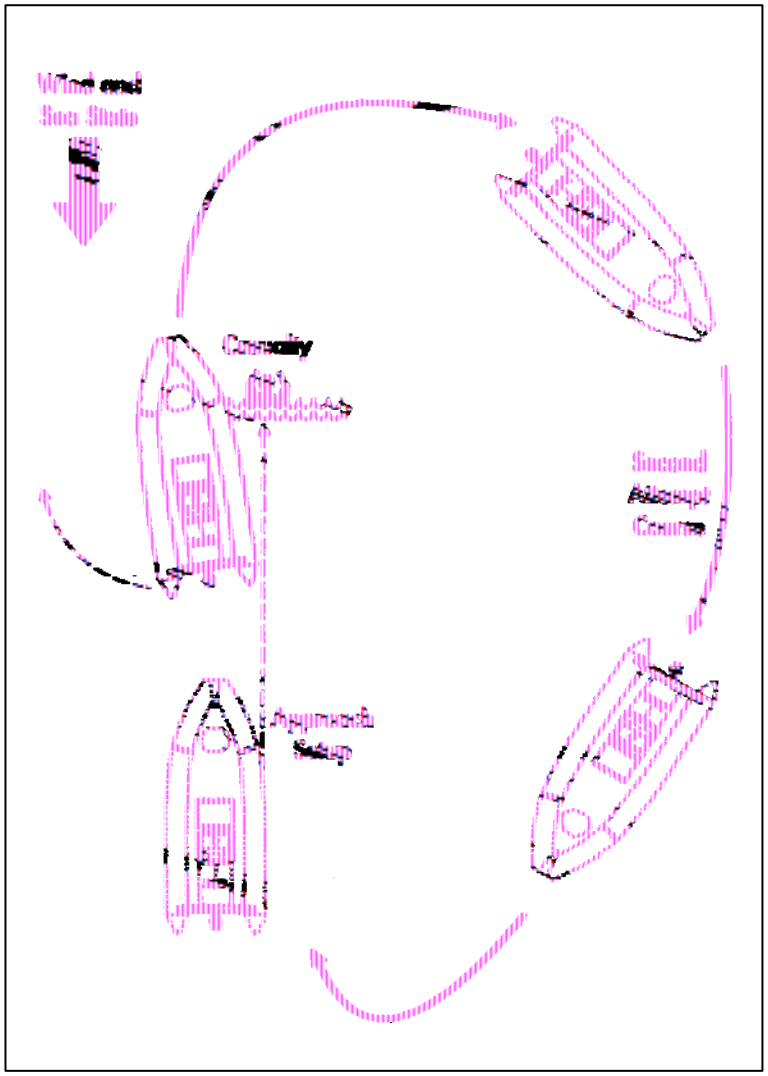

Figure 11.4-2 - Man Overboard Recovery

11.4.6 Proceeding Alongside

The full sequence of events for recovering a boat is explained later in this chapter for each class of ship. This section describes the steps for an approach on a ship underway and onto a jetty.

a. **Moving Ship**

(**1**) Approach the ship from abaft the beam at a 30 degree angle.

(**2**) Overshoot the recovery position and match the ship's speed to allow the bowsman to retrieve the boat rope.

(**3**) Once the boat rope is attached, the bowsman will report to coxswain "Boat Rope Hooked On".

(**4**) Ease back on the throttle to allow the boat to ride on the boat rope.

(**5**) The after steadying line is passed to the coxswain who attaches it to the outboard side aft.

(**6**) Continue to ride on the boat rope and steer the boat until the order "Hook On" is given. The bowsman normally hooks on.

(**7**) Continue to steer the boat until it is hoisted clear of the water. The engine is then shut down.

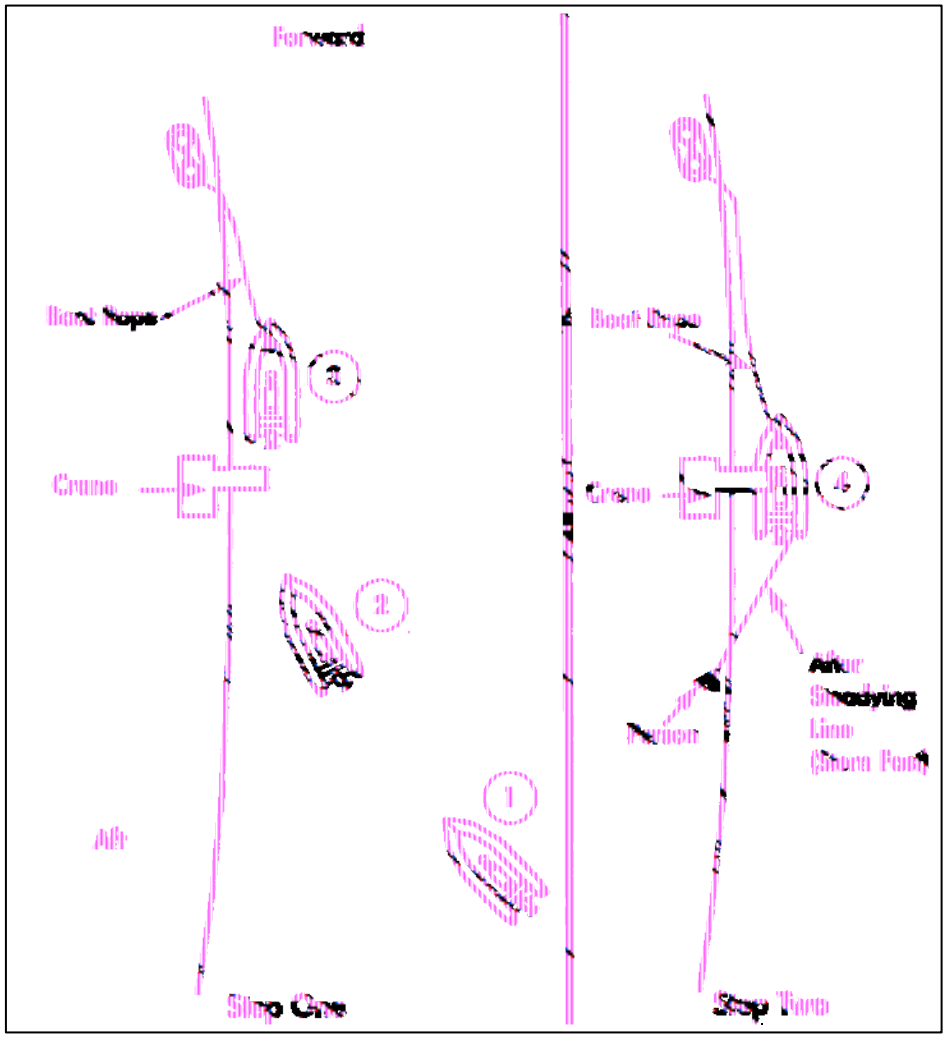

Figure 11.4-3 - Proceeding Alongside Moving Ship

b. **Jetty**

(**1**) Make a slow speed approach towards the jetty at a 30 degree angle.

(**2**) At one boat length away from the jetty, place the controls in neutral, and start to turn away from the jetty.

(**3**) At a one-half boat length away from the jetty, put the engine astern, and turn towards the jetty.

(**4**) Berthing lines are passed to the jetty and the boat is secured.

> **NOTE**: *Coxswains must be aware of how the payload and speed will affect the performance of the boat when coming alongside.*

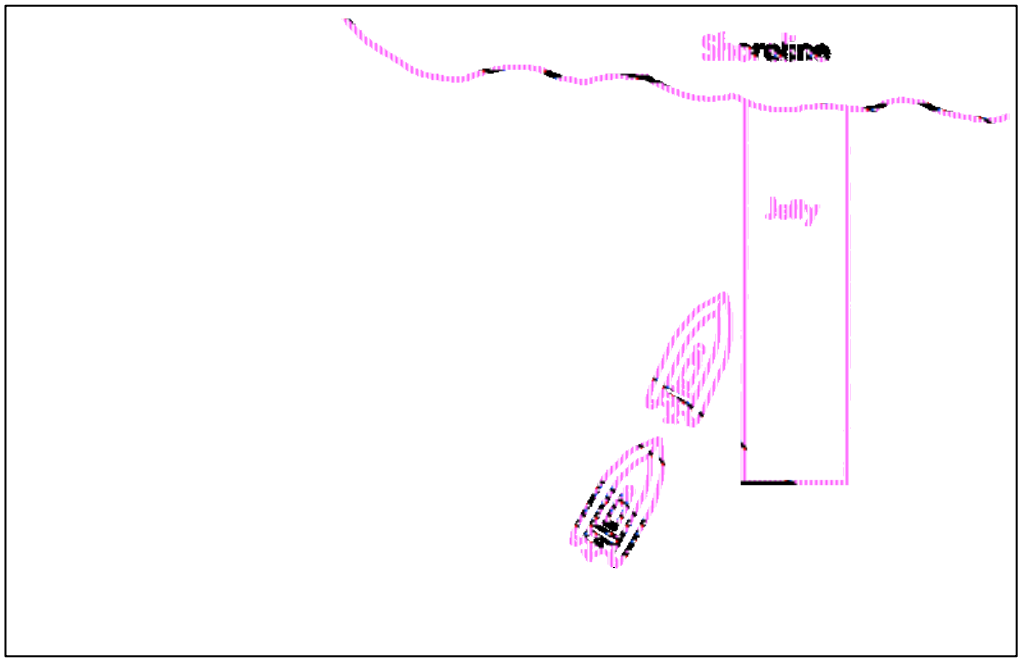

Figure 11.4-4 - Proceeding Alongside Jetty

11.4.7 Departing

The full sequence of events for launching is explained later in this chapter for each class of ship. This section describes the steps for a departure from a ship underway and from a jetty.

a. **Moving Ship**

(**1**) Just prior to the boat entering the water, the engine is started (RIB only).

(**2**) When the Cranston Eagle Hook is slipped, the boat continues to ride on the boat rope. Gradually steer outwards, keeping the boat parallel to the ship. Let go the after steadying line.

(**3**) Put the engine in gear and apply throttle to take the strain off the boat rope.

(**4**) The coxswain then orders the bowsman to slip the boat rope.

(**5**) Once the boat rope is slipped, the coxswain increases speed and proceeds.

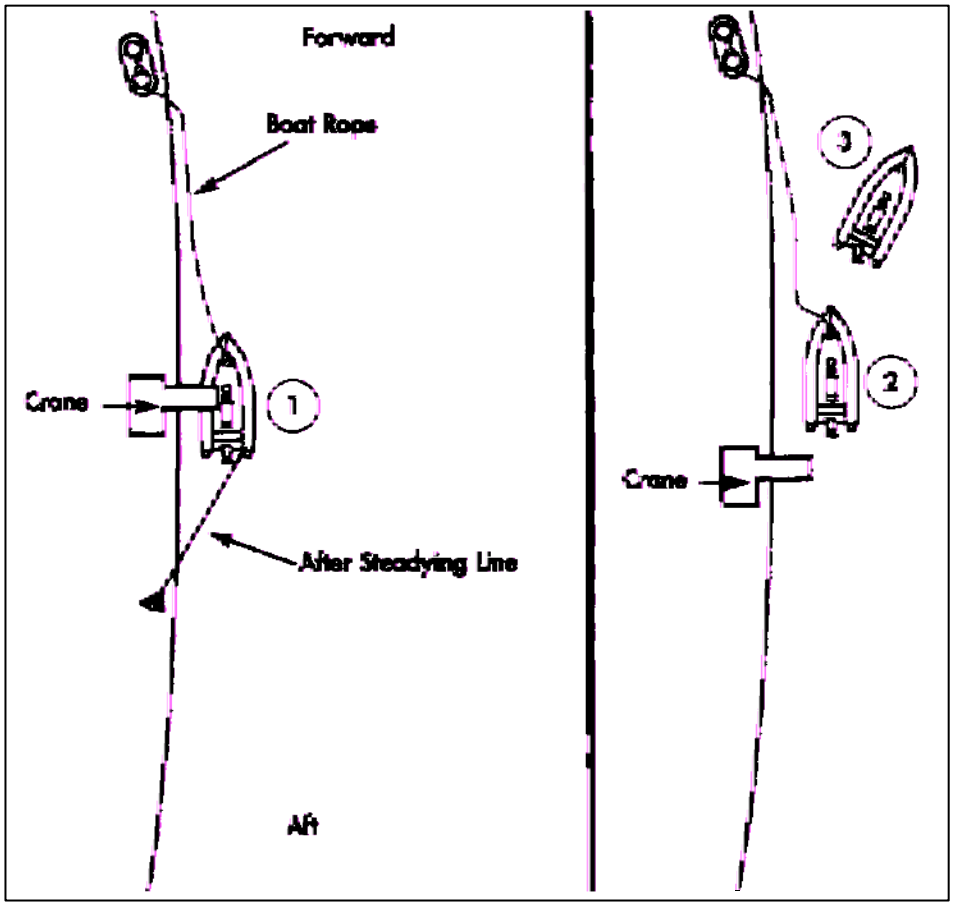

Figure 11.4-5 - Departing Moving Ship

b. **Jetty.** There are two methods of departing from a jetty: stern first or bow first.

(**1**) Stern First

(a) Let go the stern line.

(b) Turn the helm inward and use forward propulsion to cast the bow in towards the line of the jetty.

(c) Stop the engine, turn the helm away from the jetty, let go the bow line and proceed astern.

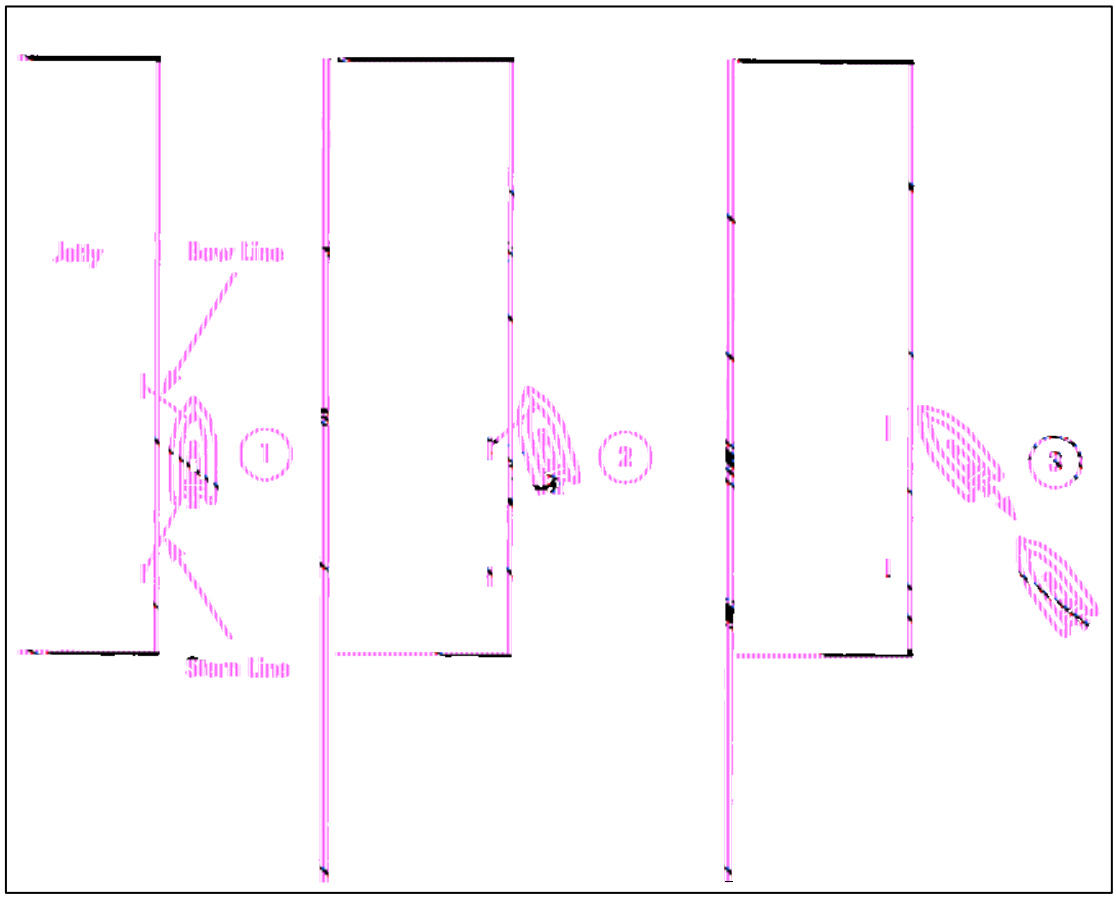

Figure 11.4-6 - Departing Jetty Stern First

(**2**) Bow First

(a) Let go the bow line.

(b) Turn the helm away from the jetty and use forward propulsion to cast the stern in towards the line of the jetty.

(c) Let go the stern line and proceed ahead slowly.

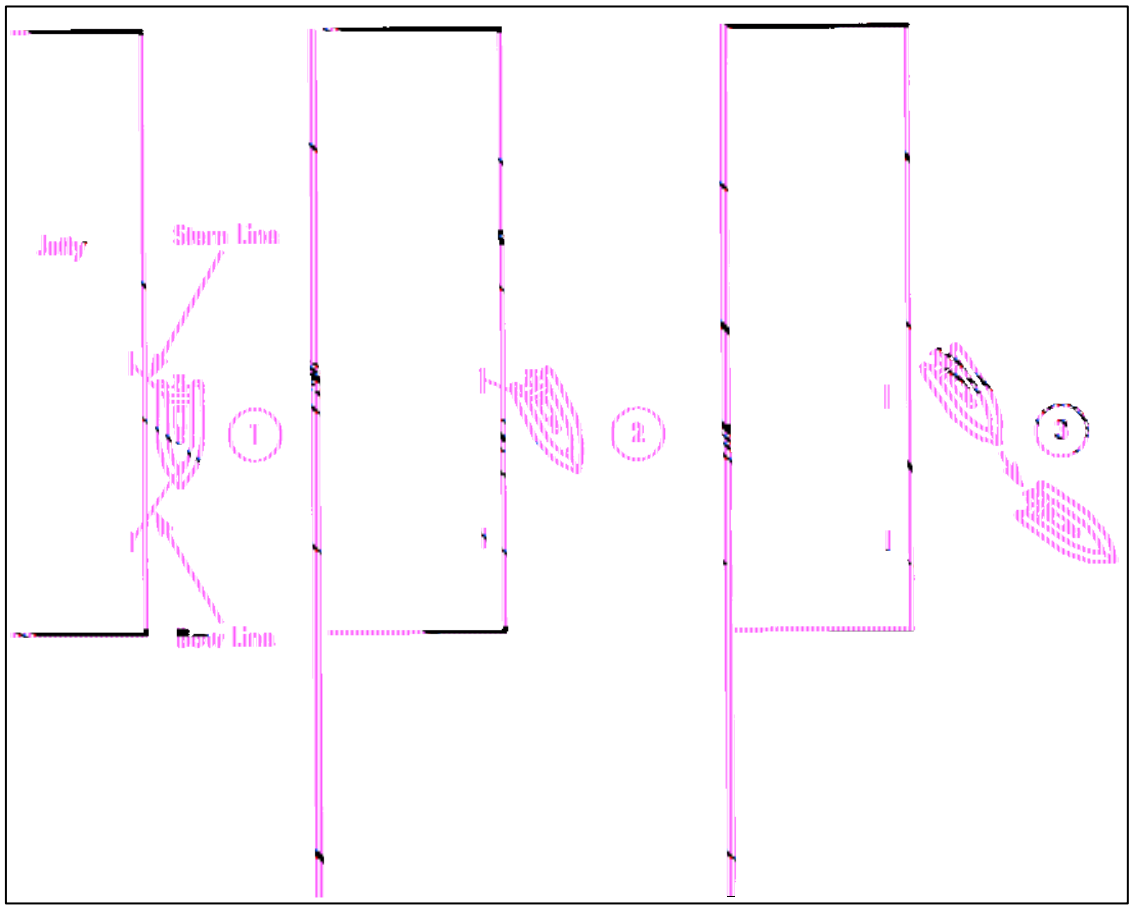

Figure 11.4-7 - Departing Jetty Bow First

11.4.8 Sticking

a. **Sticking**. The RIB is used to transport the Naval Boarding Party to and from vessels of interest. These ships, which normally only slow down to be boarded, will not provide a boat rope so the coxswain must hold the boat alongside while the team disembarks. This is known as sticking. It is easiest when the speed of the ship is between five to eight kts. It is common practice, and highly encouraged, for HMC Ships to conduct stick training for RIB coxswains during each home port arrival and departure.

(**1**) The RIB approaches the ship at a 30 degree angle and matches its speed.
(**2**) The coxswain positions the RIB between the bow and stern wave of the ship.
(**3**) The coxswain then steers toward the ship and makes contact.
(**4**) Inward helm and speed is maintained to keep the RIB in position.

> **NOTE**: *The coxswain will have to adjust the RIB speed as personnel embark/disembark, or if the payload changes.*

b. **Breaking Away**

(**1**) The coxswain is to check astern to ensure a safe departure.
(**2**) Maintaining the same speed as the ship, slowly turn the helm outward.
(**3**) Once clear of the ship, accelerate and depart.

11.4.9 Towing

There are two ways a boat can tow another boat: alongside or astern. The alongside method is used for towing short distances or when direct control of the disabled vessel is required.

a. **Alongside**. The boat is secured to the other vessel by attaching a bow line first, canting the bow slightly inward. A stern line is next passed aft and heaved in. Lastly a spring is attached, leading aft.

> **NOTE**: *If the vessel being towed is longer than the boat, the towing boat provides propulsion and the longer vessel steers.*

b. **Towing Astern**. When towing astern, a bridle should be used to position the towline directly behind the boat. Care must be taken to ensure when passing the towline and during the tow that the towline does not foul the propeller.

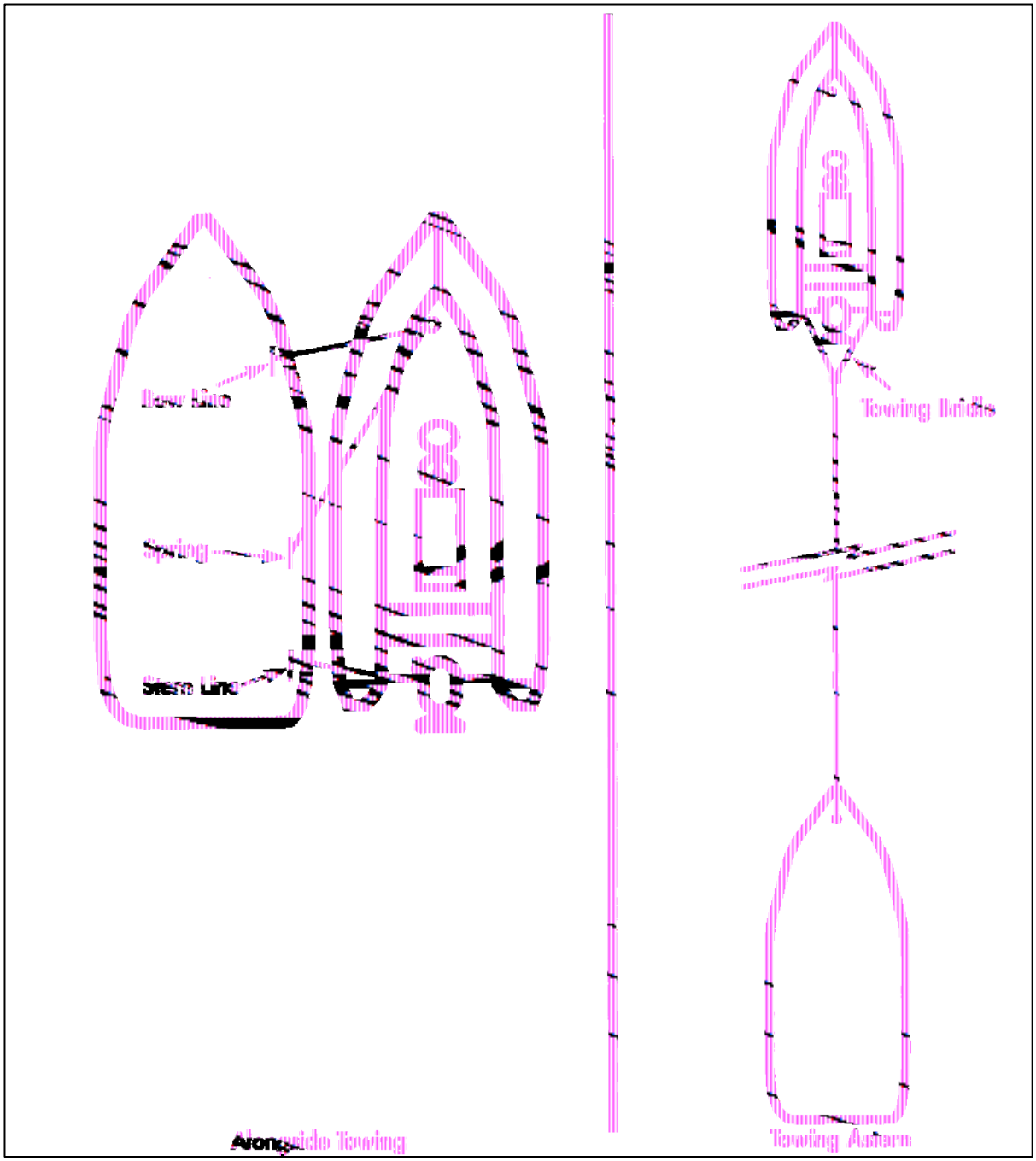

Figure 11.4-8 - Towing

11.4.10 Ceremonial

Many naval ceremonies such as changes of command, visits by VIPs, and inspections involve the use of boats. On these occasions, it is important that the boat and crew be well turned out. For instructions on all aspects of ceremonial, refer to the Manual of Ceremony for HMC Ships.

11.5 BOAT'S LOG

A log is to be kept on all boats and outboard engines. The log will describe any problems encountered, as well as all first-line maintenance conducted. This log should be kept with the boat or engine when conducting second- and third-line maintenance.

11.6 BOAT DAVITS/CRANES AND COMMON EQUIPMENT

11.6.1 Major Davit Systems

a. The arrangement for launching and recovering boats is different in each class of ship. Currently there are three major and several minor davit/crane systems in use in the Fleet.

(**1**) Sluing Arm Cranes, which have a boom that rotates around a central axis, are used in the IROQUOIS, PROTECTEUR, and KINGSTON Classes.

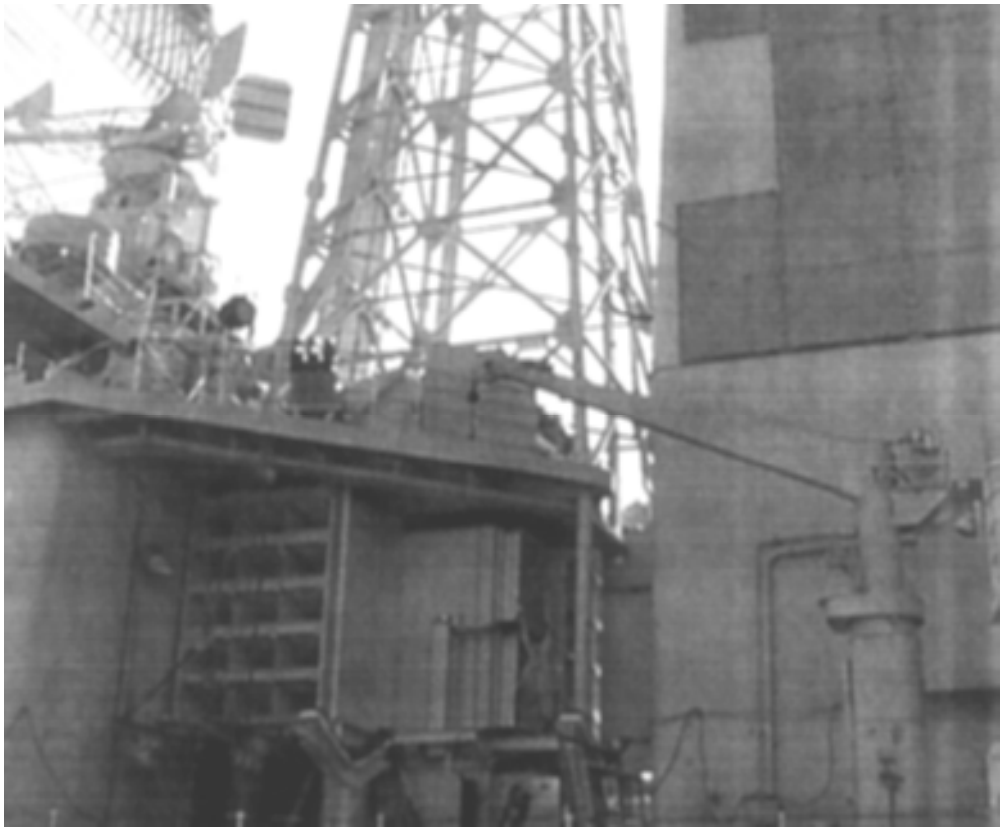

Figure 11.6-1 – IROQUOIS Class RIB Davit

Figure 11.6-2 - KINGSTON Class Crane

Figure 11.6-3 - HALIFAX Class Davit

Figure 11.6-4 - Protectecur Class Davit

(**2**) Knuckle Boom Cranes, that use articulated joints and hydraulics, are used in the IROQUOIS, HALIFAX and AOR Classes to launch the SR 11. Maximum personnel capacity when launching and recovering with a 25 HP motor fitted is three due to the constraints on the lifting points.

Figure 11.6-6 – IROQUOIS Class Crane

PROTECTEUR Class Crane

b. The IROQUOIS Class RIB is launched and recovered using the ARVA Single Arm Crane. The single arm crane slues the RIB in and out during launching or recovery. The crane is mounted on a pedestal on the port side of top part ship. It is operated electro-hydraulically from a separately mounted console, which is located on its own raised platform. The RIB is stowed on a raised cradle in order to free up the deck for midships refueling. The constant tension winch is designed to allow the RIB to ride the swells while maintaining constant tension on the whip wire. The whip wire is 38 m of 16 mm diameter 8 x 19 rotation resistant wire rope. At the maximum capacity of the crane (2484 kgs), the winch has a hoist speed of 27 m per minute. In the event of a power failure, the crane can be operated manually using a hand crank method. When launching or recovering the RIB, the maximum number of personnel to be carried will be

.

NOTE: *More positive control of the system can be maintained by remaining in manual during recovery.*

c. The HALIFAX Class RIB is launched and recovered on the starboard side top part ship using the Schat Luffing Arm Davit. The davit arms are mounted on pivot pins. The hydraulic cylinder pivots the davit inboard or outboard. This is called luffing and can be accomplished in 10 seconds. The control console is mounted on the forward arm of the davit requiring the operator to move with the davit. The hoist winch is designed to allow the RIB to ride the swells while maintaining constant tension. The whip wire is 25 m of 16 mm diameter 18 x 7 galvanized non-rotating steel wire rope. At the Safe Working Load of 2300 kgs, the winch has a hoist speed of 27 m per minute. In the event of a power failure, the davit can be operated manually by using either the hand crank or the manual hydraulic pump located forward of the davit assembly. When launching and recovering the RIB, the maximum number of personnel to be carried will be 2, due to the weight of the RIB.

d. When launching the RIB the following factors should be considered:

(**1**) experience of the boat's crew;
(**2**) speed at time of launch (normally 5 to 7 knots but should be no more than 10 kts);at sea state 3
(**3**) direction and size of sea and swell; and
(**4**) a lee for launching

e. The ORCA class boat is launched with an ARVA crane. The launching and recovery limitations of the ARVA crane are governed by the applicable CFTO and ORCA SOPS.

11.6.2 Orders and Hand Signals for Controlling Cranes

The boat deck I/C communicates with the crane operator using both orders and hand signals. It is important that both know the proper signals and their meanings thoroughly. The figure shown depicts the signals and the response to be taken.

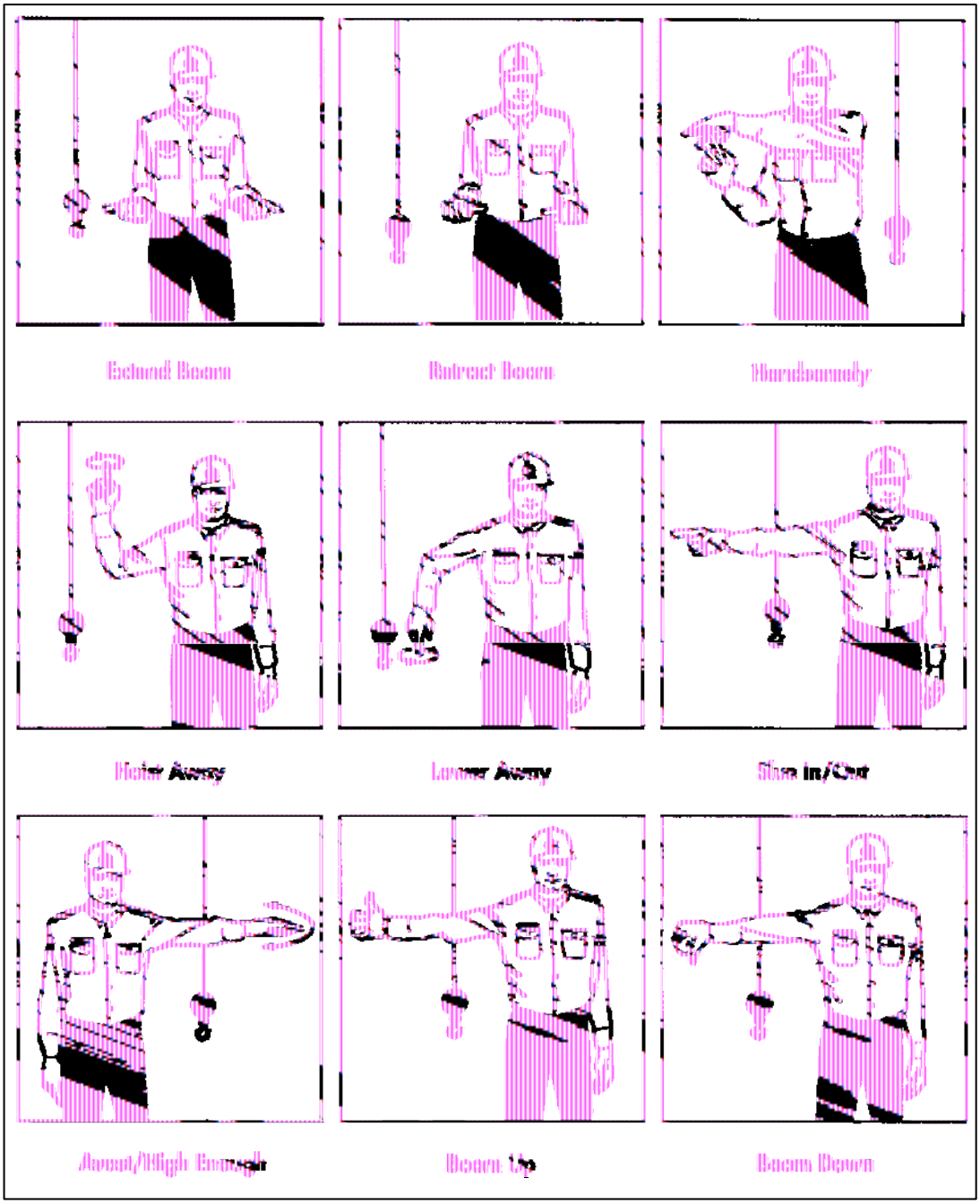

Figure 11.6-8 - Hand Signals for Controlling Cranes

11.6.3 Personnel Required to Launch/Recover Boats

Table 11.6-1: Personnel Required to Launch/Recover Boats)	
Position	**Number**
I/C Boat Deck (QL 6A BN)	1
Crane/Davit Operator (5A BN/NWT)	1
Boat rope/Bow line	2
After Steadying Line	2
Whip Control Line	1
Part Ship Communicator	1
Boat Coxswain (RIB/LCVP- QL 5A BN) (SR 11 - QL 3 BN) or a qualifed person that has had modular boat coxn training. (non rescue only)	1
Bowsman (Diver/Rescue Swimmer)	1
Stern Sheetsman (ER - LCVP/	1
DRP Rescue Swimmer/Diver	1*
Medical Assistant/PA	1*
Casualty Clearers	3*

* Rescue watch only

NOTE: *DRP is manned by personnel required to launch/recover boats.*

11.6.4 Common Equipment

a. **Cranston Eagle Hook**. The Cranston Eagle Hook is a hook designed to facilitate the safe and quick launch and recovery of a boat. There are two sizes: a three-ton version for IRBs and a five-ton version for RIBs. The hook is designed to release when the release cable lanyard is pulled and the weight of the boat is off the hook. The self-locking feature prevents release when the hook is under a load of 250 kg or more.

Figure 11.6-9 - Cranston Eagle Hook (large 5 ton)

Table 11.6-3: Cranston Eagle Hook Safe Working Loads

	Safe Working Load	Model
3 Ton	2000 Kg	APR206 - CB
5 Ton	3500 Kg	APR356 - CB

b. **Lifelines**. Lifelines are lines attached to the davit so that if the lifting gear fails, the crew will not fall with the boat. All davits/cranes used for launching and recovering boats must have sufficient lifelines for all crew members. The only exception to this rule is with the AOR cranes, which are used for launching the LCVP.

c. **Boat Rope**. A boat rope is a common item to both the RIB and IRB. It shall be a length of polypropylene 22 mm in diameter, with a 26 cm soft eye at the outboard end. The soft eye will be passed over the RIB's forward bollards or snapped onto the IRB towing bridle. The length of the boat rope will depend on class of ship and the position where it is turned up. It should be of sufficient length to hold the boat directly under the recovery position. At approximately 3 m from the end, a recovery line is spliced in which is used to recover or lower the boat rope.

> **NOTE**: *A boat rope is not to be slipped until the engine is running properly and the coxswain has given the order.*

Figure 11.6-11 - Boat Rope

d. **Stern Fast**. A 12 m length of 12 mm diameter polypropylene line with a monkey's fist on the outboard end. It is used to control the stern of the boat during launch and recovery.

e. **Whip Control Line**. A length of line attached to a bow shackle/snaphook, which is shackled/hooked around the whip wire. The shackle/snaphook floats on the whip wire and is used to hold the whip wire and Cranston Eagle Hook against the ship's side after the boat is launched, and before being hooked on during recovery.

11.7 OUTBOARD ENGINES

11.7.1 Entitlement

a. The following table shows ship entitlement of outboard motors by class.

Table 11.7-1: Entitlement by Class

Class	15 HP Motor	25 HP Motor	40 HP Motor	75 HP Motor
IROQUOIS		3	1*	
HALIFAX		4	1*	
KINGSTON		2		1
ORCA		2		
AOR		6	1*	
VICTORIA	1			

* If required for operational reasons, ships may carry one 40 HP outboard for MIO duties. If fitted to a ten-man IRB it can only be launched and recovered with one crew member due to weight constraints.

b. As the outboards are constantly exposed to a salt water environment, they require daily checks. These checks involve flushing the motor with fresh water. As well, every 30 days, the following external points are to be lubricated with triple-guard grease:

(**1**) throttle and shaft linkage,
(**2**) rear engine cover latch,
(**3**) starter neutral lockout, and
(**4**) tilt shaft.

11.7.2 Operating Procedures

Figure 11.7-1 - 25 HP Outboard Engine

a. **Pre-Start Checks**

(**1**) Check the fuel tank to ensure:
- (a) sufficient fuel;
- (b) the fuel tank is secured to the boat;
- (c) the fuel line is not wedged under the tank;
- (d) the fuel line is connected properly (arrow toward engine), and
- (e) there is enough slack in the fuel line to allow the engine to pivot.

(**2**) Remove the engine cover and look for any irregularities.

(**3**) Ensure the engine cover is properly secured.

(**4**) Ensure the motor is secured to the boat (clamps tight and chained).

(**5**) Check the propeller for damage.

(**6**) Check to ensure the trim/tilt lever is in the proper position.

(**7**) Check throttle grip operation.

(**8**) Check shift lever operation.

b. **Engine Start/Stopping Procedures**

Table 11.7-2: Outboard Engine Start/Stop Procedures

Starting	Stopping
Secure engine kill switch lanyard to coxswain.	Normal Shutdown
Ensure control level is in neutral.	Allow engine to run at idle speed for one minute.
Adjust throttle to start position.	Push stop button until engine stops.
Prime fuel bulb.	Emergency Shutdown
Pull start cord until engine starts.	Pull the kill switch lanyard that is secured to coxswain.
Allow engine to warm up.	

11.8 BOAT MAINTENANCE

11.8.1 Troubleshooting

There are many faults that could cause the engine or electronic systems to fail. Initially, the Coxswain should check for the obvious faults. If unsuccessful, refer to the user's manual.

Table 11.8-1: Troubleshooting Suggestions - Maintenance

Starter motor does not turn over	Engine will not start or stops	Motor vibrates excessively or makes little headway:
Control lever not in neutral position	Kill switch not properly engaged/or wrong switch	Propeller blades bent, broken or missing
Loose battery wires	Out of fuel	Propeller fouled and/or restricted
Blown fuse	Fuel line disconnected or kinked	Carburetor mixture adjustment not set correctly
Battery not turned on	Fuel system contaminated with water	Steering friction screw loose
	Engine flooded	Boat not inflated correctly
	Spark plug carboned or wet	
	Fuel pump filter obstructed	

11.8.2 Rubber Boat Repair

For best results repairs should be performed in temperatures of 18 to 25 degrees C. Avoid carrying out repairs in direct sunlight, rain or in conditions of high humidity. Repairs can be carried out on deflated or partially deflated boats.

Prepare the surfaces to be glued as follows:

a. Cut a patch about 75 mm larger than the tear in all directions.

b. Trace the position of the patch on the boat.

c. Scuff the areas of the patch and the boat with the buffer (sandpaper) taking care not to tear or rip the rubber.

d. Clean the patch and boat areas with solvent using a brush. Allow the solvent to completely evaporate.

e. Apply a second coat of solvent and allow to completely evaporate.

f. Apply a thin layer of adhesive to the patch and the boat. Wait until the adhesive is dry to the touch. Apply a second coat of glue and allow to dry.

g. Carefully apply the patch to the boat starting with one edge and ensuring that both surfaces are in contact without wrinkles.

h. Bone down the patch thoroughly and eliminate all air bubbles. (Use a spike as a roller).

i. Wait 24 hrs before re-inflating.

11.9 RESCUE STATIONS

11.9.1 Rescue Stations at Sea

a. Rescue Stations are closed up in response to a man overboard from your own ship or your consort in order to maximize the capability of a ship to rescue the casualty. Circumstances may range from an aircraft crash in the sea to a man overboard. In either case, the standard rescue pipe is made (refer to AL 8 SSOs) and personnel close up according to the Special Parties Board. When the alarm is raised, the lookouts and lifebuoy sentry release the Kisby Rings, and Pains-Wessex. A key component of the pipe that brings the ship to rescue stations shall be determination of the method of recovery, i.e., port/starboard, SR11/RIB, or helicopter. Factors to be considered by the OOW are:

(**1**) resources available,
(**2**) sea state, time of day, and wind,
(**3**) water temperature, and time the casualty has been in the water, and
(**4**) potential injuries of the casualty.

b. The primary rescue boat will normally be the IRB, especially in high sea states. Although an airborne helicopter might appear to provide the quickest means of recovery, experience has shown that it will take 15 to 25 minutes for the helicopter to fly to the man, transition to the hover, lower the guideline and conduct the hoist. On the other hand, a well-trained ship's crew will have the man back on board via boat in considerably less time.

c. At the same time, the Operations Room Supervisor marks the plot and begins reporting range and bearing of the casualty. Special Sea Duty watch on deck personnel close up to relieve personnel who are required to man/launch the boat. The OOW immediately manoeuvers the ship to return to the position of the casualty, taking into account the need to provide a lee for the boat. At night, a Williamson turn is used so that the ship retraces its track. Designated off watch NAVCOMs muster on the bridge to assist with searchlights and flares. This type of rescue is practiced frequently at sea to ensure all personnel are familiar with their responsibilities.

Additional guidance for ORCA class can be found in ORCA SOPs

NOTE: *If there is ever any suspicion that someone has gone over the side in daylight, Command should consider ordering a verification muster. At night, this is mandatory (refer to SSOs).*

11.9.2 Search and Rescue (SAR)

Depending on the circumstances, the use of all the ship's boats, davits, Billy Pugh, ladders, and scramble nets must be considered.

11.9.3 Rescue Stations in Harbour

When a person falls overboard from a ship in harbour, the reaction of the discoverer will always be the same; however, the method of rescue will depend on the time of day.

a. **Response**

(**1**) Throw a Kisby Ring with line attached if possible (one is kept at the brow position).
(**2**) Raise the alarm by shouting "Man Overboard" and inform the brow as quickly as possible.
(**3**) Do not enter the water but keep the person in sight.

b. **Reaction**

(**1**) The Brow Staff must:
- (a) pull alarm box/89-911 (Esquimalt);
- (b) make appropriate emergency pipe;
- (c) call 9-911 (Halifax); and
- (d) keep record of events.

(**2**) **OOD.** The options available to the OOD will depend on where the person is in relation to the ship, state of the person (unconscious/injured), the status of the ship's davits/cranes and boats, and whether or not it is during or after working hours. During working hours, the OOD usually has the expertise to launch a boat. Some of the options available are:

- (a) lower a jumping ladder or scramble net;
- (b) lower a rescue sling using the DRP;
- (c) launch or send a boat;
- (d) utilize a harbour craft that is in the area; and
- (e) put a person over the side with a lifeline and life jacket (last resort only and highly weather dependent).

NOTE: *Regardless of the time of day or if they are part of the duty watch, all divers on board will dress, and all casualty clearing team members will muster to assist.*

NOTE: *All MOBs are to be treated as potential hypothermia casualties and every effort is to be made to recover them in a horizontal manner, preferably in the rescue boat.*

ADULT WATER RESCUE MANKIN

The rescue Mankin simulates the weight of an adult

11.9.5 Pains-Wessex and Kisby Ring

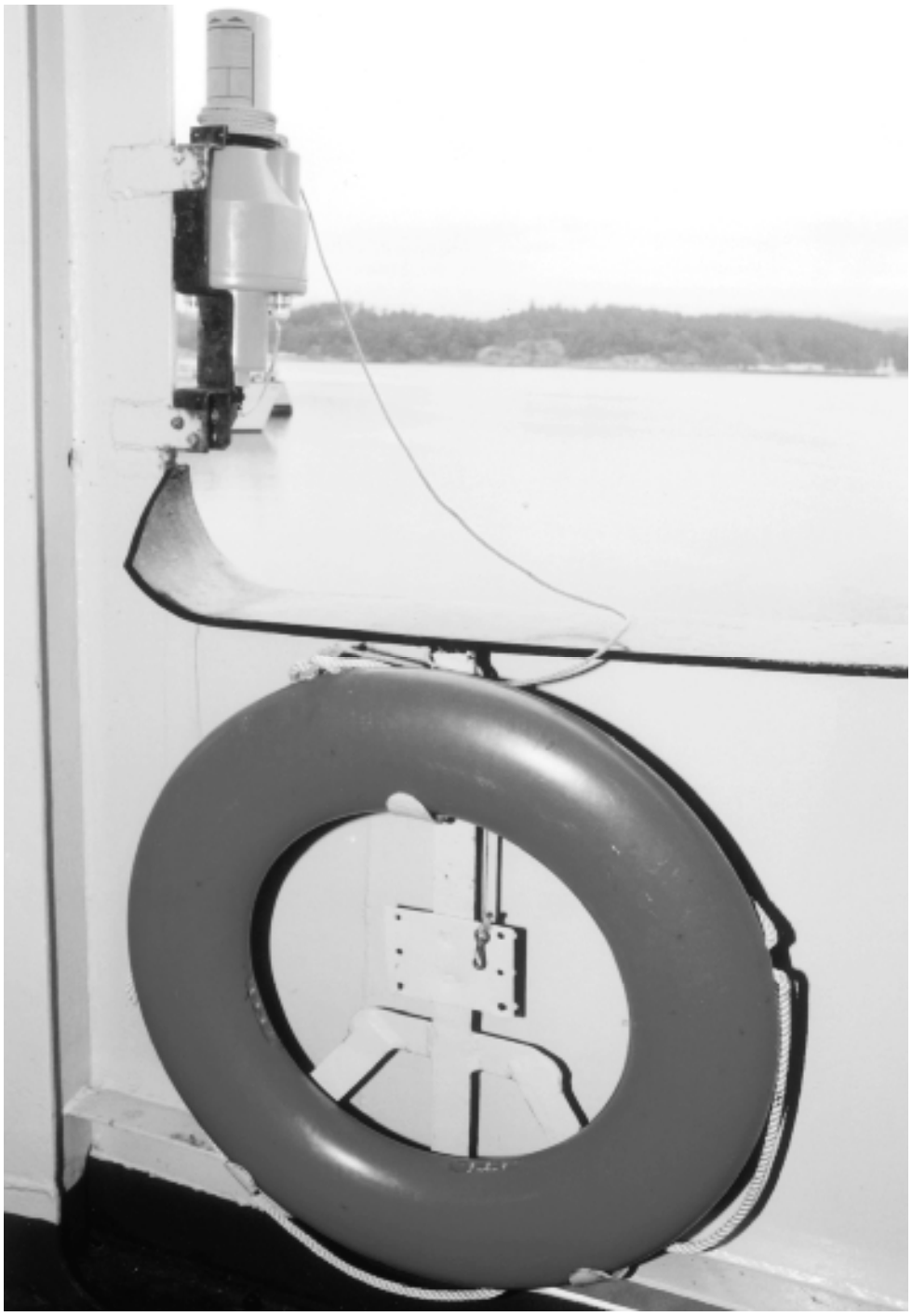

Figure 11.9-2 - Pains-Wessex Smoke Marker and Kisby Ring

NOTE: *4m lanyard that pulls the Pains-Wessex out of its securing bracket when the Kisbys is thrown.*

a. The Pains-Wessex is a combined day and night marker used to mark the position of a man overboard. It incorporates a smoke candle and two electric lights. The candle is mechanically ignited on deployment and water-activated electrical cells independently power the two lights. These cells are sealed with watertight plugs that are pulled away when deployed. The smoke is dense orange in colour and is emitted for a minimum of 15 minutes. Each light will operate for a minimum of two hours. The marker is safe to operate in fuel and oil-covered waters.

b. HMC ships use two sizes of Kisby Ring: 50 cm and 76 cm. They consist of a hard plastic shell of international orange colour filled with solid foam. Lifelines are attached around the outside perimeter. The 76 mm version is used on the upper decks and the smaller version is used in boats.

NOTE: *If the outside shell is cracked, the Kisby ring is to be removed from service.*

c. The Pains-Wessex is designed to be fitted to the guardrail. A Kisby Ring is attached to the Pains-Wessex with a 4 m lanyard. When thrown, the Kisby Ring forcibly pulls the Pains-Wessex away from its mounting bracket, activating the smoke. A floating light fitted on top of the marker is activated by salt water.

d. Each ship has two sets of Pains-Wessex and Kisby Rings located on the quarterdeck and one set on either side of the bridge. Launching all four provides the casualty with several lifesaving devices to hold onto, and a “gate” for the OOW to manoeuvre the ship back through to rescue the casualty.

11.9.6 Diver Recovery Position (DRP)

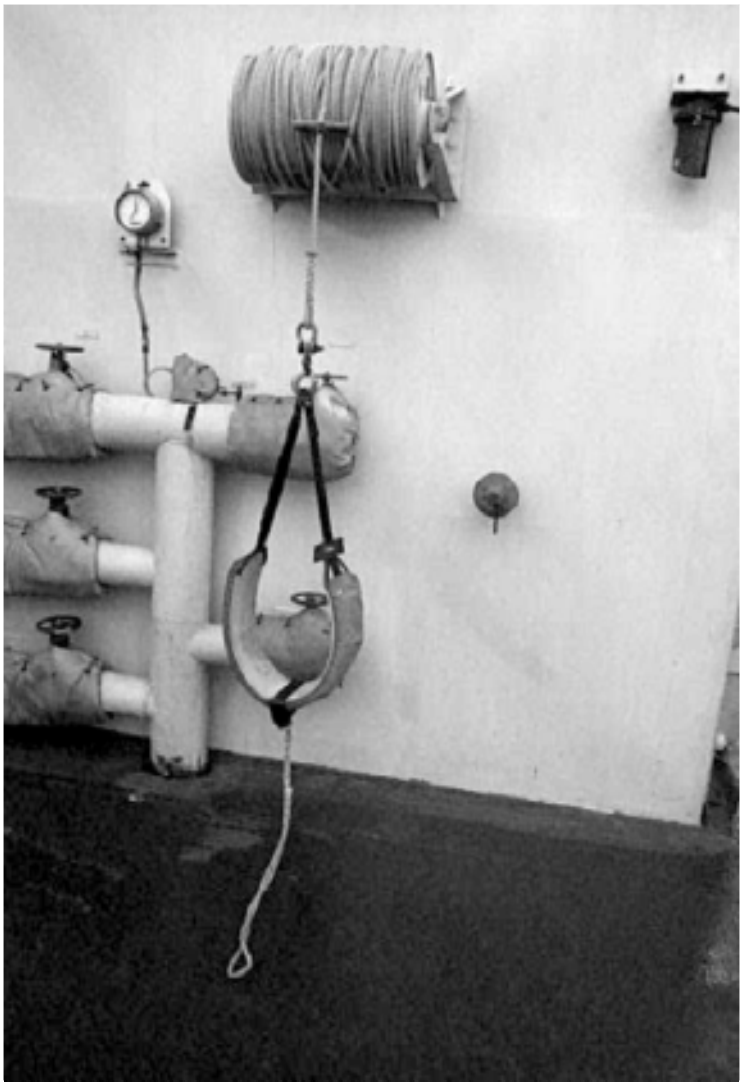

Figure 11.9-3 - DRP Rescue Line and Lifting Sling

a. When it is not possible or practical to launch a boat, a diver or rescue swimmer may be used to recover a man overboard. Each ship has a crane or davit, from which the necessary blocks can be rigged, designated as the Diver Recovery Position (DRP).

b The following equipment is required to set up a DRP:

(**1**) a crane or rescue davit,
(**2**) two 6” snatch blocks,
(**3**) rescue sling,
(**4**) recovery line (180 m of 12 mm diameter polypropylene),
(**5**) a Kisby ring with 10 m of 12 mm diameter polypropylene attached,

(**7**) two blankets,
(**8**) Stokes Litter,
(**9**) resuscitation apparatus, and
(**10**) first aid kit.

c. To rig the DRP, a six-inch snatch block is secured to the head of the crane or davit and another six-inch snatch block is secured to an appropriate eyepad as per class of ship to provide a good lead for the recovery line. The recovery line is rove through the blocks and a rescue sling is attached to the outboard end. On HALIFAX/ IROQUOIS Class ships, it is suggested that deck cranes be utilized as stand-alone (using power) or by rigging blocks. The DRP is not manned for rescue stations, but the equipment is rigged. If required, personnel closed up to launch the boat will man the DRP. The DRP can be used in two ways:

(**1**) If more than one immobile casualty is in an SR 11 thus putting it outside recovery weight limits, a rescue sling or Stokes Litter can be lowered to recover casualties using the DRP.
(**2**) When the diver is ordered to recover the casualty, he will jump from the ship while holding the rescue sling and swim to the casualty. The DRP line handlers will haul the diver and casualty back to the ship when the diver gives the signal that he is ready. A Kisby Ring, tended from the ship with the line, is to be lowered to the diver while waiting to be hoisted.

NOTE: *Only one person at a time is to be hoisted using the DRP. Six line handlers are required to man the recovery line.*

11.9.7 Rescue Sling (Horse Collar)

Figure 11.9-4 - Rescue Sling (Horse Collar)

The rescue sling (Horse collar) is a padded web strap used to hoist one person at a time. It is worn under the arms and across the back with both ends secured to the life hook in front of the face. Arms are extended downward with hands clasped.

11.9.8 Stokes Litter (Stretcher)

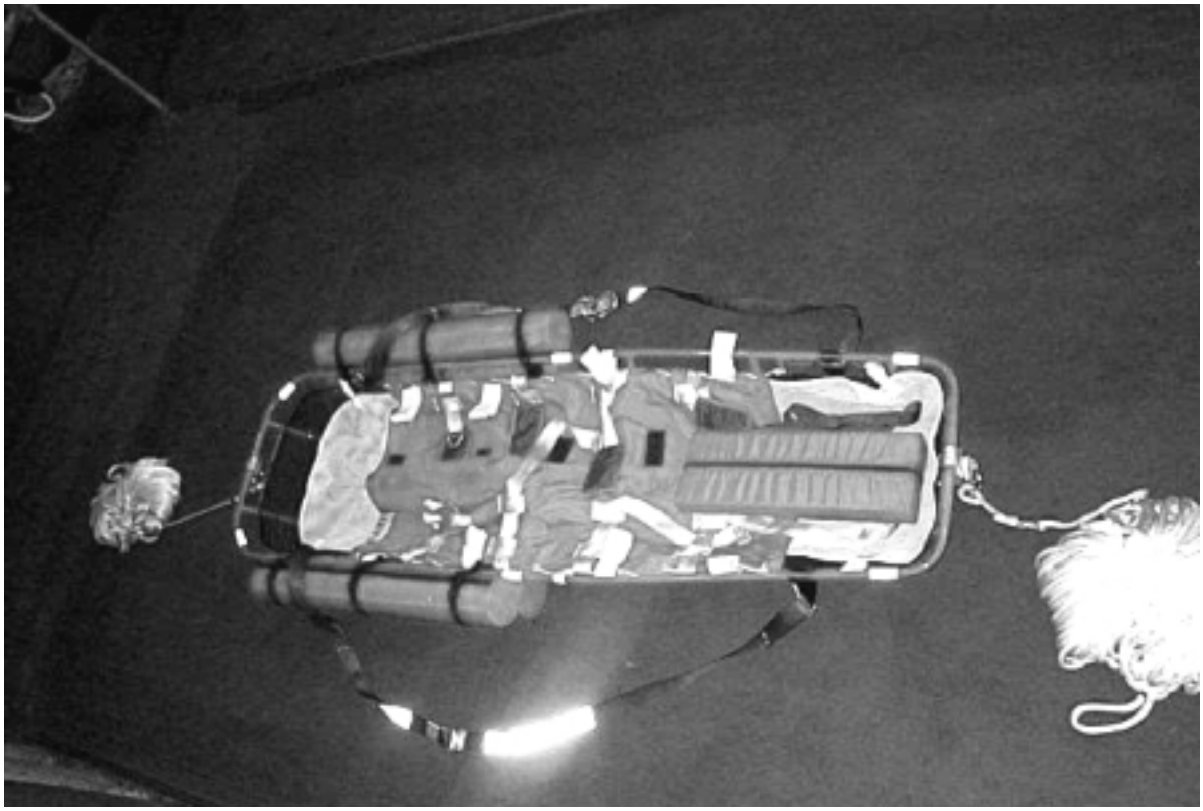

Figure 11.9-5 - Stokes Litter (Stretcher)

A Stokes Litter is a wire basket stretcher used to hoist casualties that are injured or unconscious or may have hypothermia. A flotation collar is fitted around the upper end of the litter to support the weight of the casualty and keep the head out of the water.

> **NOTE**: *A Stokes Litter with flotation collar must be considered when hoisting a casualty with suspected hypothermia at the DRP as the use of a secure sling could lead to fatal circulatory complications.*

11.9.9 Billy Pugh Net

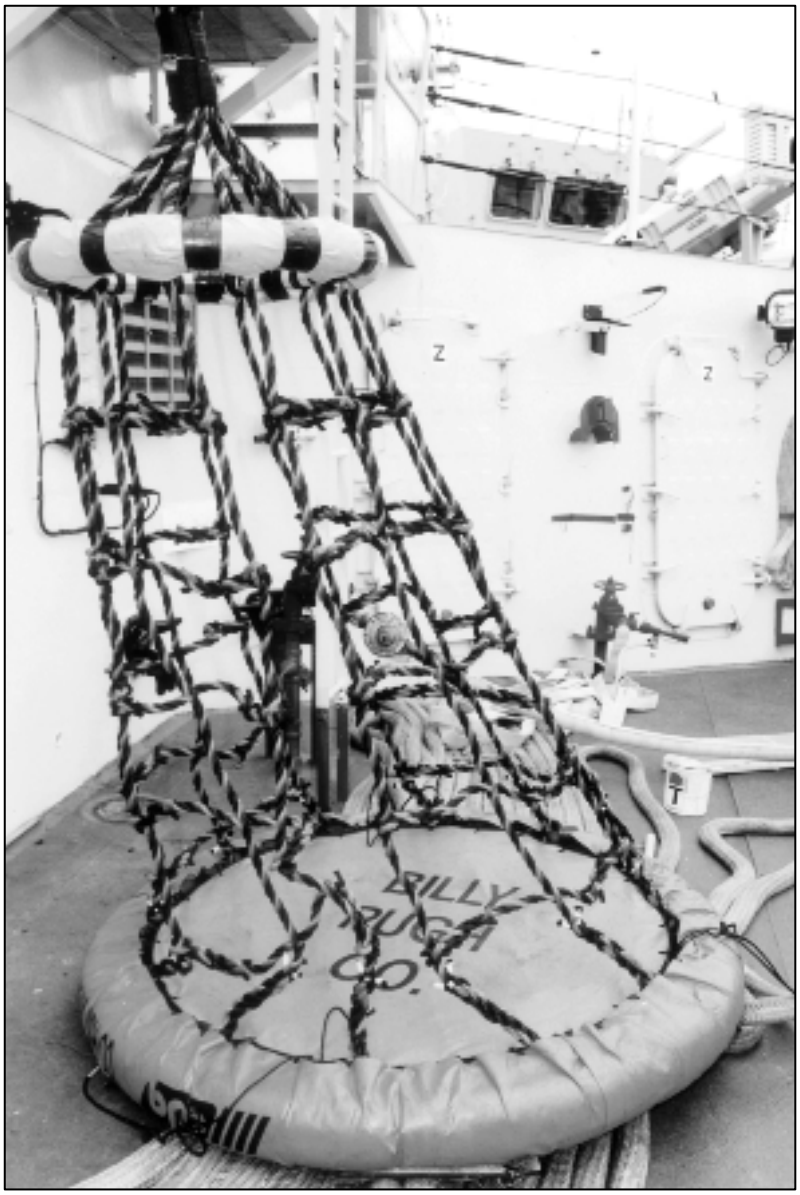

Figure 11.9-6 - Billy Pugh Net

The Billy Pugh net is a collapsible, metal-framed polypropylene net used for lifting and transferring personnel. The Billy Pugh net has a SWL of 1043 kgs and is designed to lift up to 4 personnel at a time. Riders stand on a rigid metal base ring, which is attached to a heavy grade Styrofoam flotation ring. The Styrofoam ring serves to keep the net buoyant and also provides a shock dampening effect, adding a measure of safety to neck, back and knees by absorbing a large degree of any landing shock which may be experienced and is often common to pitching or rolling decks.

While used primarily in HMC ships to recover divers, the Billy Pugh net is also well-suited to SAR operations and transferring embarking casualties from a ship's boat to the ship should other methods (Stokes litter) prove unsuitable.

Safety Inspections

Pre Use Safety Inspection: Prior to utilizing the Billy Pugh net, the Sr Boatswain/POOW must conduct a pre-use inspection of the net to include the following items:

(**1**) Visually inspect the safety load line when attaching the net to the crane. Inspect the crane snap hook for function and physical condition;
(**2**) Check sidewall netting, top and bottom platforms and cushion ring for wear or damage; and
(**3**) Ensure the tag line (if fitted) is securely attached to the base platform and free of knots that may get caught on a deck fitting.

Should the Sr Boatswain/POOW have any safety concerns resulting from his/her pre-use safety inspection, he should immediately advise Command with a recommendation as to whether it is safe to proceed or not. Command will bear the ultimate responsibility for any decision to utilize the Billy Pugh.

Quarterly Safety Inspection: Normally secured on the upper decks, the Billy Pugh net is exposed to what can often be a harsh and unforgiving environment, a consequence of which is accelerated deterioration. Accordingly, a more thorough inspection of the Billy Pugh must be conducted at intervals not to exceed 3 months. This inspection should be conducted by a senior member of the deck department and should include, but is not limited to, the following:

(**1**) Inspect top and bottom lifting ring for excessive wear, cracking or corrosion;
(**2**) Visually inspect safety load line for degradation, inspect crane snap hook for function and physical condition;
(**3**) Check sidewall rigging line splices (top and bottom) for wear, UV degradation (blistering, discolouration, cracking) and fraying;
(**4**) Visually inspect stabilizer and safety load line for damage including external protective covering;
(**5**) Inspect bottom platform ring for deterioration, cracks or angular distortion;
(**6**) Check cover on bottom platform ring for tears or cuts; and
(**7**) Inspect top and bottom buoyancy floats for deterioration or damage.

These quarterly inspections should be incorporated into the deck departments planned maintenance scheme. Command must be advised of any concerns arising from a quarterly safety inspection. Safety concerns should be addressed by repair or replacement as the case may dictate.

Operating Procedures

The following operating procedures should be followed when utilizing the Billy Pugh net:

(**1**) A snag resistant line should be fitted to the base of the Billy Pugh net and manned to reduce excessive swinging/turning of a manned net. The tag line should be used at the Sr Boatswain/POOW's discretion based on sea state and removed when not in use. A tag line should be of sufficient length to allow the boat deck to take positive control of the Billy Pugh net immediately upon hoisting from the water;

(**2**) Only a limited number of personnel/equipment is permitted inside the carrier when personnel are being transferred. Taking SWL and sea state into consideration, the Sr Boatswain/POOW must make an assessment as to the permissible amount of cargo placed in the net;

(**3**) As the situation permits, all passengers are to be given clear direction as to the procedure for manning the net prior to commencing any lift;

(**4**) If possible, personnel suffering from acute seasickness or vertigo should be transferred by alternate means;

(**5**) All personnel riding on/in the Billy Pugh net must wear an approved lifejacket;

(**6**) All personnel riding on the Billy Pugh net should stand on the outer rim, evenly spaced, and adjacent to a sidewall opening in the netting, facing inwards;

(**7**) Injured, ill or unconfident persons may ride in a sitting position, on the inside of the Billy Pugh, preferably with a qualified person as an escort; and

(**8**) As the situation dictates, the Boat Deck I/C may refuse to lift any person who does not comply with his instructions

Figure 11.9-7 – Billy Pugh Net

11.9.10 Lifebuoy Release Alarm

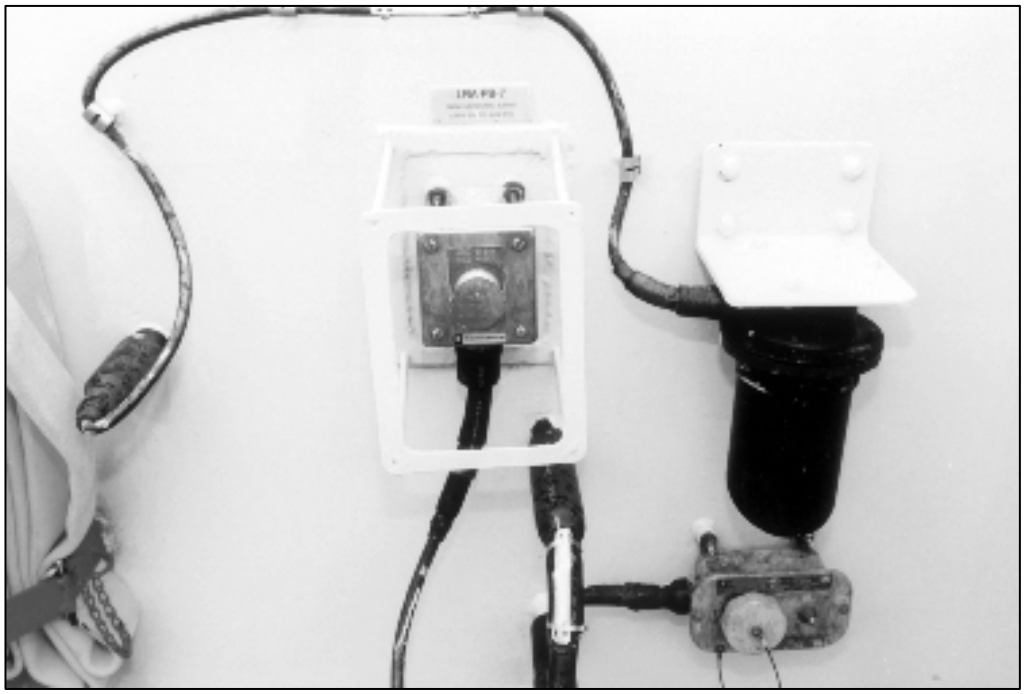

Figure 11.9-8 - HALIFAX Class Lifebuoy Release Alarm

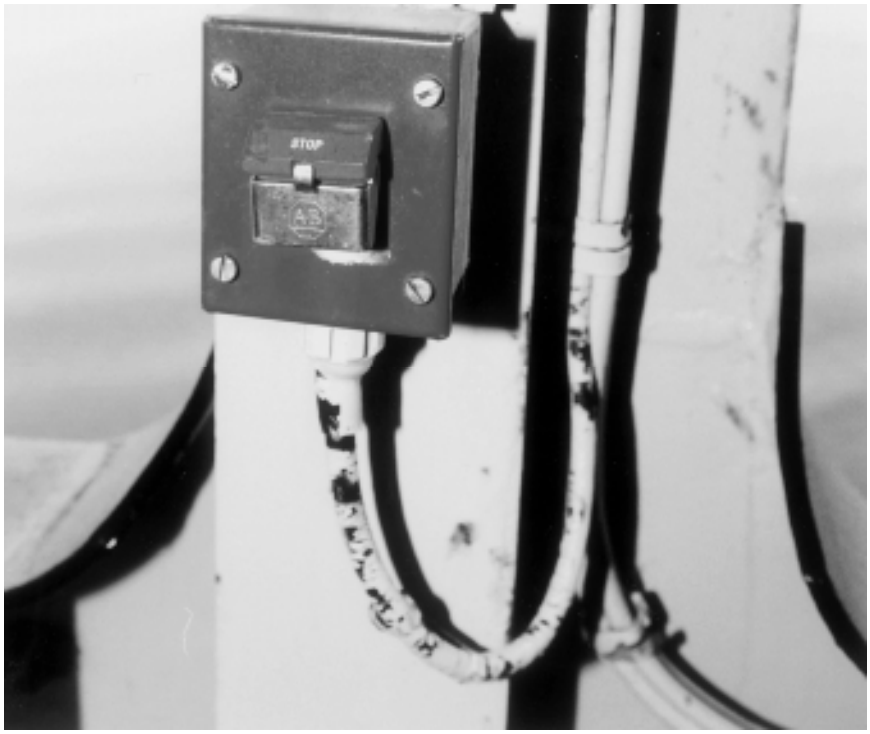

Figure 11.9-9 - IROQUOIS Class Lifebuoy Release Alarm

The number and location of the lifebuoy release alarms depends on the class of ship. All ships have at least one on the quarterdeck and one on the bridge. The alarm is used by the lifebuoy sentry to notify the OOW that a person has fallen overboard.

NOTE: *The Lifebuoy Release Alarm is to be tested daily at sea (after wakey-wakey) and during pre-sail checks.*

11.10 RESCUE BOAT EQUIPMENT

a. In order to be ready to conduct a rescue at sea, it is essential that at least one boat (normally the IRB) be fully equipped with the following equipment. A radio for the boat's coxswain is also to be brought down from the bridge or CCR and a radio check conducted.

Table 11.10-1: Rescue Boat Equipment
Paddles
Repair kit
Bellows (boat pump)
Boat hook
Rescue sling with 20 m of 12 mm diameter polypropylene
Red/green chemlites (running lights)
At least one full tank of gas
Boat's bag
Boat's bag contents: Blanket and toque Spotlight Quick release safety knife First aid kit
Bolt cutters (46cm)*
Crow bar*
Rescue (crash) axe*
Fire extinguisher (2 kg CO2)*
Towline *

* RIB (PC) or LCVP only

NOTE: *The Boat's Bag shall be packaged so that it is watertight.*

Figure 11.11-1 – RIB SR II

The hull of the SR II is aluminum. The chamber has five separate compartments to ensure that the boat will remain afloat should one of the compartments be punctured. An aluminum transom with 2x18 mm thick marine-grade mahogany plywood padding is fitted to support the outboard motor. The floor is made of aluminum and welded to the hull.

Figure 11.11-2 - RIB 540 (Used on KINGSTON Class Ships)

b. **RIB 540/472.** The hull and deck are constructed from Fiberglass Reinforced Plastic (FRP). A core of end-grain balsa in selected areas provides additional stiffening of the deck. The hull moulding incorporates planning strakes. As well, the aft or face of the transom is cored with two layers of marine-grade plywood.

The deck moulding includes a bow locker, cable trough and non-skid on all walking surfaces. The bow locker is separated from the hull cavity by an FRP sole. A flush-fitting FRP hatch provides access to the bow locker. The boat is hoisted with a four-point webbing lift sling. The forward lift points are located on the inboard face of the bow locker. The aft lift points are on the forward face of the transom. A tow eye is located on the bow to facilitate towing.

The in-line control console is made of the same material as the hull. It incorporates a padded seat with the steering wheel, compass, switch panel and engine instruments mounted on the control face. A recess under the consoles has room to house two portable outboard gas tanks. The console is mechanically fastened to the deck amidships.

Figure 11.11-3 - Control Console 540

Figure 11.11-4 - Control Console 472

The inflatable collar is constructed from fabric that consists of a polyester core with a neoprene coating inside and a hypalon coating outside. It is divided into three airtight chambers. Each chamber has an inflation/deflation valve. Wear protection is provided by the full length extruded rubstrakes. A rope lifeline is attached at intervals along the lacing cuff on the top centreline of the collar.

Table 11.11-1: SR11s and Ship's Class				
Class	**Ten-Man**	**Six-Man**	**Location**	**Launch By**
IROQUOIS	2		Port/Stbd AX	HIAB 61 Crane
HALIFAX	2		Port/Stbd TPS	Torpedo Recovery Crane
KINGSTON	1		Starboard	Crane
ORCA				
AOR	4		Port/Stbd Dispersal area	HIAB 61 Crane
VICTORIA		1	Forward Torpedo Room	Hand

11.10.2 Manoeuvring

a. . An SR11 handles very differently than a RIB or LCVP. The coxswain operates the boat from a sitting position on the starboard side where the engine can be controlled and the boat steered. To alter course, the outboard engine is used like a rudder and, when going forward, turned in the opposite direction to which the boat is to be turned.

Most service outboard engines are equipped with a Kill Switch Lanyard. This lanyard is attached to the end of the engine handle and is designed to stop the engine when it is removed. Whenever operating the IRB, the other end of the lanyard must be attached to the coxswain so that if the coxswain falls overboard, the engine will stop.

Firm control of the outboard is essential when conducting turns, as the engine will tend towards tightening the turn. High-speed turns are dangerous and should be avoided. Gear changes must be done at low engine speeds (RPMs) because at higher engine speeds, control of the boat may be lost and the motor damaged.

The performance of the SR 11 is determined by its trim. In calm waters and with a normal payload, the boat should come up on plane very quickly. The trim of the boat is determined by the angle of the outboard engine. If the SR 11's bow is pushed into the water, the leg is too close to the transom. If the SR 11 will not plane, the leg is too far away from the transom. When first attaching the outboard motor to the IRB, a test run should be made to ensure the trim is set correctly. Low inflation may cause cavitation under the hull. (6-man IRB only)

b. **RIB 540**. The behavior of the 540 are similar to the RIB (PC) but the coxswain must be aware that they are about four times lighter. As well, the outboards are capable of providing more power than is needed in most situations. Both RIBs are fitted with powerful outboards to carry heavy loads and transport boarding parties without losing speed. With a two-person crew at full

throttle, the boat will plane across calm water in excess of 30 kts. At no time should a tight turn be attempted at this speed.

11.10.3 Checklist

a. **SR-11**. When an SR 11 is issued, it will be supplied with the following:

Table 11.11-2: SR 11 Equipment
Paddles (2)
Foot Bellows
Gauge w/ adapter
Lifting sling
towing bridle
Repair kit - leak stoppers - instructions - patches - scissors - sandpaper/buffer - brushes (2) - glue

NOTE: *All SR11s and lifting slings are tested before issue. A tally plate is attached to the transom (inboard) and the lifting ring is stamped. If an IRB is received without the tally plate or stamp, it should not be used until tested. If the test date is over two years old, the boat must be retested.*

NOTE: *Once the boat is inflated the towing and lifting slings are attached, thus ensuring that the longer legs of the lifting sling go forward. Snap hooks are shackled to the eyelets on the after end for the after steadying line or sternfast.*

b. **RIB 540**. The following is a list of equipment that comes with the RIB. It should be checked periodically to ensure it is in proper repair.

Table 11.11-3: RIB 540Equipment	
Outboard engine	Lifting sling
Portable fuel tanks (2)	Bellows
Paddles (2)	Repair kit
Navigational light mast	

11.10.4 Pre-Launch Checklist

The pre-launch checklist is to be completed prior to each launch as follows.

Pre-Launch Checklist RIB 540	
Description	**Check off**
Rigid hull free of leaks or damage	_____
Inflatable collar free of any punctures or excess wear	_____
Inflatable collar attachments secure	_____
Inflatable collar at operating pressure (150 millibars)	_____
High capacity trunks up	_____
Bilge pump operational and switch on auto	_____
Sufficient fuel on board	_____
Fuel lines and filter free of leaks	_____
VRO tank (if fitted) full	_____
Battery electrolyte at proper level	_____
Battery fully charged	_____
Navigation lights operational	_____
Paddles on board and stowed	_____
Mooring lines on board	_____
Fire extinguisher on board and stowed	_____
Inflation pump on board and stowed	_____
Tube repair kit on board and stowed	_____
Flares on board and stowed	_____
Life jackets on board (1 per person + 10%)	_____
All hatches secured	_____
Steering system operates smoothly and freely without leaks	_____
Throttle and shift controls operate smoothly and freely	_____

11.10.5 Engine Start/Stop Procedure

Table 11.11-4: RIB 540Start/Stop Procedures	
Starting	**Stopping**
Turn the battery switch to "ON".	Normal Shutdown
Ensure the engine kill switch lanyard is attached to the console switch and clipped to coxswain.	Reduce the engine temperature by allowing the engine to run at idle for two to three minutes.
Squeeze the fuel line primer bulb until it becomes firm.	Turn ignition switch to off.
Place control lever in the neutral position.	
Move the neutral throttle lever on the control head upwards (choke).	Emergency Shutdown
Move the ignition switch to the "START" position; release the switch when engine starts.	Turn ignition switch off right away or pull the kill switch lanyard attached to the coxswain.
Allow engine to warm up for 2 – 3 minutes (above 5°C), 5 minutes (below 5°C) if possible.	

NOTE: *The boat must be in the water to start, as the engine is water-cooled.*

11.10.6 Procedures for SR 11 and RIB 540 During rescue stations, the I/C boat deck may place the boat outboard at deck level until the order to launch the boat is given. This is highly dependent on sea state and the manoeuvering of the ship.

a. **HALIFAX and IROQUOIS Class**. Ships are always rigged and ready to launch a rescue boat at sea. Both classes of ship use hydraulic knuckle boom cranes to launch their SR 11s. If the system fails, there is no backup. However, in an emergency, manual recovery can be achieved by rigging a block and tackle on the accommodation ladder davit. With a minimum of twenty personnel, the SR 11 can be hoisted to almost deck level and manhandled on board (if possible the boat's crew should disembark before recovery).

IROQUOIS /HALIFAX CRANE

b. **KINGSTON Class**. The KINGSTON Class has two boat stowage positions from which a boat can be launched. The primary position is the portable boat cradle located on the sweep deck, which can be used for either RIB or SR11 stowage. The secondary position is the permanent boat cradle located between the funnels on the starboard side. The IRB is the only boat that can be stowed and launched from this position. The SR11 will normally be carried when the ship is deployed in coastal operations, fisheries, and sovereignty patrols

c. PROTECTEUR **Class**. SR 11s are launched and recovered using hydraulic knuckle boom cranes

PROTECTEUR Class Crane

Table 11.11-5: IROQUOIS/HALIFAX/ /SR 11 Launch		
Order	**By/To**	**Response**
HALIFAX CLASS - The crane/crane deck or boat shall not be manned until the pipe "RADHAZ Safe, RADHAZ Safe" is made.		
KINGSTON CLASS - The crane operator ensures 600v power is available and prepares the boat rope. He also ensures that the emergency stop is pulled out and that the light is on.		
Clear Away the Boat I/C to designated personnel		
		Remove securing gripes.
		When "RADHAZ Safe", crane operator extends the boom and positions it directly above the SR 11 and veers sufficient wire.
		The hook is then attached to the IRB's lifting sling.
		The whip control line is attached and manned.
		The after steadying line is hooked on to a snap hook on the outboard side and manned.
		The boat rope, having been rigged upon proceeding to sea, is now manned.
		Attach lifelines
Man the Boat	I/C to boat's crew	The crew assumes their position in the boat.
Ready in the Boat	Coxswain to I/C	Made once the boat is cleared away and the lifeline is manned.
Ready to Launch	I/C to Command by part ship comms	The boat is fully ready to be launched on order from Command.
Note. The boat may be put at deck level (when safe to do so) prior to the order to launch.		
Launch the Boat	Command to I/C via upper deck broadcast and part ship comms	
Boom Up/Hoist Away	I/C to crane operator	Crane operator raises the boom/hoists the boat.
High Enough	I/C to crane operator	Given when the boat is high enough to clear the guardrails.
Slue Out	I/C to crane operator	Crane operator slues the boom outboard.
		Designated personnel control the movement of the boat with boat rope and after steadying line.

Table 13 IROQUOIS/HALIFAX/KINGSTON/SR 11 Launch (cont)		
Order	**By/To**	**Response**
Boom Down/ Lower Away	I/C to crane operator	Crane operator lowers the boom/veers the hoist wire.
Avast/Hook on the Boatrope (KINGSTON Class only)	I/C to designated personnel	The boat rope is hooked on and the bow line is removed.
Boat is at Deck Level	I/C to Command	If launch order not previously given.
Avast	I/C to crane operator	Given when the boom is approximately 0.5 m above the guardrails.
Lower Away	I/C to crane operator	Crane operator veers the hoist wire.
Avast	I/C to crane operator	Crane operator stops veering.
Slip When Ready	I/C to coxswain	
Slip	Coxswain to bowsman	The bowsman slips the Cranston Eagle Hook.
		The coxswain starts the engine.
		The after steadying line is slipped and recovered.
Boom Up/Hoist Away	I/C to crane operator	Crane operator raises the boom/hoists the wire clear of the boat and crew.
		Designated person pulls hoist wire clear.
Slip the Boatrope	Coxswain to bowsman	The boat rope is slipped and recovered.
Prepare to Recover the Boat	I/C to designated personnel	Re-set the Cranston Eagle Hook.
		Prepare the boat rope.
		Prepare the after steadying line.

Table 11.11-6: KINGSTON CLASS SR 11 Launch Procedures		
Order	**By/To**	**Response**
KINGSTON CLASS – The crane deck or boat shall not be manned until the pipe "RADHAZ Safe, RADHAZ Safe" is made.		
KINGSTON CLASS – The crane operator ensures power is available, emergency stop is pulled out and the light is on.		
Clear away the Boat	I/C to designated personnel	.
		Remove securing gripes.

Table 11.11-6: KINGSTON CLASS SR 11 Launch Procedures		
Order	**By/To**	**Response**
		The whip control line passed and manned at deck level.
		The bow fast is manned.
		The stern fast is manned.
		The IRB is to be brought outboard to deck level as soon as safe to do so and when ordered to by Command.
Hoist Away (Handsomely)	I/C to crane operator	Personnel stand-by to bring IRB to deck level.
Avast or High Enough	I/C to crane operator	Given when the boat is clear of cradle/POD and obstructions
Slew Outboard	I/C to crane operator	Crane operator slews boat outboard.
		Designated personnel control the movement of the boat by using the bow and stern fast.
Avast	I/C to crane operator	Once boat is outboard of ships side.
Lower Away	I/C to crane operator	
Avast	I/C to crane operator	Given once boat is at deck level.
Slew Inboard	I/C to crane operator	Crane operator slews boat into ship's side.
Avast/Hook on the Boat rope	I/C to crane operator and designated personnel on boat rope	Boat rope connected up to bridle and bow fast removed.
Man the Boat	I/C to Boat's Crew	Boat's Crew man boat at deck level, assumes positions and grasps lifelines. The whip control line is manned.
Ready in the Boat	Boat Coxn to I/C	
Ready to Launch	I/C to Command via comms	
Launch the Boat	Command to I/C via upper deck broadcast and part ship comms	
Slew Outboard	I/C to crane operator	Crane operator slews the boat outboard.
Avast	I/C to crane operator	
Lower Away	I/C to crane operator	Crane operator veers the hoist wire.
Avast	I/C to crane operator	Crane Operator stops veering.
Slip	I/C to Boats Coxn	The Boat's Coxn slips the Cranston Eagle Hook.
		The whip control line is hauled in against ships side.
		The Boat's Coxn starts the engine.
		The stern fast is slipped and recovered.

Table 11.11-6: KINGSTON CLASS SR 11 Launch Procedures		
Order	**By/To**	**Response**
Hoist Away	I/C to crane operator	Crane operator hoists the wire clear of the boat and crew.
Avast	I/C to crane operator	Crane operator stops heaving in on hoist wire.
Slip the Boat rope	Boat Coxn To Bowsman	The Bowsman slips boat rope from bridle and boat rope is recovered onboard.
Prepare to Recover the Boat	I/C to designated personnel	Re-set the Cranston Eagle Hook.
		Prepare the boat rope.
		Prepare the stern fast and place monkey's fist in Cranston Eagle Hook to be lowered to boat.

Table 11.11-8: IROQUOIS/HALIFAX/ /SR 11 Recovery		
Order	**By/To**	**Response**
In preparation for recovery, the after steadying line is attached to the Cranston Eagle hook. The hook and whip line are then placed outboard and the boom is lowered to the correct height. The whip line and hook are held against the ships side with the whip control line.		
Recover the Boat	Command to I/C. Piped on upper decks "Recover the Zodiac".	I/C signals the boat to come alongside.
When the boat makes its approach, the bowsman will hook the soft eye of the boat rope to the snap hook of the bridle under the direction of the coxswain.		
Pass the After Steadying Line	I/C to designated personnel	IC orders the hook to be eased out and the after steadying line is passed to the coxswain who secures it to the out-board snap hook.
Boom Down/Lower Away	I/C to crane operator	Crane Operator lowers the hook to the boat by lowering the boom/hoist wire.
		The coxswain and bowsman position themselves midships between the legs of the sling. The bowsman holds the ring and lifting sling up ready to hook on.
Avast	I/C to crane operator	When hook is in the boat.
Hook On	I/C to coxswain	The bowsman hooks the Cranston Eagle Hook to the ring on the sling.
Hooked on Ready in the Boat	Coxswain to I/C	Boat's crew man lifelines.
Boom Up/	I/C to crane operator	Crane operator raises the boom to clear the boat from the water.
		Designated personnel control the boat with the boat rope and after steadying line.
		I/C will report to Command when the boat is clear of the water.
Avast	I/C to crane operator	Crane operator stops raising the boom
Hoist Away	I/C to crane operator	Crane operator heaves in on the wire until the boat clears the guardrails.

Table 11.11-8: IROQUOIS/HALIFAX/ /SR 11 Recovery		
Order	**By/To**	**Response**
High Enough	I/C to crane operator	Crane operator stops heaving in.
Slue In	I/C to crane operator	Crane operator swings the boom inboard.
		Designated personnel control the movement of the boat with the boat rope and after steadying line.
Avast	I/C to crane operator	Crane operator stops when the boat is in position.
Boom Down/Lower Away	I/C to crane operator	Crane operator lowers boom/veers the hoist wire.
Secure the Boat	I/C to designated personnel	Designated personnel unhook Cranston Eagle Hook.
		Crane operator stows crane.
		Remove plugs.
		Pass the securing grips.

Table 11.11-9: KINGSTON CLASS SR 11 RECOVERY		
Order	**By/To**	**Response**
Recover the Boat	Command to I/C	I/C signals the boat to come alongside.
When the boat makes its approach, the bowsman will hook on the boat rope to the bridle of the boat under the direction of the Boats Coxswain.		
Lower Away	I/C to crane operator	Crane operator lowers the Cranston eagle hook to the boat by lowering the hoist wire.
		The Coxswain and Bowsman position themselves midships between the legs of the sling
		The Bowsman hold the ring of the sling up to be connected to the Cranston eagle hook.
		Boat Coxswain controls Cranston eagle hook once hook reaches boat.
Avast	I/C to crane operator	Once Cranston eagle hook is in the boat.
		The boat coxswain removes sternfast from Cranston eagle hook secures it outboard onto the snap hook.
		The boat coxswain tilts the motor up if boat is to be lowered on to deck.
Hook On	I/C to boat coxswain	The boat coxswain hooks the Cranston eagle hook to the ring of the sling
		Boat coxswain and Bowsman grasp lifelines.
Hooked on Ready in the Boat	Boat coxswain to I/C	
Hoist Away	I/C to crane operator	Crane operator raises the hoist wire roundly to clear the boat from the water.
		Designated personnel control the boat with the boat rope and stern fast.
		I/C reports to Command when boat is at deck level
Avast	I/C to crane operator	Crane operator stops raising the hoist wire.
Slew In	I/C to crane operator	Crane operator slews IRB onto ship's side.
		Bow fast attached to the snap hook inboard side and manned. Boat rope is unhooked and stowed.
		Boat coxswain and bowsman depart boat at deck level.
During Rescue operations the casualties are to be disembarked from the sweepdeck. The Boat Coxswain and Bowsman remain in IRB until placed on deck.		

Table 11.11-9: KINGSTON CLASS SR 11 RECOVERY		
Order	**By/To**	**Response**
Slew Out	I/C to crane operator	Slews IRB off of ships side.
Avast	I/C to crane operator	Crane operator stops sluing outboard.
Hoist Away	I/C to crane operator	Crane operator raises the hoist wire.
High Enough	I/C to crane operator	Crane operator stops heaving in on hoist wire.
Slew In	I/C to crane operator	Crane operator swings boom inboard.
		The movement of the boat is controlled by the bow and stern fast.
Avast	I/C to crane operator	Crane operator stop sluing in.
Boom Down/Lower away	I/C to crane operator	Crane operator lowers boom and hoist wire into cradle position
Secure the Boat	I/C to designated personnel	Boat coxswain ensures gripes are passed, plugs are out, gas topped up and equipment ready for use.
		Designated personnel secure all lines and equipment.
Note: "I/C will report the state of the SR 11 to Command once all is secured."		

Figure 11.11-5b - KINGSTON Class RIB

Figure 11.11-6 Iroquois Class SR 11 Crane

Figure 11.11-7 - HALIFAX Class SR 11 and Crane

11.11 RIB PC

11.11.1 General Description

a. The RIB PC is a 7.3 m rigid, inflatable boat consisting of an inflatable collar attached to a rigid hull. It is powered by a 165 HP turbo-charged Volvo AQAD 41 diesel engine. The engine is attached to a Volvo 290S/P Outdrive by a Carden driveshaft. A combined engine cover and console is located in the centre of the boat. Equipment stowage is provided aft in a stowage box, and forward in a below deck locker accessed through a deck hatch. Part of the RIB PC is a solid lift frame that allows the boat to be launched and recovered by a single arm davit. They are carried in the following HMC ships.

Table 11.12-1: RIB PC and Ship's Class		
Class	**Held**	**Launch By**
IROQUOIS	1	Arva Single Arm Crane (port side)
HALIFAX	1	Schat Davit (Luffing Arm) (stbd side)
PROTECTEUR	2	Luffing Arm Crane (port/stbd side)

Note: *A maximum of two personnel are to be in the RIB during launching/recovery.*

Figure 11.12-1 - RIB PC

b. The hull is constructed of Fibre Reinforced Plastic (FRP) with foam-cored internal frames and transom. The resin used to construct the hull, deck and console is a fire retardant vinyl-ester. The hull, combined with the cored deck, provides an extremely strong base for the diesel power plant and inflatable collar.

Note: *FRP hulls shall not be painted except by Fleet Maintenance Facility personnel using an approved epoxy.*

c. The FRP control console covers the centrally located engine. Engine controls, gauges and steering are located on the after part of the console. The forward section of the cover forms a seat for passengers. The engine is accessed by lifting up the control console.

d. The inflatable collar is made of heavy-duty, neoprene-hypalon, polyamide fabric. The industrial quality tube is extremely damage-resistant. An exterior rubbing strake provides additional protection for the tube. The tube is divided into seven separate chambers to provide buoyancy in the event of a tube puncture. Inboard and outboard lifelines provide handholds for crew and passengers.

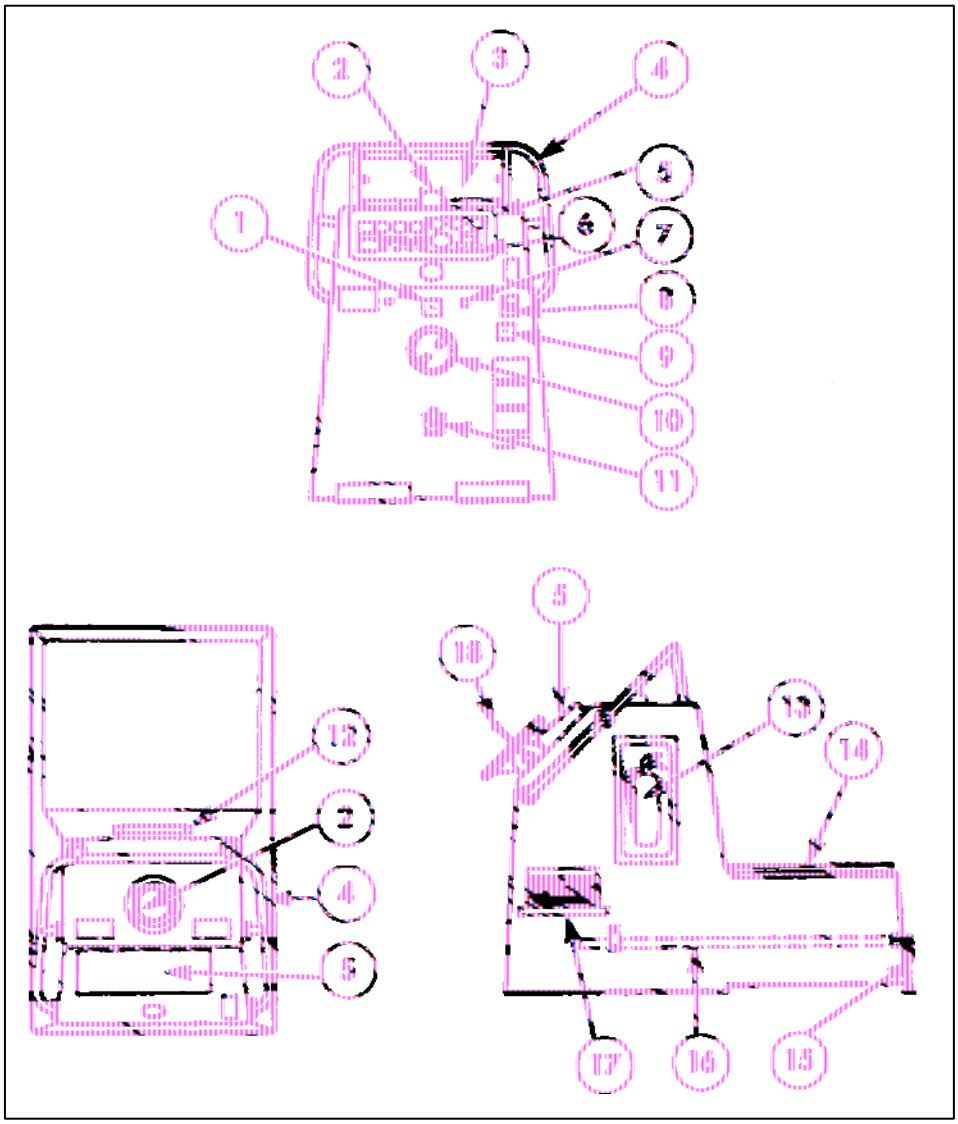

Figure 11.12-2 - RIB PC Control Console

1. Manual Stop
2. Compass
3. Windscreen
4. Handrail/Windscreen Frame
5. Instrument Panel and Box
6. Coxn Overboard Kill Switch
7. Engine Alarm Buzzer
8. FM200 Manual Release (Halon)
9. Engine Air Shutdown
10. Battery Switch Access
11. Shore Power Plug
12. Horn
13. Fire Extinguisher (Port/Starboard)
14. Seat Cushion
15. Console Latch
16. Console Support Rod
17. Engine Airbox
18. Single Lever Engine Control

11.11.2 Manoeuvring

a. **Steering.** RIBs are powerful boats that respond quickly to changes in engine power. When moving slowly, the RIB has a tendency to wallow but, when properly trimmed on plane, steering is very responsive.

b. **Turning.** RIBs lean steeply inwards when turning at high speeds, but the lift from the immersed side of the buoyancy tube keeps the boat stable at a constant angle during the turn. RIBs can be turned with complete confidence under full helm and power in calm weather. However, it is unwise to manoeuvre this sharply because a RIB will skid in a hard turn and the engine may race due to cavitation. A more effective turn can be made by reducing speed before putting the helm over, and then increasing speed again when the turn is complete. In rough weather, altering course across the direction of the waves requires care so that the RIB does not expose too much of its underside to a strong gust and increase the risk of capsizing.

c. **High Seas.** The RIB can operate safely in a high sea state (4 to 6 m), but the speed, and possibly the load, will have to be reduced. In rough weather, it is advisable to reduce violent slamming by steering in a series of zigzags across the direction of the sea. When running down sea, a RIB is less manageable. Constant attention to the boat's speed is required and frequent throttle adjustments are needed. The most important principle to be followed is to present a high bow to the wave that the RIB is about to overtake. The bow of a RIB lifts as the boat comes off or goes onto the plane. So, by slowing down just before the moment of encounter and accelerating quickly to start planing again, a RIB can be made to climb a wave rather than to plunge into it. The surfing situation should be avoided as this may lead to a RIB burying her bow into the tail of the wave ahead. Lastly, it must be remembered that the stern of a RIB is less buoyant than the bow, so it is inadvisable to allow a steep following wave to overtake and possibly swamp the boat over the transom.

d. **Loading.** The distribution of a load in a RIB affects its performance. A RIB is heavier at the bow when stopped or proceeding at slow speed, so the boat should be loaded with the weight towards the stern until it reaches sufficient speed to plane. An incorrect angle of trim will reduce both speed and range; therefore, coxswains must correctly adjust the trim for optimum performance.

11.11.3 Equipment Checklist

The following is the list of equipment that comes with the RIB. It should be checked periodically to ensure it is in proper repair.

Table 11.12-2: Equipment RIB PC

Equipment	Qty	Equipment	Qty
Canopy cover (forward)	1	Boat hook	1
Canopy cover (aft)	1	Fuel stripping container	1
Cover boat overall	1	Lifelines 16 mm 3-strand nylon	2
Handle w/ball grip	1	Lifelines 10 mm	2
Anchor, Danforth	1	Blue towline 30 m of 18 mm three-strand polypropylene	1
Anchor line 30 to 45 m of 12 mm DB nylon	1	Centreline lifeline	1
Paddle 2 m	6	Fire extinguisher	2
Canopy rod 2.6 m	1	Search light	1
Canopy rod 3 m	1	First aid kit	1
Canopy rod 3.35 m	1	Cushion stowage box	1
Canopy rod 3.65 m	1	Cushion console	1
Sea anchor	1	Cushion backrest	1
Sea anchor line 30 m 7 mm 3-strand nylon	1	Plastic pail	1
		Painter line 18 mm DB nylon	1
Repair kit	1	Painter release shackle	1
Instrument protective cover	1	Ensign staff assembly	1
Cradle	1	Propeller marine SS	1
Single point hoisting adapter	1	Pressure relief valve caps	7
Kill switch and lanyard	2	Foot pump	1
Magnetic compass	1	Foot pump adapter	1
Compass guard	1	Life raft knife	1
Fuel sounding rod	1	Shore power cable	1
Emergency tiller	1	3/8” bow shackle (lifelines)	2
Kisby Ring and throwing line	2	3/8” bow shackle (anchor)	1
Bailer	1	3/8” bow shackle (attach painter release shackle)	1

11.11.4 Pre-Launch Checklist

The pre-launch checklist is to be completed prior to every launch.

1. **Bow Area**
   - a. Inflatable collar at operating pressure ..... ❒
   - b. Contents of forward locker ..... ❒
   - c. Locker dry ..... ❒
   - d. Secure forward hatch ..... ❒
   - e. Caps on relief valves ..... ❒

2. **Fuel Level**
   - a. Full fuel tank ..... ❒
   - b. Secure fuel cap ..... ❒

3. **Engine Compartment**
   - a. Visual inspection ..... ❒
   - b. Stripping valve open ..... ❒
   - c. Operation of stripping pump ..... ❒
   - d. Stripping valve closed ..... ❒
   - e. Fuel/water separator bowl clear ..... ❒
   - f. Fuel supply valve open ..... ❒
   - g. Fuel return valve open ..... ❒
   - h. Belt tension ..... ❒
   - j. Coolant level ..... ❒
   - k. Oil level ..... ❒
   - m. Sea water strainer clean ..... ❒
   - n. Secure console/engine cover ..... ❒
   - p. Replace lifeline on console ..... ❒

4. **Console/Engine Cover**
   - a. Disconnect shore power ..... ❒
   - b. Battery switch to position No. 1 ..... ❒
   - c. Voltmeter reads greater than 12 volts ..... ❒
   - d. Battery switch to position No. 2 ..... ❒
   - e. Voltmeter reads greater than 12 volts ..... ❒
   - f. Reset battery switch to position No. 1 ..... ❒
   - g. Outdrive trim pump (-5 to 12 degrees) ..... ❒
   - h. Electric bilge pump ..... ❒
     - (**1**) Manual ..... ❒
     - (**2**) Switch set to automatic ..... ❒
   - j. Lights ..... ❒
   - k. Horn ..... ❒
   - m. Steering wheel operated ..... ❒

5. **Aft Stowage Locker**
   - a. Water intake valve open (outdrive) ..... ❒
   - b. Manual bilge pump ..... ❒
   - c. Float switch ..... ❒
   - d. Reservalve pressure 20 to 30 psi ..... ❒
   - e. Outdrive trim pump fluid level ..... ❒
   - f. Secure aft stowage locker ..... ❒

11.11.5 Engine Start/Stop Procedure

Table 11.12-3: RIB PC Start/Stop Procedure	
Starting	**Stopping**
Ensure engine kill switch lanyard is attached to the switch on the console and clipped to the coxswain.	**Normal Shutdown**
Turn the battery switch to "1".	Allow engine to run at idle speed for one minute.
Trim the outdrive to "0".	Push stop button on control panel and hold until the engine stops.
Move the engine control lever to the "neutral" position.	
Move the ignition switch to the "Start" position. Release the ignition switch when engine starts.	Pull out the manual stop handle located on the aft face of the console.
Check that the oil pressure gauge shows the normal value of 30 to 40 PSI and that the alarm is silent. If abnormal values show or the alarm sounds, move the engine switch to stop.	Pull the kill switch lanyard that is attached to coxswain.

NOTE: *The boat must be waterborne immediately after starting the engine. Engine gauge readings should be:*

Oil Pressure:	*30 PSI minimum @ 650 RPM*
	80 PSI minimum @ 3600 RPM
Voltmeter:	*13 to 15 Volts*
Temperature:	*167 to 194 degrees F*
Tachometer:	*600 to 3600 RPM*

Figure 11.12-3 - IROQUOIS Class RIB and Crane

Figure 11.12-4 - HALIFAX Class RIB and Davit

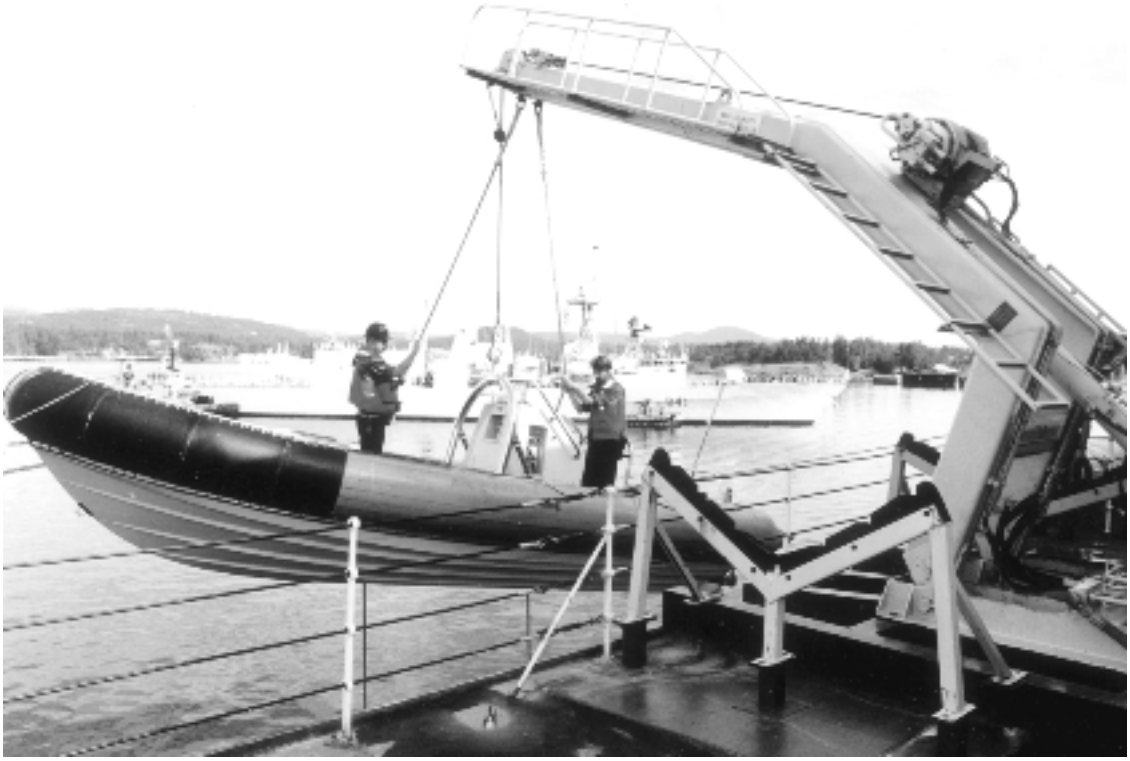

Figure 11.12-5 - PROTECTEUR Class RIB and Davit

11.11.6 Launch Procedures for RIB PC

Table 11.12-4: HALIFAX CLASS RIB Launch Procedures			
Order	**By/To**	**Response**	**Davit Operator Action**
Man the Boat	I/C to boat's crew	Boat's crew man the RIB.	Operator will check oil level in reservoir and replenish if necessary. Prior to starting conduct a visual check of all components.
Clear Away the Boat	I/C to designated personnel		Switch "ON" electrical supply to starter panel. Check that POWER ON light (RED) is illuminated. Press START button. Check that the RUN light (GREEN) is illuminated. Power pack is now ready for use.
		Prepare the boat for launch.	
		Slip the securing arrangements (slips and grips).	
		Disconnect the Arctic Start (if connected)	
		Whip control line hooked on and manned.	
Ready in the Boat	Coxswain to I/C	When boat is cleared away and lifelines manned, prepare the boat rope and after steadying line.	
Ready to Launch	I/C to Command by part ship comms	The boat is fully ready to be launched on order from Command.	

Table 11.12-4: HALIFAX CLASS RIB Launch Procedures			
Order	**By/To**	**Response**	**Davit Operator Action**
Launch the RIB	Command to I/C via P/S Comms and upper deck broadcast		
Hoist Away	I/C to /davit operator	Davit operator raises the RIB to clear chocks.	"Hoist-Lower" lever to "Hoist".
High Enough	I/C to davit operator		/davit operator stops hoisting.
CAUTION If the davit exhibits any sign of erratic operation or control difficulties, the evolution is to be stopped and appropriate tests and repairs shall be performed immediately. Continued operation in this manner may result in equipment damage or personal injury.			
Luff Out	I/C to davit operator	Davit operator luffs the davit outboard.	Luff "In-Out" lever to "Out".
Designated personnel control the movement of the RIB with boat rope and aft steadying line.			
Lower away (As soon as the previous order is given)	I/C to davit operator		"Hoist-Lower" lever to "Lower".
Avast (if required)	I/C to /Davit operator	When RIB is at deck level.	
When the boat is water borne the davit operator must be prepared to operate the "Tension-Payout" lever in the "Payout" mode in conjunction with the "Hoist-Lower" lever in the "Lower" mode to give slack in the boat's fall and sling.			
Slip when ready	I/C to coxswain	As the RIB enters the water, the engine is started.	
Slip	Coxswain to Bowsman	Bowsman slips the Cranston Eagle hook.	Whip control line is used to pull the whip and Cranston Eagle hook away from the boat's crew.
Care is to be taken not to attempt to slip while weight is on the hoist wire. Too hard a pull could cause the toggle wire on the hook to part.			
Hoist Away	I/C to /davit operator.		Davit operator hoists the hook clear of the boat.
Let go aft	Coxswain to bowsman	After steadying line is let go and recovered by designated personnel.	
Slip the Boat Rope	Coxswain to Bowsman	Bowsman slips the boat rope, recovered by designated personnel.	

NOTE: *While the RIB is away, personnel required for launching will make preparations for recovery and reset the Cranston Eagle Hook.*

11.11.7 RIB PC Recovery Procedures

For recovery of the RIB, permission is sought from the bridge. Designated personnel man their positions. The orders for recovering are as follows.

Table 11.12-5: HALIFAX CLASS RIB Recovery Procedures			
Order	**By/To**	**Response**	**Davit Operator Action**
Prepare to recover the RIB	I/C to deck party	Davit operator ensures "Power On" and "Motor Running". Boat rope made ready for the boat to pick up. After steadying line is made ready for use.	Davit operator ensures "Power On" and "Motor Running" lamps are lit. Operator will check oil level in reservoir and replenish if necessary. Prior to starting conduct a visual check of all components.
Luff Out	I/C to davit operator	Davit operator luffs the davit outboard.	Luff "In-Out" lever to "Out". When cut out occurs, release the lever.
Recover the RIB	Command to I/C via upper deck broadcast and part ship comms	I/C signals RIB to come alongside. Hook to be lowered approximately 2 m above the waterline.	"Tension-Payout" lever to "Payout" and the "Hoist-Lower" lever to "Lower"
When the RIB makes its approach, the bowsmen will hook the soft eye of the boat rope over the towing bollard. The Coxn will ease off the throttle and ride the boat rope while steering the RIB. The Bowsman will proceed aft and attaché the aft steadying line. Once completed, he/she will proceed forward and wait to hook on the Cranston Eagle hook.			
CAUTION If the davit exhibits any sign of erratic operation or tension control difficulties, the evolution is to be stopped and appropriate tests and repairs shall be performed immediately. Continued operation in this manner may result in equipment damage or personal injury.			
Hook On	I/C to boat's crew	Bowsman can reach up and pull the hook down and hook the Cranston Eagle Hook to the lifting point.	
Extreme caution is to be exercised when hooking up the Cranston Eagle Hook to the lifting point. A finger can easily be jammed at this part of the recovery.			
If there is no intent to hoist the RIB, the davit operator should operate the "Tension-Payout" lever in "Tension " and the "Hoist-Lower" in the "lower" mode. The RIB will continue to rise and fall but the fall wire will remain taught.			
Hoist Away	I/C to davit operator	Davit operator heaves in on the hoist wire. Designated personnel control the movement of the RIB with the boat rope and after steadying line.	Once the hook is connected to the lift frame, and the crewman is clear, the "Hoist-Lower" lever to "Hoist. When cutout occurs release the lever.
Luff In	I/C to davit operator	The boat is brought in until it lines up and clears the chocks.	Luff "In-Out" lever to the "In".
Lower	I/C to davit operator	Davit operator lowers the RIB into the chocks	"Hoist-Lower" lever to "Lower".

Table 11.12-5: HALIFAX CLASS RIB Recovery Procedures			
Order	**By/To**	**Response**	**Davit Operator Action**
Secure the RIB	I/C to designated personnel	Flush out coolant lines with anti-freeze and re-connect the Artic Start (winter only). Set up slips. Top up fuel if required. Shut down hydraulic unit. Rig tie downs. Secure lifelines.	Shut down the unit by pressing the "STOP" pushbutton. Turn on/off switch to the "OFF" position.

Table 11.12-6: IROQUOIS CLASS RIB Launch Procedures			
Order	**By/To**	**Response**	**Davit Operator Action**
Man the Boat	I/C to boat's crew	Boat's crew man the RIB.	Operator will check oil level in hydraulic unit prior to starting and a visual check of all components.
Clear Away the Boat	I/C to designated personnel	Insert the plugs.	Depresses the "POWER ON" (green push button) and allow the hydraulic system to "warm through". "POWER ON" (green light) will be illuminated at the winch control panel.
		Prepare the boat for launch.	
		Slip the securing arrangements (slips and grips).	
		Disconnect the Arctic Start (if connected).	
		Prepare the boat rope and after steadying line.	
Ready in the Boat	Coxswain to I/C	When boat is cleared away and lifelines manned.	
Ready to Launch	I/C to Command by part ship comms	The boat is fully ready to be launched on order from Command.	
Launch the RIB	Command to I/C via upper deck broadcast and part ship comms.		
Hoist Away	I/C to davit operator	Davit operator hoists the RIB until it clears the chocks.	Move the winch control lever from position "1" toward position "5" slowly.
			The tension sensor roller assembly should lift as tension is applied to the cable and the RIB is raised.
High Enough	I/C to davit operator	Davit operator stops hoisting.	Return winch control lever to position "1".
CAUTION If the davit exhibits any sign of erratic operation or tension control difficulties, the evolution is to be stopped and appropriate tests and repairs shall be performed immediately. Continued operation in this manner may result in equipment damage or personal injury.			
Slew Out	I/C to davit operator	Davit operator slews the davit outboard.	Use the swing control lever, slew the davit left for launch operations.
Avast	I/C to davit operator	Davit operator stops slewing the davit outboard	Return swing control lever to center position.

Table 11.12-6: IROQUOIS CLASS RIB Launch Procedures			
Order	**By/To**	**Response**	**Davit Operator Action**
Designated personnel control the movement of the RIB with boat rope and aft steadying line.			
Lower Away	I/C to davit operator	RIB is lowered towards the water.	Move the winch control lever from position "1" towards position "2".
Avast (if required)	I/C to davit operator	When RIB is at deck level davit operator stops veering.	Return to position “1”.
Lower Away	I/C to davit operator	RIB is lowered towards the water.	Move the winch control lever from position "1" towards position "2".
Slip When Ready	I/C to coxswain		
Slip	Coxswain to bowsman	The bowsman slips the Cranston Eagle Hook. Care is to be taken not to attempt to slip while weight is on the hoist wire. Too hard a pull could cause the toggle wire on the hook to part.	
Hoist wire control line/Shepherd’s Hook is used to pull the whip and Cranston Eagle Hook away from the crew.			
Hoist Away	I/C to davit operator	Davit operator hoists the hook clear of the boat.	Once the RIB has slipped, move the winch control lever to position “5” through position “1”.
			The speed of ascent will be determined by manipulating the winch control lever between those two positions.
Slip the Boat rope	Coxswain to bowsman	Bowsman slips the boat rope and designated personnel recover it. Swing in the davit arm if required.	Use the swing control lever, slew the davit inboard (right).
Secure	I/C to all personnel		Shut unit down by depressing the “Power Off “(red push button). Power On (green light) will extinguish at the Winch Control Panel.
			Close winch control panel cover on completion.

Table 11.12-7: IROQUOIS RIB Recovery Procedures			
Order	**By/To**	**Response**	**Davit Operator Action**
Prepare to recover the RIB	Command to I/C via upper deck broadcast and part ship comms	Davit operator ensures "Power On" and "Motor Running".	Check oil level in hydraulic unit prior to starting and a visual check of all components.
		Davit to be slewed outboard.	
		Hook to be lowered approximately 2 m below deck level.	Depresses the Power On (green push button). Power On (green light) will be illuminated at the winch control panel.
		After steadying line is made ready for use.	
		Boat ropes made ready for the boat to pick up.	Use the swing control lever, slew the davit outboard for recovery operations. Return swing control lever to center position once arm is swung outboard.
			Move the winch control lever towards position "2" from position "1" lowering the hook.
Recover the RIB	Command to I/C via upper deck broadcast and part ship comms.	I/C signals RIB to come alongside.	
CAUTION If the davit exhibits any sign of erratic operation or tension control difficulties, the evolution is to be stopped and appropriate tests and repairs shall be performed immediately. Continued operation in this manner may result in equipment damage or personal injury.			
When the boat makes its approach, the bowsman will hook on the boat rope under the direction of the coxswain.			
Pass the After Steadying Line	I/C to designated personnel	Aft steadying line is passed to boat's crew who secure it to the outboard towing bollard.	The davit operator lowers the Cranston Eagle Hook to the boat.
Designated personnel control the RIB with boat rope and after steadying line.			Winch control lever is then moved to position "3" to enable the "CONSTANT TENSION" mode of operation.
			Since the cable has no load on it, the roller assembly tension switch is already active and, therefore, constant tension mode is active. The yellow "CONSTANT TENSION SELECTED" indicator will be illuminated.
			The winch control lever is then moved to position "1". The system is now in "Minimum Constant Tension".

Table 11.12-7: IROQUOIS RIB Recovery Procedures			
Order	**By/To**	**Response**	**Davit Operator Action**
Once the winch is in Constant Tension, the hook can no longer be lowered under power. Cable must be pulled from the drum by the boats crew. At any time the operator can cancel Constant Tension by moving the winch control lever into position "4"or "6".			
Hook On	I/C to boat's crew	Bowsman reaches up and pulls the hook down and hooks Cranston Eagle Hook to the lifting point.	
Hooked on Ready in the boat	Coxn to I/C		Once the release hook is connected to the lift frame, and the crewman is clear, operator moves the winch control lever from position "1" to position "5". This provides full constant tension on the cable. The vessel will now rise and fall following the waves with a taut cable.
Extreme caution is to be exercised when hooking up the Cranston Eagle Hook to the lifting point. A finger can easily be jammed at this part of the recovery.			
Hoist Away	I/C to davit operator	Davit operator heaves in on the hoist wire.	As the vessel approaches the crest of the wave, move the winch control lever from position "5" to position "6".
		Designated personnel control the movement of the RIB with the boat rope and after steadying line.	This action disengages the constant tension motor and the main hoist motor is engaged.
			The main hoist motor will immediately begin to raise the vessel at maximum hoist speed. The speed of ascent will be determined by manipulating the winch control lever between position "1" and "5".
High Enough	I/C to davit operator	When the boat is just below the davit head.	As the release hook nears the weight for the Anti 2 Block Stop, the hoist speed is to be reduced by moving the winch control lever from position "5" to position "1".
Slew In	I/C to davit operator	The boat is brought in until it is lined up with the chocks.	When the vessel is at the desired height it is to be slewed inboard using the swing control lever.
Avast	I/C to davit operator	Davit operator stops slewing	Return swing control lever to center position once the RIB is in correct position.
When slewing in, the RIB's hull must clear the chocks and guardrails. The boat's crew must be distributed in the boat so that it is lifted on an even keel.			
Lower Away	I/C to davit operator	Designated personnel must be alert to correctly align the keel into the	When the vessel is in place above the boat cradle it is to

Table 11.12-7: IROQUOIS RIB Recovery Procedures			
Order	**By/To**	**Response**	**Davit Operator Action**
		chocks.	be carefully lowered into place by moving the winch control lever from position "1" to position "2".
Avast	I/C to davit operator	Davit operator stops lowering.	Operator moves the winch control lever from position "2" to position "1".
Secure the RIB	I/C to designated personnel	Flush out coolant lines with anti-freeze and re-connect Artic Start (winter only).	Shut unit down by depressing the "Power Off "(red push button). Power On (green light) will be extinguished at the Winch Control Panel.
		Rig tie downs.	
		Shut down the power to the hydraulic unit.	
		Secure lifelines.	
			Close winch control panel cover on completion.
Clear the boat	I/C to boat's crew	Clear all personnel from the boat.	
Boat secure for sea	I/C to Command	Boat secured for sea.	

EMERGENCY OPERATING PROCEDURES IROQUOIS CLASS

Should there be a system hydraulic or electrical power failure and the recovery of the RIB is essential, the davit is provided with a backup hydraulic/mechanical system to hoist the boat, swing it over the cradle and lower it**.** Before any emergency operation procedure the davit power units shall be electrically isolated.

EMERGENCY RECOVERY

HOISTING

1. Verify that the emergency lowering needle valve and operation emergency ball are closed.

2. To hoist rotate the hoist motor crankshaft cover to the up position. This will expose a proximity switch that will prevent application of electrical power to the control console and, at the same time, close an interlock valve to prevent accidental gravity lowering while the hand crank is in place. During this mode of operation, the 3-way ball valve should be left with the arrowhead pointed toward the lowering manifold.

3. Using the supplied ratchet wrench, manually turn the winch motor clockwise. Continue turning until the boat clears the cradle. Remove the ratchet wrench from the hoist motor drive shaft allowing the crank cover to close.

SWINGING

4. Verify that the emergency lowering needle valve is closed. Open the emergency operation ball valve. While holding the swing control lever in the maximum "right" or "left" position, operate the emergency hand pump until the davit is in the required position.

LOWERING

5. Verify that the motor crankshaft cover on the winch main motor is closed, and that the emergency operation ball valve is closed. Open the emergency lowering needle valve two full turns. It is important that the emergency lowering needle valve be opened the prescribed two turns. If the valve is not opened far enough, the brake release pressure will bleed off too fast, making it difficult if not impossible, to pump fast enough to keep the brake released. Even though the relief valve should relieve any excess pressure back to the tank, extreme caution should be exercised when pumping to prevent the load from being lowered too fast.

6. For this mode of operation the hoist motor crankshaft cover will be in the down position, opening the interlock valve. The 3-way ball valve must be rotated 180 degrees pointing up away from the lowering manifold. This will open the passage for hydraulic fluid from the hand pump to release the brake. At the same time the path for the normal power hydraulic operating is closed.

7. Operate the hand pump to release the winch brake. The RIB will slowly lower.

NOTE: When carrying out this procedure, it is important to note that there will be no tension in the cable in the absence of a load. It is recommended that where possible, recovery should be deferred until the system can be operated in the normal manner.

Table 11.12-8: KINGSTON CLASS BOAT Launch Procedures

Order	By/To	Response	Davit Operator Action
Man the Boat	I/C to boat's crew	Boat's crew man the boat.	Operator will check oil level in reservoir and replenish if necessary. Prior to starting conduct a visual check of all components.
Clear Away the Boat	I/C to designated personnel	Insert the plugs.	With the "POWER ON" Light illuminated, push the "START" button. The "MOTOR ON" light will illuminate. The switch on the lever control panel must be
		Prepare the boat for launch.	
		Slip the securing arrangements (slips and grips).	

Table 11.12-8: KINGSTON CLASS BOAT Launch Procedures			
Order	**By/To**	**Response**	**Davit Operator Action**
		Disconnect the Arctic Start (if connected)	switched to the "ON" position to activate the hydraulic control levers.
		Prepare the boat rope and after steadying line.	
At this time the remote station will have "POWER ON" light (red) and the "MOTOR ON" light (green) illuminated as well. The switch on the lever control panel must be "ON" to activate the hydraulic control lever.			
Ready to Launch	I/C to Command by part ship comms	The boat is fully ready to be launched on order from Command.	
Launch the boat	Command to I/C via P/S Comm		
Hoist Away	I/C to davit operator	Davit operator raises the boat to clear chocks.	Raise the sleeve on the control lever to release the lock and move the hoist control lever from the neutral held position towards the hoist raise position.
High Enough	I/C to davit operator	Davit operator stops hoisting.	Return the hoist control lever to the neutral position.
CAUTION If the davit exhibits any sign of erratic operation or control difficulties, the evolution is to be stopped and appropriate tests and repairs shall be performed immediately. Continued operation in this manner may result in equipment damage or personal injury.			
Boom Out	I/C to davit operator	Davit operator raises the davit arm.	Raise the sleeve on the control lever to release the lock and move the control lever from the neutral held position towards the desired direction. The arm luffing speed will increase as the lever travels from the neutral position.
Designated personnel control the movement of the boat with boat rope and aft steadying line.			
Slew out	I/C to davit operator	Davit operator swings the davit outboard.	Raise the sleeve on the control lever to release the lock and move the control lever away from the operator to move the end of the arm to the right and towards the operator to move the arm to the left. The swing speed will increase as the lever travels from the neutral position.
Ready to launch	I/C to bridge via P/S Comm	The boat is fully ready to be launched on order from the bridge.	
Lower away (As soon as the previous order is given)	I/C to davit operator	To launch the boat.	Raise the sleeve on the control lever to release the lock and move the hoist control lever from the neutral-held position towards the hoist lower position.
Man the Boat	I/C to boat's crew	Boat's crew man the boat.	
Slip	I/C to coxswain	Boat's coxswain slip the boat fall. Davit operator hoists the hook clear of the boat.	Move the hoist control lever from the neutral-held position towards the hoist position.
Let go the tag	Coxswain to deck	Blank end of tag lines released and	

Table 11.12-8: KINGSTON CLASS BOAT Launch Procedures			
Order	**By/To**	**Response**	**Davit Operator Action**
lines	crew	lines pulled on board. Boat's crew ensures lines run freely through the boat's fittings.	
Let go boat rope	Coxswain to bowsman	Bowsman slips the boat rope while Deck Party recovers the boat rope.	
Note: The hook may be recovered on board to cease banging on the hull especially if the boat is to be away for any period of time.			

Table 11.12-9: KINGSTON CLASS BOAT Recovery Procedures			
Order	**By/To**	**Response**	**Davit Operator Action**
Prepare to recover the BOAT	I/C to deck party	Davit operator ensures "Power On" and "Motor Running". Boat rope made ready for the boat to pick up. After steadying line is made ready for use.	Davit operator ensures "Power On" and "Motor Running" lamps are lit. Operator will check oil level in reservoir and replenish if necessary. Prior to starting conduct a visual check of all components.
Boom Out	I/C to davit operator	Davit operator luffs the davit outboard.	Luff "In-Out" lever to "Out". When cut out occurs, release the lever.
Recover the BOAT	Command to I/C via upper deck broadcast and part ship comms	I/C signals BOAT to come alongside. Hook to be lowered approximately 1m above the waterline.	"Hoist-Lower" lever to "Lower"
CAUTION If the davit exhibits any sign of erratic operation, the evolution is to be stopped and appropriate tests and repairs shall be performed immediately. Continued operation in this manner may result in equipment damage or personal injury.			
Hook On	I/C to boat's crew	Bowsman can reach up and pull the hook down and hook the Cranston Eagle Hook to the lifting point.	
Extreme caution is to be exercised when hooking up the Cranston Eagle Hook to the lifting point. A finger can easily be jammed at this part of the recovery.			
Hoist Away	I/C to davit operator	Davit operator heaves in on the hoist wire. Designated personnel control the movement of the boat with the boat rope and after steadying line.	Once the hook is connected to the lift frame, and the crewman is clear, the "Hoist-Lower" lever to "Hoist. When cutout occurs release the lever.

Table 11.12-9: KINGSTON CLASS BOAT Recovery Procedures			
Order	**By/To**	**Response**	**Davit Operator Action**
Slew in	I/C to davit operator	Davit operator swings the davit inboard.	Raise the sleeve on the control lever to release the lock and move the control lever away from the operator to move the end of the arm to the right and towards the operator to move the arm to the left. The swing speed will increase as the lever travels from the neutral position.
Boom In	I/C to davit operator	The boat is brought in until it lines up and clears the chocks.	Luff "In-Out" lever to the "In"
Lower	I/C to davit operator	Davit operator lowers the boat into the cradle.	"Hoist-Lower" lever to "Lower"
Secure the boat	I/C to designated personnel	Flush out coolant lines with anti-freeze and re-connect the Artic Start (winter only).	Shut down the unit by pressing the "STOP" pushbutton. Turn on/off switch to the "OFF" position.
		Set up slips.	
		Top up fuel if required.	
		Shut down hydraulic unit.	
		Rig tie downs.	
		Secure lifelines.	

Table 11.12-10: PROTECTEUR CLASS RIB Launch Procedures			
Order	**By/To**	**Response**	**Davit Operator Action**
Man the Boat	I/C to boat's crew	Boat's crew man the RIB.	Operator will check oil level in hydraulic unit prior to starting and a visual check of all components.
Clear Away the Boat	I/C to designated personnel	Insert the plugs.	Start the hydraulic power unit by pressing the "START" button and allow the hydraulic system to "warm through" The yellow run light will glow. To enable the winch control system press and release the green "POWER ON" button. The green "POWER ON" indicator will light.
		Prepare the boat for launch.	
		Slip the securing arrangements (slips and gripes).	
		Disconnect the Arctic Start (if connected).	
		Prepare the boat rope and after steadying line.	
Ready in the Boat	Coxswain to I/C	When boat is cleared away and lifelines manned.	
Ready to Launch	I/C to Command by part ship comms	The boat is fully ready to be launched on order from Command.	
Launch the RIB	Command to I/C via upper deck broadcast and part ship comms		
Hoist Away	I/C to davit operator	Davit operator raises the RIB to clear chocks.	Move the winch control lever from position "1" toward position "5" slowly.

Table 11.12-10: PROTECTEUR CLASS RIB Launch Procedures			
Order	**By/To**	**Response**	**Davit Operator Action**
			The tension sensor roller assembly should lift as tension is applied to the cable and the RIB is raised.
High Enough	I/C to davit operator	Davit operator stops hoisting.	Return winch control lever to position “1”.
CAUTION If the davit exhibits any sign of erratic operation or tension control difficulties, the evolution is to be stopped and appropriate tests and repairs shall be performed immediately. Continued operation in this manner may result in equipment damage or personal injury.			
Luff Out	I/C to davit operator	Davit operator luffs the davit outboard.	Move the davit control lever to the “out” position. This will lower the arm to the horizontal position.
Designated personnel control the movement of the RIB with boat rope and aft steadying line.			
Lower Away	I/C to davit operator	RIB is lowered towards the water.	Move the winch control lever from position "1" towards position "2".
Avast (if required)	I/C to davit operator	When RIB is at deck level.	Return to position “1”.
Avast at Waterline	I/C to davit operator	Davit operator stops veering.	Once the RIB has reached the water. Move the control lever to position “1” until the hook is disconnected.
Slip When Ready	I/C to coxswain		
Slip	Coxswain to bowsman	The bowsman slips the Cranston Eagle Hook. Care is to be taken not to attempt to slip while weight is on the hoist wire. Too hard a pull could cause the toggle wire on the hook to part.	
Hoist wire control line/Shepherd’s Hook is used to pull the whip and Cranston Eagle Hook away from the crew.			
Hoist Away	I/C to davit operator	Davit operator hoists the hook clear of the boat.	After the hook is disconnected move the winch control lever from position "1" to "5". The speed of ascent will be determined by manipulating the winch control lever between those two positions.
Let Go Aft	I/C to Coxswain	The coxswain slips the after steadying line and designated personnel recover the line.	
Slip the Boat rope	Coxswain to bowsman	Bowsman slips the boat rope and designated personnel recover it. Swing in the davit arm if required.	Raise the davit arm to the vertical position by moving the davit arm control to the “IN” position.
Secure	I/C to all personnel		Shut down the unit by pressing the red winch control and the red power unit buttons. Green and amber indicator lights will turn off indicating that the davit power is “OFF”.

Table 11.12-10: PROTECTEUR CLASS RIB Launch Procedures			
Order	**By/To**	**Response**	**Davit Operator Action**
			Close Winch Control Panel cover on completion.

Table 11.12-11: PROTECTEUR CLASS RIB Recovery Procedures			
Order	**By/To**	**Response**	**Davit Operator Action**
Prepare to recover the RIB	Command to I/C via upper deck broadcast and part ship comms.	Davit operator ensures "Power On" and "Motor Running".	Check oil level in hydraulic unit prior to starting and a visual check of all components.
		Davit to be luffed outboard.	
		Hook to be lowered to approximately 2 meters above the water line.	Start the hydraulic power unit by pressing the "START" button and allow the hydraulic system to "warm through" The yellow run light will glow. To enable the winch control system press and release the green "POWER ON" button. The green "POWER ON" indicator will light.
		After steadying line is made ready for use.	
			Move the davit control lever to the "out" position. This will lower the arm to the horizontal position.
		Boat rope made ready for the boat to pick up.	
			Move the winch control lever towards position "2" from position "1" lowering the hook.
Recover the RIB	Command to I/C via upper deck broadcast and part ship comms	I/C signals RIB to come alongside.	
CAUTION If the davit exhibits any sign of erratic operation or tension control difficulties, the evolution is to be stopped and appropriate tests and repairs shall be performed immediately. Continued operation in this manner may result in equipment damage or personal injury.			
When the boat makes its approach, the bowsman will hook on the boat rope under the direction of the coxswain.			
Pass the After Steadying Line	I/C to designated personnel	Aft steadying line is passed to boat's crew who secure it to the outboard towing bollard.	The Cranston Eagle Hook is lowered to the boat by the davit operator.
Designated personnel control the RIB with boat rope and after steadying line.			
			Winch control lever is then moved to position "3" to enable the "CONSTANT TENSION" mode of operation.

Table 11.12-11: PROTECTEUR CLASS RIB Recovery Procedures			
Order	**By/To**	**Response**	**Davit Operator Action**
			Since the cable has no load on it, the roller assembly tension switch is already active and, therefore, constant tension mode is active. The yellow "CONSTANT TENSION SELECTED" indicator will be illuminated.
			The winch control lever is then moved to position “1”. The system is now in “Minimum Constant Tension".
Once the winch is in Constant Tension, the hook can no longer be lowered under power. Cable must be pulled from the drum by the boat’s crew. At any time the operator can cancel CT mode by moving the winch control lever into position “4” or “6”.			
Hook On	I/C to boat’s crew	Bowsman can reach up and pull the hook down once in minimum constant tension and hooks the Cranston Eagle Hook to the lifting point.	Once the release hook is connected to the lift frame, and the crewman is clear, moves the winch control lever from position “1” towards position “5” until slack in cable is removed; move control lever to position “5” for full constant tension. The vessel will now rise and fall on the waves with a taut cable.
Extreme caution is to be exercised when hooking up the Cranston Eagle Hook to the lifting point. A finger can easily be jammed at this part of the recovery.			
Hoist Away	I/C to davit operator	Davit operator heaves in on the hoist wire.	As the vessel approaches the crest of the wave, move the winch control lever from position “5” to position “6”.
		Designated personnel control the movement of the RIB with the boat rope and after steadying line.	This action disengages the constant tension motor and the main hoist motor is engaged.
			The main hoist motor will immediately begin to raise the vessel at maximum hoist speed. The speed of ascent will be determined by manipulating the winch control lever between position “1” and “5”.
High Enough	I/C to davit operator	When the boat is just below the davit head.	As the release hook nears the weight for the Anti 2 Block Stop, the hoist speed is to be reduced by moving the winch control lever from position “5” to position “1”.
Luff In	I/C to davit operator	The boat is brought in until it lined up with the chocks.	Raise the davit arm to the vertical position by moving the davit arm control to the “IN” position.
When luffing in, the RIB’s hull must clear the chocks and guardrails. The boat’s crew must be distributed in the boat so that it is lifted on an even keel.			

Table 11.12-11: PROTECTEUR CLASS RIB Recovery Procedures			
Order	**By/To**	**Response**	**Davit Operator Action**
Lower Away	I/C to davit operator	Designated personnel must be alert to correctly align the keel into the chocks.	When the vessel is in place above the boat cradle it is to be carefully lowered into place by moving the winch control lever from position "1" to position "2".
Avast	I/C to davit operator	Davit operator stops lowering.	Operator moves the winch control lever from position "2" to position "1".
Secure the RIB	I/C to designated personnel	Flush out coolant lines with anti-freeze and re-connect the Artic Start (winter only).	Shut down the unit by pressing the red winch control and the red power unit buttons. Green and amber indicator lights will turn off indicating that the davit power is "OFF".
		Rig tie downs.	
		Shut down the power to the hydraulic unit.	
		Secure lifelines.	
			Close winch control panel cover on completion.
Clear the boat	I/C to boat's crew	Clear all personnel from the boat.	
Boat secure for sea	I/C to Command	Boat secured for sea.	

11.12 LANDING CRAFT VEHICLE PERSONNEL (LCVP)

11.12.1 General Description

The LCVPs carried by PROTECTEUR Class are used to transport personnel, supplies and ammunition. They require a minimum crew of three to operate: a coxswain, a bowsman and an engineer. The open cargo area is approximately 5.5 m in length by 2.1 m wide and is accessed by a drop-down ramp to ease embarkation/disembarkation. The ramp can be lowered hydraulically or manually. The cargo area is also protected above the waterline by armour plate, which is capable of stopping small arms fire. The single screw and rudder are protected by a skeg to prevent damage during beaching operations. Fully loaded, the LCVP has a range of about 160 km at 9 kts. The maximum number of personnel to be hoisted/lowered is three.

Figure 11.13-1 - LCVP with Lifting Sling Fitted

Figure 11.13-2 - LCVP Console

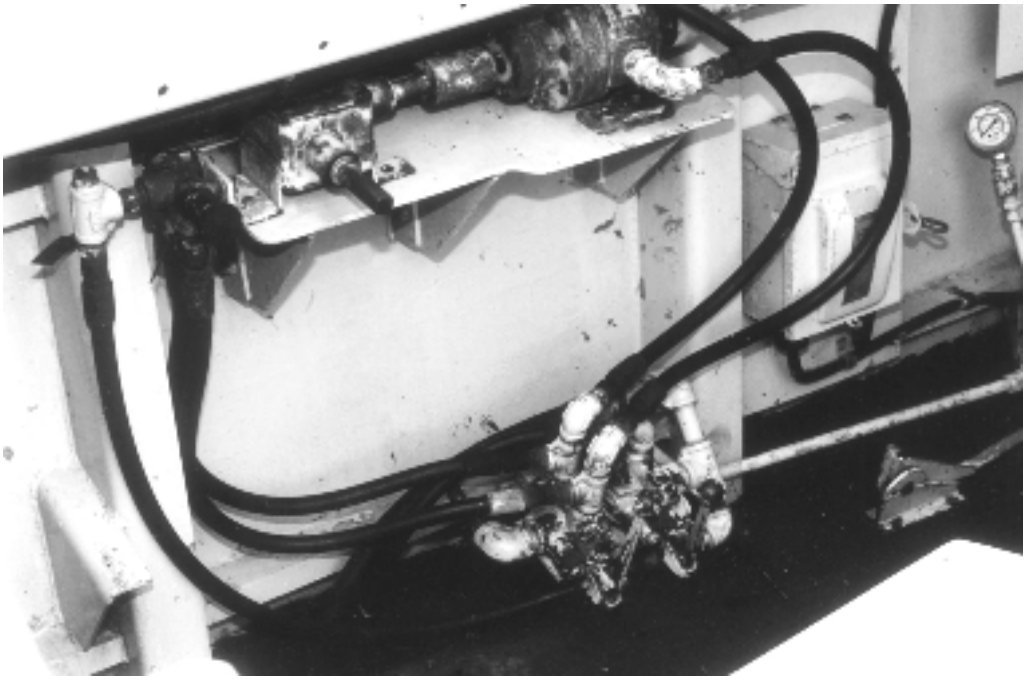

Figure 11.13-3 - LCVP Hydraulics

Figure 11.13-4 - PROTECTEUR Class Crane and LCVP

11.12.2 Manoeuvring

Since it is fitted with a single, right-hand turning propeller, when moving forward the LCVP will turn more easily to port than to starboard. When wind becomes a significant factor, a turn can be started more quickly by turning away from the wind and allowing the wind against the large freeboard to work with the rudder in making the turn. In a sudden start with a rapid application of forward throttle, the stern tends to swing temporarily to starboard. Likewise, when going astern suddenly, the stern tends to swing to port. It is difficult to go astern in a straight line as again, the high freeboard and small draft cause the LCVP to be affected by the wind. It may be necessary to periodically stop backing and apply forward thrust to control the bow.

11.12.3 Equipment Checklist

The following equipment should be stowed or made available depending on the operation:

Table 11.13-1: LCVP Equipment			
Equipment	**Qty**	**Equipment**	**Qty**
Anchor Danforth 13.5 kgs	1	Boat hook	2
Anchor line with 3 m of 10 mm chain, 92 m of 24 mm nylon	1	Search light	1
Fire extinguisher	1	Jerry can of water	1
First aid kit	1	Jerry can of oil	1
50 cm Kisby Ring with 20 m of 12 mm polypropylene	2	Fuel sounding rod	1
Grapnel hook with 30 m of line	1	Anti-broaching lines 30 m of 24 mm DB nylon	2
Berthing lines 15 m of 24 mm DB nylon	2	Broom	1
Fenders	4	Steadying lines 25 m of 12 mm polypropylene	2
Two-fold purchase with 36 m of line	1	Engineer's tool bag	1

11.12.4 Pre-Launch Checklist

The following pre-checks are to be conducted prior to flashing up the LCVP:

Table 11.13-2: LCVP Pre-Launch Checklist
Ensure both plugs are in.
Sea water intake valve fully open.
Check oil level and coolant.
Check the position of the valves on the starboard side of engine. The upper valve is the overboard cooling water discharge and should be fully open. The lower valve is the Arctic recirculation valve and should be fully closed.
Check fuel level.
Check fuel water separator valve and bleed out water.
Open fuel valve.
Check steering and tiller flats.
Check for batteries.
Check lights and horn.
Check boats equipment.
Check flares.
Check mast and ensign.
Check bow and stern lines.
Check anchor and line.

11.12.5 Engine Start/Stop Procedure

Table 11.13-3: LCVP Start/Stop Procedures	
Starting	**Stopping**
Disengage clutch.	Allow engine to idle for about 5 minutes to cool down.
Push throttle forward slightly.	Pull out manual stop handle.
Press start button.	
Check hydraulics for capstan and ramp.	
Allow to warm up.	

Engine gauge readings should be :

Oil Pressure:	60 PSI minimum @ 600 RPM
	90 PSI minimum @ 2000 RPM
Voltmeter:	25/26 Volts
Temperature:	170 to 180 Degrees F
Tachometer:	600 to 2200 RPM

11.12.6 LCVP Operations

a. **Beaching.** The proper beaching of a LCVP requires an experienced crew. The coxswain must know how to work the surf to advantage and the proper way to approach the beach. Only in extremely calm conditions and where there is little tidal range should the kedge anchor not be used. The greatest danger in beaching is that of broaching. Broaching is caused by the surf hitting the LCVP on the side or quarter, resulting in it being thrown broadside onto the beach. The approach should be made as following:

(**1**) Before entering the surf, line up the LCVP with the spot chosen to beach. Once the surf has been entered, the course should not be changed.

(**2**) Keep the LCVP at a 90-degree angle to the surf. The LCVP's angle to the surf is more important than the angle to the beach.

(**3**) Estimate the speed at which the waves are moving and adjust the speed to ride in just behind the crest.

NOTE: *If using the Kedge Anchor, let it go when 15 to 18 m from the beach.*

(**4**) Hit the beach at a good speed so that the entire keel grounds. Keep the engine in gear to hold the boat securely on the beach.

(**5**) Lower the ramp.

b. **Anti-Broaching Lines.** Anti-broaching lines are used to help prevent broaching or to help correct a broach. They should be rigged and employed according to the following diagrams.

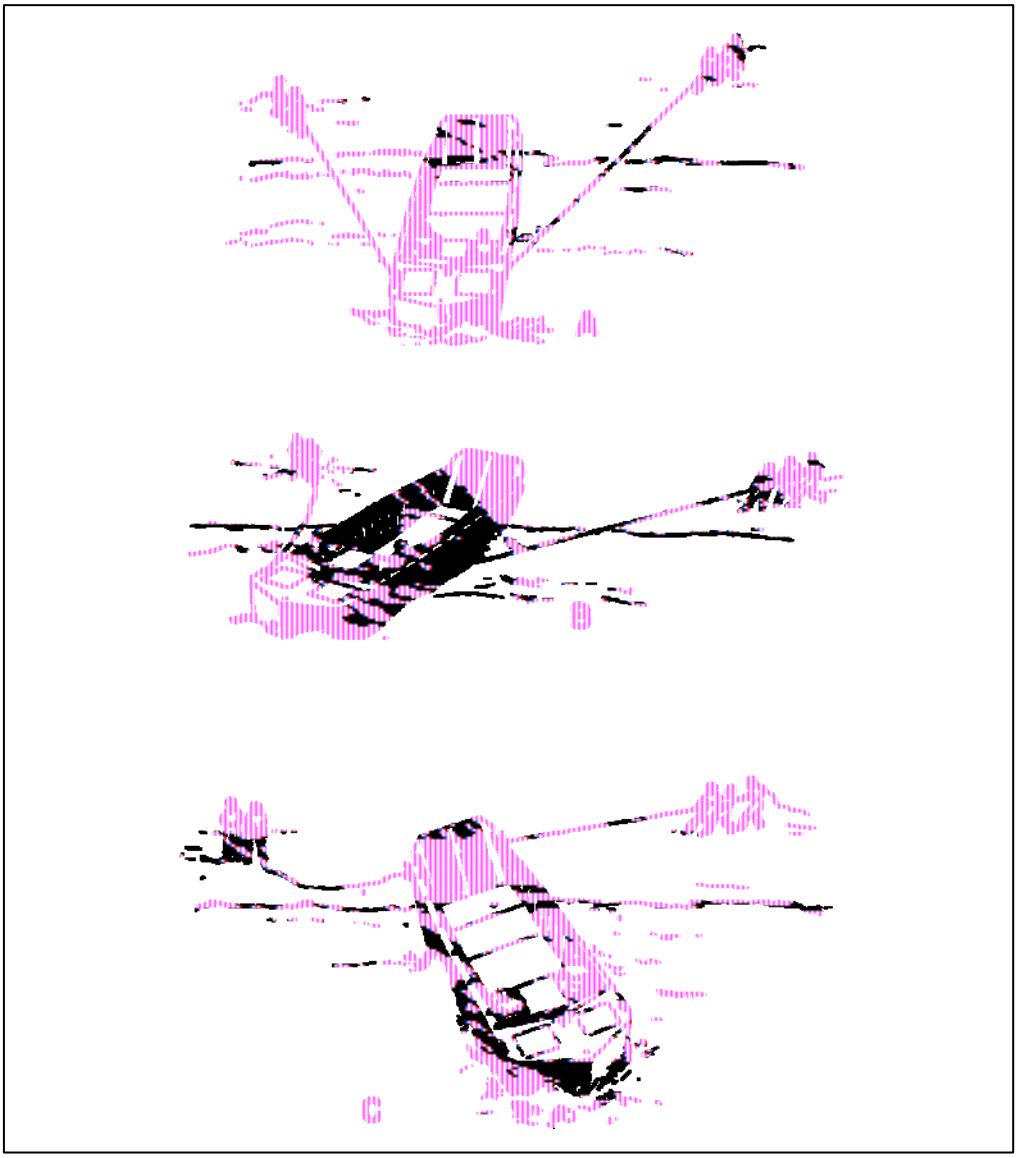

Figure 11.13-5 - Anti-Broaching Lines

NOTE: *Sometimes it is possible to free a broached LCVP without outside help. Put the rudder toward the beach and when a wave lifts the LCVP use full throttle. This should force the stern away from the shore.*

c. **Withdrawing.** Withdrawing is the most difficult part of the operation. It is during this procedure that the boat is most easily broached. The departure should be made as following:

(**1**) Close the ramp. Never leave the beach with the ramp open.

(**2**) Put the rudder amidships.

(**3**) Shift the engine into reverse. Wait for a wave to float the LCVP, then use full throttle. If the bow begins to fall off, turn the rudder in the direction of the swing. This should bring the bow back, but ease the rudder soon to avoid over correcting.

NOTE: *If using the kedge anchor, heave in on the anchor line using the capstan when the LCVP is lifted by the wave. The engine may be used to assist, but ensure the line does not foul the propeller.*

(**4**) Continue going astern, keeping the waves directly astern.

(**5**) When it is safe to come about, on the crest of the next wave shift into forward and put the helm hard over. This should cause the LCVP to come about before the crest of the next wave arrives.

11.12.7 LCVP Launch/Recovery Procedures AOR Class

PROTECTEUR class can carry two LCVPs, one on each side of the hangar. They are launched using the 15 ton fixed cranes located just forward of the flight deck. These cranes have a maximum outreach of 11 m. The double-purchase hoist uses 7/8" FSWR and a 363 kg block. Although these cranes are rated at a 15 ton lifting capacity, operators should be aware that restrictions have been issued due to structural and mechanical wear.

Table 11.13.4: PROTECTEUR Class LCVP Launch Procedures		
Order	**By/To**	**Response**
The crane operator must confirm with the MCR that sufficient power is available to operate the 15-ton crane. The operator should conduct a visual check of the crane area and flight deck and check the drums for loose or riding turns. Before starting, the control levers must be in neutral and the motors started one at a time. The ship must be stopped.		
Man the LCVP	I/C to boat's crew	Boat's crewman the LCVP.
Clear Away the LCVP	I/C to designated personnel	Prepare the LCVP for launch.
		Insert the plugs.
		Slip the securing arrangements.
		Rig fenders, bow line and after steadying line.
		Disconnect the Arctic start.
Boom Up/Slue Out	I/C to crane operator	Unhook crane from stowage cradle and slue outboard until it is over the boat.
Hook on When Ready	I/C to coxswain	Hook onto the lifting sling.
Hoist Away Handsomely	I/C to crane operator	Take minimum strain on hook.
Ready in the Boat	Coxswain to I/C	When boat is cleared away.
Ready to Launch	I/C to bridge	The boat is fully ready to be launched.
Launch the LCVP	OOW to I/C	
Hoist Away	I/C to crane operator	The LCVP is raised enough to clear the chocks. The crew is to stand on the outboard side of the LCVP.
High Enough	I/C to crane operator	Crane operator stops hoisting.
Slue Out	I/C to crane operator	Crane slues LCVP outboard.
Lower Away	I/C to crane operator	Using boom and hoist.
Slip When Ready	I/C to coxswain	
Slip	Coxswain to bowsman and engineer	The lifting sling is slipped from the crane hook.
Boom Up	I/C to crane operator	To raise the crane hook away from the crew.
Let Go Aft/Forward	Coxswain to bowsman and engineer	The bowline and after steadying line are removed and recovered on board.
Note: Always let go aft first.		

Table 11.13-5: PROTECTEUR Class LCVP Recovery Procedures		
Order	**By/To**	**Response**
Recover the LCVP	Command to I/C	Check with MCR for power.
		Make up heaving lines.
Slue Out	I/C to crane operator	Crane slued outboard.
Lower Away	I/C to crane operator	Hook lowered halfway to water.
		Wave the LCVP alongside.
		Heaving lines lowered and after steadying line and bowline brought on board.
Lower Away	I/C to crane operator	Hook lowered to LCVP using boom and hoist.
Hook On	I/C to coxswain	
Hooked On - Ready in the Boat	Coxswain to I/C	
Hoist Away	I/C to crane operator	Once hooked on the LCVP is hoisted clear of the water using the boom and then hoisted roundly.
High Enough	I/C to crane operator	When boat is high enough to clear chocks.
Slue In	I/C to crane operator	Until the LCVP is over chocks.
Lower Away	I/C to crane operator	Centering LCVP in chocks using the boom luff.
Secure the LCVP	I/C to designated personnel	The LCVP is secured for sea and reported to the Bridge.

11.13 VICTORIA CLASS

a. **IRB**. Submarines have the capability to carry a six-man IRB. Due to lack of storage for gas outboard motors are not carried on submaries.

b. **Boat Transfer.** When a boat transfer is required, the CASO, SCRATCHER and swimmer obtain permission to “Man the Tower”, then “Open the Fin Door”, then “Proceed to the Casing”.

Depending on the weather, personnel for the boat transfer will proceed to the casing via the conning tower or the accommodation space hatch.

Small boat coxswains affecting a boat transfer must usually drive their boats onto the main ballast tanks 20 to 40 ft in front of the fin at approximately a 45-degree angle. Many coxswains are reluctant to do this but it is the only way to ensure that personnel being transferred are able to step from the boat unto the bal- last tank or vice versa, rather than jumping from one moving boat to

another. The swimmer will be on the ballast tank holding onto a knotted line to assist personnel as required.

For larger boats and tugs, the transfers will take place close to the Foreplanes so as to prevent these heavier vessels from damaging the ballast tanks.

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BOOMS AND LADDERS

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12.1 INTRODUCTION

Ladders are required when a ship is at anchor or secured to a buoy. Ladders and nets can also be used to embark and disembark personnel such as harbour pilots or boarding parties. As well, the accommodation ladder can be used as a temporary gangway if required.

12.2 JUMPING/PILOT LADDER

The jumping/pilot ladder is a portable ladder, which can be lowered over the side of a ship in order to embark and disembark passengers from boats. Depending on the type of ladder its construct could consist of chain, wire or cordage side ropes that are rove through wooden treads. Through the centre of the ladder is a line called the "tricing lanyard" this lanyard is used to raise and lower the ladder. Spliced to the bottom of the ladder is a line called the "recovery line" (approximately 13 m of 18 mm Polypropylene), this line is used to haul the ladder onboard. The length of the ladder varies between classes of ship, but it must be of sufficient length that it reaches from the upper deck to the waterline.

12.3.1 Preparation

Upon confirmation by Command as to which side the ladder is to be rigged, the I/C and three to four hands will ensure that the ladder, and two 3/4" bow shackles are laid out at the rigging position.

12.3.2 General Procedures

(**1**) The inboard end of the ladder is shackled to the eyepads as per class diagrams (**2**) The recovery line is untied and led forward until needed.

(**3**) The tricing lanyard is untied and if available secured to a cleat.

(**4**) The bottom two guardrails are broken.

(**5**) The ladder is lifted over the side and the tricing lanyard and recovery line are checked away until the ladder is just above the waterline. The two lines are secured.

> **NOTE**: *All ladders require anti-twisting battens. These are rigged at 3 m intervals and are normally 1.2 m in length.*

12.3.3 Recovery

(**1**) Shorten in as much as possible by heaving in on the tricing lanyard. The recovery line is then used to haul the ladder inboard.

(**2**) All guardrails are re-rigged and the ladder disconnected and secured for sea.

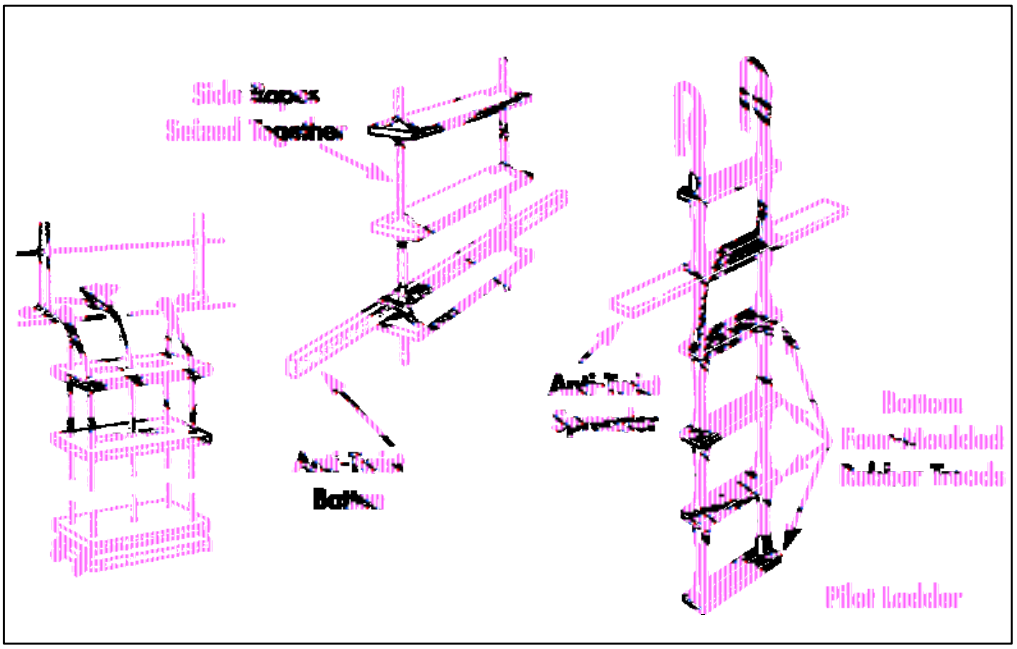

Figure 12.3-1 - Jumping Ladders

12.4 ARTICULATING ACCOMMODATION LADDER

Conditions of Use

The AAL is not designed for use while underway, but may be authorized in Sea State 2 or less, provided that the following procedures are used:

(**1**) The ship provides a lee when appropriate, for the entire period during which personnel are on the ladder.

(**2**) While embarking and disembarking personnel the ship shall not exceed 5 knots.

(**3**) When the AAL is in the down position, the combination chain and nylon strop bridal must be rigged so the lower platform is flush with the water. This will ensure the RIB is not caught underneath the lower platform while personnel are on the AAL.

(**4**) Recover the AAL to deck level on the bail bracket, or secure it on the lower platform utilizing the Davit stanchion with a lashing. This will prevent damage to the AAL caused by the ship's motion when manoeuvres are conducted at speeds in excess of 7 knots.

Equipment Required

The following equipment is required.

a) Lifting Bridle
b) Lower Platform
c) Chain Bridle
d) Upper Platform Stanchions
e) Dump Light
f) 3 Fold Purchase (300ft Samson Braid)
g) HDLJ's
h) Boat Hook
i) Small Boat Fender
j) 6 inch snatch Block
k) 5-point Harness
l) Spreader
m) Spreader tag line: and
n) 10 ft nylon strops

Personnel Required

a) I/C QL6A or above Bosn
b) 1 – Spreader tender
c) Line handling winch operator; and
d) Line handlers

Procedures for Rigging the Ladder Outboard

The following are the requirements for rigging the ladder outboard.

a) Connect the 3-fold purchase to the eye located in the center outboard side of the ladder. The inboard end of the 3-fold purchase is hooked to the davit;
b) Swing the bail bracket outboard and pin the support leg, disconnect the inboard ladder brackets;
c) Check away on the 3-fold purchase until the weight of the ladder is transferred to the bail bracket;
d) Transfer the 3-fold purchase to the lower lifting bridal and then rig the ladder railings;
e) Connect the upper part of the combination chain/nylon strop bridal to the davit and then connect the lower portion to the lifting points just forward of the lower stanchion.
f) Attach the spreader tag line to the spreader;
g) Secure the nylon strops to the railing with bungee cord (this will prevent the strops from getting fouled in the rigging when lowering and raising the ladder);

h) Transfer the weight of the ladder to the 3-fold purchase;
i) Swing the bail bracket inboard and secure with pin; and
j) Lower the ladder.

NOTE: *Reverse the procedure for securing the ladder inboard.*

Procedures for Lowering and Raising the Ladder

The following are the procedures for lowering and raising the AAL

Lowering the Ladder

a) Check away on the 3-fold purchase while simultaneously the spreader tag line is manned. This will ensure the spreader does not get fouled;
b) The ladder is lowered to the water line and the weight is transferred from the 3-fold purchase to the chain bridal;
c) The spreader tag line tender descends the ladder and removes the outboard leg of the 3-fold purchase by lifting the bridal (this allows for a clear route to embark the RIB from the lower platform); and

d) The boarding team/guests can at this time be embarked into the RIB on the direction of the ladder I/C.

Raising the Ladder

a) The hauling part of the 3-fold purchase is led to the line-handling winch utilizing the 6-inch snatch block. This is rigged on deck in line with the ladder davit;
b) Place three (3) turns on the line handling winch;
c) The spreader tagline tender remains on the platform at the top of the ladder in preparation to hoist the AAL;
d) The order " Hoist Away" is given. When the ladder is at deck level the order "High Enough" is given; and
e) The hauling line on the 3-fold purchase is then veered as it is simultaneously turned up on the davit cleat.

Officer of the Watch Considerations

The OOW must ensure the following details occur:

a) When lowering the AAL ensure the ship's speed is no more than 5 knots, depending on the sea state. The RIB and AAL are launched as concurrent activities and this speed will facilitate both operations;
b) Provide a lee as appropriate for AAL and RIB;
c) When turning to Port the least amount of helm is used to ensure the ladder is not dragged in the water; and

HF Transmissions often exceed 250 watts. It is imperative that RADHAZ precautions are met prior to sending personnel out to launch the RIB and AAL IAW MARCORD 43-02

12.5 JACOB'S LADDER

a. Jacob's ladders are constructed from steel wire rope strings 30 centimetre (cm) apart, and round wooden rungs (Canadian Elm) which are 40 cm long by 3.5 cm diameter. The rungs are inserted into the wire rope at 30 cm centres, so that three strands are on each side, and wire seizings are placed above and below to hold the rungs in position. When the ladder is used in conjunction with boat booms, a round thimble is seized in the bight of the wire to which the lazy painter of a boat can be secured.

b. These ladders are also fitted at hatches that are on escape routes from manned compartments and accommodation spaces. They are shackled at their upper ends to eyeplates and are stored rolled until required when their lower ends are secured to eyeplates by cordage tails. If these ladders are used against a vertical bulkhead, a pad should be secured between the top of the ladder and the bulkhead so that the ladder lies away from the bulkhead and provides better hand and foot holds.

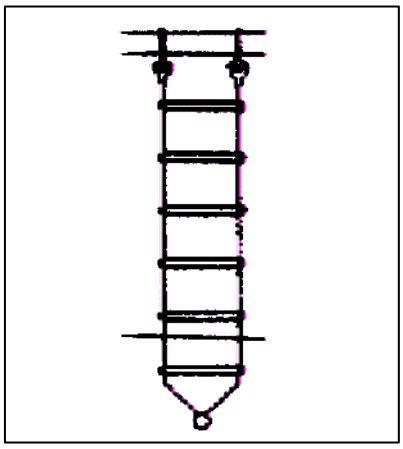

Figure 12.5-1 - Jacob's Ladder

12.6 ACCOMMODATION LADDER

The standard accommodation ladder has an upper and lower platform for easy embarkation/ disembarkation. The ladder hinges from the after end of the upper platform, which in turn hinges to the main deck. The lower platform is bolted to the ladder and supported by two stays fastened to the ladder. Both the lower platform and the ladder are held to the ship's side with struts. The lower platform has two positions to keep the platform at a convenient height above the water depending on the ship's draft. The gangway fittings or "furniture" consist of handrails that are supported by lightweight stanchions mounted on the ladder and platforms. Accommodation ladders are not carried in the KINGSTON or ORCA Class.

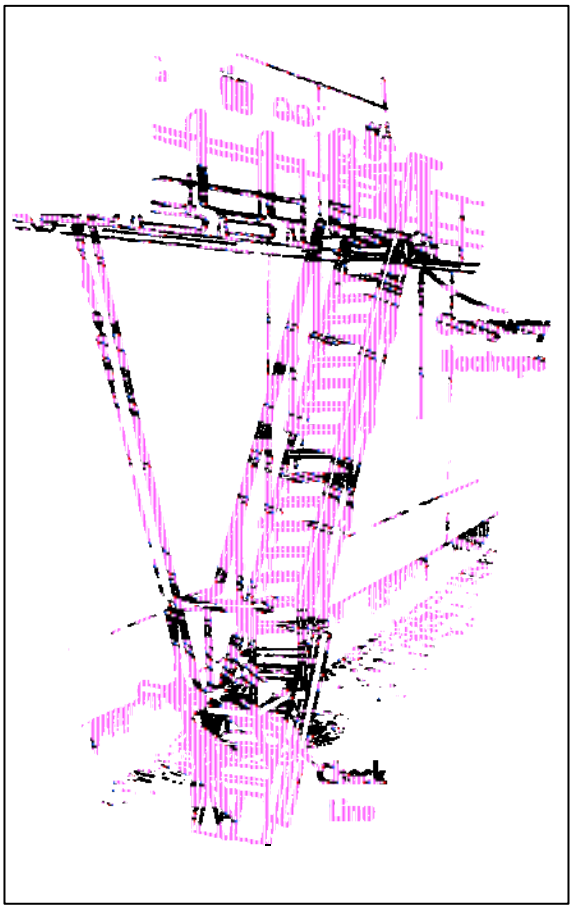

Figure 12.6-1 - Accommodation Ladder (General)

12.6.1 Personnel and Equipment

a. The I/C shall be a 6A or above Bosn . A crane operator will be required as well as eight to twelve hands to assist with the rigging. Personnel required to rig/de-rig the ladder can be drawn from the quarterdeck or top part ship hands

b. The following table lists the equipment required to rig the accommodation ladder.

Table 12.6-1: Equipment–Accommodation Ladder	
Block and tackle	Handrail stanchions
Handrails	Upper platform
Lower platform	Wishbone
Bridle	Lower platform stays
Two-legged Sling (IROQUOIS)	Forklift (AOR)

12.6.2 Preparations – IROQUOIS Class

(**1**) The two-legged sling is fitted to the lugs at the head of the ladder, while the chain bridle is secured to the lugs at the foot of the ladder.

(**2**) A preventer (tag line) is passed around the ladder's upper side.

(**3**) The heavy stores davit is removed from its stowage and placed in the step near the foot of the ladder.

(**4**) The fore and after guys and the ladder pendant are secured to the ring of the chain bridle. The tackle is secured to the same ring.

12.6.3 General Procedures – IROQUOIS Class

(**1**) The tackle is heaved in and secured to the davit cleat.

(**2**) The crane is hooked on to the two-legged sling at the head of the ladder.

(**3**) The upper platform is placed in its brackets. With one line around the outboard cleat and another attached to the legs, the upper platform is lowered into position.

(**4**) The grips are removed from the ladder and the ladder is heaved in with the HIAB crane. As the ladder comes up, it will tend to fall outboard. The rate of fall is controlled by the preventer.

(**5**) The ladder is lowered to the waterline.

(**6**) The stanchions, hand rails, and lower hull lugs are then inserted in place. If the ladder is to remain rigged for an extended period of time, the tackle is removed.

12.6.4 Recovery – IROQUOIS Class

(**1**) All furniture and stanchions are removed.

(**2**) A block and tackle is rigged to the lower end of the ladder and the ladder is hoisted to deck level.

(**3**) The bottom platform is removed and the HIAB crane is hooked onto the upper end of the ladder.

(**4**) The ladder is disconnected from the upper platform. Using the crane, davit and two preventers, the ladder is secured in its stowage position.

(**5**) The upper platform is removed from its bracket, and all gear is secured.

12.6 5 Preparations – PROTECTEUR Class

(**1**) Upon confirmation by Command as to which ladder will be used (AORs have one ladder stowed on either side), the hand winch falls are rigged on the ordered side, and hooked to the accommodation ladder yoke. The slack is taken up.

(**2**) The steadying lines are then secured to the accommodation ladder and the securing gripes removed.

12.6.6 General Procedures – PROTECTEUR Class

(**1**) Two steadying lines are secured to the ladder. One is secured at the centre rung bracket and then tied on to the mast on the forklift (positioned nearby). The second line is secured to the bottom outboard bracket and then turned up on the nearest deck cleat.

(**2**) With the weight taken up by the hand winch and using the steadying lines, the accommodation ladder is lowered to the horizontal position. Ensure that the wishbone is fully extended under the upper platform.

(**3**) The steadying lines are removed and the stanchions are placed in the appropriate fittings on the ladder and platforms. The hand rails are then fitted to the stanchions. (Hand rails are constructed of cordage versus wood.)

(**4**) The mobile accommodation platform is hoisted outboard by the mobile crane, lowered and positioned underneath the lower platform of the accommodation ladder.

(**5**) A hand who is wearing a life jacket and a safety harness descends the ladder and hooks on the mobile platform securing chains.

(**6**) The after end of the platform is secured by a two-legged sling attached to a two-fold purchase rigged from a beam clamp on the lower bulwarks.

Figure 12.6-2 - Accommodation Ladder and Platform PROTECTEUR Class

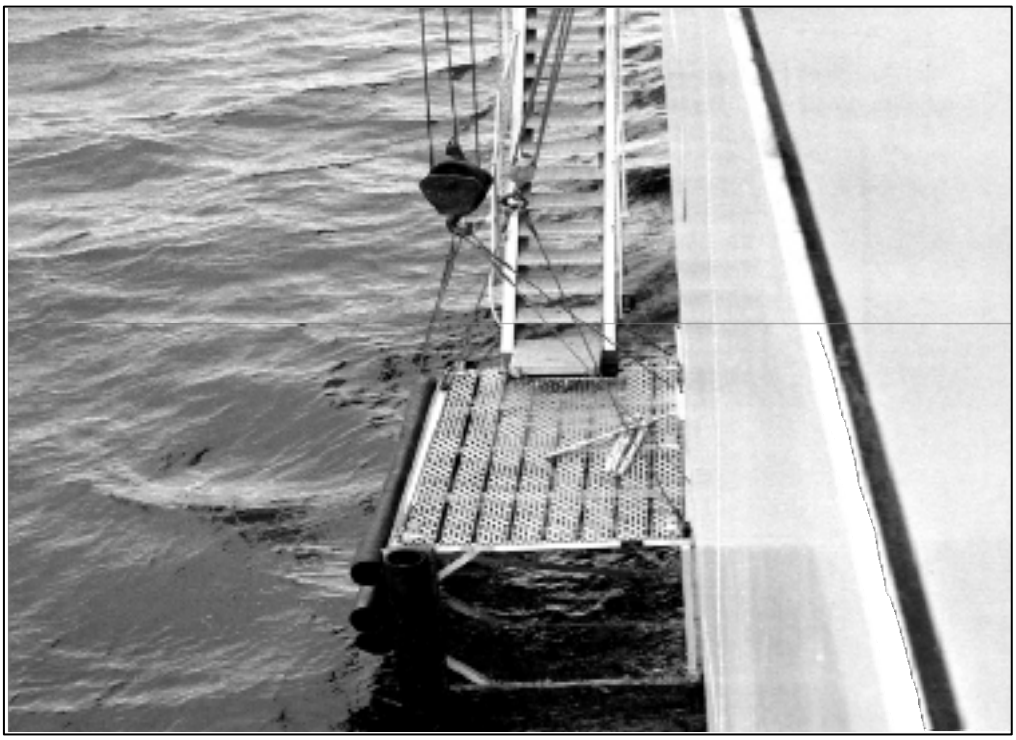

Figure 12.6-3 - Accommodation Ladder and Platform PROTECTEUR Class

12.6.7 Recovery – PROTECTEUR Class

(**1**) A mobile crane is set up on the top part of the ship and secured to the mobile platform.
(**2**) The ladder and platform are raised until the ladder is horizontal.
(**3**) A hand who is wearing a life jacket and a safety harness is sent outboard to de-rig the hand rails and stanchions and rig steadying lines.
(**4**) The ladder is turned inboard by heaving in on the steadying lines (one again tied on to the mast of the forklift), and is then hand winched into its chocks and secured with gripes.
(**5**) The yoke is disconnected and all gear is secured.

12.7. HALIFAX CLASS ARTICULATED ACCOMMODATION LADDER

12.7.1 Personnel Required

e) I/C QL6A or above Bosn
f) 1 – Spreader tender
g) Line handling winch operator; and Line handlers

12.7.2 Equipment

The following equipment is required.

(a) articulated accommodation ladder
(b) chain bridal
(c) lifting bridal
(d) lower platform
(e) safety step
(f) upper platform stantions
(g) dump light
(h) crane or 3-fold purchase
(i) 20 ft strop
(j) 5 point safety harness
(k) HDLJ
(l) 3 Fold purchase
(m) 6” snatch block

12.7.3 Preparation

(a) Attach lower platform to bottom of ladder in position as required by operating conditions.
(b) Extend bail bracket into a position perpendicular to ship’s side and pin in position.

(c) Attach one strop forward outboard of the pin securing the ladder to the forward stanchion and one strop aft outboard of the pin securing the ladder to the after stanchion. (if using crane)

(d) With the crane being outboard of the ladder approximately 6", take the slack so the weight can be evenly distributed between both strops.

(e) Remove securing pins from storage bars, hook on the chain bridal and manually push the ladder until the crane has all the weight.

(f) Ship down until ladder is resting in position on the bail bracket.

(g) Once the ladder is on the bail bracket, send one person on the ladder to disconnect the strops. Hook on the hoisting sling assembly to lower after eyes at the bottom of the ladder hook the ring to the crane ("Alternate" hook upper block of 3-fold purchase to aft eye in davit head lower block to ring of the hoisting sling). Hook single leg of chain bridal to the forward eye of the accommodation ladder davit.

(h) Raise handrails, rig upper and lower platform's stanchions and handrails

(i) The same person will place the chain bridle and strong back (spreader bar) on the ladder using a rope to prevent it from falling in the water until the lower chains are hooked up to their appropriate position. Lash the spreader bar and the upper chain on the steps and clear ladder of all personnel.

(j) Remove pins from all hinged horizontal support braces from ladder and using crane if necessary, raise ladder about 1/2" and move ladder outboard until all the support braces are removed and inboard.

(k) Hoist ladder approximately 3" off bail bracket, secure bail bracket into its ships side stowage position. Remove lashing from spreader bar attach a tethering line to spreader bar. Lower ladder to full down position.

(l) Secure the turnbuckle assembly to the ship's side and using the ship's crane to slew inboard to enable personnel to hook on the turnbuckle assembly to the lower platform.

(m) Have person remove hoisting sling assembly that was used to lower ladder in position and secure the crane.

(n) Place bumper on the lower platform.

.

12.7.4 Recovery

(a) Secure the upper platform stanchions and handrails, lower ladder handrail for the stow position remove bumper and turnbuckle, hook on tethering line to spreader bar and hook on the hoisting sling assembly and hook on to the crane (Alternate 3 fold purchase).

(b) Whip up until the ladder clears the bail bracket, place bail bracket it out position, slew inboard to place the ladder on the bail bracket.

(c) Using the crane, slew the ladder in place in all hinged horizontal support braces and put securing pins in. Remove chain bridle assembly.

(d) Disconnect hoisting sling assembly from the ladder and the crane.

(e) Attach one strop forward outboard of the pin securing the ladder to the forward stanchion and aft outboard of the pin securing the ladder to the after stanchion.
(f) Whip up and slew inboard until the ladder is in place in its stowed position.

(g) Put securing pins to hold ladder in its stowed position, disconnect and secure the crane.
(h) Remove strop and secure ladder and equipment for sea.

HALIFAX Class Articulated Accommodation Ladder

12.7.5 Procedure While Used as a Brow

When using the articulated ladder as a brow the steps are the same as for when at anchor with the exception of the following.

(a) The safety step is secured on the ladder instead of the lower platform.
(b) There is no requirement to use the spreader bar.

12.7.6 Use While Underway

The AAL is not designed for use while underway, but may be authorized in Sea State 2 or less, provided that the following procedures are used:

(**1**) The ship provides a lee when appropriate, for the entire period during which personnel are on the ladder.

(**2**) While embarking and disembarking personnel the ship shall not exceed 5 knots.

(**3**) When the AAL is in the down position, the combination chain and nylon strop bridal must be rigged so the lower platform is flush with the water. This will ensure the RIB is not caught underneath the lower platform while personnel are on the AAL.

12.7.7 Officer of the Watch Considerations

The OOW must ensure the following details occur:

d) When lowering the AAL if used for boarding opertions the ship's speed is no more than 5 knots, depending on the sea state. The RIB and AAL are launched as concurrent activities and this speed will facilitate both operations;
e) Provide a lee as appropriate for AAL and RIB;
f) When turning to Port the least amount of helm is used to ensure the ladder is not dragged in the water; and
g) HF Transmissions often exceed 250 watts. It is imperative that RADHAZ is considered IAW MARCORD 43-02

12.8 POLLUTION CONTROL BOOMS

12.8.1 Introduction

a. Containment is the most important phase in the control of an oil spill. It prevents the spread of the oil on the water, thus minimizing environmental damage. Successful containment is very dependent upon response time. The principal containment device is the oil boom.

b. Booms are normally controlled and deployed by harbour authorities such as the Queen's Harbour Masters in Halifax and Esquimalt. However, there are occasions where ship's staff will be required to deploy the boom. For instance, in Halifax, if fuelling at the Imperial Oil Ltd. jetty, it is the responsibility of the fuelling ship to deploy the boom. As well, both dockyards have fitted boom reels on each jetty. In the event of a fuel spill alongside, it is again the responsibility of the ship spilling the fuel to deploy the boom.

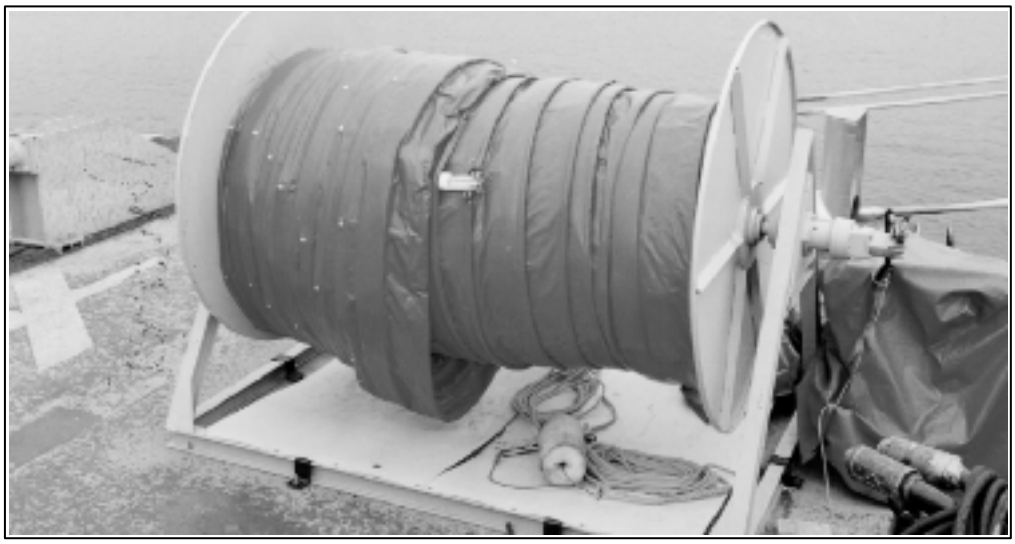

Figure 12.8-1 - Pollution Control Boom on Reel

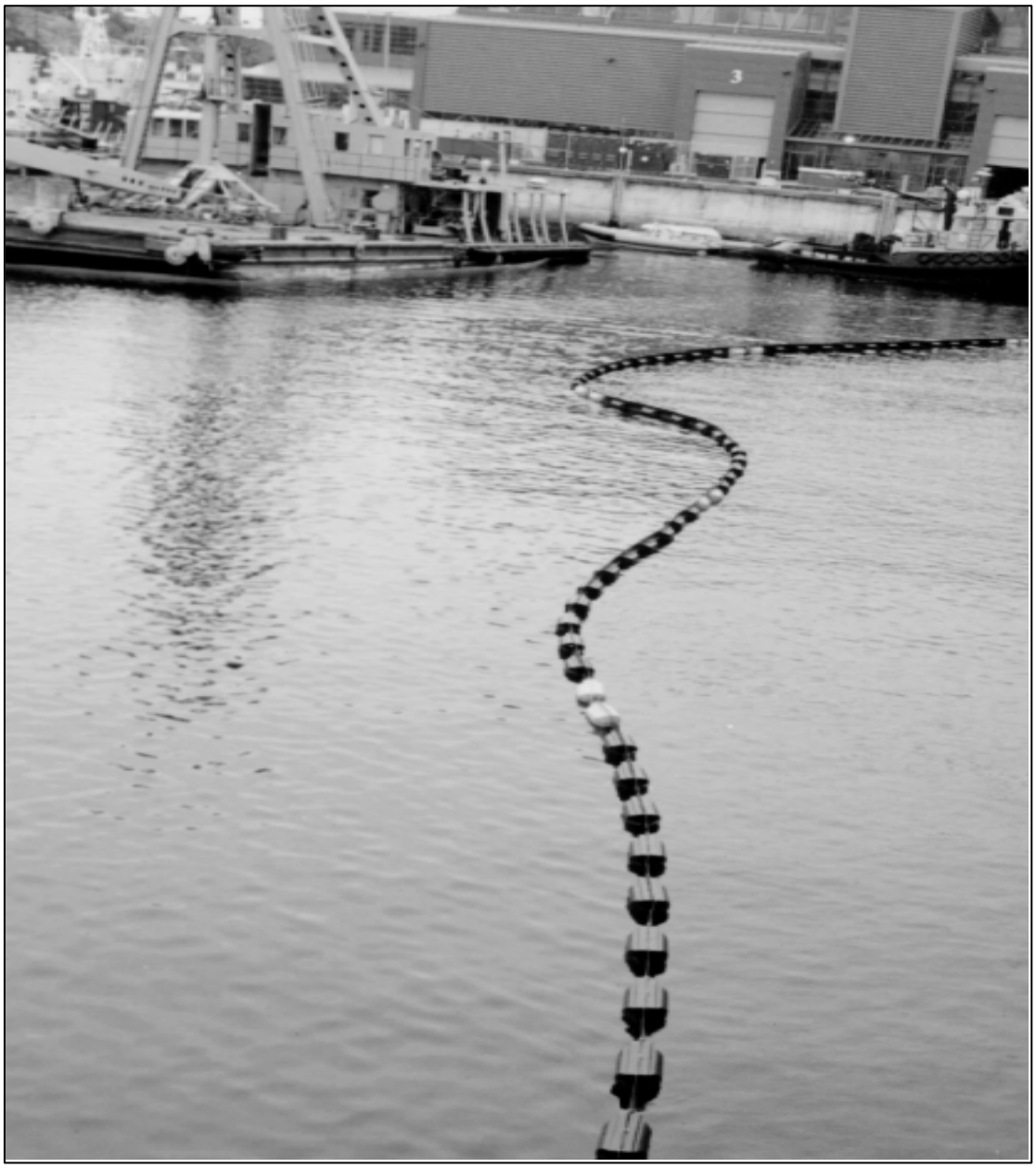

Figure 12.8-2 - Pollution Control Boom Deployed

12.8.2 Oil Booms

a. An oil boom is a man-made barrier placed on the water to prevent the spread and/or movement of distillates. There are many different types, shapes and sizes of booms available for this purpose. Booms have five basic components: flotation, skirt, tension member, ballast, and a coupling device. Other physical features are length, anchor points, lifting straps and colour.

b. Oil booms need enough draft or skirt to retain the anticipated spill. They also need enough freeboard or sail to keep the spill from splashing over the top of the boom. To maintain these

capabilities in the face of current and waves, the boom requires stability and heave response. Stability is the ability to resist rotation and keep the skirt upright. Adding ballast to the bottom of the skirt improves stability. However, a stiff skirt and flotation which provides a counter moment is more effective. Nonetheless, all booms, regardless of design, fail in stability at approximately two knots of current.

c. Heave response is the ability of the boom to follow the contours of the waves. The boom must not submerge in a crest, nor come out of the water in a trough. To accomplish this, the boom requires maximum flexibility. Strength requirements often dictate the use of a deeper skirt and an extended sail to provide better heave response. This approach allows the water to move up and down on the skirt. Open water booms will have deep skirts.

d. To the inexperienced, pulling a boom onto the water may seem simple and uncomplicated; however, it is not. Wind, current, launching craft, dock conditions and boom length are variables that must be considered.

12.8.3 Launching an Oil Boom

(**1**) A proper bridle and/or paravane required for the prevailing conditions is to be selected and attached to the boom.

(**2**) A towing craft with adequate power (e.g., RIB, IRB) to tow the boom and manoeuvre in prevailing winds and current is to be used.

(**3**) All obstacles on the dock in the path of the boom are to be removed. Protruding nails or dock edges will easily tear boom materials. A roller or slide guide should be provided to reduce the chance of dock tears and to speed up the launching process.

(**4**) Extra personnel will be required to guide the boom out of its shoreline location.

(**5**) Plan to launch the boom in an upwind direction. Pulling at an angle to the wind direction will result in a curved launch, which can create problems at the launch site. The same applies to current, especially if it is strong.

(**6**) Allow 25 to 50 feet of rope or cable between the towing craft and the bridle of the paravane. This will permit the paravane or forward end of the boom to sit properly in the water during towing. Too short a line will pull the paravane or forward end of the boom out of the water. Too long a line requires more launching distance and adversely affects the towing radius. Straight line towing with a tow vessel producing a large wake requires more lead rope, approximately 60 to 100 metres.

(**7**) Move slowly while towing the first section of the boom off the shoreline location. This allows the boom to enter the water without excessive strain from the towing craft. As the length of boom on the water increases, the boat can increase speed. Take care not to feed a boom from the shoreline faster than the speed of the towing craft. This will result in a pile-up and possible entanglement of the boom at the water's edge. A slow but smooth and uninterrupted launch will nearly always improve response time.

(**8**) Communicate with the Coxn of the towing craft by voice or hand signals when launching short sections of boom. When launching booms of greater length, good radio communication is essential for a proper and trouble-free launch.

12.8.4 Boom Recovery

(**1**) The recovery of a boom from the water after use is as important to the overall effectiveness of pollution containment as is the launch. Carelessness at this stage of the operation may cause damage that renders a boom useless or re-pollutes the water. When a boom comes in contact with the oil spill, some of the oil will adhere to the boom and soil it. The degree of soilage can range from slightly stained to entirely coated with a tar-like substance. After completion of the clean-up, the boom is to be towed slowly to its place of recovery to avoid contaminating the water. Rapid towing of the boom may wash off some of the oil, thus creating another spill.

(**2**) In removing the boom, handle it by its lifting strops versus the floats. Avoid dragging it over any rough surfaces, protruding nails or torn, rough lumber. Have sufficient personnel on the site to adequately and carefully recover the boom from the water. A surplus of personnel is not a waste, but rather a frugal insurance measure.

CHAPTER 13

KINGSTON CLASS PAYLOADS

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13.1 Introduction

a. KINGSTON Class ships have been designed to fulfill a number of mission requirements. Details of KIN Class capabilities can be found in the KINGSTON Class concept of operations .

b. KINGSTON Class employ the temporary fitting of mission-specific, interchangeable, modular payloads on the sweep deck to support the above three tasking areas. In addition, a fourth accommodation payload is embarked on occasion to house extra staff.

c. The mission payloads are delivered in containers while alongside. Installation normally takes between 12 to 24 hours. Jetty cranes and In Service Support Contract (ISSC) personnel are employed to physically load and secure the containers on the sweep deck, with assistance being provided as required by the ship's Bosns. The accommodation payload is loaded by dockyard riggers. The ISSC is also responsible for ensuring all equipment is present and all systems run up and checked.

d. Once at sea, the rigging, launch and recovery of the equipment is conducted by the ship's company. Specialized MOC training required to operate and deploy the equipment is still being refined in conjunction with post-acceptance equipment trials. Detailed sequence of events and preparation equipment layout for each payload can be found in CFCD 126 SOPs for mine countermeaures and under water system payloads and equipment.

13.2 Seabed Inspection

a. The seabed inspection payload consists of a Bottom Object Inspection Vehicle (BOIV) and supporting equipment. Due to the nature of BOIV operations, anchor and windless maintenance routines must be increased in frequency to match the useage This Remote Operated Vehicle (ROV)is deployed to inspect suspicious objects (submerged on the bottom) that have been detected. The ships crane is used to launch and recover the ROV, as well as to support the umbilical cord. From a seamanship perspective, crane operation is all that is required as clearance divers will be embarked with the payload to operate the BOIV.

b. The requirement to dedicate the ship's crane in support of BOIV operations means that the crane will not be available for boat work. Therefore, an IRB must be launched prior to deploying the BOIV in the event that it is needed for rescue operations. In addition, the ship will anchor, moor, or reduce speed to bare steerageway whenever operating the BOIV.

c. The ROV itself is of aluminum construction, weighs 734 kg, and can dive to depths of 300 m at a maximum speed of 4 knots. It is delivered in an ISO container. Rails are extended from the rear door of the container and over the MMS Pedestal. The ROV is then pulled out using block and tackle, and launched by crane from that position.

d. The primary reference to be consulted is the Mine Inspection Payload Manual - Isherwood Number BO 001-00.

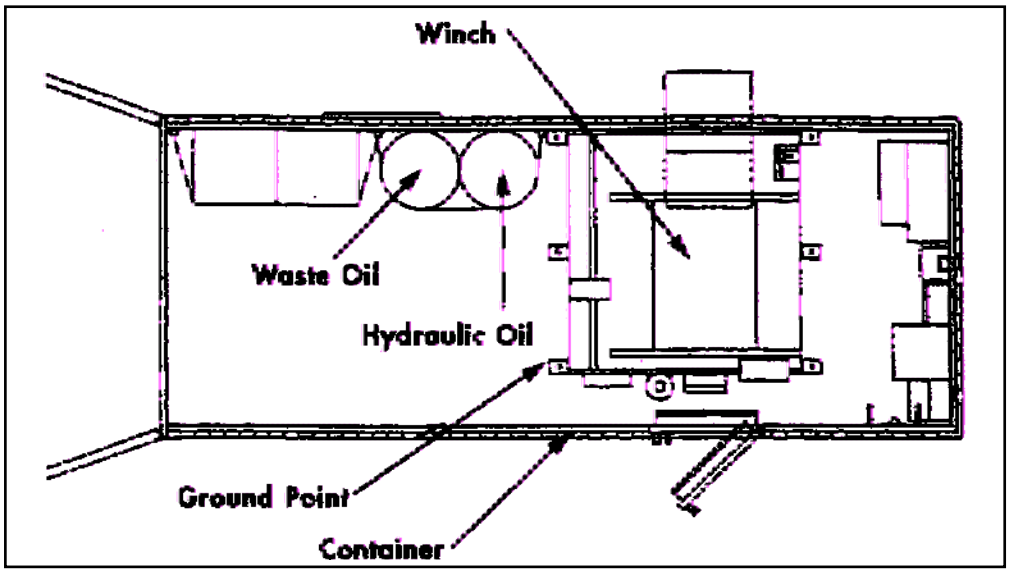


Figure 13.3-1 - Container Layout Schematic

Figure 13.3-2 - ROV

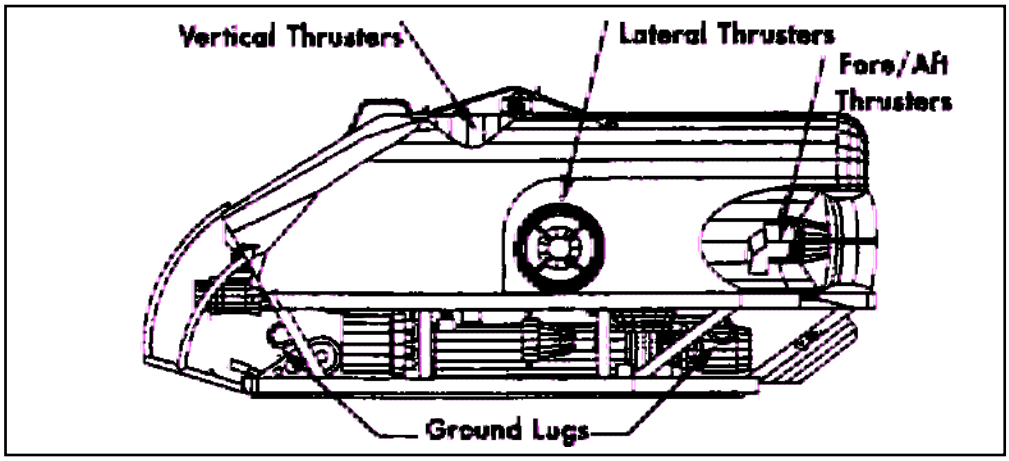


Figure 13.3-3 - BOIV Deployed

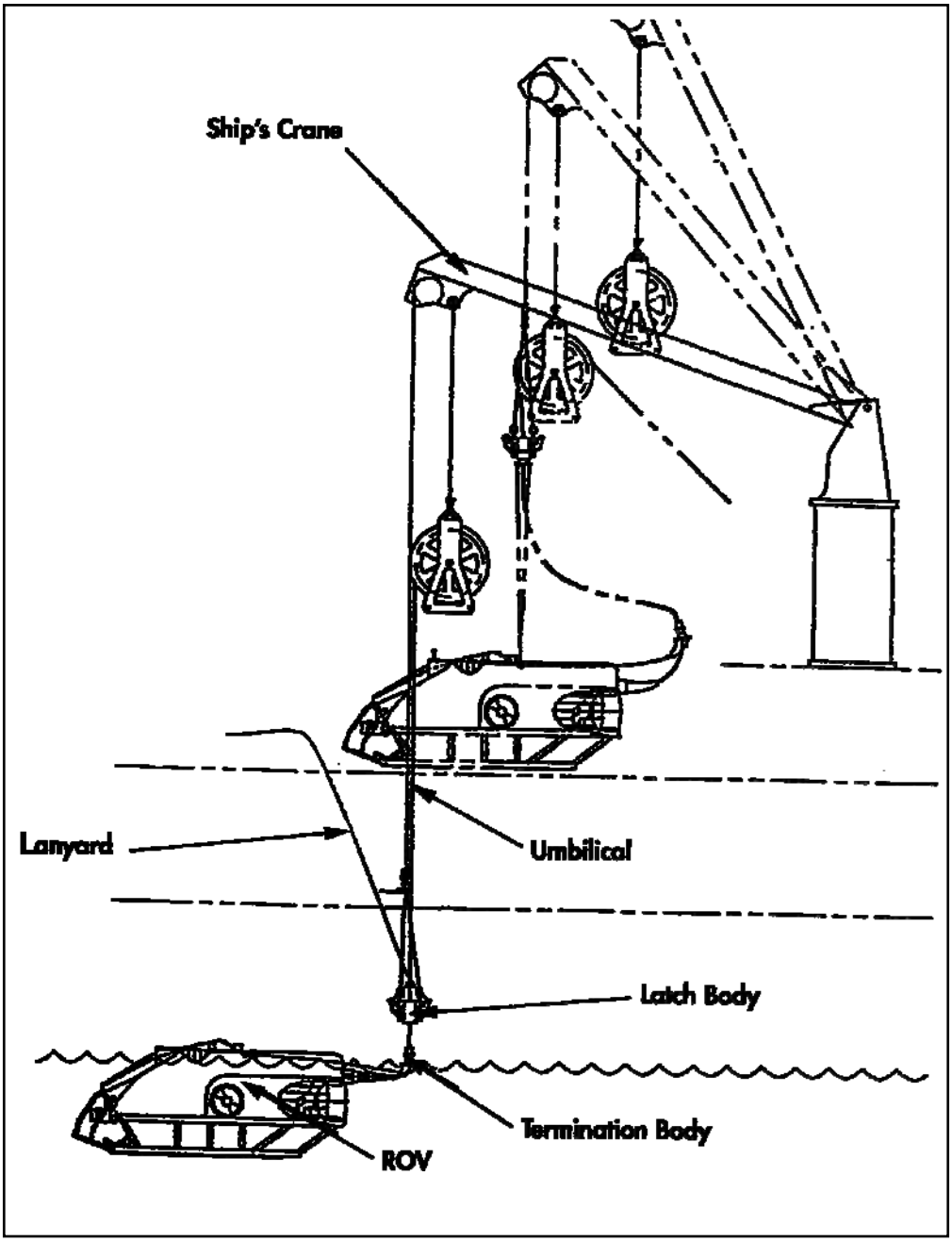


Figure 13.3-4 - BOIV Launch and Recovery

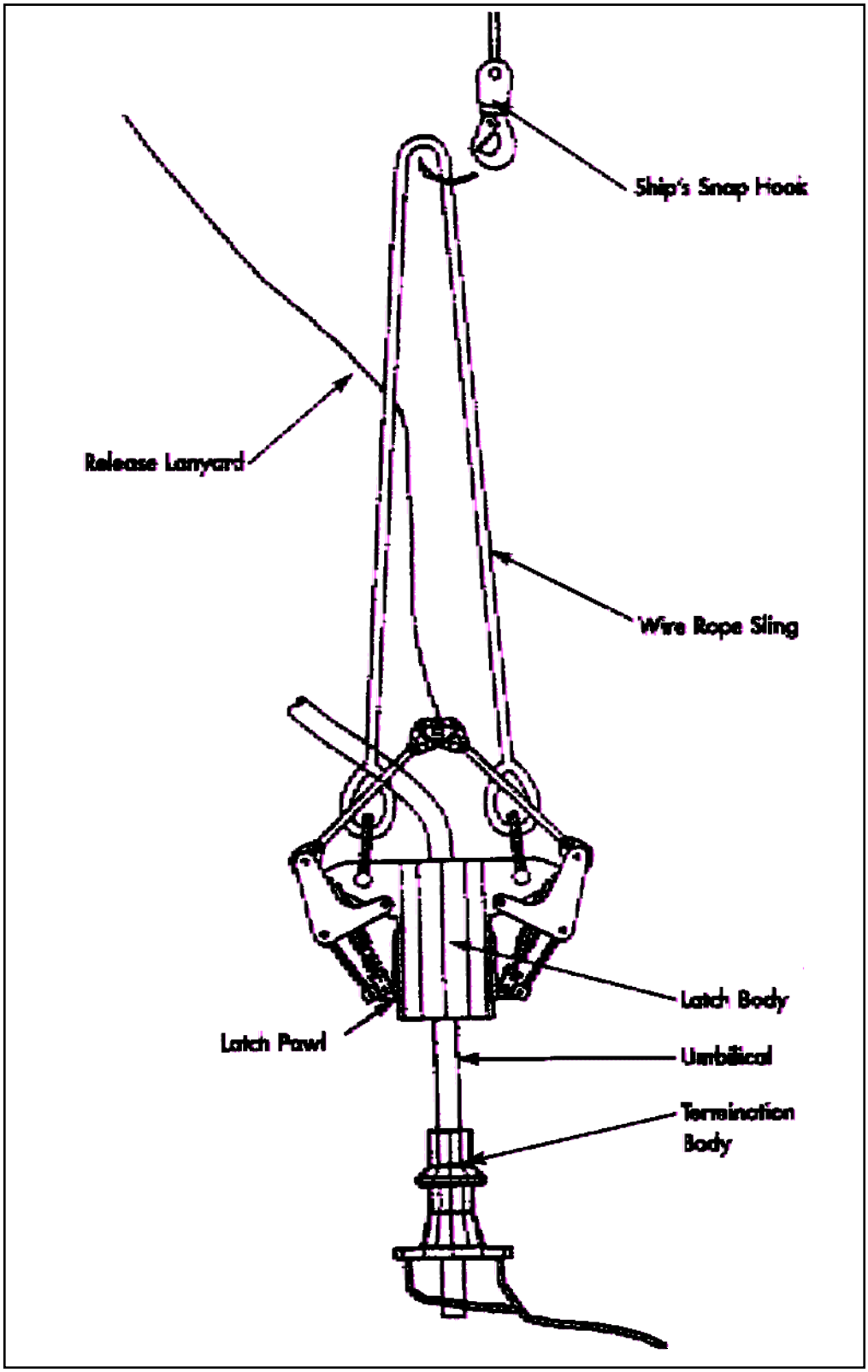


Figure 13.3-5 - Release and Capture Mechanism

Figure 13.3-6 - Release and Capture Mechanism

13.3 Route Survey

a. The route survey payload consists of a highly capable, multi-beam, side-scan sonar, which is fitted in a stern-launched towfish. The controller and process- ing equipment is installed on board ship. It is used primarily to develop a detailed knowledge of the ocean floor by identifying the nature and location of all objects along selected shipping routes, anchorages and harbours. The towfish can be launched, towed and recovered in sea conditions up to and including Sea State 4.

b. The self-contained payloads are mounted on the after ISO footings. Procedures for the deployment and operation of the towfish are being developed and will be incorporated in future amendments to this chapter.

Figure 13.3-1 - Route Survey Payload

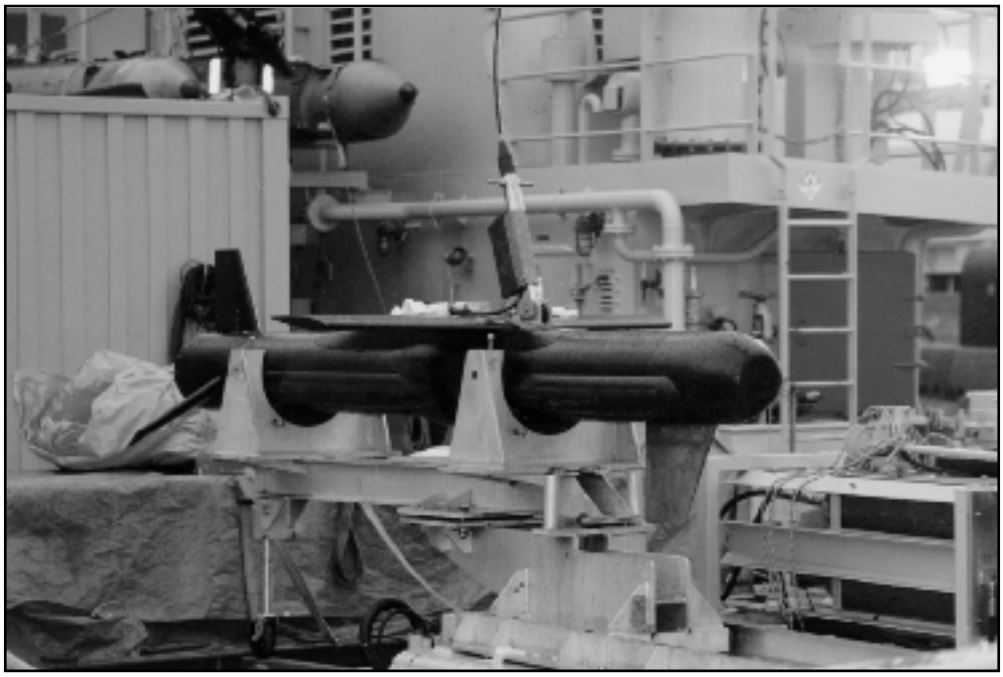
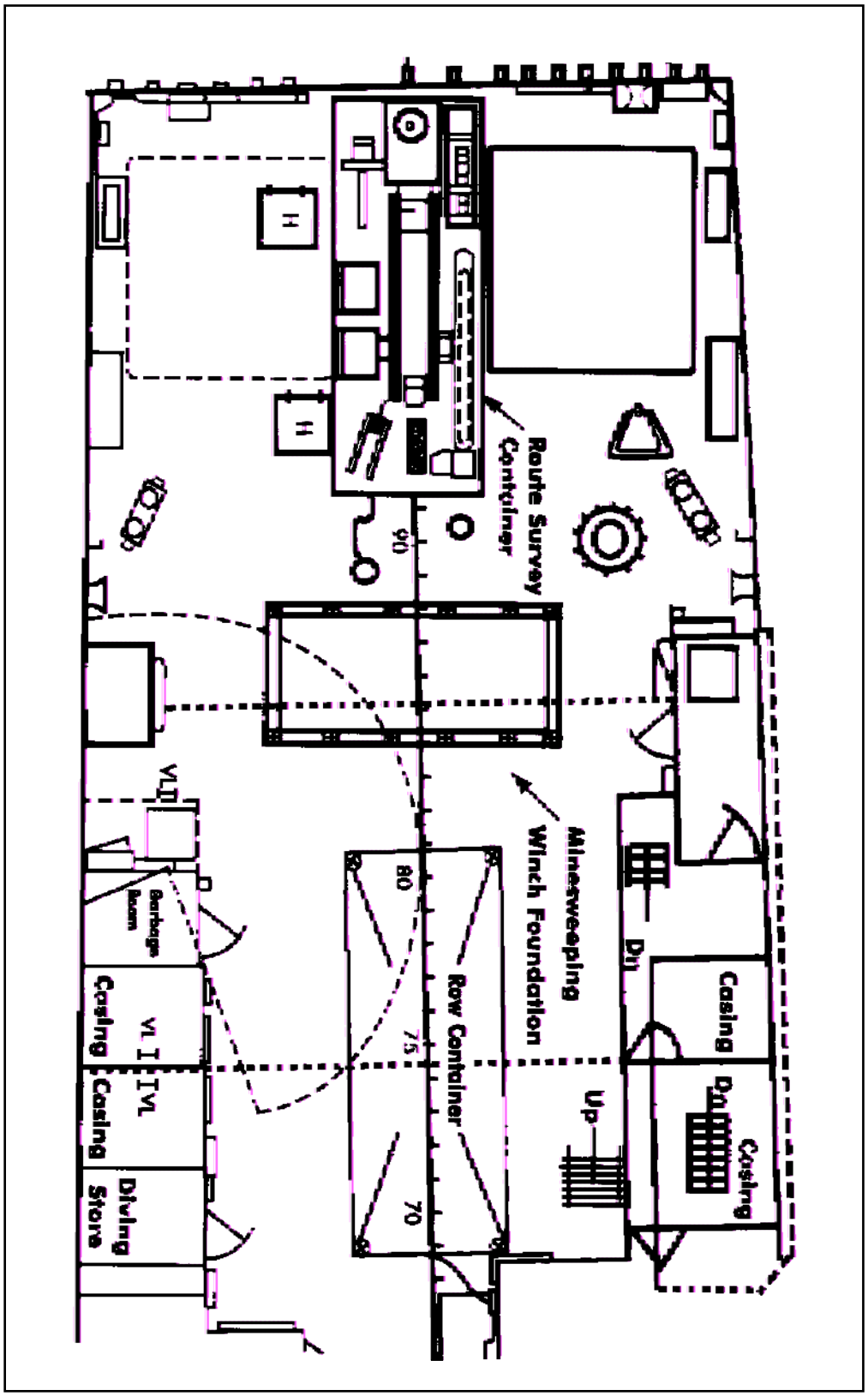


Figure 13.3-2 - Towfish

Figure 13.3-3 - Towfish Layout

Figure 13.3-4 - RS Payload Aft



13.4 Accommodations

a. The accommodation payload is an ISO 1161 Container (19.88’ long, 8.5’ height and 8.0’ wide), weighing between 2 and 2.5 tons. It is fitted on the forward end of the sweep deck between the funnels and contains:

b. Six permanent bunks and lockers in a sleeping area.

CHAPTER 14

Sailing

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14.1 SAILING INTRODUCTION

Notwithstanding that sailing vessels no longer have a role to play in naval warfare, they still can play a key role in training junior officers and seamen. This is owing to the fact that there is no better way to gain an understanding of the sea than through sailing. As such, the Canadian Navy maintains three sailing vessels in its service: HMCS *Oriole* (Fig. 14.1-1) and H.M. Sail Training Vessels (HMSTV) *Goldcrest* (Fig. 14.1-2) and *Tuna*. Although recreational vessels such as the *Albacore* are not used for training, they are available for the use of military personnel.

Figure 14.1-1 - HMCS *Oriole*

Figure 14.1-2 - *Goldcrest* (Tuna Class)

Figure 14.1-3 - *Albacore* (for recreational use)

14.1.1 Types of Sailing Vessels in the Canadian Navy

Built in 1921 and commissioned in 1948, HMCS *Oriole* is the oldest ship in the Canadian Navy. A Marconi-rigged Ketch, she is a near relative to a schooner but differs in that her aftermast (mizzen) is smaller than her mainmast and it is stepped further aft. HMSTV *Goldcrest* and HMSTV *Tuna* are 36-foot sloops, purchased in 1984 for training and recreation. They are based in Esquimalt and Halifax respectively.

14.2 PARTS OF A SAILBOAT

Backstay	A rope or wire leading aft from the masthead to support the mast. A running backstay is one that can be adjusted to change the shape of the mast (and sail).
Bolt Rope	A rope sewn in to the edge of a sail to reinforce it. It is always sewn on the side of a sail that will be to port when the sail is set.
Boom	A horizontal spar or pole attached to the mast at one end and used to support the bottom of a sail.
Centerboard (drop keel)	A keel that may be retracted.
Chainplate	A piece of hardware, built into the hull and deck, to which turnbuckles are attached.
Cleats	Fittings onto which sheets or halyards are belayed**.**
Cockpit	An opening in the deck from which the boat is steered.
Cringles	Eyes worked into the bolt rope at the side or corners of a sail. The halyard, the sheets and the tack hook are connected to them.
Earring	The lashing which secures the throat, peak, tack, or clew of a sail to a spar.
Eyelets	Eyes worked into the head or the foot of a sail for lacing to a spar.
Forestay	A rope or wire leading forward from the masthead to support the mast.
Gudgeons/Pintles	The fittings that connect the rudder to the hull and allow it to pivot. The pintles are vertical pins and the gudgeons are horizontal eyebolts into which the pintles fit.
Halyard	A rope by which a sail is hoisted or lowered. To settle a halyard is to ease it away.
Keel	The part of a boat that extends downward from the bottom of the hull. In a sailboat, the keel acts to balance the force of the wind and keep the boat

	upright in the water.
Mast	A vertical spar or pole, used to support a sail.
Mizzen Mast	The after mast in a ketch.
Reef Points	Short lengths of line secured to each side and through the sail about its foot, which are used for reefing. A sail may have one, two or three sets of reef points.
Rudder	A flat blade attached to the stern and used to steer the boat.
Running Rigging	Comprises all movable ropes such as halyards and sheets.
Sheet	A rope bent to the clew of a sail. It is used to trim the sail as required and is named after the sail to which it is bent, e.g., **foresheet**, **mainsheet**, or **mizzensheet**. To **check a sheet** is to ease it off so that the sail is eased out. To **aft** a sheet is to haul it in so that the clew of the sail is hauled aft. To **let fly** a sheet is to let it run so that the sail flaps, spilling the wind from it.
Shrouds	Ropes or wires leading from the masthead to the sides of the boat, which support the mast athwartships.
Standing Rigging	Comprises all permanently fitted and secured ropes such as stays and shrouds.
Tiller	A lever or handle used to turn the rudder.
Topping Lift	A rope used to hold up a boom.
Traveller	A rail or fitting which allows a block to move from one side to another.
Turnbuckle	An adjustable device used to tension a stay or shroud.
Vang	A rope, block and tackle or a hydraulic system used to keep a boom horizontal.
Wheel	An alternative to a tiller, which turns the rudder by mechanical or hydraulic means.

14.3 TYPES OF SAILS

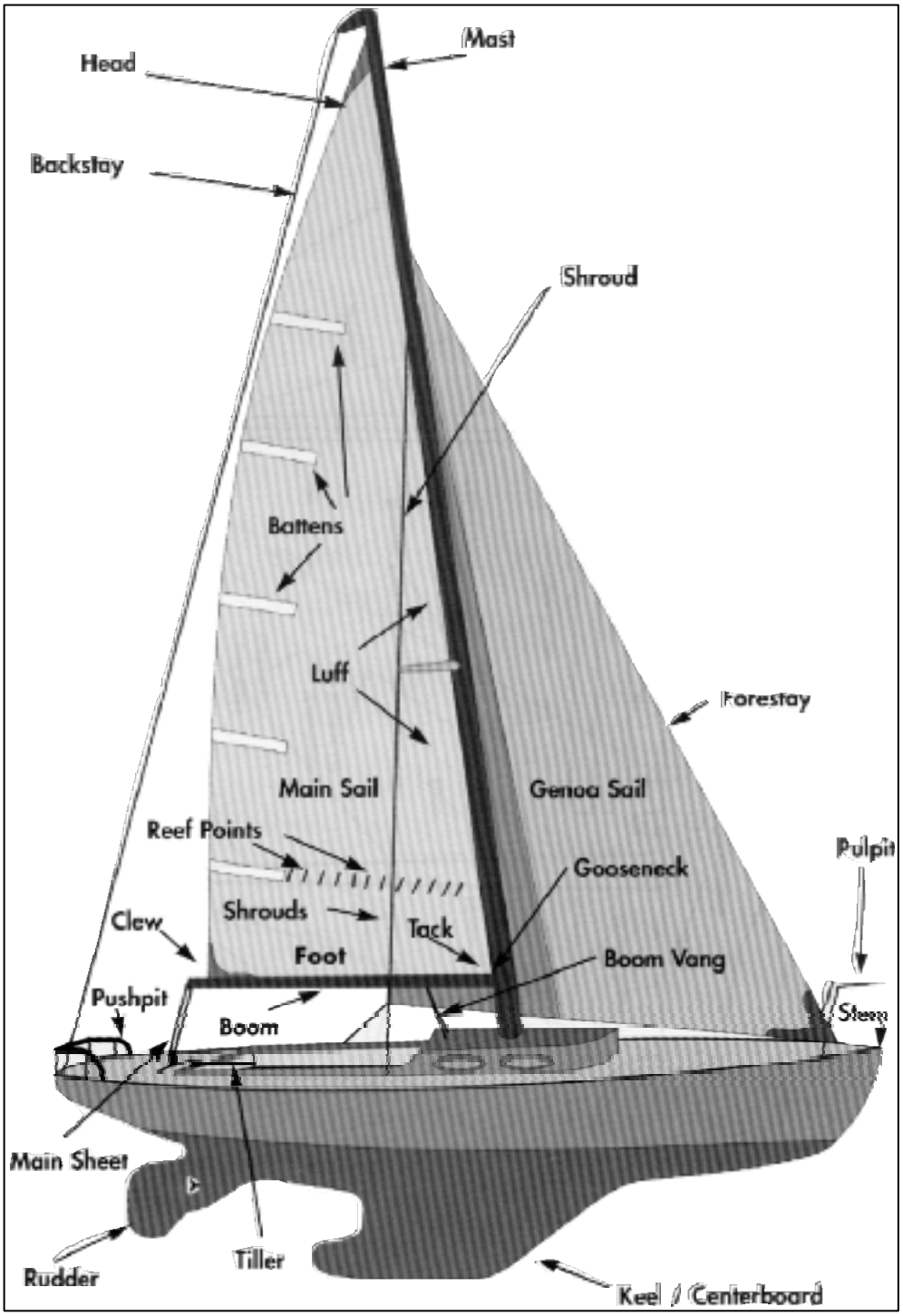

Figure 14.3-1 - Parts of a Sail and Sailboat

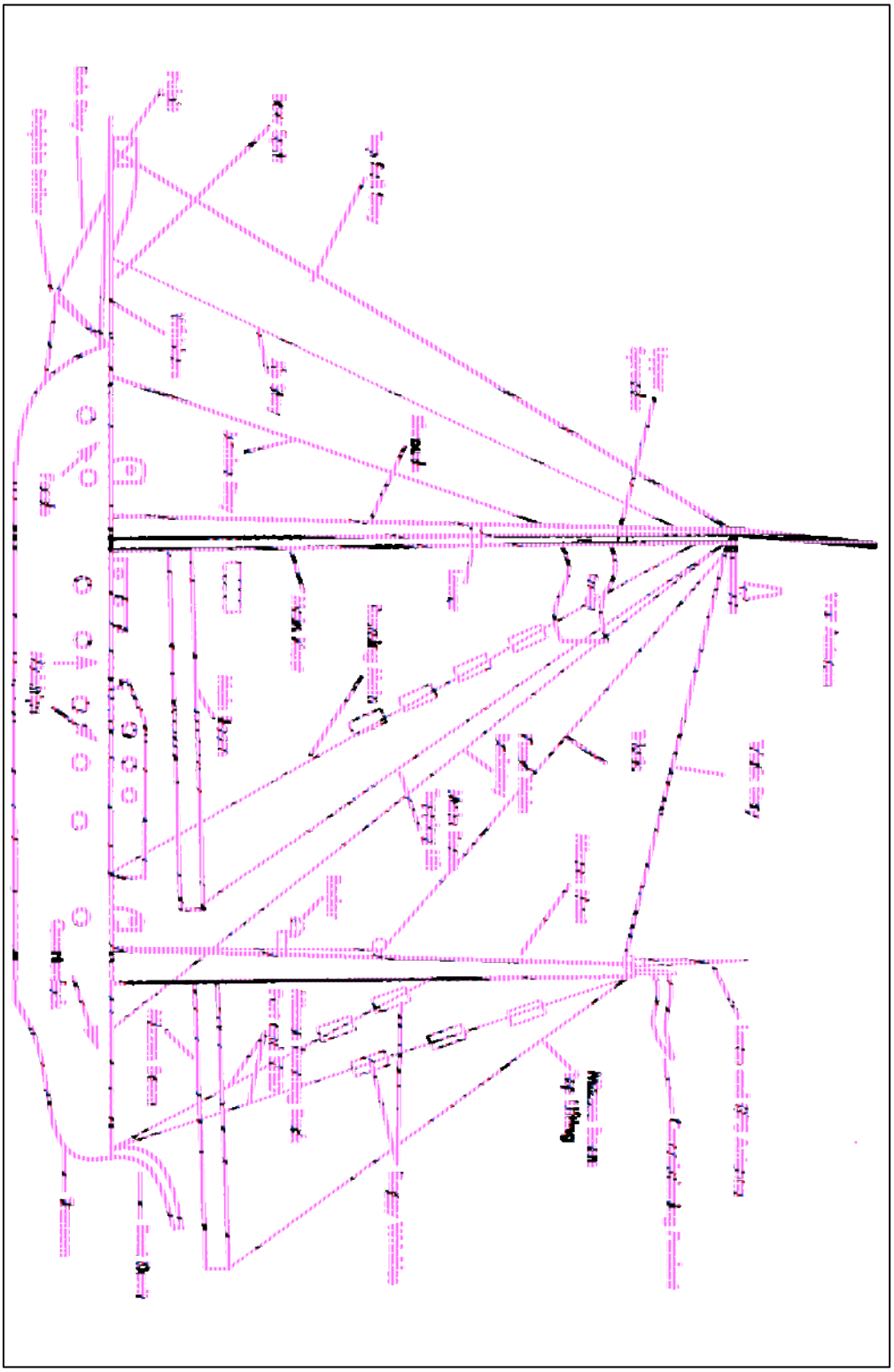

Figure 14.3-2 - HMCS *Oriole* Rigging

Foresail or Jib	The sail in front of the main sail. The foresail attaches to the forestay.
Gennaker	A combination Genoa and Spinnaker. This lightweight sail is used in light airs.
Genoa	A large foresail.
Main Sail	The primary sail on a boat. The main sail is attached to the mast and boom or yard.
Mizzen Sail	A triangular sail rigged on the mizzen mast.
Mizzen Stay Sail	A sail rigged between the main mast and the mizzen mast.
Spinnaker	A large colourful nylon sail that is set forward of the foresail, used when sailing before the wind.

14.4 COMMON ORDERS

Table 14.4.1: Common Orders and Actions

ORDER	ACTION
Avast	Stop
Let Fly	Let go instantly
Check Away	Let out under control
Haul Taut	Pull tight
Aft the Sheet	Pull in the sheet
Ease (the sheet)	Let out slowly
Hoist	Raise by pulling on the halyard
Ready About	Prepare to tack or gybe
Helm's A Lee	Boat is turning to tack, prepare to let fly

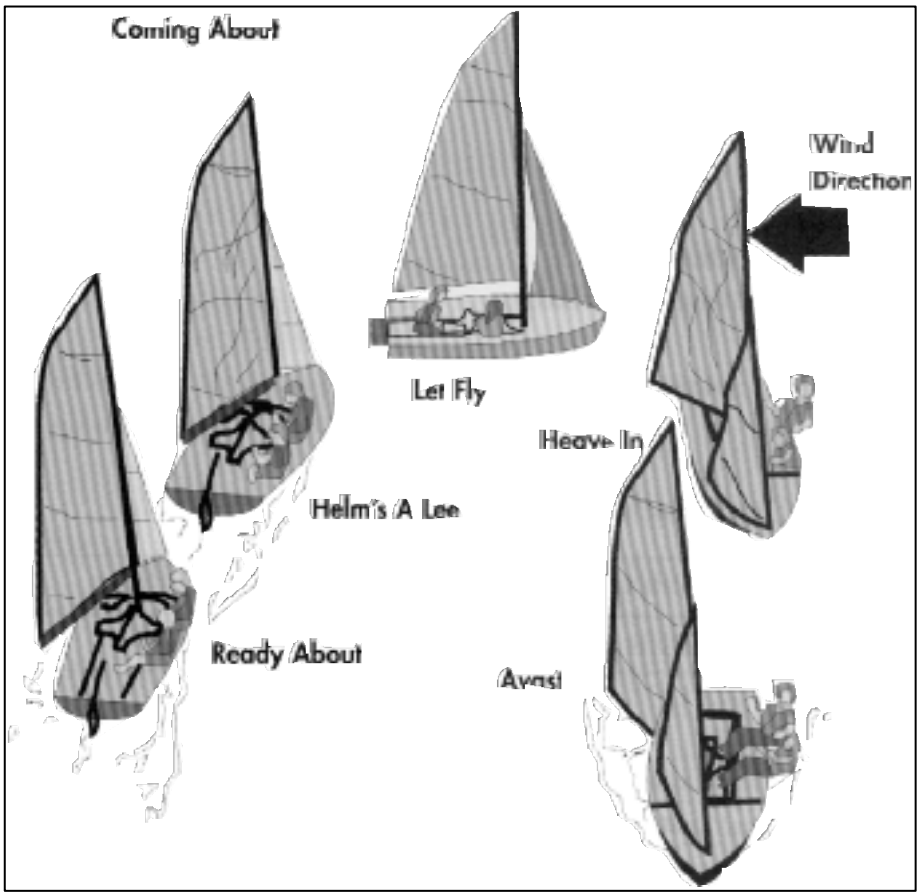

Figure 14.3-3 - Orders for Coming About

14.5 SAILING TERMINOLOGY

To sail a boat effectively, a seaman should know how the wind acts on the sails to move the boat ahead. The relationship between the centre of pressure of the sail area and the boat's pivot point; how to set the sails; and how to optimally trim the sails when **beating, tacking, reaching, running or wearing** must be understood.

Beam Reaching	A sailboat is beam reaching when the wind is blowing from abeam.
Bearing Away	Altering course away from the wind until the boat is on her new course, or she gybes.
Beating	When the destination of a sailboat is directly up wind, she beats to windward by sailing close hauled in a series of alternate tacks.
Bend On	To secure a sail to a spar by its earrings and lacing.
Broad Reaching	Between beam reaching and running, the wind is abaft the beam.

Close Hauled	Sailing as close to the direction from which the wind is blowing as possible. This is usually no less than 40-50 degrees either side of the wind direction.
Close Reaching	Between beam reaching and close-hauled.
Gybing	A manoeuvre to turn the boat, putting the stern through the wind, so that the wind is on the other side of the boat (opposite of tacking).
Head to the Wind	Pointing the bow of the boat directly into the wind.
Heave To	To keep the boat as near the wind and as stationary as possible.
In Irons	A boat is said to be "In Irons" when she is head up on the wind and will not pay off on either tack.
Leeward	The side opposite that from which the wind is blowing.
Let Fly	To let go instantly.
Luff	To let the boat come up to the wind.
Luffing	Altering course into the wind until the boat approaches being head to the wind.
Reaching	A sailboat is reaching when the wind is blowing from abeam, but she is not sailing close hauled.
Ready About	A warning order to prepare to tack.
Reefing	To **reef a sail** is to reduce the area it offers to the wind in order to prevent the boat from heeling over too far or capsizing. A sail is reefed by gathering up its foot to the desired line of reef points, and tying it off with reef knots. To **shake out a reef** is to increase the sail area.
Running (running free)	A boat is running when the wind is blowing from directly astern.
Starboard/Port Tack	A boat is on a port tack when the wind is on her port side and on a starboard tack when the wind is on her starboard side.
Tacking (coming about)	A manoeuvre to turn the boat through the wind, so that the wind changes from blowing over one side of the boat to blowing over the opposite. The turn puts the bow into the wind (order *"Ready About"*).
Tailing	The sheet is pulled in by turning the winch handle and pulling on the sheet.
Windward	The side from which the wind is blowing.

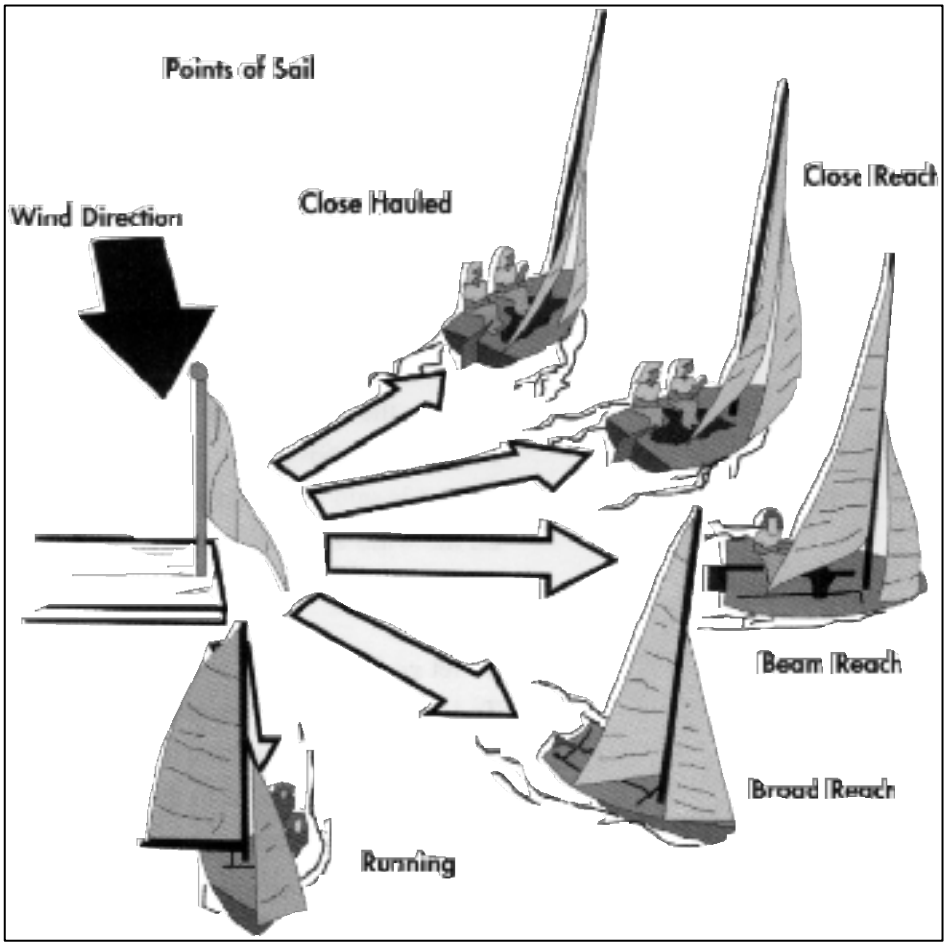

Figure 14.5-1 - Points of Sail

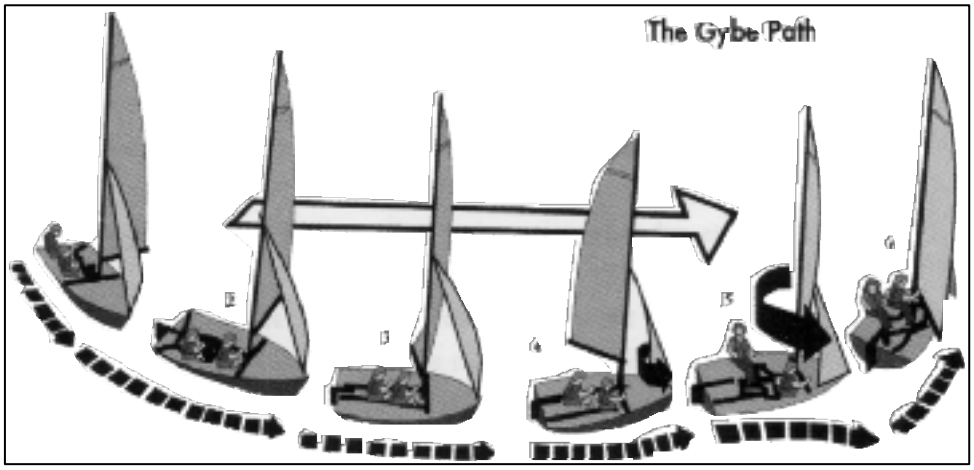

Figure 14.5-2 - Gybe Path

14.6 SAFETY

The following safety points are particular to sailboats.

(**1**) Always stay with your boat even if it breaks or capsizes.
(**2**) Wear an approved PFD or life jacket whenever you are on or around boats.
(**3**) Dress warmly for sailing and wear appropriate waterproof garments when conditions warrant.
(**4**) Before setting up a boat in the parking lot or wheeling it down to the water, always check that there is no overhead electric cable in the way. Look out for low hanging power cables while sailing, and come in immediately if thunderclouds develop.
(**5**) Protect your skin and eyes from the damaging effects of too much sunlight. Drink plenty of liquids (non-alcohol) on hot days and watch for signs of heat exhaustion.

14.7 RULES OF THE ROAD

The skipper of a sailing vessel is required to have a thorough knowledge of the International Regulations for Preventing Collisions at Sea. .

ANNEX "A"
Publications

Publication Name	Publication Number
Rigging & Procedures Manual (CFCD 105)	B-GN-181-105/FP-E01
Admiralty Manual of Seamanship (BR67)	B-ON-050-002/PT-004
Admiralty Manual of Navigation Vol.1 BR45(1)	C-57-007-002/AF-001
Rigging Manual	
Maritime Command Ships Standing Orders (SSO's)	
Operational Readiness Requirements (CFCD102)	
Manual of Ceremonial for HMC Ships	
HELP Sea Rescue	
Shipborne Helicopter Operating Procedures (SHOP)	B-OG-282-000/FP-000
Survival at Sea	B-22-050-279/PT-001
International Regulations for Preventing Collisions at Sea, 1972 with Canadian Modifications	
Naval Maintenance Management System	C-03-005-012/AM-001
Ship's Maintenance Management Information System (SMMIS)	C-03-005-012/AM-002
Workplace Hazardous Material Information System (WHMIS) Manual	1SBN 0-459-56215-0
Specification for 20 Man Liferaft	D-22-490-000/SF-001
Corsair 20 Marine Liferaft	C-22-490-000/MS-001
Life Saving Equipment (CFP286)	B-GN-286-001/TS-001
Life Preserver Yoke, Maritime Pouch	C-22-501-000/MB000

Publication Name	Publication Number
Life Preserver, Hazardous Duty	C-22-552-000/MF-001
Jacket Buoyancy and Black	C-22-554-000/MF-001
Dockyard Wire Splice Booklet	
Sampson Braid Splice Booklet	
QHM Pollution Containment Course	Handout
N 47 /QHM Marine Pollution Contingency	Handout
IROQUOIS Rigging Warrant	GR282-H27-36001-01
HALIFAX Rigging Warrant	
AOR Rigging Warrant	509-H-41-21321-01
Testing of Shipboard Lifting Appliances	C-28-020-001/TB-001
Encyclopedia of Fancy Knots, Bends and	ISBN 0-87033-021-7
Maritime Command Tug Assistance with or without a Pilot	
Ships and Marine Craft	C-23-000-000/AX-000
Deep Sea Lift Crane System Operating and	C-28-468-000/MS-001
Anchors, Chains, Cables and Associated	C-28-010-024/MS-001
Ship to Ship Towing (Navy)	ATP-43 (Navy)
Replenishment at Sea	ATP 16(D) (Navy)
Information Manual Replenishment at Sea	C-28-007-007/JD-001
The Auxiliary Oiler Replenishment Handbook (Naval)	

Publication Name	Publication Number
Probe and Receiver Fuelling System	C-28-270-000/MS-000
Kingpost HALIFAX Class	C-28-463-000/MS-001
Zodiac Manual	Zodiac of North America
Operating Instructions 24 ft Rigid Inflatable Boat	C-23-343-000/MB-001
Davit, Boat, Boom	Allied Systems Company
Hurricane-Technical Manual (530 OB-540 OB)	M-B-10004
Johnson Outboard Operators Manual	212150
M III-K2 Hydraulic Crane Technical	C-28-470-000/MS-001
Basic Sailing Skills	ISBN 0-920-232-17-5
4.6 Metre Albacore	C-23-338-000/MS-001
Mine Inspection Payload-Isherwood	BO-001-00
Mechanical Mine Sweeping Operation &	7010E001-1 Interim