COMSCINST **3180.2J**	**COG CODE** **PM1**	DATE **3 SEP 1986**

DEPARTMENT OF THE NAVY
COMMANDER MILITARY SEALIFT COMMAND
WASHINGTON NAVY YARD BLDG 210
901 M STREET SE
WASHINGTON DC 20398-5540

COMSCINST 3180.2J
M-3T5
3 September 1986

COMSC INSTRUCTION 3180.2J

Subj: MSC REFUELING-AT-SEA *(RAS)* INSTRUCTIONS

Ref: (a) NWP 14-2, MSC Handbook for Refueling-at-Sea

Encl: (1) MSC Refueling-at-Sea Instructions
(2) NWP 14 *(Rev. C),* Replenishment-at-Sea *(Chapters 2, 3, 10 and Appendices C, E, and J)*

1. Purpose. To provide Military Sealift Command *(MSC)* controlled tankers with instructions for refueling and consolidating cargo with other ships while underway.

2. Cancellation. COMSCINST 3180.2H.

3. Background

a. MSC owned and chartered tankers are equipped to transfer cargo to Navy ships which are capable of passing fuel hose rigs *(replenishment and certain amphibious ships, carriers).* In addition, most MSC tankers are equipped to refuel by the astern method.

b. Enclosure (1) provides Masters with MSC supplementary instructions for refueling-at-sea. Enclosure (2) is an extract of the Navy replenishment-at-sea publication which provides additional guidance. Chapter 10 of that publication is specifically devoted to MSC tanker RAS operations. Additionally, all MSC controlled tankers should have four copies of reference (a) onboard.

4. Action. Masters of MSC controlled tankers are to ensure a periodic *(at least quarterly)* review of enclosures (1) and (2) and reference (a) by all concerned tanker personnel, and strict adherence to the provisions thereof during refueling-at-sea operations.

5. Reports. The reporting requirements prescribed by this instruction are assigned RCS MSC 3180-2 and 4020-4 and are effective for 3 years from the date of this instruction.

R. F. DONNELLY

Vice Commander

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SNDL T-101 *(MSC contract-operated tankers & operators) (2)*
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REFUELING-AT-SEA INSTRUCTIONS

1. General. It is imperative that all tankers be prepared to conduct underway refueling operations on short notice. Operations may occur at any time while transporting a cargo of USN ship compatible fuel *(i.e., DFM, JP-5).* Preparedness includes possessing adequate equipment, conducting briefings and assigning specific duties to the crew, and accomplishing training whenever time permits.

2. Equipment

a. Refueling-at-sea portable equipment shall be stowed in a separate locker or storage area which is marked for such equipment. The equipment shall be stenciled or painted white so that it may be easily identified. MSC Form and Report 3180/2 *(Refueling-at-Sea Equipment and Material Report)* lists the required inventory. This report will be submitted to COMSC and the operator/owner quarterly. Corrective action on discrepancies is to be taken immediately upon discovery. It is incumbent upon the operator/owner to initiate procurement of deficient items as indicated in these reports without waiting for a formal request or requisition from the ship. If there is no change since the previously submitted report, a dated statement to that effect will be acceptable.

b. Each refueling-at-sea station is required to be static load tested every four years during the ABS Special Survey as follows:

(1) Apply simultaneously a static load of 36,000 pounds at the span wire link, and 15,000 pounds at the riding line padeye. Span wire load shall be 15^{o} forward or aft or squarely outboard and 10^{o} below horizontal. The riding line load shall be horizontal and squarely outboard.

NOTE: This will result in a combined horizontal static pull of 50,000 pounds on the fueling-at-sea tripod or sampson post.

(2) Apply a static load of 15,000 pounds at the messenger padeye. The load shall be horizontal and squarely outboard.

(3) Jigger line padeyes and cleats shall be individually tested under a static load of 15,000 pounds applied along the anticipated line of action.

(4) Tests (1), (2) and (3) shall be performed separately.

(5) All test loads shall be held for 10 minutes during which time no failure or deformation shall result.

The fact that this test has been conducted, with the date last accomplished, is to be noted on the 3180/2 report.

3. Procedures. COMSC will advise tankers and their operators by message when a RAS operation is intended. This is commonly referred to as a "CONSOL" *(Consolidation)* when transferring cargo to an oiler or another tanker. Upon receipt of RAS orders, Masters shall:

a. Acknowledge the orders by immediate message and advise all concerned of any equipment deficiencies and/or readiness to conduct CONSOL.

b. Ensure key personnel review enclosure (2) and onboard RAS equipment. Particular attention is to be paid to rigging, emergency breakway and safety procedures.

c. Commence submitting the "Noon Position Report" contained in Article 1-6-16 of COMSCINST 3121.3D *(TANKOPINS)* every 24 hours. Advise customer ship of any change in PIM once issued.

d. Submit the communication plan to the designated receiving ship in accordance with Article 10.2.1, enclosure (2), as soon as possible, but no later than 72 hours prior to the intended rendezvous date. Unless otherwise directed, HF transmissions between ships are not authorized unless one or the other encounters difficulties which preclude compliance. As practical, tactical communication should be by flag or flashing light. Voice communications are to be established solely to ensure correct operation and thence utilized only as necessary to ensure a safe CONSOL operation. USS ships are unable to transmit on 500 KHZ.

e. Ensure key personnel review NWP 14 *(Rev. C)* and/or NWP 14-2 and inspect refueling-at-sea equipment with attention to emergency and safety equipment. Assign the most qualified helmsman for the operation. Rigid adherence to maintaining the designated CONSOL course is essential to the safety of operation. Masters and helmsman must be aware of varying pressure effects of steaming alongside per Article 2.2.7, enclosure (2). Rig tensioning/detensioning and retrieval should only be undertaken when operating at maximum safe distances and when observed steady state conditions between ships exists.

f. ASTERN REFUELING - It is recommended that a minimum speed of 10 to 11 KNOTS be maintained while streaming hoses; otherwise, spout type floats may upset and dive underwater. This condition will not occur when barrel type floats are used.

4. Cargo Quality Control. Petroleum products transferred to Navy ships must be of the highest quality. The most common problem in effecting successful consolidations has been contamination from bottom sediment and water. In order to avoid this contingency, the following precautionary measures are to be taken PRIOR to the transfer operation:

a. Take a low suction on the designated tank *(or tanks)* from which the product is to be transferred. Pump the product through all lines to be used for the transfer to flush out any water or sediment, and then through the opened drop valve to other tanks which have sufficient ullage and are not scheduled to be used in the transfer operation.

b. Pump the product in this manner for about 10 to 15 minutes, so as to remove any bottom water or sediment from the designated tanks.

5. Cargo Accountability. Upon completion of the transfer, Masters must file the MSC 4020-4 message discharge report in accordance with Article 10.8.1, enclosure (2). In addition, ensure receipt of a DD Form 1149 or message acknowledgement showing quantity of fuel received by the other ship. This paperwork is to be turned in to the Government fuel representative at the next terminal.

DEPARTMENT OF THE NAVY
OFFICE OF THE CHIEF OF NAVAL OPERATIONS
WASHINGTON, D.C. 20350

October 1985

LETTER OF PROMULGATION

1. NWP 14 (Rev. C), REPLENISHMENT AT SEA, is an Unclassified Naval Warfare Publication. It is effective upon receipt and supersedes NWP 14 (Rev. B), REPLENISHMENT AT SEA, which shall be destroyed without report.

2. Disclosure of this publication or portions thereof to foreign governments or international organizations shall be in accordance with NWP 9.

C.E. ARMSTRONG
Commodore, U.S. Navy
Director Tactical Readiness Division

CHAPTER 2

Common Procedures and Equipment

2.1 BASIC PRINCIPLES

The close coordination required to effect transfers of material and personnel between ships underway can be achieved only by a clear understanding of the responsibilities of each ship. In the following description of these responsibilities, two sets of basic terms are used. The responsibilities relating to shiphandling are described in terms of the CONTROL SHIP and the APPROACH SHIP: the control ship maintains the replenishment course and speed and is the guide; the approach ship keeps station alongside. The responsibilities relating to the rigs which are passed between the ships are set forth in terms of the DELIVERY SHIP and the RECEIVING SHIP: the delivery ship furnishes and handles the rigs; the receiving ship receives the rigs. These terms are independent; either the approach ship or the control ship may be the DELIVERY SHIP, the other being the RECEIVING SHIP. Normally the CONTROL SHIP is the DELIVERY SHIP. Exceptions to this convention are indicated herein; any additional exceptions must be established by the OTC, prior to the UNREP.

2.1.1 Control Ship. The control ship is the local guide ship for the UNREP. The control ship is responsible for these duties:

1. Maintaining steady course and speed.

2. Controlling — in close coordination with the approach ship(s) — changes in course and speed, necessitated by:

   (a) Station keeping on the formation guide; or, if the guide, responding to changes signaled by the OTC. Formation course changes are executed in steps of not more than 5^{o} (10^{o} in emergencies), with time between steps to steady up.

   (b) Avoiding navigational hazards or collision.

   (c) Other situations, wherein the hazards of a change in course or speed are outweighed by the advantages.

3. During course changes:

   (a) Using rudder to produce a 3,000-yard tactical diameter turn.

   (b) Advising the approach ship(s) as follows: (1) when the rudder is put over for a course change, (2) as each degree of heading is passed during the turn, and (3) when the rudder is shifted to steady up.

   (c) Altering the planned course change to steady on an intermediate course, and advising the approach ship(s) if it appears that a hazardous situation is developing during the turn.

4. During speed changes, which are not to be made simultaneously with course changes

   (a) Changing speed in increments not exceeding 1 knot — in coordination with the approach ship(s).

   (b) Steadying on an intermediate speed, and advising the approach ship(s) if it appears that a hazardous situation is developing during the speed change.

5. Making the required readiness (Romeo) signals for approach and transfer in accordance with the signal flag hoists

illustrated in Figures 2-2 and 2-15 or by flashing light at night. (See paragraph 2.2.3.)

6. Displaying the appropriate international signal shapes (or task lights at night) from the time the approach ship commences the approach until the time the approach ship is clear. (See paragraph 2.4.5.)

2.1.2 Approach Ship. The approach ship makes the approach and keeps station on the control ship. The approach ship is responsible for these duties:

1. Attaining and maintaining a position relative to the control ship that is optimum for safe tending and handling of the rigs passed between the ships. (See paragraph 2.2.5 and Figure 2-3.)

2. Responding to required course or speed changes — in close coordination with the control ship. During the maneuver, the conning officer shall constantly observe:

(a) Gyro heading

(b) Rate of turn during a course change

(c) Distance to delivery ship

(d) Paralleled relationship of ships

(e) Fore-and-aft position relative to the control ship.

3. During course changes, ensuring that orders to the helm are given in terms of course (in preference to rudder angle). The conning officer may initiate a course change by ordering:

(a) "Come right (left) to course _____." This method is appropriate for course changes of less than 5° and for large ships with slow rudder response.

(b) Continuous course changes in 1° or 2° steps (that is, "Steer _____"). This method is desirable for turns of 5° or more and is used by small ships with quick rudder response.

4. Maneuvering to and from station alongside with due regard for the effects of close approaches, high relative speeds, and sea and wind on both the approach ship and the control ship.

5. Making the required readiness (Romeo) signals for approach and transfer in accordance with the signal flag hoists illustrated in Figures 2-2 and 2-15 or by flashing light at night. (See paragraph 2.2.3.)

6. Displaying the appropriate international signal shapes (or task lights at night) from the time of commencing the approach until clear of the control ship. (See paragraph 2.4.5.)

7. Furnishing and tending the bridge-to-bridge phone/distance line. (See paragraphs 2.3.6 through 2.3.6.4.)

8. Making the required disengagement (Prep) signals for departure in accordance with the signal flag hoists in Figures 2-2 and 2-15. (See paragraph 2.2.10.)

2.1.3 Delivery Ship. The delivery ship is normally the control ship and will assume — unless otherwise specified herein, or as directed by the OTC — the responsibilities of the control ship. The delivery ship is also responsible for these duties:

1. Making the preparations for and carrying out the delivery-ship procedures prescribed elsewhere in this publication for the rig to be used or for the situation encountered.

2. Furnishing the rigs, including the bolos or gun lines, station-to-station phone lines, and rig messengers. Exceptions are:

(a) CV, LPH, or LHA always furnishes the bolos or gun lines. Other air-capable

receiving ships, because of operational necessity with aircraft on deck, also furnish the bolos or gun lines, and will so advise the delivery ship when in waiting station.

CAUTION

Air-capable ships under normal conditions should secure aircraft in the hangar, prior to the UNREP.

(b) Carriers and cruisers furnish and handle synthetic highlines for transfers to or from other types of ships.

(c) When burton and double-burton rigs are used, the receiving ship furnishes (1) the rig messenger for its own burton whip and (2) the station-to-station phone line at each burton station.

3. When the receiving ship has a complement of 50 men or less: passing the zero end of the bridge-to-bridge phone/distance line to the receiving ship, instead of the lead line messenger. The delivery ship shall send and tend all phone lines.

2.1.4 Receiving Ship. The receiving ship is ordinarily the approach ship and will assume — unless otherwise specified herein, or as directed by the OTC — the responsibilities of the approach ship. The receiving ship is also responsible for these duties:

1. Making the preparations for and carrying out the receiving-ship procedures prescribed elsewhere in this publication for the rig to be used or for the situation encountered.

2. Handling all phone lines.

3. When burton and double-burton rigs are used: furnishing and handling its own burton whip(s) and the station-to-station phone line(s). The bridge-to-bridge phone/distance line will usually be sent over with the rig messenger.

4. If a carrier or cruiser: furnishing and handling synthetic highlines for transfers to or from other types of ships.

5. If a CV, LPH, LHA, or other air-capable ship with aircraft on deck: furnishing the bolos or gun lines.

6. When the receiving ship has a complement of 50 men or less, the delivery ship shall send and tend all phone lines.

2.2 MANEUVERING

The necessity for working at close quarters makes maneuvering during the replenishment a critical operation. Course and speed must be carefully selected to permit the precise maneuvering required of all ships for the approach, station keeping, and departure. There must be adequate lateral separation during the approach, and the proper distance between ships must be maintained during transfers. Precise maneuvering is required to maintain station, because of the forces which act upon both ships. Particular emphasis must be placed on steering control and coordination between ships. Both ships must be prepared to execute an emergency breakaway and to avoid a collision.

2.2.1 Designating the Control Ship

2.2.1.1 Convention. The ship delivering the product will usually be the delivery ship and the control ship.

2.2.1.2 Exceptions. During consolidations or intratype transfers, ships may be delivering products to each other. In such instances, the OTC must specify which ship is the control ship and which ship is the delivery ship. In rough weather, it is desirable to have the more maneuverable ship be the approach ship, if the more maneuverable ship is also better equipped to furnish the rigs, the OTC should designate

that ship as the approach ship and the delivery ship.

2.2.1.3 Summary. Unless otherwise specified, the convention of paragraph 2.2.1.1 applies. The OTC *must* specify the control ship and delivery ship when an ambiguous interpretation of the convention is possible. The OTC *may* specify exceptions to the convention whenever, in his judgment, the situation calls for it. Exceptions must be specified sufficiently in advance of the UNREP to permit the required preparations to be made.

2.2.2 Selecting Replenishment Course and Speed. The OTC is responsible for selecting and promulgating the replenishment course and speed. He should obtain the recommendation of the replenishment force commander. The replenishment course and speed selected should permit ships to maintain station with a minimum of strain on the rigs.

2.2.2.1 Course Selection — Sea State. The direction and height of swells are the principal considerations in selecting the replenishment course. Heavy seas have an adverse effect on the replenishment operation. Increased rolling and pitching, with high waves breaking over low freeboard ships, will add to the difficulties of station keeping and line handling and may cause excessive strain on the rigs. During heavy weather, a course with the sea (Figure 2-1) will moderate the adverse effects of heavy seas and may permit conduct of the replenishment, when it otherwise would be impossible.

2.2.2.2 Course Selection — Sheer Currents. A sheer current is a line of water with a small boundary layer between differing sets/drift. It is similar in appearance to a tidal rip. The north wall of the Gulf Stream is a good example of where sheer currents may be found. The velocity of the current varies and can produce, if encountered suddenly from still water, a heading change of 10° in ships as large as a carrier in a short period of time. Shiphandlers should be aware of and take special precautions to avoid sheer currents during replenishment, as sheer currents may cause handling difficulties while ships are alongside.

2.2.2.3 Course Selection — Wind Conditions. Wind conditions are not as significant as sea state, but must be considered when selecting the replenishment course.

1. Relative wind velocity should be as low as the tactical situation permits. High relative winds, especially in cold and rainy weather, will quickly fatigue exposed personnel and increase replenishment time. Therefore, a downwind heading may be preferable.

2. Under other conditions, heading into the wind may be more desirable. It may permit carriers to conduct flight operations at replenishment course and speed (Figure 2-1). Also, steaming with the wind one or two points on the port bow provides a lee for small units replenishing to starboard of larger units.

3. For VERTREP, the relative wind should be between 330° and 030° on the bow (see Chapter 9). Relative wind direction does not inhibit an H-46 helicopter. Receiving ships can maneuver during VERTREP with an H-46, provided it is done with the helicopter pilot's concurrence.

4. Small units with large deckhouses aft tend to yaw badly with winds above 30 knots from abaft the beam.

2.2.2.4 Speed Selection. Speeds between 12 and 16 knots are usually advisable. However, weather conditions influence the selection of a replenishment speed, just as they do the selection of a replenishment course. Under all conditions, a ship must make sufficient speed to maintain steering control. A speed less than 8 knots is not advisable, because of reduced rudder effect. A speed above 16 knots may be used, if weather permits, but greater lateral separation must be maintained, because of the increased venturi effect.

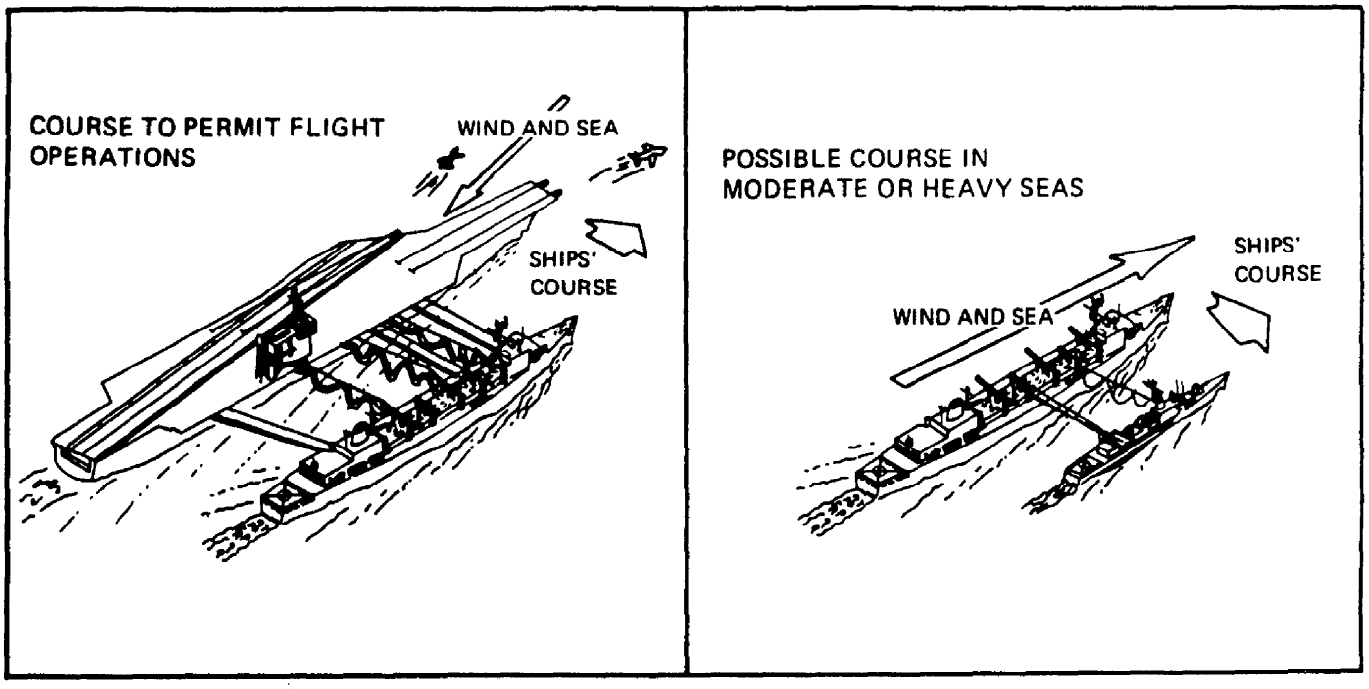


Figure 2-1. Replenishment Course

Note

DD 963 Class destroyers and FFG 7 Class frigates have a critical speed at 12 knots (due to RPM/pitch arrangements). Consider a minimum replenishment speed of 13/14 knots when replenishing with these ships.

2.2.3 Approach Procedures

1. The control ship, when ready to receive a ship alongside, hoists Romeo close up (see Figure 2-2). At night Romeo close up must be signaled by flashing light.

2. The approach ship, when ready for UNREP at the designated stations, commences the approach and hoists Romeo close up. At night Romeo close up must be signaled by flashing light.

3. The approach ship slows, so as to be moving at replenishment speed when in position alongside. (Use of high approach speeds and/or backing bells is permissible, but only if weather conditions are favorable and personnel are proficient.)

4. When both ships are in the proper relative position, the lines are passed. Both ships haul down Romeo when the first messenger is in hand on the receiving ship.

2.2.4 Lateral Separation. The approach ship must ensure adequate lateral separation during the approach, particularly when its bow passes the control ship's stern. There is a risk of collision at this stage, unless lateral separation is adequate. The differential in water pressure can cause the approach ship's bow to veer in toward the control ship. Relative speed should be reduced when replenishing in shallow water. Shallow water increases the effect of the differential in water pressure. Adequate

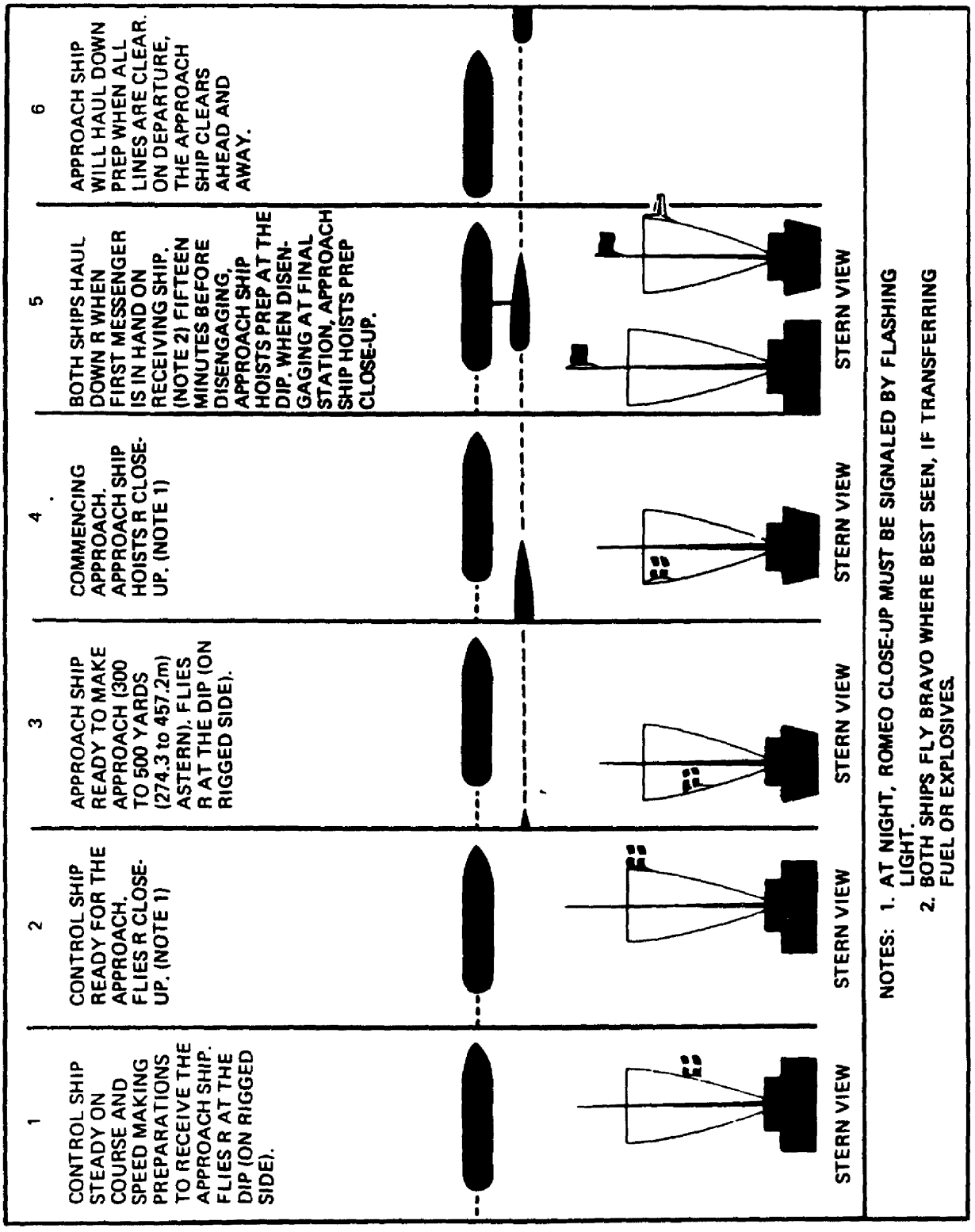


Figure 2-2. Flag Hoist Procedure — Approach, Riding Alongside, and Departure

lateral separation is vital at night and during periods of poor visibility when depth perception is impaired.

When steering by magnetic compass, the approach ship must make a wider approach than would normally be required using the gyrocompass. Conning officers and helmsmen must be alert for the swing of the magnetic compass toward the other ship. The swing occurs while the approach ship is coming alongside.

2.2.5 Distance Between Ships. The approach ship must maintain station at a sufficient distance from the control ship to ensure that the replenishment can be accomplished safely and efficiently. The proper distance between ships depends on several factors:

1. Wind and sea conditions
2. Sizes and types of ships
3. Ability of ships to maneuver while alongside
4. Types of transfer rigs employed
5. Depth of the water
6. Replenishment speed.

Figure 2-3 provides the distances between ships for the transfer rigs in use. The following guidelines apply to the information in the table:

1. Optimum distance between ships normally lies between the upper and lower limits of the normal interval.
2. Minimum safe distance between ships is the lower limit of the normal interval.
3. When tensioned and nontensioned rigs are used together, the distance between ships should not exceed that specified for the nontensioned rig.

CAUTION

Ships which have protrusions that extend outward from the hull must measure the distance between ships from the outermost protrusion, perpendicular to the centerline.

Certain operational considerations have an effect on the distance between ships:

1. When replenishing in water of less than 35 fathoms (64 m), increase the distance between ships as the depth of the water decreases.
2. Increase the distance between ships as replenishment speed increases. At a speed of 15 knots or more, distance between ships should be near the maximum limit.
3. When ships are yawing excessively, distance between ships should be near the maximum limit.
4. When all transfer stations are located on the quarter of a large ship, distance between ships should be near the upper limit of the normal interval. (This is due to the forces that tend to draw the ships together. It is of particular importance when the ship alongside is a destroyer or other small unit.)
5. When using a burton or housefall rig, the strain on the winches will be greater at wider distances between ships.
6. Since transfer rate is directly proportional to distance between ships, replenishing near the maximum limit will take much longer than replenishing near the lower limit.

2.2.6 Maintaining Station. Maintaining station alongside the control ship requires precise maneuvering by the approach ship. Steaming

		SHIP TYPE		
TYPES OF RIG	INTERVAL	FF and Smaller	Larger Ships	Carriers
Missile/Cargo STREAM*	Normal	80-200 ft 24.3-60.9 m	80-200 ft 24.3-60.9 m	100-200 ft 30.4-60.9 m
	Maximum	300 ft 91.4 m	300 ft 91.4 m	300 ft 91.4 m
Burton Housefall Modified Housefall Synthetic Highline	Normal	80-100 ft 24.3-30.4 m	80-120 ft 24.3-36.5 m	100-140 ft 30.4-42.6 m
	Maximum	180 ft 54.8 m	200 ft 60.9 m	200 ft 60.9 m
Fuel STREAM**	Normal	80-180 ft 24.3-54.8 m	(Note 1) 80-180 ft 24.3-54.8 m	80-180 ft 24.3-54.8 m
	Maximum	200 ft 60.9 m	200 ft 60.9 m	200 ft 60.9 m
Nontensioned Spanwire Fuel Rig	Normal	80-100 ft 24.3-30.4 m	80-120 ft 24.3-36.5 m	100-140 ft 30.4-42.6 m
	Maximum	180 ft 54.8 m	200 ft 60.9 m	200 ft 60.9 m
Close-in Fuel Rig	Normal	60-80 ft 18.2-24.3 m	60-100 ft 18.2-30.4 m	

*Minimum separation of 140 ft (42.7 m) required during initial tensioning.
**300 ft (91.4 m) heavy weather rig.

Note 1: For oiler consolidation, see paragraph 3.21, Special Procedures.

Figure 2-3. Distance Between Ships for Various Replenishment Rigs

too far apart will put an undue strain on the transfer rigs. Steaming too close will restrict maneuverability and increase the turbulence between the ships. With some loaded oilers, turbulence can throw seas into the tank deck and endanger personnel who must work there. Steaming too close when using tension/detension rigs will increase the probability of a collision. Refer to paragraph 2.2.5 and Figure 2-3 for minimum safe distances between ships.

2.2.7 Pressure Effects. A ship underway creates a hull wash (Figure 2-4a). There are areas of increased water pressure at the bow and stern and areas of decreased water pressure (suction) amidships. This venturi effect results from the differences in velocity in the flow of water around the hull.

When ships are underway alongside, the venturi effect is increased. It is complicated further by the intermingling of the pressure areas. Pressure effects vary with distance between ships, size and configuration of ships, replenishment speed, and depth of the water.

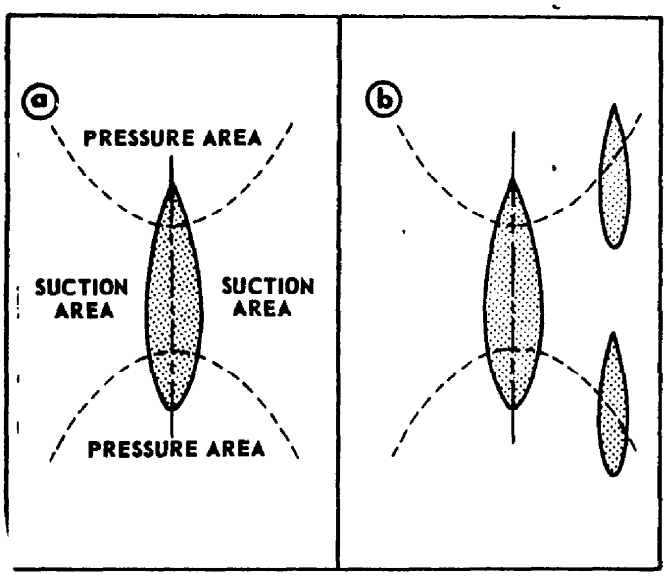


Figure 2-4. Dangers of Hull Wash

When ships of the same size are alongside, the best position is exactly abeam. If the approach ship is considerably smaller than the control ship, the best position is in between the bow and stern pressure areas.

Figure 2-4b shows ships that are in dangerous positions, because they are being acted on by radically different pressures. A change in relative position will impose rapid changes in the pressure effects on their hulls. Either position may require quick rudder action by the smaller ship. The hazard is increased when speed is reduced. A radical speed change will further aggravate the situation.

Replenishment operations usually are conducted in relatively deep water. In shallow water, where pressure effects are more pronounced, extra care is required while maneuvering.

2.2.8 Steering Control. The following requirements pertain to steering control during a replenishment operation:

1. Prior to going alongside, check steering control in all modes of operation, in accordance with applicable PMS, from both the pilot house and after steering. Determine gyro error and the operability of the standby gyro and associated alarms.

2. Assign a commissioned line officer as ship control safety officer on the bridge. If not a regularly assigned OOD/JOOD, this officer must have demonstrated proficiency to the commanding officer or his designated representative, prior to assignment. The ship control safety officer shall ensure that steering control station personnel acknowledge and comply with all orders of the conning officer. He shall assist as necessary in the event of a steering casualty and will have no other duties while assigned.

3. Assign an E-6 or above as after steering safety officer. The officer or petty officer

assigned shall be a mature and responsible individual who has the special thrust and confidence of the commanding officer. He shall have the same qualification standard as the ship control safety officer. The after steering safety officer shall ensure all orders received from the bridge are properly executed by all watchstanders in after steering.

4. Ensure that personnel assigned to steering control stations are PQS qualified (as appropriate) and are thoroughly familiar with steering casualty control procedures. All ship control watchstanders are to be final or interim PQS qualified, when standing watch during restricted maneuvering evolutions. If interim qualified, a final PQS-qualified watchstander shall be present with no other duties except to supervise and take over as necessary in the event of an actual emergency. When one interim PQS-qualified watchstander is being trained, all other ship control watchstanders must be fully qualified.

5. Keep after steering continually informed of the progress of the evolution, with particular attention to course and speed changes. To this end, dedicate a circuit to ship control functions. Do not overly burden the phone talker assigned to this circuit with added responsibilities.

6. Keep substitutions of watch station personnel to a minimum consistent with operational requirements and available resources.

7. Conduct training with qualified supervisors only.

Note

Enough emphasis cannot be placed on the qualifications of personnel assigned to steering controls, the physical condition of personnel involved, and the material condition of the steering equipment.

A small amount of rudder is usually necessary for maintaining station alongside. The rudder angle to carry will vary with the following factors:

1. Sizes and loads of ships
2. Sea and wind conditions
3. Replenishment speed
4. Distance between ships
5. Location(s) of transfer station(s)
6. Transfer rig(s) employed.

When the standard tensioned replenishment alongside method (STREAM) is used, conning officers of both ships should agree on a minimum distance between ships considered safe for the receiving ship when tension is first applied. The conning officer of the control ship makes the recommendation, considering wind, sea, and the location(s) of the rig(s). In no case shall the ships be closer than 140 feet (42.7 m) when initially tensioning (see Figure 2-3). The conning officers of both ships should again agree on a minimum safe distance when finally detensioning.

CAUTION

The delivery ship's bridge must notify the receiving ship's bridge when initial rig tension is to be applied and when final rig tension is to be released. Joint concurrence from both bridges is required.

Conning officers must be aware of the effects of STREAM upon their ships:

1. Conning officers of ships receiving STREAM must be constantly alert to avoid being drawn in toward the control ship

while maintaining station alongside. This applies especially to destroyers and shallow-draft ships, such as LSTs.

2. Conning officers of the control ship and the approach ship(s) must be constantly alert for the relatively instantaneous impact on ships' headings at the moments when STREAM is tensioned and detensioned.

3. After all STREAM rigs have been tensioned:

(a) The conning officer of the control ship may need to carry some degree of relatively steady rudder angle to maintain the prescribed course.

(b) The conning officer(s) of the ship(s) maintaining station alongside the control ship may need to carry some degree of rudder angle; in many instances, he (they) may also need to steer a slightly different heading from the prescribed course to maintain the proper distance between ships.

The need for and the degree of rudder angle that the receiving ship carries depends, principally, on the location(s) of the STREAM receiving station(s) relative to the ship's center of rotation (pivot point). Once all STREAM rigs have been tensioned, the receiving ship can usually maintain the proper distance between ships using fewer rudder angle and engine order changes than she would use with the burton and housefall methods, which apply transient side force to the ships. An exception is the tension/detension method of transfer with STREAM, which applies and releases side force suddenly and repetitively. This method will require prompt and frequent rudder changes.

A control ship with receiving ships hooked up on both sides will probably carry a different amount of rudder angle than when she has only one receiving ship alongside. When STREAM is used and two receiving ships are alongside:

1. Both the control ship's conning officer and her helmsman must be prepared for rudder angle changes when a STREAM rig on one side is initially tensioned and finally detensioned, while replenishing continues to the ship on the other side.

2. The control ship's conning officer must also alert the conning officer of the ship continuing alongside to be prepared for a possible change in the amount of rudder angle carried, when a STREAM rig to the ship on the other side is tensioned or detensioned.

A greater amount of rudder usually is required when ships ride closer together than 80 feet (24.3 m). As a result of such increased rudder, speed is reduced. This complicates the problem of maintaining station. Should a steering casualty occur at such a time, the possibility of being "drawn in" by the combination of screw suctions, the pull of tensioned lines, and excessive use of rudder will increase the probability of collision.

CAUTION

When loss of steering control is reported or sounded, the commanding officer and conning officer should determine as quickly as possible the position of the rudder and direction the ship is heading in relation to the replenishment course, before automatically giving a rudder command.

2.2.9 Coordination Between Ships. It is imperative that communications and liaison be maintained between respective conning officers. Bridge-to-bridge phones are essential for this purpose. If the control ship changes course or speed or encounters difficulty in steering, the approach ship must be notified immediately.

The conning officer of the approach ship must conn from a position where he can observe his own ship's heading, the rudder angle indicator if installed, and the relative motion of the two ships. Only experienced helmsmen and throttlemen should be used. Orders should be given to the helmsmen by actual course, in degrees or in half degrees. This should enable the conning officer to maintain proper distance between ships and adjust his relative fore-and-aft position without resorting to radical changes in course or speed.

A large combatant coming alongside a supply ship may cause the speed of the supply ship to be reduced by as much as 1 knot. The supply ship must make compensatory speed changes to prevent disruption of the formation. Such speed changes must be coordinated with ships alongside.

2.2.10 Departure Procedures

1. The approach ship hoists Prep at the dip, 15 minutes before disengaging (Figure 2-2).

2. The approach ship hoists Prep close up, when disengaging at the last transfer station.

3. The approach ship increases her speed moderately (3 to 5 knots), and clears ahead and away.

4. The approach ship directs a course outboard in small steps of 2° to 4°.

CAUTION

To preclude fouling of the screws, ships shall ensure that all wires are clear of the water before altering course.

5. The approach ship hauls down Prep, when all lines are clear.

Radical changes in speed and course must be avoided. Propeller wash from the approach ship's departure can adversely affect the control ship's steering, and may cause a dangerous situation to develop, if another ship is alongside the control ship on her other side.

When a large ship departs station, the conning officer of the control ship should be prepared for an increase in speed of his own ship, as it is freed from the dragging influence of the approach ship.

2.2.11 Emergency Breakaway. During underway replenishment, an emergency may arise that requires an emergency breakaway. An emergency breakaway is basically an accelerated standard breakaway using an orderly and prearranged procedure. The objective is to disengage quickly without damaging the rigs or endangering personnel.

2.2.11.1 Training. The basis for proper preparation is the assignment of specific duties to personnel at each UNREP station. Emergency breakaway duty assignments and procedures should be outlined in a separate section of the ship's underway replenishment bill. Personnel involved in replenishment must be thoroughly briefed on the entire evolution prior to each UNREP. Periodic "walk-through" drills should be conducted to ensure a satisfactory level of understanding. These basic points must be covered:

1. Emergency breakaway procedures contained herein.

2. Review of ship's UNREP bill, emergency breakaway procedures, and specific responsibilities associated with personnel duty assignments. The responsibilities of the conning officer, helmsman, ship control safety officer, after steering safety officer, and rig captain should be included in the ship's UNREP bill and rehearsed prior to each evolution.

3. All associated internal and external communications, including visual signals.

4. The use of velocity, pole type, wire rope cutters (see paragraph 2.2.11.3). Personnel assigned to use these cutters shall be trained and certified in accordance with OPNAVINST 8023.2.

5. The use of equipment to reduce the extent of damage, retrieve the rigs, and effect prompt repairs. Special equipment (such as Klein grips, wire clips, and chain stoppers) should be included.

6. The organization for making repairs.

7. The location of spare gear that may be required to return an inoperable station to full operation as soon as possible.

8. Winch watchers may be stationed at winches used during replenishment. Each winch watcher shall remain alert to detect malfunctions in the winch assigned him and report immediately any malfunction to the rig captain. For winch malfunctions to watch for, see Appendix I.

2.2.11.2 Securing Wires to Winch Drums. On ships using wire rope rigs for underway replenishment, each wire rope end shall be secured to the winch drum by only one wire rope clip or specially designed clamp that will allow the bitter end of the wire to slip free of the drum during an emergency breakaway.

2.2.11.3 Velocity, Pole Type, Wire Rope Cutters. The explosive-charged, velocity pole type, wire rope cutters are used to cut nontensioned wires and lines during an emergency breakaway if there is danger to ship's personnel or the ship's structure. These cutters shall not be used for any other purpose *and shall never be used to cut a tensioned wire.* (See Figure 2-5.)

Explosive-charged, velocity, pole-type, wire rope cutters are required at transfer stations as follows: two cutters at each missile/cargo STREAM station on an UNREP ship and at each double-burton station; one cutter at each nontensioned solid cargo station on an UNREP ship and at each burton station on other burton-capable ships (CV, LHA, LPH, and so forth).

2.2.11.4 Exchange of Information Between Ships. After station-to-station communications have been established, the safety officer at each transfer station on the delivery ship should contact the corresponding safety officer on the receiving ship and review — in detail — the procedures for an emergency breakaway. The delivery ship shall send over with the first lines at each station written instructions for breakaway applicable to the rig being used. As soon as bridge-to-bridge communication is established, commanding officers should review — in detail — all actions to be taken in the event of an emergency breakaway.

2.2.11.5 Preparation of Lines. Since an emergency may occur at any time during the replenishment operation, preparations must be made upon receipt of the first line.

1. All lines, as they are brought aboard, shall be faked clear for running in the direction of tend and maintained faked down (if possible) during the replenishment. Messengers are to be returned in accordance with the procedures for the applicable rigs.

2. Housefall rig and messenger lines, riding lines, and easing-out lines shall be belayed to cleats (similar to the cleats shown in Figure 3-16) that are clear of stores and other interference and made ready for instant slacking.

3. As soon as the end fitting on the spanwire or highline is secured to the attachment point on the receiving ship, an easing-out line is to be rigged through the shackle attached to the pelican hook. One end is to be belayed to a cleat so that the line is ready for easing-out. The easing-out line shall be 12- to 21-thread manila and of suitable

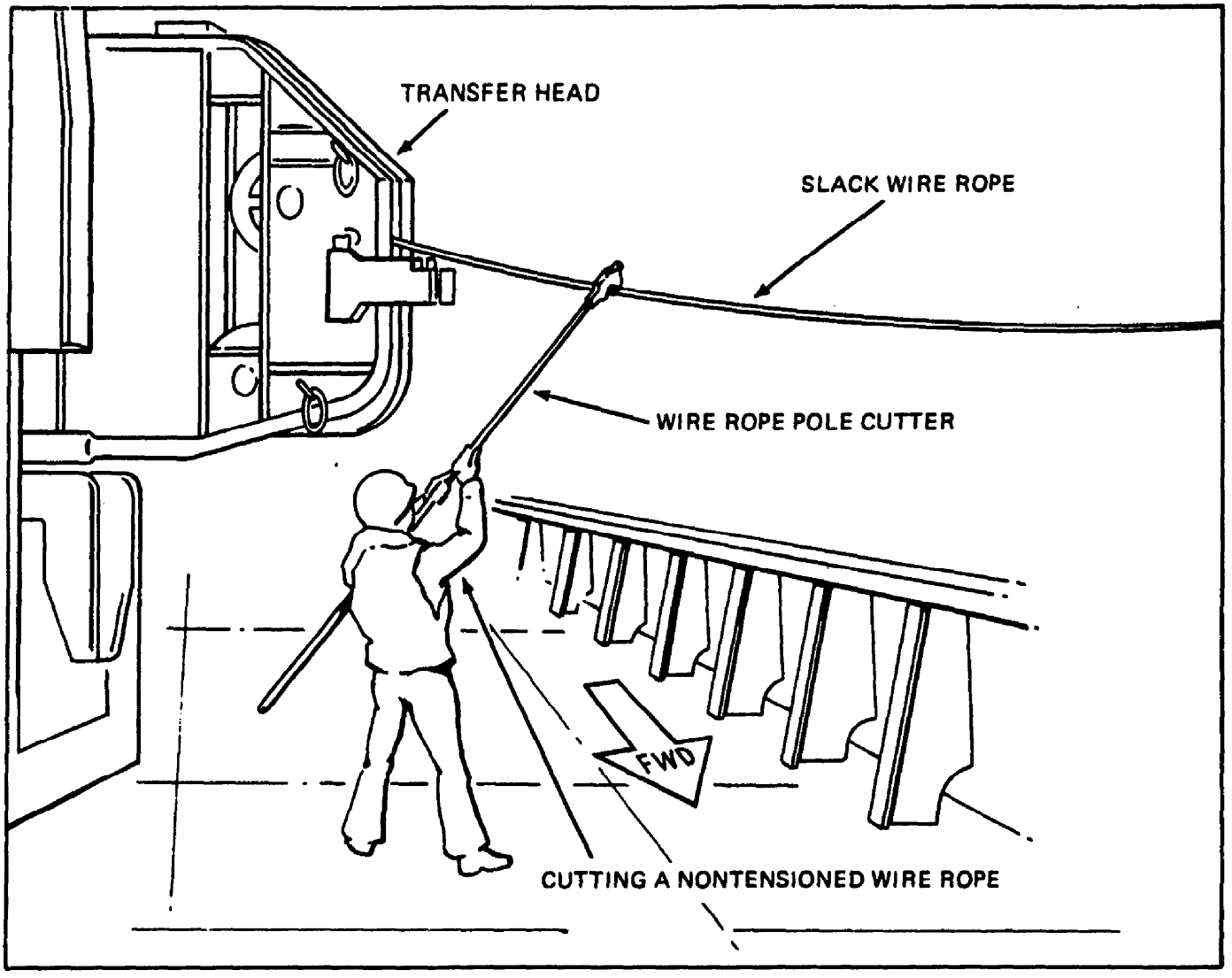


Figure 2-5. Cutting a Nontensioned Wire Rope

length to ease the wire clear of the ship's side. Easing-out lines are required for all RAS and FAS highlines and spanwires.

2.2.11.6 Conditions Warranting Emergency Breakaway. Examples of conditions which warrant ordering an emergency breakaway are listed below.

1. When either ship experiences an engineering casualty that affects her ability to maintain the replenishment course or speed

2. When an enemy contact is reported that presents immediate danger to the force

3. When a carrier must break off for an emergency launch or recovery of aircraft

4. When ships separate to the point at which hoses appear in danger of parting, when the separation distance causes wires to approach the last layer on the winch drums, or when a casualty or equipment failure may result in a tightline condition

5. When a rig parts and there is a possibility of the screw becoming fouled

6. When a man is lost overboard and a lifeguard ship or helicopter is not on station.

2.2.11.7 Ordering Emergency Breakaway. The order for an emergency breakaway may be given by the commanding officer of either the receiving ship or the delivery ship. Once initiated, the delivery ship will assume control and initiate proper hand signals with appropriate parallel information on the sound-powered phones to the receiving ship. Paramount in execution of an emergency breakaway is the allowance of sufficient time for the ships to disconnect the rigs in an orderly manner.

Sound-powered phones and hand signals should be the primary means of communication for ordering an emergency breakaway, because of the minimal amount of noise generated; however, 1 MC, bull horns, and voice radio circuits should be used, if necessary, to ensure rapid ship-to-ship communications.

The danger signal (at least five short blasts) shall be sounded by the ship initiating the emergency breakaway to alert all ships in the vicinity. In sounding five short blasts on the whistle to alert ships in the vicinity of emergency breakaway, due regard should be taken of (1) the tactical situation, (2) the effect of increased noise levels on conning officer-to-helmsman communication, and (3) the disruption to intership and intraship sound-powered phone communications caused by whistle signals. Radio or even visual means may be preferred to whistle signals to notify ships in company. Authorization and/or coordination for non-use of whistle signals shall be affirmed between ships involved in the underway replenishment and the OTC, prior to commencement of the underway replenishment.

The OTC and other ships in the formation shall be informed immediately of the emergency via voice radio if security permits. Amplifying details must be relayed as soon as possible thereafter.

2.2.11.8 Emergency Breakaway Procedures. When a condition warranting an emergency breakaway is recognized, take the following actions:

1. Notify the following intraship stations of conditions or situations which require execution of an emergency breakaway:

   (a) Bridge (initiate the danger signal by radio or visual means, if prearranged, or by sounding five short blasts on the ship's whistle)

   (b) Cargo control center

   (c) Fuel control center

   (d) Fueling stations

   (e) Cargo stations.

2. Pass the word between ships in accordance with paragraph 2.2.11.7:

   (a) Bridge to bridge for all ships alongside

   (b) Station to station

   (c) Bridge to OTC and other ships in formation (security permitting).

3. Stop all transfers.

4. Retrieve rigs in accordance with the procedures in Chapters 3, 4, 5, and 7.

WARNING

Never trip a spanwire or highline under tension.

5. Station-to-station and bridge-to-bridge sound-powered phones should remain connected until the rigs are disconnected and clear of the receiving ship's side. The delivery ship should retrieve the station-to-station phone line, up to the jackbox on the receiving ship, and tend the phone line until the rig is disconnected.

6. When all lines have been released by the receiving ship, both ships maneuver as appropriate to get clear.

2.2.11.9 Special Precautions. In the event that a general ship's power loss or a local power loss at a transfer station causes an emergency breakaway, control winches and slack off (pay out) wires using the hydraulic brake on the winch. The wire can be readily controlled with this brake until power is restored or the wire is payed out over the side. Exercise extreme care when trailing wires in the water. A turn away from the wire may draw it under the hull of the ship and into the screw.

2.2.11.10 Recommended Emergency Maneuvering. When there is a steering casualty or loss of propulsion, use all means available (sound-powered phones, voice radio, 1 MC, or hand-held megaphones) to communicate own ship's intentions or limitations to the unit alongside. The flow of information must be continuous until the danger has passed.

If the gyrocompass fails, steering by magnetic compass is frequently not the best alternative. Changes and deviations in readings from the magnetic compass, because of the ship(s) alongside and their relative movements, and the low sensitivity of the magnetic compass to small changes in heading, suggest that there are times (such as during emergency breakaway) when positive control can only be obtained by rudder orders.

Emergency maneuvering is essential if either the delivery or receiving ship experiences a casualty that affects her speed or steering. Recommended maneuvering procedures are listed below.

1. If the receiving ship experiences a casualty affecting her speed, the delivery ship should attempt to match her speed until breakaway has been completed, then clear ahead at good speed. This procedure will keep the replenishment gear near the surface of the water and reduce the possibility of fouling own ship's screws.

2. If the delivery ship experiences a casualty affecting her speed, she should request the receiving ship to slow down to allow more time for disconnecting the rigs.

3. If either ship experiences a casualty affecting her steering, both ships should take action to minimize relative speed in order to reduce the damage that may be caused by raking.

4. If the delivery ship has a ship alongside to port and starboard and either one veers out, the delivery ship should maintain course and speed. Rigs will thus tend to remain near the surface as they are retrieved.

2.2.11.11 Practicing Emergency Breakaways. Upon the completion of normal UNREPs, all ships should simulate an emergency breakaway (when the situation permits) to train the crews in the procedures to be followed.

2.2.12 Collision Procedures. During an alongside replenishment, the conning officers of both ships must be alert for the possibility of a collision. If a collision occurs, damage will vary

directly with the degree of relative motion between the ships at the moment of impact. Therefore, if a collision appears to be inevitable, conning officers shall take every possible action to reduce relative motion in both the lateral and the fore-and-aft directions. Should a collision occur:

1. Institute damage control measures immediately. Maintain watertight integrity and protect explosives and inflammable material from fire.

2. Effect separation with great care to keep damage to a minimum. Good bridge-to-bridge communications at this time are essential.

2.3 STANDARD REPLENISHMENT EQUIPMENT

Equipment items in this section are common to all methods of ship-to-ship transfer.

2.3.1 Wire Rope. Wire rope used in FAS and RAS rigs shall be Type I, general purpose, class 3, construction 6, 6 by 37 (6 by 29 is within the classification of 6 by 37 and is acceptable), independent wire rope core (IWRC), improved plow steel, preformed, regular right-hand lay, in accordance with Federal Specification RR-W-410.

2.3.2 Fiber Rope. Fiber rope used in FAS and RAS rigs shall be in accordance with the following specifications:

1. Manila rope — Type M, Federal Specification T-R-605

2. Nylon rope — Three-strand, Specification MIL-R-17343

3. Nylon rope — Double-braided, Specification MIL-R-24050

4. Spun polyester — Double-braided, Specification MIL-R-24536

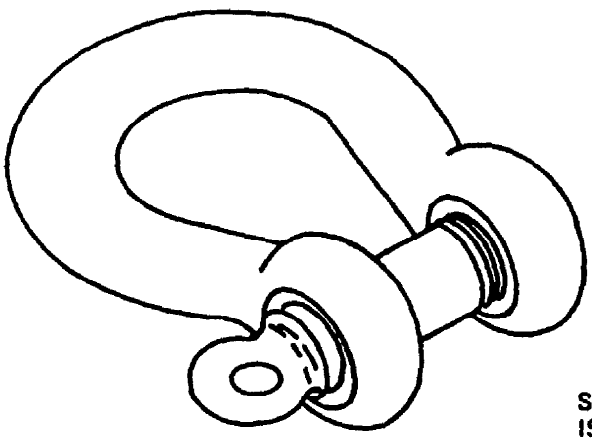
5. Spun polyester — Plaited, Specification MIL-R-24537.

2.3.3 Shackles. Shackles used in FAS and RAS rigs are anchor shackles, Type I, Class 2 and 3; and chain shackles, Type II, Class 2 and 3 (see Figure 2-6). All shackles used in rigs shall be Grade A (regular strength), in accordance with Specification MIL-S-24214. Class 2 shackles have a screw pin that passes through one eye and screws into the other eye. Class 3 shackles have a bolt that passes through both eyes and a nut that is threaded onto the bolt. A cotter pin is used to prevent the nut from backing off. Class 3 shackles are called safety shackles. Grade A (regular strength) shackles can be distinguished from Grade B (high strength) shackles by the lack of the raised letters HS on the head.

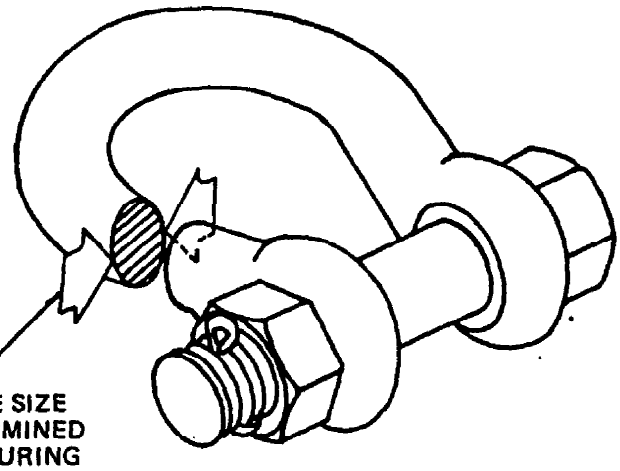
2.3.4 Line-Throwing Devices. Line-throwing guns and bolos are used to pass nylon shot lines between ships. Shot lines are sent across by the delivery ship to all receiving ships, except CVs, LPHs, LHAs, and other ships with aircraft on deck. Care should be used to ensure that the shot line does not hit any ship on the other side of the ship to which the line is passed.

2.3.4.1 Bolo. The bolo is hand heaved. It can be used for passing the shot line in daylight and should be used when practicable. The bolo is attached to the end of the nylon shot line. It consists of 10 oz (283 g) of lead with rounded corners and is well padded — encased in rubber or leather. A 2 inch (50.8 mm) wooden toggle is secured to the line about 4 to 5 feet (1.2 to 1.5 m) from the weight. To use the bolo, a man grasps the toggle, twirls the weight about his head several times to gain momentum, and then lets go of the toggle. Two bolos are required at each station. A line-throwing gun shall be readily available for use, if needed.

2.3.4.2 Line-Throwing Gun and Projectile. The Mk 87 Mod 1 line-throwing rifle adapter kit, SW 350-A1-MMO-010, is used on the M14,

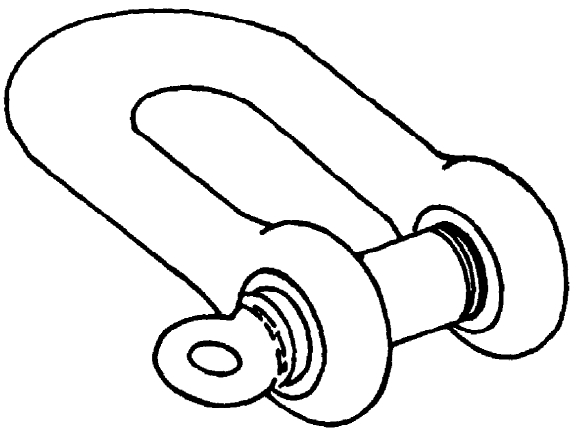


TYPE I, CLASS 2
SCREW-PIN ANCHOR SHACKLE

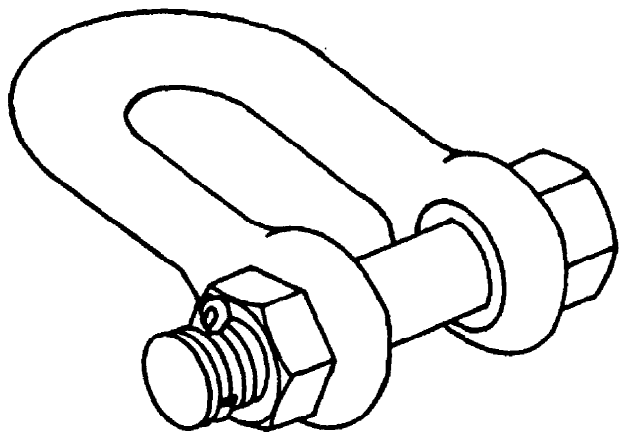


SHACKLE SIZE IS DETERMINED BY MEASURING ACROSS THIS POINT

TYPE I, CLASS 3
SAFETY ANCHOR SHACKLE



TYPE II, CLASS 2
SCREW-PIN CHAIN SHACKLE



TYPE II, CLASS 3
SAFETY CHAIN SHACKLE

Screw-pin shackles are used in applications where it is or might be necessary to break down the shackle quickly. Safety anchor shackles are used in areas where there will be little chance that the rig must be taken apart quickly, such as stress wires, trolleys, and saddles. The safety shackle is also used for places where there is a possibility that a screw-pin type shackle might work loose. A screw-pin shackle may be used when a safety shackle is not available but then the screw-pin must be seized.

Figure 2-6. Anchor and Chain Shackles

M16, and A1 rifles to propel a rubber projectile. The shot line is attached to the projectile. One gun and at least two projectiles are required at each station. An additional gun and projectile should be available for each engaged side. Only the approved illuminated projectile shall be used at night.

2.3.4.3 Shot Line Bag. The shot line bag is used to return the shot line (see Figure 2-7). It consists of an 8 inch (20.3 cm) by 10 inch (25.4 cm) canvas bag, sewn to 18 inches (45.7 cm) of 9-thread, which has a halyard snap on one end and a halyard ring on the other end. The shot line bag shall be secured between the nylon shot line and the messenger, before the shot line is passed.

2.3.4.4 Passing the Shot Line

1. Line-throwing gunners and bolo heavers must be thoroughly trained. They shall wear red safety helmets.

2. When ready to send lines across, pass the word on both ships over the topside loudspeakers (1MC) and/or electric megaphones as follows:

FIRING SHIP. "On the (name of ship), stand by for shot line(s). All hands topside take cover."

RECEIVING SHIP. "On the (name of ship), stand by for shot line(s). (Port/starboard side forward, aft, midships, all stations.) All hands topside take cover."

3. The safety officer in charge of each replenishment station on the firing ship shall sound a one-blast signal on a mouth whistle. He may, if an electric megaphone is available, pass the word, "Standby."

4. The safety officer in charge of the receiving station on the other ship shall reply with a two-blast signal on a mouth whistle. He may, if an electric megaphone is available, pass the word, "Ready," when ready to receive the shot line.

CAUTION

Sound the above two signals each time the shot line is to be fired.

5. On receipt of the ready signal, the safety officer in charge on the firing ship shall give the order to fire. The gun will not be fired except by his order.

6. Only personnel designated by the rig captain at the receiving station shall leave cover to retrieve the shot line. Other personnel shall remain under cover until all shot lines are on board and the word is passed that the shot lines are secure.

7. The shot line shall not be cut by the receiving ship, except in an emergency, and shall be returned intact at the earliest possible time.

2.3.5 Messenger. The messenger is the main line used to assist in hauling any basic rig across between the ships (see Figure 2-8). The preferred location for handling the messenger and other lines is forward of the rig. If space is limited forward, aft of the rig is acceptable on a station-to-station basis. Other lines, such as the station-to-station phone line and the lead line messenger for the bridge-to-bridge phone/distance line, are attached to the messenger at a minimum distance of 200 feet (60.9 m) from the smaller end. The spanwire or highline is stopped to the messenger at a minimum distance of 350 feet (106.5 m) from the larger end. A 3 inch (76.2 mm) soft eye splice forms the bitter end of the messenger.

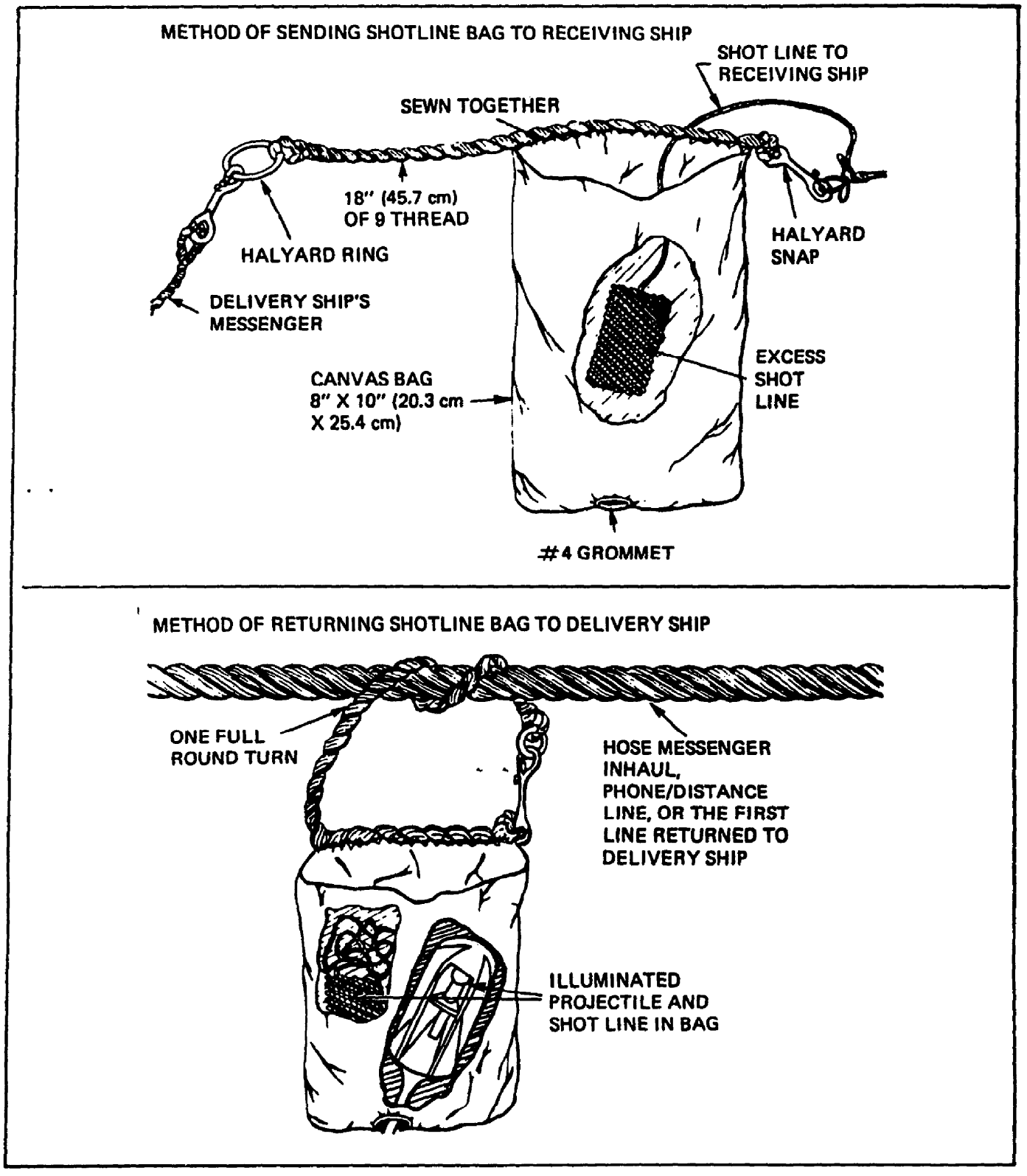


Figure 2-7. Shot Line Bag

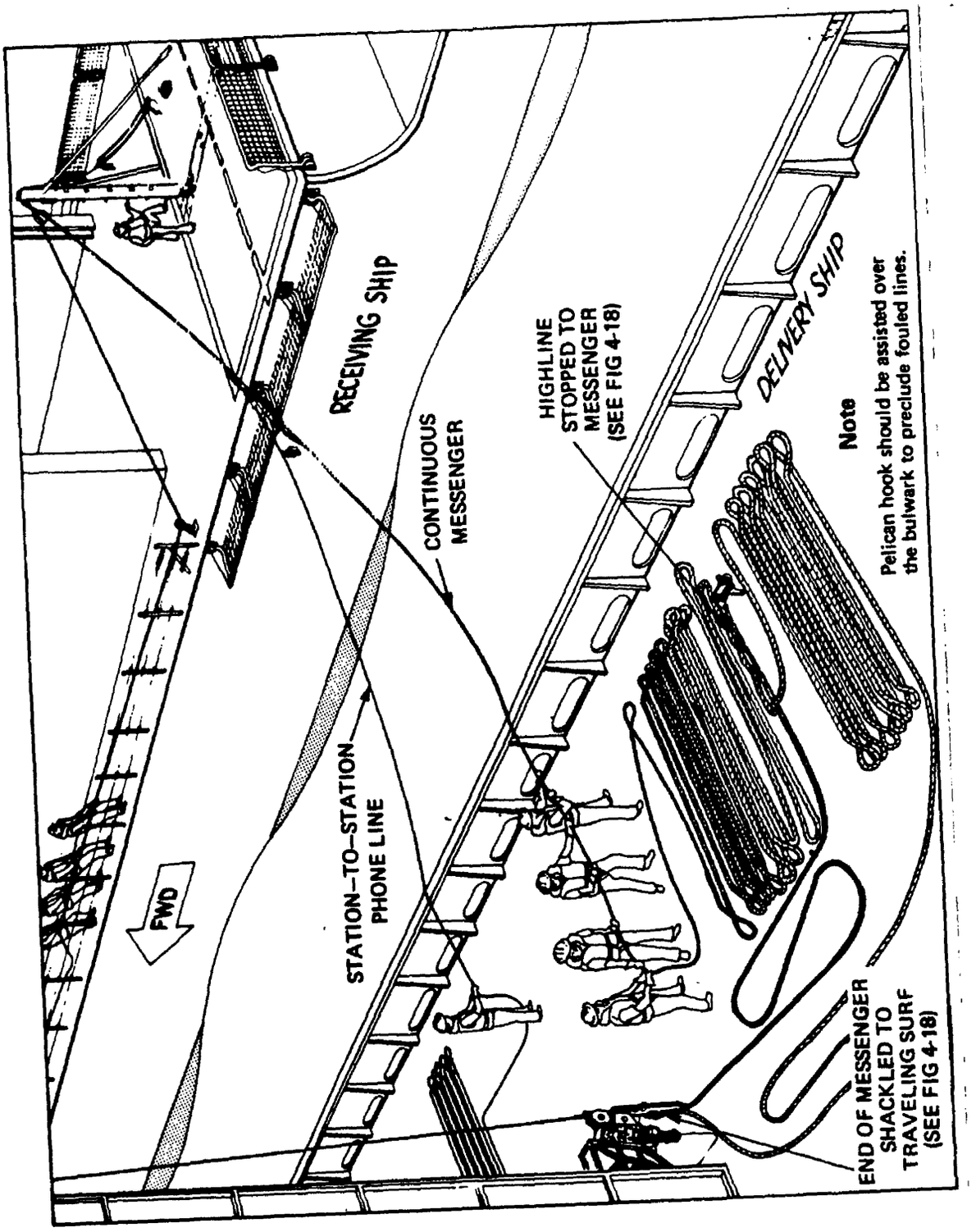


Figure 2-8. Replenishment-at-Sea Messenger

WARNING

If chafing is observed between the shackle and the soft eye splice, remove the eye splice and resplice the end of the messenger.

2.3.5.1 Basic FAS/RAS Messenger. The basic FAS/RAS messenger (see Figure 2-9) is 800 feet (243.8 m) of continuous graduated manila, plaited polyester, or three-strand nylon with tapered splice(s), as follows:

1. Nylon/polyester: 200 feet (60.9 m) of 1-1/2 inch (38.1 mm) line and 600 feet (182.8 m) of 3 inch (76.2 mm) line

2. Manila: 100 feet (30.4 m) of 12-thread, 100 feet (30.4 m) of 21-thread, 100 feet (30.4) of 2-1/4 inch (57.1 mm) line, and 500 feet (152.4 m) of 3 inch (76.2 mm) line.

2.3.5.2 STAR Messenger. The STAR messenger is made up as shown in Figure 2-10. It is 800 feet (243.8 m) of graduated plaited polyester or three-strand nylon with tapered splices as follows:

200 feet (60.9 m) of 1-1/2 inch (38.1 mm) line, 534 feet (162.8 m) of 3 inch (76.2 mm) line, 6 feet (1.8 m) of 2-1/4 inch (57.1 mm) line, a pair of brummel hooks, and 60 feet (18.2 m) of 2-1/4 inch (57.1 mm) line.

2.3.6 Bridge-to-Bridge (B/B) Phone/ Distance Line. The bridge-to-bridge phone/distance line provides both a sound-powered phone circuit and a distance-between-ships visual indicating system. This line is required on all ships. (See Figure 2-11.)

2.3.6.1 Rigging the Line

The bridge-to-bridge (B/B) phone portion of the line is made up as follows:

1. A minimum of 350 feet (106.6 m) of 1-1/2 inch (38.1 mm) circumference, three-strand, lightweight, polypropylene line — each strand of line has one wire interwoven therein

2. A jack or jackbox at each end — labeled "B/B phone"

3. A 6 foot (1.8 m) long tail line at both ends of 3/4 inch (19.0 mm) nylon or 21-thread

4. A ring, attached at the 350 foot (106.6 m) end, for rapid connect-up of the lead line messenger when the receiving station is unable to supply the B/B phone/distance line, or when it is necessary to replace the receiving station's B/B phone/distance line.

The distance line messenger is made up as follows:

1. A 200 foot (60.9 m) length of 3/4 inch (19.0 mm) nylon or 6-thread, spliced to the zero end of the B/B phone portion of the line

2. A ring, attached at the bitter end, for rapid connect-up of the lead line messenger for passing the B/B phone/distance line

3. A 5 inch (12.7 cm) by 6 inch (15.2 cm) tag at the bitter end — labeled, "Bri/Bri phone line."

The lead line messenger is made up as follows:

1. A 200 foot (60.9 m) length of 3/4 inch (19.0 mm) nylon or 6-thread, with steel snap hooks at each end

2. A 5 inch (12.7 cm) by 6 inch (15.2 cm) tag at the outboard (other ship) end — labeled, "Attach zero end B/B phone/distance line."

2.3.6.2 Distance Markers. Distance markers on the B/B phone/distance line are arranged as shown in Figure 2-12. They are made up as follows:

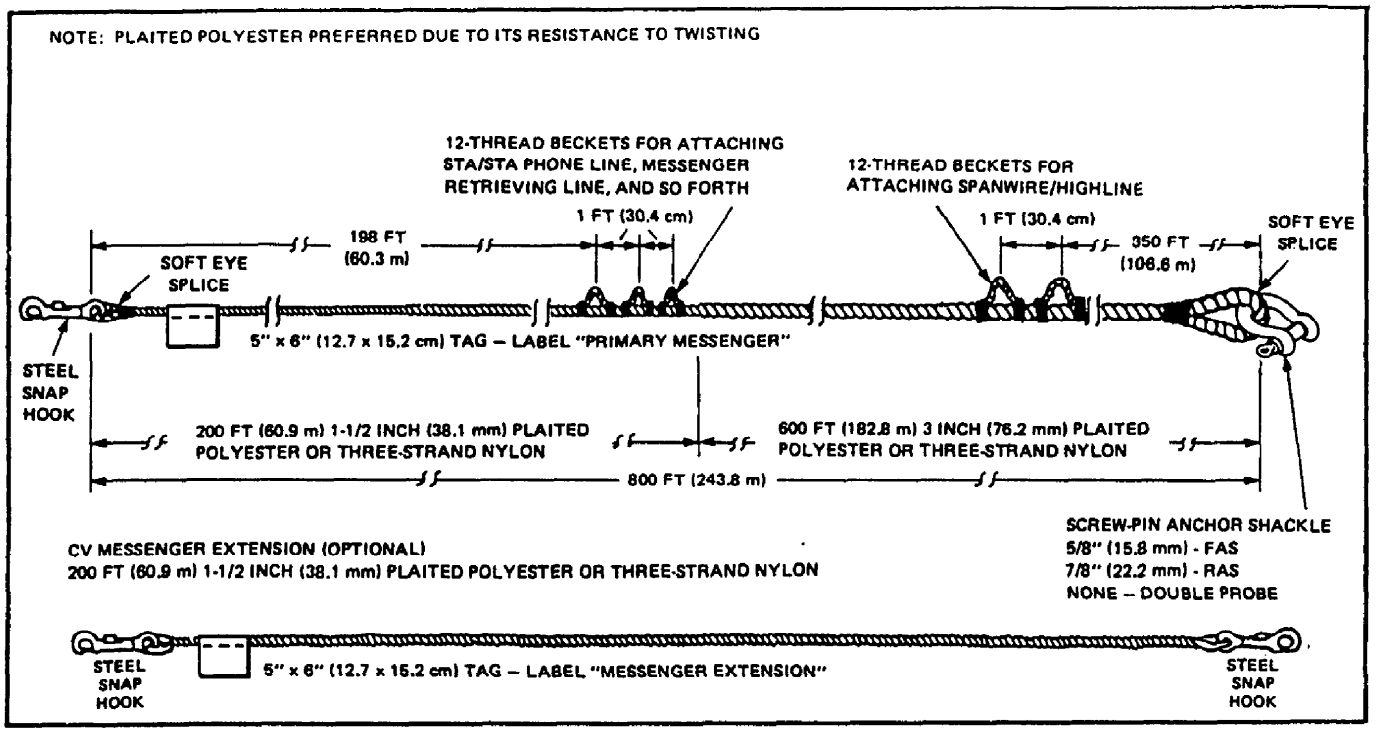


Figure 2-9. Basic Messenger (FAS/RAS)

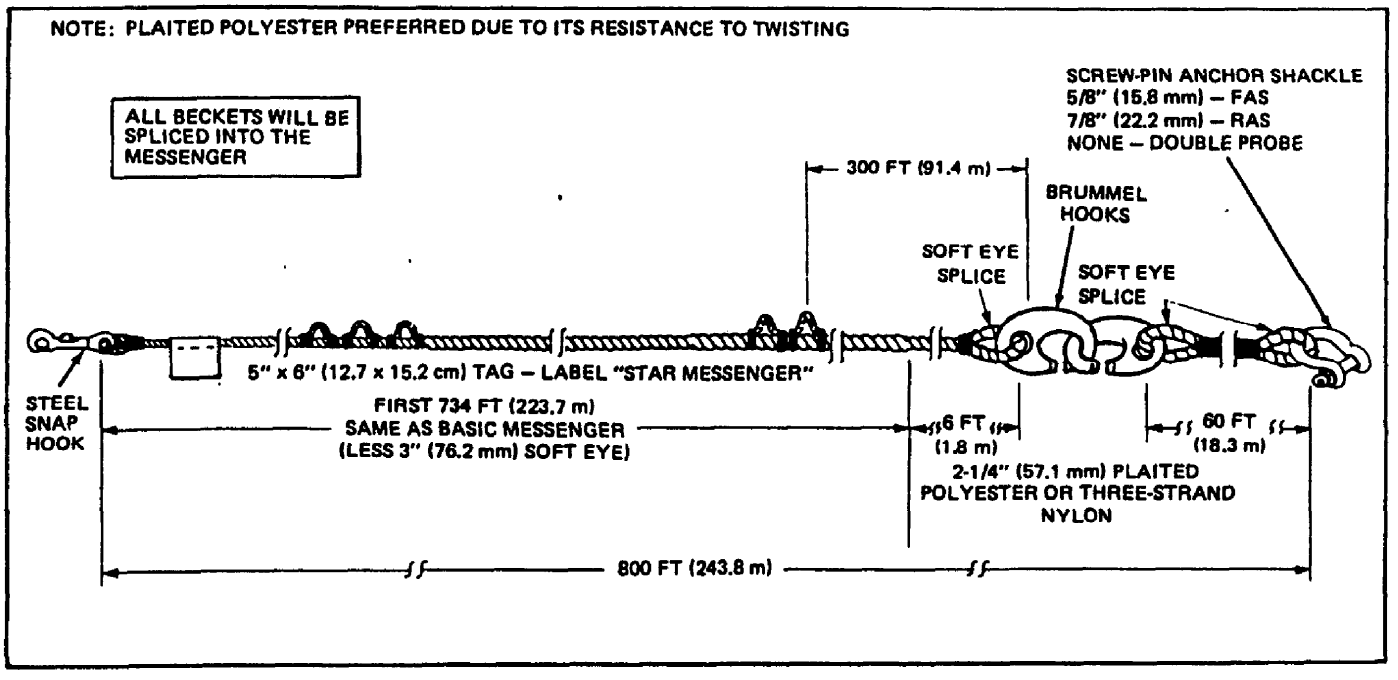


Figure 2-10. STAR Messenger

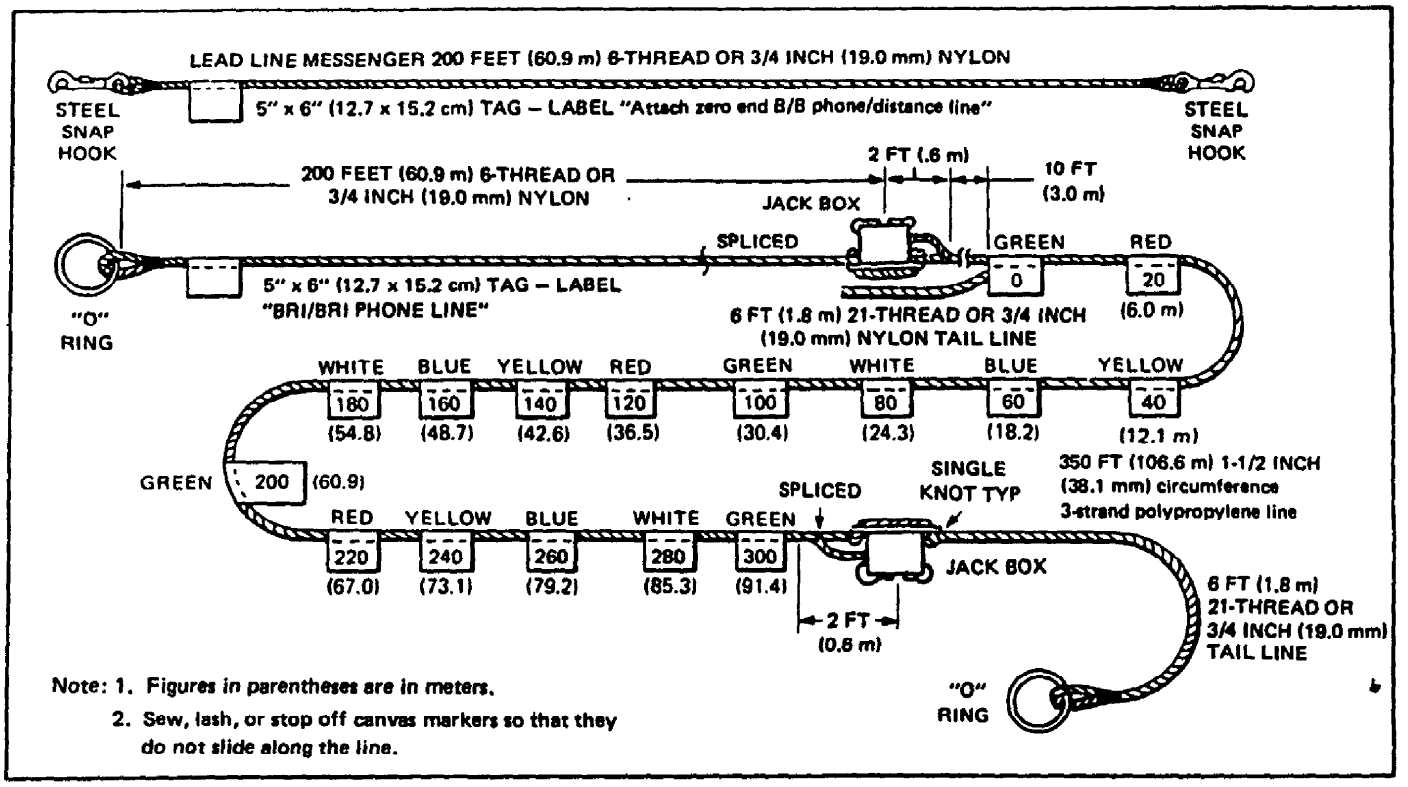


Figure 2-11. Bridge-to-Bridge (B/B) Phone/Distance Line

1. In daylight: Colored-cloth, nylon-coated, fabric or painted-canvas markers, each 8 inches (20.3 cm) by 10 inches (25.4 cm), and spaced at 20 foot (6.0 m) intervals from 0 to 300 feet (0 to 91.4 m). The distance is shown in numerals 5 inches (12.7 cm) high. Markers must be sewn, lashed, or otherwise stopped off in such manner that they will not slide along the line. Provide grommets as appropriate for lashing chemical lights at night to provide an unobstructed view during flapping and twisting of the distance line.

2. At night: Chemical lights as indicated: use two blue chemical lights, one on each side of the marker, at the 60, 100, 140, and 180 foot (18.2, 30.4, 42.6, and 64.8 m) markers. Use one red chemical light on the approach-ship side of the other markers. (One-cell, pin on type, red flashlights may be used in lieu of red chemical lights.)

2.3.6.3 Passing the Line. Pass the B/B phone/distance line from the approach ship to the control ship using the lead line messenger (Figure 2-13):

1. The control ship attaches the lead line messenger for the B/B phone/distance line to the main messenger of the rig nearest the B/B phone/distance line's tending point. If a delay develops, or if the rig being sent over is remote from the tending point, the control ship (approach ship if a CV, LHA, or LPH) sends over an individual shot line for the B/B phone/distance line. The lead line messenger is equipped with a snap hook and

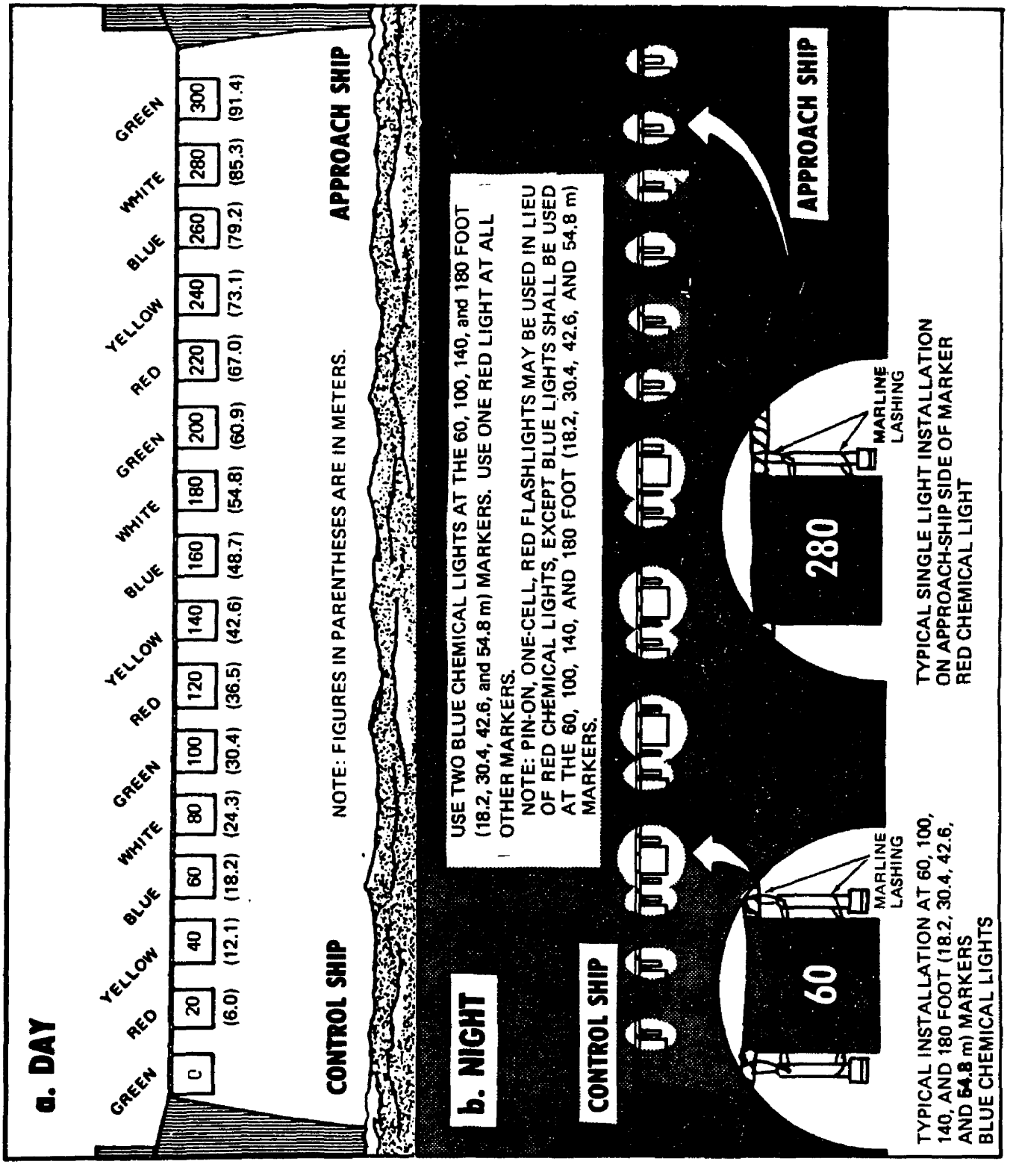


Figure 2-12. B/B Phone/Distance Line Markings

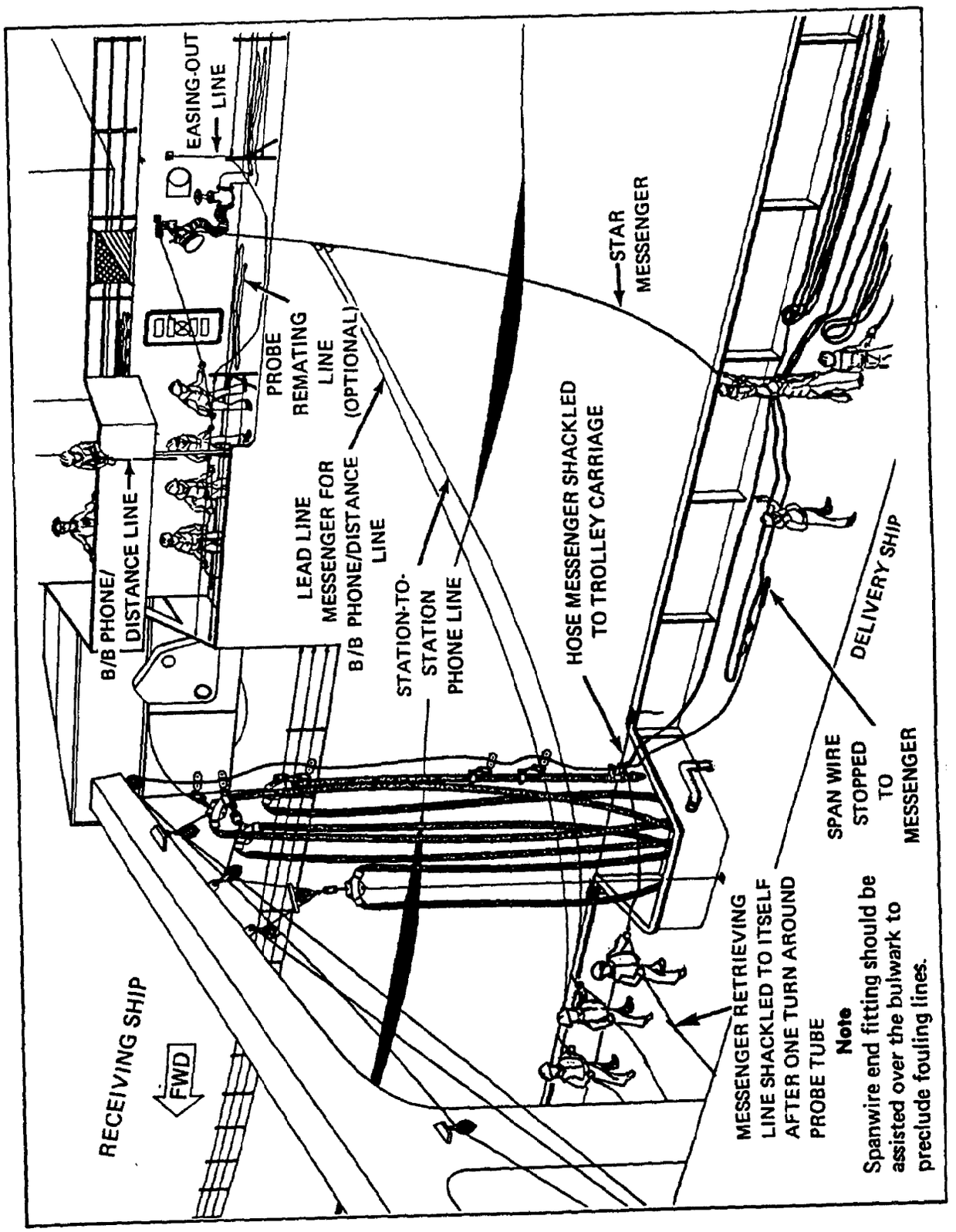


Figure 2-13. Passing the Lines

has a tag marked, "Attach zero end B/B phone/ distance line."

2. The approach ship unhooks the lead line messenger and snaps it on to the zero end of the B/B phone/distance line. If an individual shot line is used, the approach ship attaches the zero end of the B/B phone/distance line to the shot line. It then signals the control ship, "Heave around."

3. The control ship hauls in the B/B phone/ distance line and secures the zero end to the outermost rail.

4. The control ship unsnaps the lead line messenger from the B/B phone/distance line and fakes the lead line messenger down, clear for running.

5. When the approach ship has a complement of 50 men or less: the control ship passes the zero end of the B/B phone/distance line to the approach ship instead of the lead line messenger. The approach ship secures the zero end to the outermost rail and the delivery ships sends and tends all phone lines.

6. When the approach ship has the messenger/highline aboard, the control ship should — prior to hookup — separate the messengers and the highline.

7. Maintain a light strain on the B/B phone/distance line while passing the messenger, to prevent the B/B phone/distance line from twisting around the messenger.

8. Send an individual shot line for the B/B phone/distance line, in the case of a CV, LHA, or LPH.

2.3.6.4 Tending the Line

1. The B/B phone/distance line is kept taut, at right angles to the ship's centerline, in view of the conning officer.

2. During night replenishment, the B/B phone/distance line tender shall keep the conning officer informed of the distance.

3. When the line is tended some distance from the bridge, there should be a sound-powered phone link between the line-tending station and the conning officer.

2.3.7 Station-to-Station (Sta/Sta) Phone Line. The station-to-station phone line provides sound-powered phone communication between each delivery and receiving station. The line is required for each rig in use and is normally provided by the delivery station. The station-to-station (Sta/Sta) phone line is made up as follows:

1. A minimum of 350 feet (106.6 m) of 1-1/2 inch (38.1 mm) circumference, three-strand, lightweight, polypropylene line — each strand of line has one wire interwoven therein.

2. A jack or jackbox at each end — labeled "Sta/Sta phone"

3. A 6 foot (1.8 m) long tail line of 6-thread or 3/4 inch (19.0 mm) nylon at the inboard (own ship) end, for use in securing at the rail

4. A 200 foot (60.9 m) length of 6-thread or 3/4 inch (19.0 mm) nylon, spliced to the outboard (other ship) end, for use as a messenger

5. A snap hook, attached to the outboard end of the messenger portion, for rapid connect-up to the rig messenger for passing

6. Each station-to-station phone line shall be tested prior to sending it to the receiving station.

2.3.8 Fenders. Fenders provide little or no protection for ships engaged in underway replenishment. They are not required for underway replenishment.

2.3.9 UNREP Working and Repair Tools. All necessary tools, spare parts, and spare components necessary to effect repairs to transfer stations must be maintained in readiness to meet major or minor repair requirements. While the individual ship's configuration will dictate stowage of spare components, a complete set of working tools and repair equipment must be maintained in a location that can be readily accessed by transfer station personnel. Tools and equipment should be inventoried and checked for proper operation prior to each replenishment. Each transfer station should maintain, as a part of station equipment, a listing of all items (tools, spares, and so forth) which may be required to repair the station, together with the stowage location of such items.

As a minimum, provide the working and repair tools listed in Figure 2-14 at each transfer station (as applicable) and stow them in lockers and/or tool boxes at the station. They are an integral part of the transfer station's equipment and shall not be used for any other purpose.

2.3.10 Pelican Hooks. Certain FAS and RAS rigs use one of three types of pelican hook to connect the spanwire or highline at the receiving station.

1. The 1 inch (25.4 mm), fueling-at-sea, lightweight, pelican hook is used on the outboard end of the fueling spanwire when using either the combined quick-release coupling and valve (Robb coupling) or the breakable-spool, quick-release (NATO) coupling. It is not to be used with the probe fueling system.

2. The 1-3/8 inch (34.9 mm) standard pelican hook is used to secure the highline to the long link on the receiving station's fixed padeye, sliding padeye, or pendant. It must be used with the STREAM with STAR rig.

3. The 1-3/8 inch (34.9 mm) STREAM pelican hook is used to secure the highline to the long link on the receiving station's fixed padeye, sliding padeye, or pendant. It must be used with the STREAM with traveling SURF rig. It must not be used with the STREAM with STAR rig.

For details on pelican hooks, cotter pins to use, and the correct procedure for spreading cotter pins, see Figure 2-21.

2.4 COMMUNICATIONS

Communication equipment required for replenishment includes sound-powered phones, flags, paddles, wands, radios, signal searchlights, and electric megaphones.

2.4.1 Sound-Powered Phones are the primary means of passing information.

1. Phone lines must be provided and manned between conning stations, between transfer stations, and between the bridge and transfer stations.

2. Station-to-station phone lines go across at each transfer station, attached to the rig messengers. Each line must be properly tagged for identification.

3. Phone leads must be ready for establishing communications as soon as jackboxes are received.

4. All phone lines must be hand tended.

WARNING

To avoid injury, phone talkers on intership phone lines shall not fasten the neck straps.

5. When sound-powered phone communications cannot be established, even though

ITEM	KEY	QUANTITY
ALLEN WRENCHES (for end fittings and hose split clamps)	B	2 each size
AXE	B	1
CHAIN STOPPER	B	1
COTTER PINS, STEEL, 3/32 inch (2.3 mm) x 2 inches (50.8 mm) (for shackles)	B	12
HAMMER, 2 to 5 lb (.9 to 2.2 kg)	B	1
HAMMER, SLEDGE, 10 or 12 lb (4.5 or 5.4 kg)	B	1
HOSE COUPLING TOOLS (Allen wrenches and screwdrivers of required sizes)	A	2 each size
MARLINESPIKE, 16 inch (406.4 mm)	B	2
PLIERS, SIDE-CUTTING, 8 inch (203.2 mm)	B	1
PLIERS, SLIP-JOINT, appropriate size	B	1
SCREWDRIVER (size to fit FAS hose split clamp)	B	2
SEIZING WIRE	B	6 feet (1.8 m)
SHACKLES, SAFETY, 5/8, 3/4, and 7/8 inch (15.8, 19.0, and 22.2 mm)	B	1 each size
SHACKLES, SCREW-PIN, 5/8, 3/4, and 7/8 inch (15.8, 19.0, and 22.2 mm)	B	1 each size
WIRE ROPE CUTTER, HYDRAULIC, PORTABLE	A	2
WRENCH, ADJUSTABLE, 10 inch (254.0 mm)	B	1
WRENCH, ADJUSTABLE, 12 inch (304.8 mm)	B	1
WRENCH, ADJUSTABLE, 15 inch (381.0 mm)	B	1
KEY: A – PER SHIP WITH WIRE ROPE DELIVERY CAPABILITY B – ALL DELIVERY AND RECEIVING STATIONS		

Figure 2-14. UNREP Working and Repair Tools

both stations are apparently manned, the person at the station sending the phone line shall initiate a "test signal" by positioning his arms over his head to form a "steeple." Both stations will then connect hand test sets to their station's terminals. If communications still cannot be established, the phone line will be replaced immediately. Personnel at the station returning the equipment to the originator will tend it by messenger line to prevent immersion between ships.

6. Phone boxes must be kept dry by sealing them in plastic bags or similar material before passing.

7. Whenever possible, the station-to-station sound-powered phone lines should be passed and tended forward of the rig.

2.4.2 Electric Megaphones may be used during the approach until phone lines are connected, and as a standby means of communication. Megaphones should be tested prior to each replenishment and be readily available during the evolution.

2.4.3 Radios may be used prior to the approach to exchange messages concerning replenishment capabilities. They should also be available during replenishment to pass vital information in case of an emergency.

2.4.4 Flag and Light Signals discussed below are in addition to the lights and shapes required by the International Rules of the Road. See paragraph 2.4.5.

2.4.4.1 Signal Flag Hoists. Display signal flag hoists during replenishment as shown in Figure 2-15.

2.4.4.2 Transfer Station Markers. Display transfer station markers (bunting, metal, or painted area markers for day, and red lights for night) to indicate the type of commodity that is to be transferred at the station. (See Figures 2-16 and 2-20.)

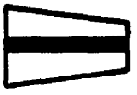
SIGNAL	MEANING
 Romeo Displayed on fore yardarm on side rigged	**CONTROL SHIP** At the dip: Am steady on course and speed and am preparing to receive you on side indicated. Close up: Am ready for your approach. Hauled down: When messenger is in hand.
 Romeo Displayed on fore yardarm on side rigged	**APPROACH SHIP** At the dip: Am ready to come alongside. Close up: Am commencing approach. Hauled down: When messenger is in hand.
 Prep Displayed at the outboard yardarm	**RECEIVING SHIP** At the dip: Expect to disengage in 15 minutes. Close up: Replenishing completed; am disengaging at final station. Hauled down: All lines clear.
 Bravo	**BOTH SHIPS** Where best seen: Fuel or explosives are being transferred. **DELIVERY SHIP** At the dip: Have temporarily stopped supplying. Close up: Fuel or explosives are being transferred. Hauled down: Delivery is completed. **RECEIVING SHIP** At the dip: Have temporarily stopped receiving. Close up: Fuel or explosives are being transferred. Hauled down: Delivery is completed.

Figure 2-15. Signal Flag Hoists

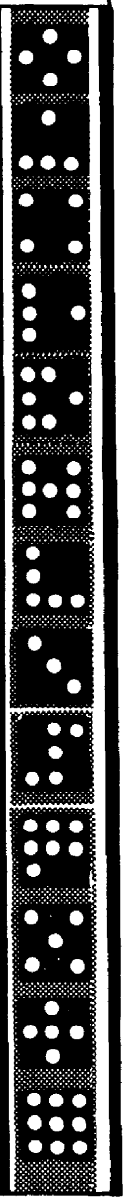
COMMODITY TRANSFERRED	CODE		
	DAY 3 ft^2 (91.4 cm^2) BUNTING OR PAINTED AREA		NIGHT LIGHT BOX
MISSILES	INTERNATIONAL ORANGE		
AMMUNITION	GREEN		
FUEL OIL	RED		
DIESEL OIL	BLUE		
F76	RED & BLUE TRIANGLES		
F44 (JP-5)	YELLOW & BLUE TRIANGLES		
LUBE OIL	BLACK, YELLOW QUARTERS		
WATER	WHITE		
STORES	GREEN WITH WHITE VERTICAL STRIPES		
PERSONNEL AND/ OR LIGHT FREIGHT	GREEN WITH WHITE LETTER "P" CENTERED		
FUEL OIL AND F44 (JP-5)	RED/YELLOW & BLUE TRIANGLES		
F76 AND F44 (JP-5)	RED/BLUE & YELLOW/ BLUE TRIANGLES		
BRIDGE-TO-BRIDGE PHONE/ DISTANCE LINE	GREEN WITH WHITE LETTER "B" CENTERED		

Figure 2-16. Transfer Station Markers

2.4.4.3 Hand Signals. Use hand signals to parallel all orders passed over sound-powered phones. Hand signals will be given with 12 inch by 12 inch (30.4 cm by 30.4 cm) paddles or 12 inch (30.4 cm) diameter paddles during the day or with colored wands on flashlights at night.

1. Assign the transfer station's signalman specifically to these duties. The requirement for a signalman to respond instantaneously to changing situations precludes his collateral assignment to any other duties (such as phone talker). Position the signalman in an area where he can readily see and be seen by the signalman with whom he is communicating and by the person in charge at the station. Signalmen will wear green safety helmets.

2. Print the signals shown in Appendix C on the backs of the signal paddles.

3. Red and amber paddles will be of solid colors. Green paddles will contain a 1 inch (25.4 mm) wide, white, diagonal stripe, running from the upper left corner to the bottom right corner.

4. Use red and amber signals during rigging and unrigging operations and as operational signals during the actual transfer. Use green signals only during the beginning and end of pumping and transfer operations.

5. To augment hand signals in daytime, messages may be written in large letters on placards or blackboards.

2.4.4.3.1 General Procedures for Hand Signals

1. Normally each ship signals the action it desires to be taken on the other ship.

2. If the signaled ship is unable to comply with the signaled action, that ship will initiate the avast signal. The originating ship will match any avast signal, halting the operation. The ship initiating an avast signal must originate the next signal when it is ready to proceed.

3. When two ships are replenishing from opposite sides of a service ship at night, care must be taken on each alongside ship not to confuse the signals of the other alongside ship for those of the replenishment ship.

2.4.5 Task Shapes and Lights required by Rule 27 of COMDTINST M16672.2, Navigation Rules (International and Inland), shall be displayed in accordance with the criteria below.

2.4.5.1 Day Shapes. Ships engaged in alongside replenishment shall display the required shapes during daylight hours from a vantage point that can be seen for a distance of at least 2 miles. Day shapes shall be displayed from 30 minutes prior to sunrise until 30 minutes after sunset. Approach ships shall display the shapes at a centerline halyard, or from the unengaged side, from the time that the replenishment approach has started (when Romeo is close up) until the approach ship has cleared the control ship and is able to maneuver in an unrestricted manner. The control ship shall display the shapes at a centerline halyard, or from the unengaged side when only one side is engaged, whenever an approach ship is making an approach, is alongside, or is clearing the control ship. These shapes shall not be displayed, unless one or more of the above situations exist.

2.4.5.2 Task Lights. Ships engaged in alongside replenishment at night shall display the required task lights in accordance with the criteria set forth for day shapes in paragraph 2.4.5.1.

The display of task lights during the approach and while alongside often tends to impair conning officers' night vision to the point where safety is endangered. Therefore, if the tactical situation permits, it may be advisable for the replenishment ship to turn off her task lights during another ship's approach, keep

them off while a carrier is alongside (using the carrier's lights for the alongside group), or have replenishing ships turn off task lights during the approach and while alongside. All ships must be prepared, however, to turn on task lights (as required by the Rules of the Road) if the replenishment formation is approached by other shipping.

2.5 REPLENISHMENT AT NIGHT

Replenishment proceeds more slowly and cautiously at night. Operations that may be straightforward in daylight — approach, maintaining station, passing and tending rigs — become more difficult and complicated after dark.

All ships must maintain a capability to replenish at night. To ensure proficiency, fleet, task group, and type commanders should schedule night replenishment exercises for their ships at frequent intervals.

2.5.1 Preparations for Night Operations. Preparations for night operations on both the delivery and receiving ships include:

1. Ensuring that required station marker light boxes are ready for operation

2. Providing necessary signaling equipment, rig and working lights, and illuminated line-throwing projectiles for each transfer station

3. Testing lights for proper operation

4. Giving special attention to personnel safety factors; issuing whistles and chemical lights (or single-cell flashlights) to all personnel requiring life jackets; checking operation of lifebuoy float light

5. Seeing that all attachment points and major rig fittings are painted white (to aid visibility under night lighting conditions)

6. Using soft, unpainted, canvas tags (5 inch (12.7 cm) by 6 inch (15.2 cm)) on all lines passed between ships, with short identification titles as follows:

   (a) Hose rig messenger

   (b) Attach zero end B/B phone/distance line

   (c) Bri/Bri phone/distance line

   (d) Sta/Sta phone

   (e) Hose messenger return

   (f) Highline messenger

   (g) Burton messenger.

   The canvas tags shall be marked as indicated and sewn by hand to the messenger lines to allow for reeving through fairlead blocks.

7. Testing switches for darkened-ship condition

8. Testing Nancy gear.

2.5.2 Night Lighting. Darkened-ship condition (no white lights showing) is the normal lighting condition for night replenishment. Ships should be darkened prior to commencing the approach.

Under darkened-ship condition, certain lighting is needed for coming alongside, maintaining station, and handling the gear and stores in the hold and on deck. Typical ship's lighting for night replenishment is illustrated in Figures 2-17 and 2-18 and described in the paragraphs below.

If possible, avoid the blinding effect of bright white lights. Navigation lights may be dimmed by both ships from the time the approach ship starts its approach until it is well clear. Dimmed navigation lights do not comply with the Rules of the Road.

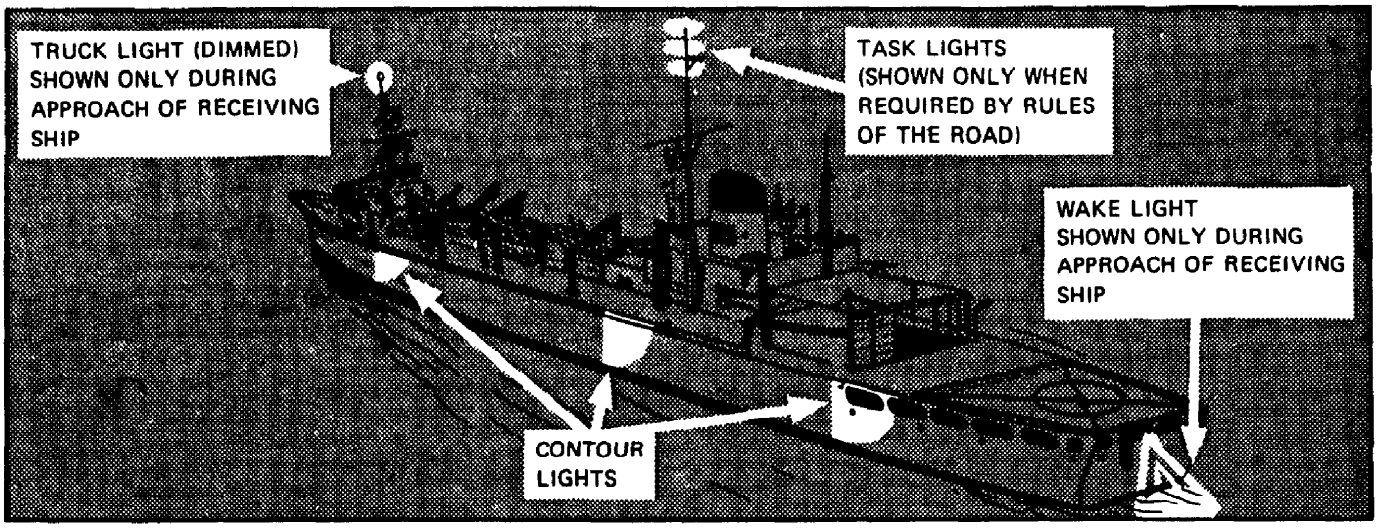


Figure 2-17. Approach and Station-Keeping Lights

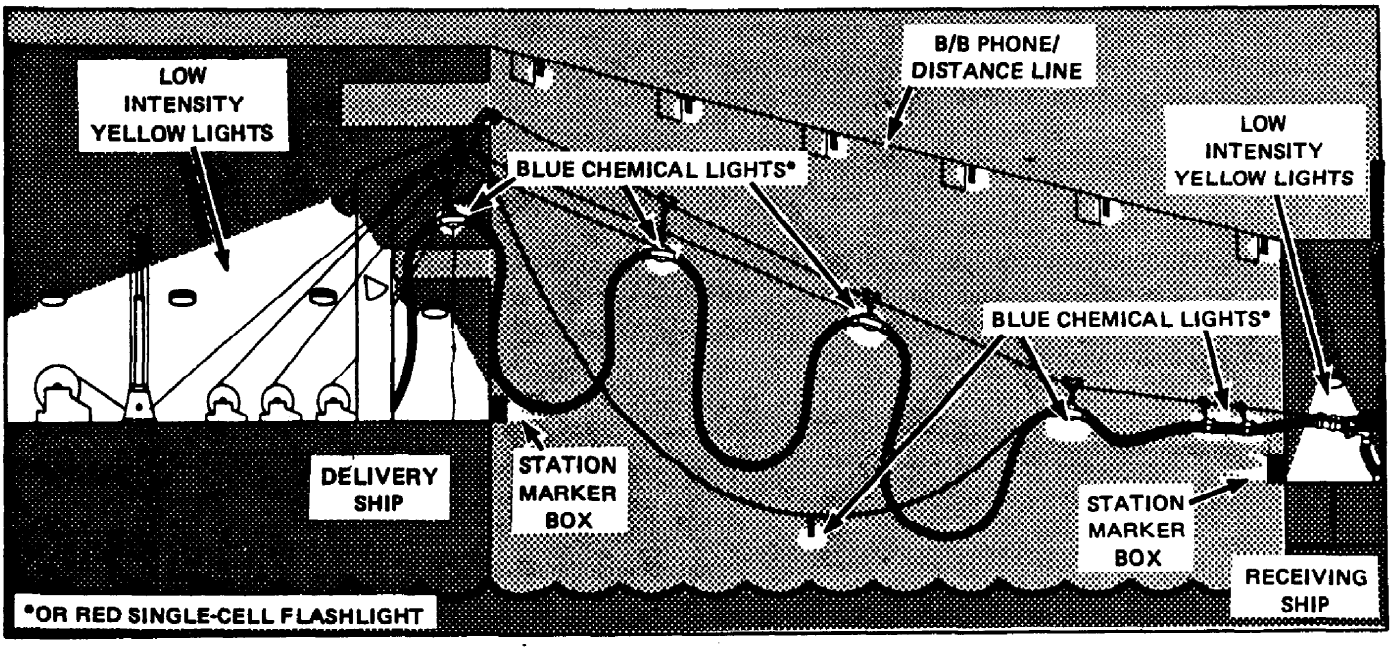


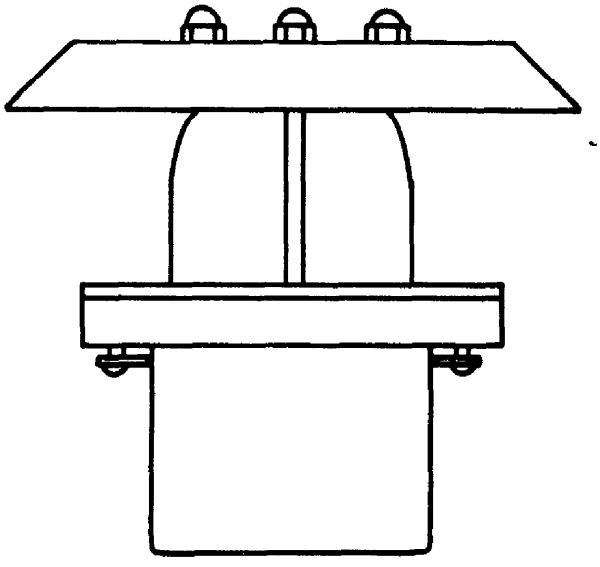
Figure 2-18. Lighting for Night Replenishment

2.5.3 Approach and Station-Keeping Lights. Typical approach and station-keeping lights are shown in Figure 2-17.

2.5.3.1 Hull Contour Lights. The control ship shows two blue 25-watt lights during the approach and while the receiving ship is alongside (see Figure 2-19). These lights are:

1. Located at the fore and aft extremes of that portion of the side parallel with the keel

2. Horizontally shaded to provide a 135° arc of visibility from directly astern to 45° forward of the beam



LIGHTING SYMBOL NO. 164.3

Figure 2-19. Hull Contour Lights

3. Vertically shaded to be visible outboard from 40° above to 40° below the horizontal.

A third contour light shall be shown on control ships over 600 feet (182.8 m) in length. This light will be located approximately midway between the other two lights.

2.5.3.2 Romeo Close Up. The control and approach ships indicate Romeo close up by using shielded directional signal lamps or Nancy.

2.5.3.3 Wake Lights. The delivery ship must shade its wake lights so as to illuminate only the wake.

2.5.3.4 B/B Phone/Distance Line Lights. These lights were described in paragraph 2.3.6.2 and shown in Figure 2-12.

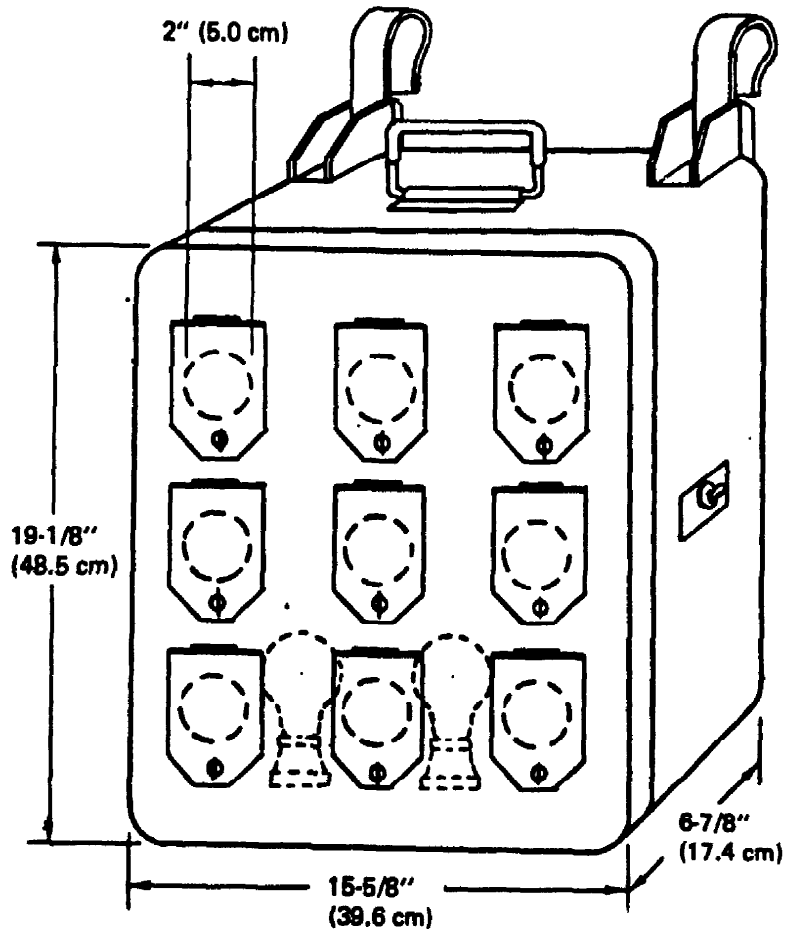
2.5.3.5 Truck Light. The control ship shows a truck light (dimmed), only during the approach of the receiving ship, and secures it when Romeo is hauled down.

2.5.4 Lights for Obstructions, Rig Fittings, Work Areas, and Attachment Points. Lighting measures prescribed herein are required to assist personnel in handling cargo and working rigs. White lights must never be used because of their blinding effect.

2.5.4.1 Transfer Station Marker Light Box. At each transfer station on both the control and approach ships, a station marker light box, similar to that shown in Figure 2-20, shall be set up to indicate the commodity to be transferred. The code for indicating commodities was shown in Figure 2-16.

2.5.4.2 Obstruction Lights. Mark the deck edge and all obstructions at the receiving station with red-lens, one-cell, pin-on-type flashlights or chemical lights.

1. Mark with at least one red-lens flashlight or one chemical light: deck edge elevator



Box has nine holes, each fitted with a red lens. Hand-operated individual shutters hinge upward. Illuminated by two 25-watt shielded bulbs (one is stand-by).
NSN 6230-00-658-3045.

Figure 2-20. Station Marker Light Box

corners; stanchion base sockets; davit sockets; torpedo and gun mounts, and similar obstructions.

2. Mark with three red-lens flashlights or three chemical lights, 6 inches (15.2 cm) apart in a vertical line: vertical stanchions, boom guys, preventer wires, elevator cables, and other vertical obstructions which form the limits of open area available for working at the receiving station.

3. Mark with six red-lens flashlights or six chemical lights the deck edge or highest obstruction outboard at the receiving station:

(a) Prepare a 6 inch (15.2 cm) wide by 12 foot (3.6 m) long strip of white canvas, with grommets and securing lines for securing the canvas in a straight line. An alternate to the canvas strip is a 12 foot length (3.6 m) of 21-thread manila or 1-1/2 inch (38.1 mm) nylon line.

(b) Affix six red-lens flashlights (mounted with the lens up) or six chemical lights to the canvas strip (or line) spaced at 24 inch (60.9 cm) intervals, with the first and last lights attached 12 inches (30.4 cm) from the ends of the canvas strip (or line).

(c) Secure the canvas strip (or line) in a straight horizontal line at the deck edge, centered at the center of the clearest space of the landing area or at the height of the highest obstruction outboard of the receiving station's landing area.

4. When a CV, LHA, or LPH is the control ship, two blue 25-watt lights will also be shown along the forward, starboard, flight deck edge to form a range of the ship's axis. Red lights will be displayed on any outboard obstruction (such as fresnel lens boom, sponson, or aircraft elevator) that will be a hazard to a ship approaching to replenish.

2.5.4.3 Lights for Rig Fittings. Red-lens, one-cell, pin-on-type flashlights or blue chemical lights shall be installed or rigged at these points, in the number and manner prescribed below. When chemical lights are used, one per side is sufficient.

1. FAS rig fittings:

(a) Hose saddles: Three, secured in line, on the side or end of the saddle facing the delivery ship.

(b) Hose spanwire free trolleys: One on each side of each trolley.

(c) No. 1 (retrieving) saddle whip: One, affixed to a ring or shackle secured to the No. 1 (retrieving) saddle whip and allowed to slide in the retriever bite, so that the winch operator can determine the position of the retriever.

(d) Coupling or hose end: Three on each Robb coupling, around the hose and just behind the hose adapter.

2. Messengers and lines:

(a) Primary messenger line: One at the point of attachment of the shot line and adjacent to the identification tag.

(b) Station-to-station phone line messenger: One adjacent to the identification tag.

(c) Hose messenger return line: One adjacent to the identification tag.

(d) Bridge-to-bridge phone/distance line messenger: One adjacent to the identification tag.

3. RAS rig fittings:

(a) Trolleys for personnel/cargo transfer and modified housefall: Four each side in a horizontal line, positioned with lens ends alternately up and down. When transferring a litter, install green

chemical lights on the trolley's flotation cover.

(b) Highline end: One on each side of the end fitting, the thimble, and so forth.

(c) Housefall block: Three on each side.

(d) Burton whip end: One, attached to the messenger, near the whip wire end.

(e) Burton or housefall tie plate: Three on each side, secured to the side of the plate.

(f) Cargo hook tag line: One at the lower end.

4. Missile transfer dolly: One on each lower corner.

5. Special weapon's transfer dolly or container: One on each lower corner.

6. Special weapon's transfer sling: Three at the sling's attachment point.

7. Personnel transfer chair: One at each corner, top and bottom.

8. Attachment point: Receiving stations shall rig three lights at each forward and aft side of, and on a horizontal line with, the attachment point for:

(a) Highline pelican hook

(b) Housefall block pelican hook

(c) Fueling-at-sea spanwire pelican hook

(d) Outhaul/messenger block padeye or link.

The lights shall be tied together and secured with the lens ends facing the attachment point — to serve as a reference point for delivery station deck rigging crews and winch operators.

Note

In addition to those items specifically indicated herein, light any other items, fittings, or rigging hardware as found necessary by type commanders or individual unit commanders.

2.5.4.4 Lights for Work Areas, Attachment Points, and Winches. Illuminate with low-level yellow floodlights the working areas on deck and in the holds, cargo landing areas, areas at attachment points, and areas around winches. Floodlights shall be:

1. A minimum of 150 watts

2. Controlled by individual switches and variable transformer dimmers

3. Equipped with shields of sufficient dimensions to avoid illuminating the other ship

4. Installed at suitable locations, except that exterior weather deck lighting may be portable.

Illuminate cargo landing, cargo handling, and working areas in accordance with NAVSEA 0964-000-2000 and the following:

1. At least two floodlights for illuminating each cargo landing area. Where practicable, one light is located forward of the area and directed aft to illuminate the deck area and bulkhead (if applicable). The other light is located aft of the area and directed forward to illuminate the deck area and bulkhead (if applicable).

2. Floodlights, spaced horizontally at appropriate intervals, for lighting deck working areas. A deck working area is any area where personnel are handling lines, stores, ammunition, and so forth.

3. At least one floodlight to illuminate the attachment point area. If practicable, locate the floodlight so that it can be directed inboard and down to illuminate the attachment point.

4. Floodlights to illuminate the winches used for RAS and FAS rigs.

2.5.4.5 Line-Throwing Gun's Projectile Light. Use only the approved illuminated projectile at night (see paragraph 2.3.4.2).

2.5.4.6 Lighting for Night Helicopter Operations. For lighting during night operations with helicopters, see paragraph 9.11.1.4.

2.6 INSPECTION AND TEST FREQUENCY

1. FAS and RAS fittings shall be tested statically in accordance with the individual ship's plan. Ships using portable fittings or stowable equipment (that is, pendant stations and retractable sliding padeyes) must ensure that the fittings or equipment are statically tested in place for each rig application, port and starboard, for off-station angles forward and aft.

2. Following a major repair, FAS and RAS fittings shall be tested in accordance with the individual ship's plan and the original test memoranda.

3. FAS and RAS fittings shall be tested in accordance with the overhaul specification for the ship, when the fittings have been affected by the overhaul.

4. Equipment and fittings shall be inspected prior to each use. When upon visual inspection they are thought to be defective, they shall be examined by a tender or repair activity using visual and dye penetrant methods of inspection. Fittings must also be examined to ensure that the correct sizes and types of fasteners are used to prevent unauthorized substitutions (bolt size for portable fittings, shackle size, and so forth). Any defect discovered shall be repaired or replaced. If repair is required, the individual equipment or fitting shall be tested statically.

5. It is not necessary to conduct periodic static and dynamic tests of FAS and RAS stations, provided that inspections are held before each use, that no defects are noted, and that records of the last successful static and dynamic tests are maintained on board. Particular care should be exercised to maintain test label plates intact.

6. Equipment and fittings subjected to excessive strains during operation should be visually inspected prior to transferring another load. If transferring ordnance, a dummy load shall be shuttled to retest the rig. At the first opportunity, affected equipment shall be examined by a tender or repair activity using visual and dye penetrant methods of inspection.

2.6.1 Transfer Rig Fittings. Rig fittings are designed to withstand the "breaking whip" condition. That is, in the event of high stresses in the transfer system caused by excessive ship motion, operator error, or equipment casualty, the rig itself should part, rather than the attachment point or structure. It is recognized that this cannot be true in all cases.

Normally, a 3/4 inch (19.0 mm) independent wire rope core (IWRC) whip is assumed to break at 50,000 lb (22,675 kg). Therefore, rig fittings should be tested to the load at those angles within the working range which subject them to the most stress.

In rigs where the fittings must take two parts of wire, the load in the rig can become two times 50,000 lb (22,675 kg) or 100,000 lb (45,350 kg). This is an impracticable level to which FAS and RAS fittings can be designed. Therefore, a compromise is made by introducing a weak link into the system (see paragraph 2.6.6).

2.6.2 Safety Factor. Rig fittings are normally designed with an adequate factor of safety (about 2.25) based on the ultimate strength to prevent any deformation when the test loads are applied.

2.6.3 Fitting Strength. Because of the nature of the material used, the fitting and supporting structure should not carry away, unless a load of double the test value is applied to them. Since twisting of cables, fatigue, corrosion, and welding can reduce the strength of fittings, the "test load" on the label plate must be adhered to rigidly.

2.6.4 Static Load Test. The static load test shall simulate actual operating conditions and shall be performed at the angle, within the working range, which will produce maximum stresses.

2.6.5 Booms. If stress analysis indicates that any boom or its related gear specified for RAS or FAS operation will be more highly stressed when breaking the spanwire, burton, housefall, or modified housefall whip, than when withstanding the static load test for the boom, the boom or that portion of its gear shall be given a special test to demonstrate its ability to withstand stresses at least equal to those indicated by the stress analysis.

2.6.6 Weak Link. A weak link is a fitting designed to fail at a predetermined load. It is introduced (1) between the receiving station's supporting structure and the rig or (2) within the transfer rig. A weak link carries away completely at a load level low enough to prevent deformation of the supporting structure or damage to the rig.

2.6.6.1 Rule. When the static-tested load for the attachment point, as shown on the label plate, is less than the breaking point of the transfer rig to be used, a weak link must be employed.

EXCEPTION

Weak links will not be used for personnel transfer, except when used as the attachment for the hand-tended outhaul in the personnel STREAM rig.

WARNING

Weak links give no absolute ensurance that they will fail at the anticipated level. This is because of condition, design, torsion or twist loads, and dynamic surges.

2.6.6.2 Types of FAS Weak Link

1. 7/8 inch (22.2 mm) spanwire weak-link end fitting — NAVSHIPS Dwg 805-2252856

2. 3/4 inch (19.0 mm) spanwire weak-link end fitting — NAVSHIPS Dwg 805-2252855.

2.6.6.3 Types of RAS Weak Link

1. 8,000 lb (3,628 kg) weak link — NAVSHIPS Dwg 805-1749106

2. 13,000 to 15,000 lb (5,897 to 6,804 kg), STREAM system lightweight trolley, 1/2 inch (12.7 mm) inhaul/outhaul weak-link end fitting — NSN 2S 1450-01-067-5601

3. 13,000 to 15,000 lb (5,897 to 6,804 kg), STREAM system lightweight trolley, 3/4 inch (19.0 mm) inhaul/outhaul weak-link end fitting — NSN 2S 1450-01-067-5602

4. 14,000 lb (6,349 kg) STREAM system trolley outhaul shear pin — NAVSHIPS Dwg 805-4537743

5. 25,000 lb (11,227 kg pendant receiving station) weak link for stations tested to

25,000 lb (11,227 kg) — NAVSHIPS Dwg 528-4404974

6. 40,000 lb (18,140 kg) STAR highline shear pin — NAVSHIPS Dwg 805-4629291

7. 50,000 lb (22,675 kg) STAR rig (highline STAR probe) shear pin — NAVSHIPS Dwg 805-4629266

8. 7/8 inch (22.2 mm) safety anchor shackle.

WARNING

Only Grade A shackles shall be used for weak-link applications.

2.6.7 Rig Loads. Normal loads on a transfer rig are caused by:

1. The load being carried

2. The tension applied by the winch(es) and ram tensioner

3. Ship's motion.

2.6.8 Catenary. The flatter the catenary (that is, the angle that the whip takes from the outboard fairlead block to the load), the greater the tension in the wire. The load transferred affects the catenary in both tensioned and nontensioned wires. For the effects of the load on the catenary in nontensioned transfer rigs, see paragraph 5.1.5 and Figure 5-3.

2.7 REPLENISHMENT IN COLD WEATHER

Cold weather increases the difficulty of underway replenishment. During high wind conditions, cold can quickly fatigue exposed personnel and force a premature halt in operations. If spray ice builds up heavily, it may adversely affect the ship's stability and hamper the use of replenishment equipment.

2.7.1 Ice Formation. To retard formation of ice, use anti-icing coatings on replenishment gear. One such coating is an inhibited, thickened solution of lithium chloride; to be applied prior to entering an area where icing is prevalent. Do not apply this coating to decks, as the mixture itself is slippery. Remove ice already formed by:

1. Hand tools — mallets, clubs, scrapers — if used with care to avoid damaging equipment

2. Steam jet (lance) to free restricted items, such as topside valve wheels and fuel trunk covers

3. Firehose streams to undercut and weaken heavy accumulations until they can be removed manually.

Remove snow with brooms and shovels before it becomes trampled and hardened.

2.7.2 Replenishment in Ice Fields. In ice fields, replenishment can be accomplished only with both ships stopped and lying to as close alongside as practicable. To accomplish this, a polynya of sufficient size to permit maneuvering may be used, provided wind conditions are not such as to cause drifting onto the edge of the polynya.

If a polynya of sufficient size cannot be found or wind conditions prevent its use, an area large enough to accommodate both ships and to permit maneuvering should be cut out by an ice-breaker. This area of broken ice will provide a cushioning effect permitting an approach close aboard without danger of collision. The broken ice will flow rather than exert pressure on the hulls of the ships involved. Local ice conditions should be carefully analyzed to ensure that the replenishment can be carried out safely. A working ice pack or a pack drifting down on a lee shore must be avoided.

The greatest hazard in approaching another ship while in an ice pack lies in the danger that pressure generated by the approaching ship will force intervening ice blocks through the hulls of one or both of the ships or will damage the rudder and screws of the ship approached. For this reason, a bow-to-bow approach is generally safest for mooring alongside. If an icebreaker is available, it should proceed carefully through the ice ahead of the ship making the approach.

2.8 SUPPLIES AND ACCOUNTS

Supply and accounting procedures for underway replenishment include:

1. Submission of requirements by receiving ships

2. Preparation of invoices by delivery ships

3. Completion of surveys.

The commander of the supported force may submit the requirements for all his units to the replenishment force, or he may have each ship submit requirements directly to the appropriate replenishment ship.

2.8.1 Supplies Available for Transfer. The supplies that are available for transfer are listed herein by types of replenishment ships from which they can be obtained.

1. AO — Petroleum products — F76, F44 (JP-5), selected lube oils (drums), and bottled gases

2. AE — Ammunition, bombs, rockets, and missiles; F76; and a mini/multi-capability which includes fresh frozen, chilled, and dry

3. TAF — Provisions — fresh frozen, chilled, and dry; and selected high-volume general stores items, such as rags, paints, paper, and cleaning materials

4. AFS — TAF load; plus general stores items, technical supplies (ordnance, electronic, and ship's), repair parts, medical and dental material, ships store stock, clothing and small stores, and forms and publications; and F76 and packaged lubricants and grease

5. AOE — AO and AE combined plus TAF load; range of provisions at lesser depth; selected high-volume general stores items

6. AOR — Same as AO or AE and TAF; range of ordnance and provisions at lesser depth; selected high-volume general stores items

7. AO 98 and 99 — Same as AOR.

The cargo aboard a replenishment ship is designated as consigned or nonconsigned. Consigned cargo is stowed on a ship-by-ship basis and is located in a specific hold for issue to particular ships. Nonconsigned cargo, such as provisions, is normally loaded on an item basis and is stowed for convenience of access for issue on an as-required basis.

2.8.2 Submission of Requirements. The operational commander or his designated logistic representative will direct the time and format for submitting requirements to the replenishment force. The time for submission of requirements normally will vary from little or no advance notice for fuel up to 30 days for technical (AFS) stores items. The required format may be an invoice, a formal requisition, or a message. For detailed procedures for submission of requirements, see NAVSUP 4998-P.

If it is necessary for the receiving ship to make a special request for supplies not included in its previously submitted requisitions, the required papers should be attached to one of the first messengers exchanged with the delivery ship.

2.8.3 Invoices. Consigned cargo will be carried on bills of lading accompanied by

invoices from the invoicing activity to the receiving ships.

Nonconsigned cargo will be invoiced from the supply activity to the delivery ship, carried in her stock records, and then invoiced by the delivery ship to the receiving ship.

For fuel invoices, the quantity determined as having been transferred by the delivery ship is considered conclusive (see NAVSUP 4998-P). Messages, followed by standard invoices, will be forwarded to the receiving ship as soon as possible.

Immediate receipt is required for certain accountable items. Papers requiring signatures should be transferred with the first loads in order that the signed receipts may be returned to the delivery ship prior to the completion of replenishment.

For provisions, clothing, and small stores, the delivery ship will use cargo issue slips or their equivalent as a basis for invoicing.

2.8.4 Surveys. All stores will be considered as having been transferred once they clear the side of the delivery ship during an alongside replenishment, or are lifted from the helicopter loading platform of the delivery ship during vertical replenishment (VERTREP). Ammunition and missiles are considered transferred when they safely reach the receiving ship's deck (see paragraph 6.2.6).

2.9 LOADING AND HANDLING OF CARGO

Cargo on replenishment ships is fleet-issue loaded for quick and easy access and handling for underway transfer. Base-loaded supply ships are loaded without particular attention to cargo accessibility while underway, since these ships deliver to a base or unit of the replenishment force.

2.9.1 Guiding Principles. The primary objective of underway replenishment is to effect safe delivery of the maximum amount of cargo in a minimum of time. Therefore, the cargo loading, handling, and transfer must be accomplished with careful regard to the following considerations:

1. Ready access to cargo for handling and checking, including adequate passageways throughout the cargo spaces

2. Quantities of the same kind or lot of cargo to be stowed in various holds convenient to as many transfer stations as possible

3. Provisions to be stowed and shored such that reshoring may be readily accomplished

4. Bulky and heavy items to be stowed for ease of unloading, considering location of transfer and receiving stations on each ship.

2.9.2 Cargo Plan. The location and distribution of cargo in the replenishment ship is made according to a loading plan agreed to by representatives of the ship and the loading depot. This plan is based on the following considerations:

1. Design and construction of the replenishment ship

2. Kind and amount of cargo

3. Anticipated schedule of transfer to receiving ships

4. Types and locations of transfer stations on the receiving ships.

The commanding officer retains the final responsibility for ensuring that his ship is properly loaded within its designed capabilities.

2.9.3 Loading Procedures. NAVSUP Publication 485 details procedures to be followed in loading provisions and stores. Give special attention to the following materials.

2.9.3.1 Perishables. Of particular importance are the instructions on handling sensitive fresh provisions, including holding temperatures, ventilation, and humidity conditions.

2.9.3.2 Pilferable Material. Certain small items of ships stores stock, clothing, and other materials are subject to pilfering. Adequate control of handling and storage are required.

2.9.3.3 Classified and Nonconsigned Cargo. The supply department of the delivery ship must designate responsible personnel to check aboard loads of nonconsigned cargo and classified cargo (whether consigned or not). Classified cargo is to be handled with particular care and given the proper classification stowage in accordance with the Department of the Navy Information Security Program Regulation (OPNAVINST 5510.1).

2.9.4 Handling Equipment. The efficiency of the replenishment operation depends (1) on the efficient movement of loads from the stowage areas to the transfer station on the delivery ship and (2) on the timely clearing of the landing area on the receiving ship. The type and quantity of handling equipment available on the replenishment ship depends on the ship's allowance and the ship's usual assignment. The cargo handling equipment may consist of forklift trucks, pallet jacks, and other power equipment for moving palletized cargo or heavy items. Where the cargo is not palletized and must be moved to the transfer area for assembly into net loads or pallet loads, roller conveyors, package conveyors, or other means may be used to move cargo within the ship. Selection of handling equipment for any particular replenishment operation will depend on these considerations:

1. Size and weight of item

2. Breakout condition, prepalletized or single unit

3. Stowage location and/or height

4. Location with respect to elevator, hatch, or conveyor.

When required, the delivery ship may provide certain cargo handling equipment (for example, pallet jacks or Mk 45 handlift trucks) to the receiving ship for use during the operation. Such equipment shall be returned before breakaway.

Because of the differences in available equipment and the space limitations on combatants, each ship presents a different problem. It is required that the ships develop efficient techniques or methods for handling incoming cargo loads within the limits of safety and practical considerations. The strikedown and stowage of provisions and stores must be accomplished on such a basis that the primary mission of the ship is not compromised.

The capabilities of each ship to handle various cargo loads should be carefully noted for future reference and for planning purposes.

2.10 SAFETY REQUIREMENTS

Primary considerations in every shipboard evolution are the safety precautions and safety equipment used.

2.10.1 Safety Precautions. Personnel assigned to transfer stations must be thoroughly instructed in safety precautions. Safety precautions shall be reviewed immediately prior to each replenishment and must be observed.

1. Only essential personnel shall be allowed at a transfer station during replenishment.

2. Life lines should not be lowered unless absolutely necessary; if lowered, temporary life lines must be rigged. Temporary life lines shall be a minimum of 2 inch (50.8 mm) circumference line.

3. When passing the shot line with a line-throwing gun, the procedures set forth in paragraph 2.3.4.4 are to be followed.

4. Personnel assigned to each transfer station, including line and cargo handlers, should remove rings, watches, key chains, and other jewelry which could inadvertently be caught in the rigs, blocks, lines, and cargo.

5. Personnel shall be instructed to keep clear of bights, to handle lines from the inboard side, and to keep at least 6 feet (1.8 m) from the blocks through which the lines pass. If practicable, personnel should be forward of the spanwire or highline.

6. Additional safety precautions to be observed during fueling can be found in paragraph 2.10.1.1.

7. Use correct cotter pins in pelican hooks (see Figure 2-21). Do not spead cotter pins excessively. See the bottom panel of Figure 2-21 for the correct procedure for spreading a cotter pin. A sharp bend on the cotter pin leg will make it very difficult to insert or remove.

8. Personnel shall be cautioned to keep clear of a suspended load and to stay clear of the rig's attachment points until the load has been landed on deck. Personnel must remain alert and never turn their backs on an incoming load.

9. Each transfer station shall be equipped with a life ring with a distress marker light attached.

10. Care must be taken to prevent the shifting of cargo that might endanger personnel or material. Personnel should not get between the load and the rail.

11. Spanwires, whips, and wire highlines shall be secured to winch drums by one wire rope clip or specially designed clamp — to minimize the possibility of damage should an emergency breakaway be necessary.

12. Use fairled lizard lines when retrieving spanwires and highlines to prevent the transfer head from swinging sharply into the stops and causing the wire to pinch inside the trolley.

13. Deck spaces in the vicinity of transfer stations must be covered with nonskid paint to provide secure footing.

14. Both the delivery and receiving ships shall station a lifebuoy watch well aft on each engaged side. The watch shall have sound-powered phone communications with the bridge and shall be equipped with two smoke floats and a 24 inch (60.9 cm) ring buoy fitted with a float light.

15. All hands shall be instructed on the hazards of emergency breakaway (see paragraphs 2.2.11 through 2.2.11.11).

16. Precautions on radio frequency hazards are to be observed. Ships transferring ordnance by CONREP should operate under a common HERO EMCON bill. See NAVSEA OP 3565/NAVAIR 16-1-529/ NAVELEX 0967-LP-624-6010.

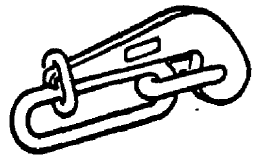
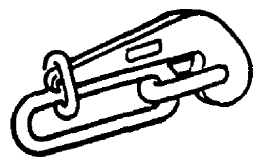
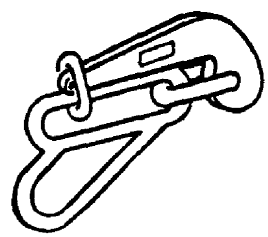
17. Phone talkers on intership phone lines shall not fasten their neck straps.

18. Cargo handlers should not step on or in a cargo net attached to a cargo hook.

19. Personnel involved in VERTREP shall wear protective clothing as indicated in NWP 42 and safety devices as indicated in paragraph 9.12 and NWP 42.

20. Personnel involved in an UNREP shall wear the safety equipment required by paragraph 2.10.2 and Figure 2-22.

21. Personnel rigging aloft or working outboard of bulwarks or safety chains shall

RIG APPLICATION	PELICAN HOOK (Stock Number)	COTTER PIN (Stock Number)
FUEL SPANWIRE WITH ROBB OR NATO COUPLING **Note** DO NOT USE WITH PROBE FUELING SYSTEM	FAS, LIGHT WEIGHT, 1" (25.4 mm)  NSN 9Z4030-00-266-7413 NAVSHIPS 805-2556852	STEEL, 3/16" (4.7 mm) x 3" (76.2 mm) NSN 9Z5315-00-899-4116
STREAM WITH STAR	STANDARD, 1-3/8" (34.9 mm)  NSN 9Z4030-00-266-7415 NAVSHIPS 805-2556852	STEEL, 1/4" (6.3 mm) x 3" (76.2 mm) NSN 9Z5315-00-243-1167
STREAM WITH TRAVELING SURF **Note** DO NOT USE WITH STREAM WITH STAR	STREAM, 1-3/8" (34.9 mm)  NSN 9Z4030-00-784-3064 NAVSHIPS 805-2580284	STEEL, 1/4" (6.3 mm) x 3" (76.2 mm) NSN 9Z5315-00-243-1167
SINGLE- AND DOUBLE-PROBE FUELING RECEIVERS	(INTEGRAL WITH RECEIVER)	STEEL, 3/16" (4.7 mm) x 3" (76.2 mm) NSN 9Z5315-00-899-4116

SPREADING THE COTTER PIN

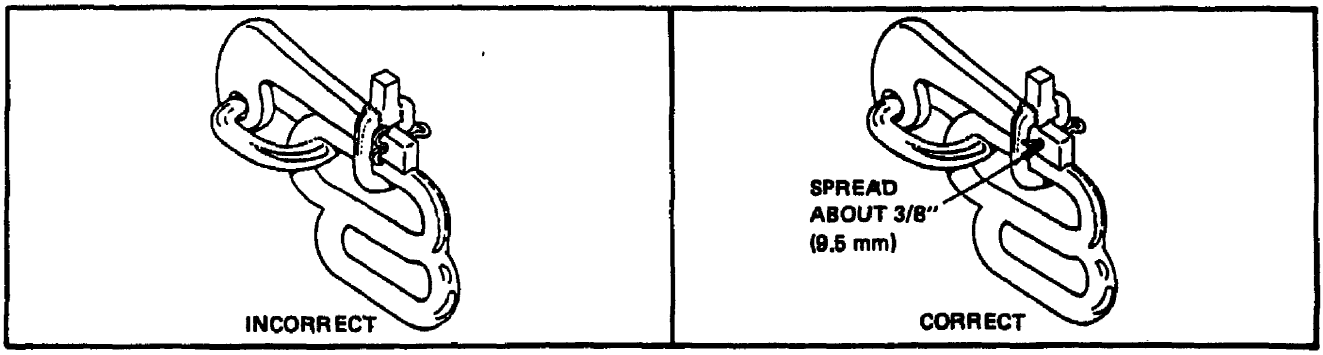


Figure 2-21. Pelican Hooks and Cotter Pins

use safety harnesses and safety and working lines.

22. Easing-out lines must be rigged immediately upon rig hook-up to prepare for a possible emergency breakaway.

23. Line handlers and riggers must button sleeves and remove all loose objects to ensure against wrapping around or fouling in lines.

2.10.1.1 Safety During Fueling. The precautions in this paragraph are mandatory during fueling operations:

1. Personnel handling petroleum must be aware of the constant danger of fire and explosion. They shall be thoroughly trained in the use of firefighting equipment.

2. Cigarette lighters and safety matches are permitted only in authorized smoking areas.

3. During fuel transfer the smoking lamp is out, except in authorized spaces. (The lamp should *never* be lighted on an oiler's weather decks.)

4. Necessary protective and firefighting equipment must be kept on hand during the transfer, ready for instant use.

5. All hands must be indoctrinated in the requirements for emergency breakaway. The following items must be checked prior to each replenishment:

(a) Check use of a single wire clip to secure the spanwire and saddle whips to the winch drums

(b) Check spanwire weak link (Figure 3-13) for deformation or damage

(c) Check that UNREP working and repair tools are on station.

2.10.2 Personnel Safety Equipment. Personnel safety equipment used for underway replenishment is listed in Figure 2-22 and shall be worn as prescribed below:

1. Personnel in the immediate area of the transfer station shall wear construction-type safety helmets, equipped with quick-acting breakaway devices. Chin straps shall be fastened and worn under the chin. Safety helmets will be color-coded as listed in Figure 2-22.

Note

Battle helmets shall not be worn at UNREP stations.

2. Except for forklift truck operators and winch repair personnel, topside personnel who are engaged in handling stores or lines or who are in the transfer area shall wear properly secured, orange-colored, inherently buoyant, vest-type life jackets with collars. Forklift truck operators and winch repair personnel will wear inflatable life jackets fully ready for use: life jacket in front, opened, with yoke over the head (except for actual inflation). Colored jerseys or vests over life jackets are not required.

3. Personnel rigging aloft or working outboard of bulwarks or safety chains shall wear a properly secured, orange-colored, inherently buoyant, vest-type life jacket with a button hole in the back cover to permit concurrent use of the safety harness and safety and working line. (See NAVSHIPS Technical Manual, Chapter 077, for details for use with a safety harness.)

4. Personnel at transfer stations must wear a one-cell flashlight (or green chemical light) and whistle on the outside of their life jacket during night replenishment. Flashlights need not be lighted except at the discretion of the commanding officer. Chemical lights must be lighted. Chemical lights are not to be discarded over the side during hours of

EQUIPMENT	REFERENCE
GLOVES	Para. 2.10.2, items 6 and 7
KNIFE	Para. 2.10.2, item 8
LIFE JACKET – INFLATABLE TYPE	Para. 2.10.2, item 2
LIFE JACKET – VEST TYPE WITH COLLAR, INHERENTLY BOUYANT, ORANGE-COLORED	Para. 2.10.2, items 2 and 3
LIFE LINES	Para. 2.10.1, item 2
LIFE RING WITH DISTRESS MARKER LIGHT	Para. 2.10.1, item 9
LIGHT – ONE-CELL WHITE PIN-ON FLASHLIGHT OR GREEN CHEMICAL LIGHT	Para. 2.10.2, item 4
SAFETY HARNESS, TAIL LINE, SAFETY AND WORKING LINES	Para. 2.10.1, item 21
SAFETY HELMET – COLOR-CODED AS FOLLOWS: WHITE – OFFICER/CPO WHITE with GREEN CROSS – SAFETY OFFICER WHITE with RED CROSS – CORPSMAN YELLOW – RIG CAPTAIN GREEN – SIGNALMAN/PHONE TALKER RED – LINE-THROWING GUNNER/BOLO HEAVER BROWN – WINCH OPERATOR PURPLE – WINCH WATCHER/ REPAIRMAN BLUE – LINE HANDLER/ DECK RIGGER ORANGE – CHECKER/SUPPLY PERSONNEL GREY – ALL OTHERS	Para. 2.10.2, item 1
SAFETY SHOES	Para. 2.10.2, item 5
WHISTLE	Para. 2.10.2, item 4

Figure 2-22. Personnel Safety Equipment

darkness or until completely extinguished. The ship on lifeguard station may mistake a discarded chemical light for a man overboard.

5. Personnel involved in cargo handling operations on both the delivery and receiving ships shall wear safety shoes.

6. Personnel handling messenger, distance, and inhaul lines should use the "hand-over-hand" grip and may wear gloves.

7. Men handling wire-bound or banded cases must wear work gloves.

8. Personnel assigned to each transfer station shall carry an appropriate knife for use in routine work and in an emergency.

2.10.3 Transfer of Dangerous Combustible Materials. Prior to transfer of dangerous material, such as acids, compressed gases, or hypochlorites, the delivery ship will identify the load to the receiving ship. The safety officer on the receiving station shall verbally acknowledge that the receiving station is prepared to receive the material.

Potentially dangerous materials, such as acids, compressed gases, inflammable material, material which will support combustion, and hypochlorites, shall not be transferred together in the same net or cargo load and shall be kept segregated from each other in the loading and receiving areas. The inadvertent mixture of calcium hypochlorite base materials and liquid hydrocarbon base materials will produce an explosive fire within seconds.

Most containers of inflammable solids and oxidizing materials are identified by a 4 inch (10.2 cm), yellow, diamond label and other special hazardous warnings conspicuously displayed on the containers.

2.10.4 Replenishment Accident/Incident Reporting. Appendix A provides the guidance for reporting replenishment accidents/incidents as required by the Chief of Naval Operations.

2.11 MINIMUM PERSONNEL REQUIREMENTS

Minimum personnel requirements for both the delivery and receiving ships are detailed in Figure 2-23. Under adverse conditions and for handling certain types of stores, additional personnel may be required.

Note

Personnel assigned shall be qualified in accordance with PQS.

2.12 REFERENCES

ATP 16, Replenishment at Sea

Department of Transportation, U.S. Coast Guard, Navigation Rules (International and Inland), COMDTINST M16672.2 of 23 AUG 1982

International Rules of the Road

NAVSEA OP 3565/NAVAIR 16-1-529/ NAVELEX 0967-LP-624-6010, Electromagnetic Radiation Hazards (Hazards to Ordnance)

NAVSEA S9570-AD-CAT-010, UNREP Hardware and Equipment Manual

NAVSEA 0964-000-2000, Lighting for Naval Ships

NAVSHIPS Technical Manual 0920-106-3010

NAVSUP 4998-P, Cargo Manual

NAVSUP Publication 485

Station Personnel	Number per Station	Remarks
Safety officer	1	
Rig captain	1	
Signalman	1	
Phone talkers	As required	Sta/sta and sta/bridge – Installed MC units may be utilized
Winch and sliding padeye operators	As required	
Winch watcher	Optional	When required. Use personnel from STREAM repair team (should not drive billet requirements)
Gunner's mate	1	Shot line, pole type wire rope cutter
Riggers	As required	Rig station, connect loads, handle tag lines, operate cargo drop reel (CDR) lanyard, and conduct breakaway
Line handlers	As required	Tend messengers, lizard lines, synthetic outhauls, phone and distance lines **Note** When manually hauling in wire, a minimum of 15 line handlers is required

Other Personnel	Number per Ship	Remarks
Technical supervisors	As required	
Corpsmen	2	
Equipment repair	As required	
Bridge-to-bridge talker	As required	One per engaged side

Figure 2-23. Personnel Requirements

CHAPTER 3

Fueling at Sea

3.1 SCOPE

Fleet units at sea are supplied with fuel by means of hoses suspended between ships. During fuel transfer, lubricating oil (in drums), industrial gases (in bottles), water, personnel and cargo may also be transferred.

This chapter details the methods for transferring fuel between ships of the U.S. Navy. Chapter 10 covers the procedures employed when MSC tankers are used for underway replenishment of Navy oilers and aircraft carriers. ATP 16 covers procedures employed when conducting fueling-at-sea (FAS) operations with ships of NATO nations.

3.2 DELIVERY SHIP CHARACTERISTICS

The largest volume of fuel is transferred by fleet oilers during regularly scheduled replenishments. However, major combatants, MLSF units (AE/AFS), and amphibious units frequently refuel other units, especially their screening destroyers.

3.2.1 Speed. Fleet oilers normally are limited to speeds of 12 to 16 knots when transferring fuel. Fast combat support ships and major combatants can transfer fuel at higher speeds when weather and sea conditions permit.

3.2.2 Liquid Conversion Table. Figure 3-1 gives the numerical relationships between selected units of volume and corresponding units of weight for F76, F44 (JP-5), and water. This table is a standard reference compiled by using a single constant API gravity. The Fleet Oiler Manual (Tables 5 and 7 of Appendix H) should be consulted for accurate and detailed liquid cargo planning.

3.2.3 Hose Sizes and Pumping Rates. Figure 3-2 gives the hose sizes and pumping rates of various types of ships when transferring F76 and F44 (JP-5).

3.3 TRANSFER STATIONS

3.3.1 Oiler Stations. Fleet oilers can rig up to seven separate transfer stations to deliver petroleum products. Figure 3-3 shows the location of typical stations on various classes of oilers, together with a listing of products available at each station.

Oilers usually are rigged for fueling large ships (including CGs) to port and destroyers to starboard. If necessary, however, oilers can transfer fuel to any ship from either side, except CVs, LHAs, and LPHs — which are always fueled to port.

3.3.2 Non-Oiler Stations. Carriers, battleships, and amphibious and auxiliary ships that often transfer fuel to other ships (generally smaller) are normally rigged as follows:

1. Carriers — Two or more starboard stations

2. Battleships — One starboard station

3. Amphibious and auxiliary ships — One or more stations, port or starboard.

3.4 STANDARD HOSE RIGS

3.4.1 Choice of Rigs. U.S. ships normally transfer fuel by fuel STREAM, by spanwire rig, or by the close-in method on some non-oiler types. Fuel STREAM is preferred because

it permits greater ship separation. The choice of rig is governed by:

1. Rig availability and design characteristics of both delivery and receiving ships
2. Existing weather and sea conditions
3. Size and draft of receiving ship.

UNITS OF WEIGHT	FUEL		WATER
	F76	F44 (JP-5)	
Metric ton (1,000 kg)	1	1	1
Long ton (2,240 lb)	0.984	0.984	0.984
Short ton (2,000 lb)	1.102	1.102	1.102

UNITS OF VOLUME (60 °F (16 °C))			
Liters	1190	1250	1000
Cubic meters	1.190	1.250	1.000
Gals US	314	329	269
Gals Imperial	261.80	274.40	220.15
Barrels US	7.48	7.84	6.29
Cubic feet	42	44	35.3

Figure 3-1. Liquid Conversion Table

CAUTION

A ram-tensioned spanwire shall not be used when fueling a small, shallow-draft ship; i.e., PCG, PHM, MSO, ARS, ASR, ATF, or ATS.

3.4.2 Deviations From Standard Rigs. Standardization in rigs and in their use assists ships in fueling expeditiously. Some deviations from standard rigs may be necessary to conform with the design features of particular ships, but such deviations should be kept to a minimum. Fueling operations may be delayed if the oiler has to make major adjustments to her rigs to accommodate nonstandard installations on the receiving ship. Should significant alterations be necessary, type and fleet commanders should be advised immediately so that corrective action may be taken. Such changes must be incorporated in the ship's plan.

3.5 STATIC-TESTED LOADS

The required static-tested loads for attachment points located at FAS receiving stations are:

1. Spanwire attachment points. . . 36,000 lb (16,326 kg)
2. Messenger padeyes . . . . . 8,000 lb (3,628 kg)
3. Riding line padeyes. . . . . 15,000 lb (6,802 kg)
4. Riding line cleats . . . . . 15,000 lb (6,802 kg)
5. Riding line padeyes for small-sized ships (PHMs, PCGs, and so forth). . . . . 6,500 lb (2,948 kg)

FUEL	DELIVERY SHIP	RECEIVING SHIP	AVAILABLE HOSE SIZE IN INCHES (mm)	DESIGN PUMPING CAPABILITY GAL (m^3)/HR/HOSE
F76	All AOs, T-AOs, AOEs, and AORs	All Types	7 (177.8)	180,000* (681.3)
	Battleships Carriers	Destroyers Frigates	7 (177.8) or 6 (152.4)	180,000* (681.3) or 120,000 (454.2)
	AE-21 Class AE-26 Class AFS-1, 2, 3, 5, 6 AFS-4, 7	All Types Except Carriers	7 (177.8) 7 (177.8) 7 (177.8) 7 (177.8)	40,000 (151.4) 45,000 (170.3) 42,000 (159.0) 60,000 (227.1)
	LHA-1 Class LKA-113 Class LPH-2 Class LPD-1 Class LPD-4 Class LSD-28 Class LSD-36 Class	Destroyers Frigates Small Auxiliaries	7 (177.8) 6 (152.4) 6 (152.4) 4 (101.6) 6 (152.4) 6 (152.4)	135,000 (511.0) 120,000 (454.2) 60,000 (227.1) 60,000 (227.1) 36,000 (136.3) 60,000 (227.1)
F44 (JP-5)	All AOs, T-AOs, AOEs, and AORs	Carriers	7 (177.8)	180,000* (681.3)
	AO-98, 99 AO-177 Class T-AO-105 Class T-AO-143 Class AOE-1 Class AOR-1 Class	Destroyers Frigates Auxiliaries Capable of Refueling Helicopters	2-1/2 (63.5)	15,000 (56.8)
	Carriers	Frigates	7 (177.8) 6 (152.4)	180,000* (681.3) 100,000 (378.5)
	*Rate shown is with fueling probe. For Robb coupling or pigtail, the rate will be less.			

Figure 3-2. Hose Sizes and Pumping Rates

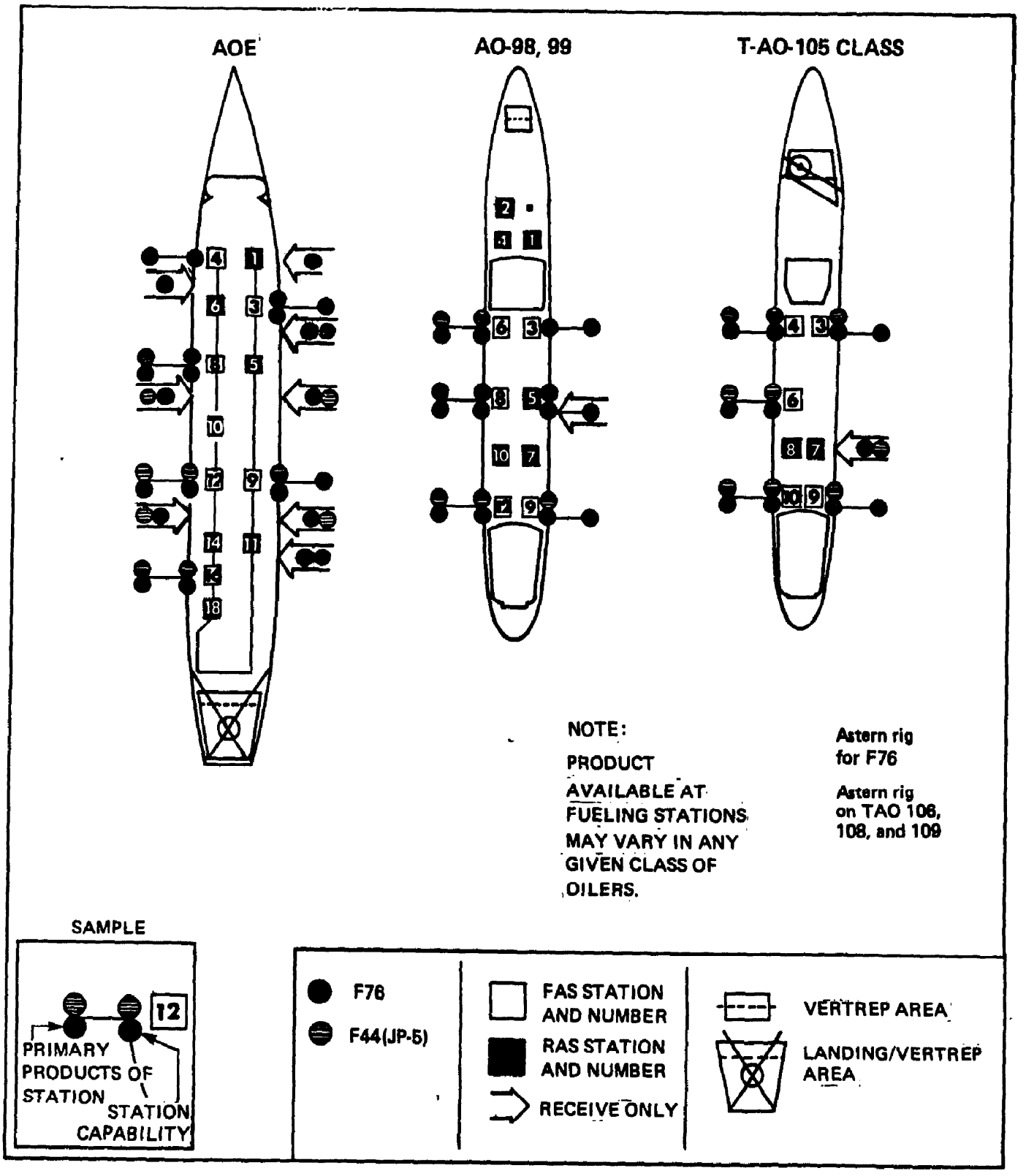


Figure 3-3. Typical Transfer Stations on Oilers (Sheet 1 of 2)

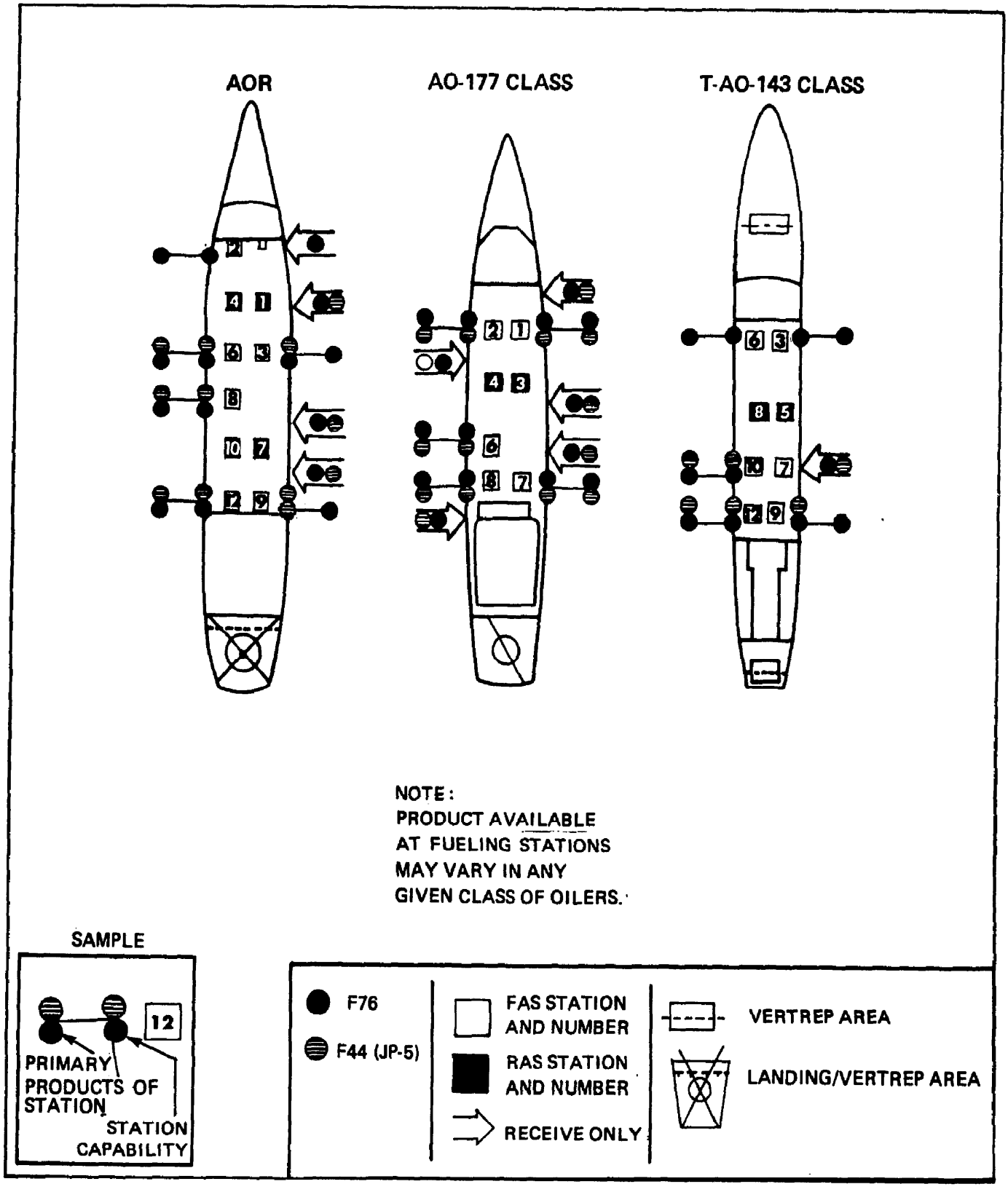


Figure 3-3. Typical Transfer Stations on Oilers (Sheet 2 of 2)

6. Riding line cleats for small-sized ships (PHMs, PCGs, and so forth). . . . . 6,500 lb (2,948 kg)

7. Messenger padeyes on new construction ships. . . . . 30,000 lb (13,608 kg)

3.6 FUELING PREPARATIONS

3.6.1 Receiving Ships. As fuel is consumed, ships may ballast with sea water to maintain their stability and liquid-protection characteristics. Prior to each replenishment, ships normally must deballast and redistribute the remaining fuel. Receiving ships will:

1. Commence deballasting at such a time that completion will coincide as nearly as practicable with the scheduled time for fuel transfer. However, during heavy weather, a ship must not deballast to such an extent that stability is endangered. Comply with deballasting instructions in the ship's Damage Control/Casualty Control Book.

2. Distribute fuel so that all stations will complete fuel transfer at the same time.

3. Inform the OTC of any conditions that may affect the planned fueling schedule.

3.6.2 Delivery Ships. Delivery ships will:

1. Ballast/deballast, strip tanks, and distribute fuel to ensure proper trim and maximum pumping rates.

2. Promulgate fueling plans showing tanks, valves, and pump lineup to be used.

3. Test pumps, winches, and other equipment.

4. Inform the OTC of any conditions that may affect the planned fueling schedule.

3.6.3 Checkoff Lists Comprehensive checkoff lists shall be prepared by each ship to ensure that it is ready in all respects for the fueling operation. Appendix D may be used as a guide in preparing individual lists; but, in all cases, checkoff lists must suit the individual ship's installation.

3.7 BASIC ALONGSIDE FAS RIG EQUIPMENT

Paragraphs 3.8 through 3.13 describe major equipment used in alongside fueling operations.

3.8 Wire Rope

Wire rope used in FAS rigs is in accordance with paragraph 2.3.1. Sizes and lengths for various applications are as follows:

WIRE	SIZE IN INCHES (mm)	MINIMUM LENGTH IN FEET (m)
SPANWIRE (Tensioned) (See Note)	3/4 (19.0) 7/8 (22.2)	800 (243.8)
SPANWIRE (Nontensioned)	3/4 (19.0) 7/8 (22.2)	600 (182.8)
SADDLE WHIP	1/2 (12.7) 3/4 (19.0)	450 (137.1)
STRESS WIRE	1/2 (12.7)	CRES Wire (Length to suit)

Note

AE/AFS units using a tensioned FAS delivery rig shall use the highline winch wire rigged through the ram tensioner as the spanwire, instead of the inhaul and outhaul wires.

3.9 FIBER ROPE

The fiber rope used in FAS rigs is in accordance with paragraph 2.3.2 and the paragraphs below.

3.9.1 Messenger. The hose messenger is the main line used to assist in hauling the spanwire and fuel rig across between the ships. When sending probe (single or double) to a single-probe receiver, use the STAR messenger (see Figure 2-10 and paragraph 2.3.5.2). The 60 foot (18.2 m) releasing line section of the STAR messenger will be used as the remating line at the receiving station; the remating line in paragraph 3.9.3 is not required. When passing a single- or double-hose rig to double-probe receivers, use the basic messenger (see Figure 2-9 and paragraph 2.3.5.1), since the brummel hooks of the STAR messenger will not easily pass between the receivers' bell housings. Double-probe receiving stations will provide the remating line in paragraph 3.9.3.

3.9.2 Messenger Return Line. The messenger return line is 300 feet (91.4 mm) of 2-1/4 inch (57.1 mm) nylon line. It is fitted with a 5/8 inch (15.8 mm) screw pin shackle on one end.

3.9.3 Remating Line. The remating line is required at double-probe receiving stations. It is a hand-tended 2-1/4 inch (57.1 mm) nylon line of a length suited to the individual ship. It should be no less than 60 feet (18.2 m) in length and shall have a soft eye fitted on one end. The remating line is furnished by the receiving station. It is attached at the messenger pip-pin attachment point after the probes are seated and the messenger has been removed.

3.9.4 Riding Line. The standard riding line is 4 inch (101.6 mm) manila line, 25 to 45 feet (7.6 to 12.7 m) long. A thimble eye splice with a 3-1/4 inch (82.5 mm) pear-shaped link is inserted in one end of the riding line. The riding line used with small ships (PHMs, PCGs, and so forth) is 2-1/2 inch (63.5 mm) manila line (used with the 2-1/2 inch (63.5 mm) hose rig only).

WARNING

Only manila riding line is authorized. Failure to observe the prescribed riding line arrangement (especially line sizes and types) could result in overload of padeyes, cleats, or riding line fittings with resultant injury to personnel.

3.9.5 Two-Fold Purchase. The two-fold purchase is used with the riding line, as shown in Figure 3-30. The tackle consists of two 7 inch (177.8 mm) or 8 inch (203.2 mm) wood or metal blocks with 2-1/2 inch (63.5 mm) manila line (length to suit).

3.9.6 Easing-Out Line. The easing-out line is 12- to 21-thread manila with whipped ends. Its length should be sufficient to safely ease the spanwire clear of the side of the receiving ship.

3.9.7 Outer Bight Line (Optional). The outer bight line is used only for close-in rigs. It is either 4 inch (101.6 mm) braided spun polyester (MIL-R-24536) or 4 inch (101.6 mm) double-braided nylon. See Figures 3-31 and 3-32.

3.9.8 Spanline. The spanline is used with the 2-1/2 inch hose rig. It is either 4 inch (101.6 mm) double-braided polyester or 3-1/2 inch (88.9 mm) circular three-strand nylon, 450 feet (137.1 m) in length.

3.9.9 Retrieving Line (Number 1 Saddle Whip). The whip is normally wire rope; however, some ships still use 3-1/2 inch (88.9 mm) nylon line, a minimum of 450 feet (137.1 m) in length.

3.10 HOSE AND FITTINGS

3.10.1 Hose (MILSPEC MIL-H-22240). The hose is lightweight and nonrigid (collapsible). It is available in 4 inch (101.6 mm), 6 inch (152.4 mm), and 7 inch (177.8 mm) sizes. The unit

length of issue is 30 feet (9.1 m) for the 4 inch (101.6 mm) size and 35 feet (10.6 m) for the 6 inch (152.4 mm) and 7 inch (177.8 mm) sizes.

3.10.2 Hose Saddles (Flow-Through). The two types of hose saddle used with the 6 inch (152.4 mm) or 7 inch (177.8 mm) hose are shown in Figure 3-4. Type "A" is 19 inches (482.6 mm) long and is used in the single-hose rig and for the lower hose in the double-hose rig. Type "B" is 32 inches (812.8 mm) long and is used for the upper hose in the double-hose rig. Details of these saddles are shown in NAVSHIPS Std Plans 810-1385957 and 810-1385962.

3.10.3 Hose Couplings (MILSPEC MIL-C-24356). The hose couplings for 4 inch (101.6 mm), 6 inch (152.4 mm), and 7 inch (177.8 mm) hoses are re-attachable couplings of male and female design. The female end incorporates a rubber "O" ring for sealing the joint. A split clamp and band assembly is used to attach the male and female couplings together.

3.10.4 Riding Line Fittings (Flow-Through). The riding line fittings for 6 inch (152.4 mm) and 7 inch (177.8 mm) hoses are flow-through design. Details of these fittings are shown in NAVSHIPS Std Plans 810-1385968 (for the 6 inch (152.4 mm) fitting) and 810-1385969 (for the 7 inch (177.8 mm) fitting).

3.11 FUELING COUPLINGS

A variety of fueling couplings are required to provide for the compatibility of the delivery and receiving ships. The couplings are described in the following paragraphs.

3.11.1 Single Probe. The single-probe fueling coupling consists of a fueling probe and receiver as shown in Figure 3-5. See NAVSEA Technical Manual 0978-LP-035-3010. The probe fueling system is approved for the transfer of F76 and F44 (JP-5).

3.11.1.1 Single Probe and Carrier Assembly. The single probe and carrier assembly (Figure 3-5) is attached to the delivery ship's hose and consists of a trolley carriage, a tube, and a probe. The trolley carriage is hinged so that it can be rigged to the spanwire without disassembly of parts. The four sheaves in the carriage are of different diameter. Ensure sheaves are installed as shown in Figure 3-6 for correct alignment of the probe to the receiver. The tube serves as a training mechanism and provides a means for connecting the fuel hose to the probe. The probe has a latching mechanism that holds the probe in the receiver by spring force. The probe also has a built-in sliding sleeve valve that opens on proper engagement with the probe receiver and automatically closes upon disengagement during fuel transfer. A line pull of about 300 lb (136 kg) on the messenger or remating line is required to engage the probe in the receiver. A designed line pull of 2,500 lb (1,134 kg) (plus or minus 500 lb (227 kg)) on the retrieving line will disengage the probe from the receiver.

3.11.1.2 Single-Probe Receiver. The receiver (Figure 3-5) is mounted on the receiving ship and consists of a swivel arm assembly, the receiver, and a manual release lever. A pelican hook, used as the spanwire attachment point, is an integral part of the swivel arm assembly. The receiver is mounted on the swivel arm, which keeps the receiver directly in line with the spanwire and the probe. The arrangement provides excellent alignment during connect-up of the probe to the receiver, providing the messenger fairlead block has been installed on the side of the probe swivel joint that is opposite from the side of the line pull (see Figure 3-24). The manual release lever can be mounted on either the forward or aft side of the receiver to suit local conditions. Latch indicator flags, mounted on each side of the housing, indicate when the probe is fully engaged in the receiver (see Figure 3-25). When the probe is engaged, the flags are in the raised position; when the probe is disengaged, the flags are in the stowed position.

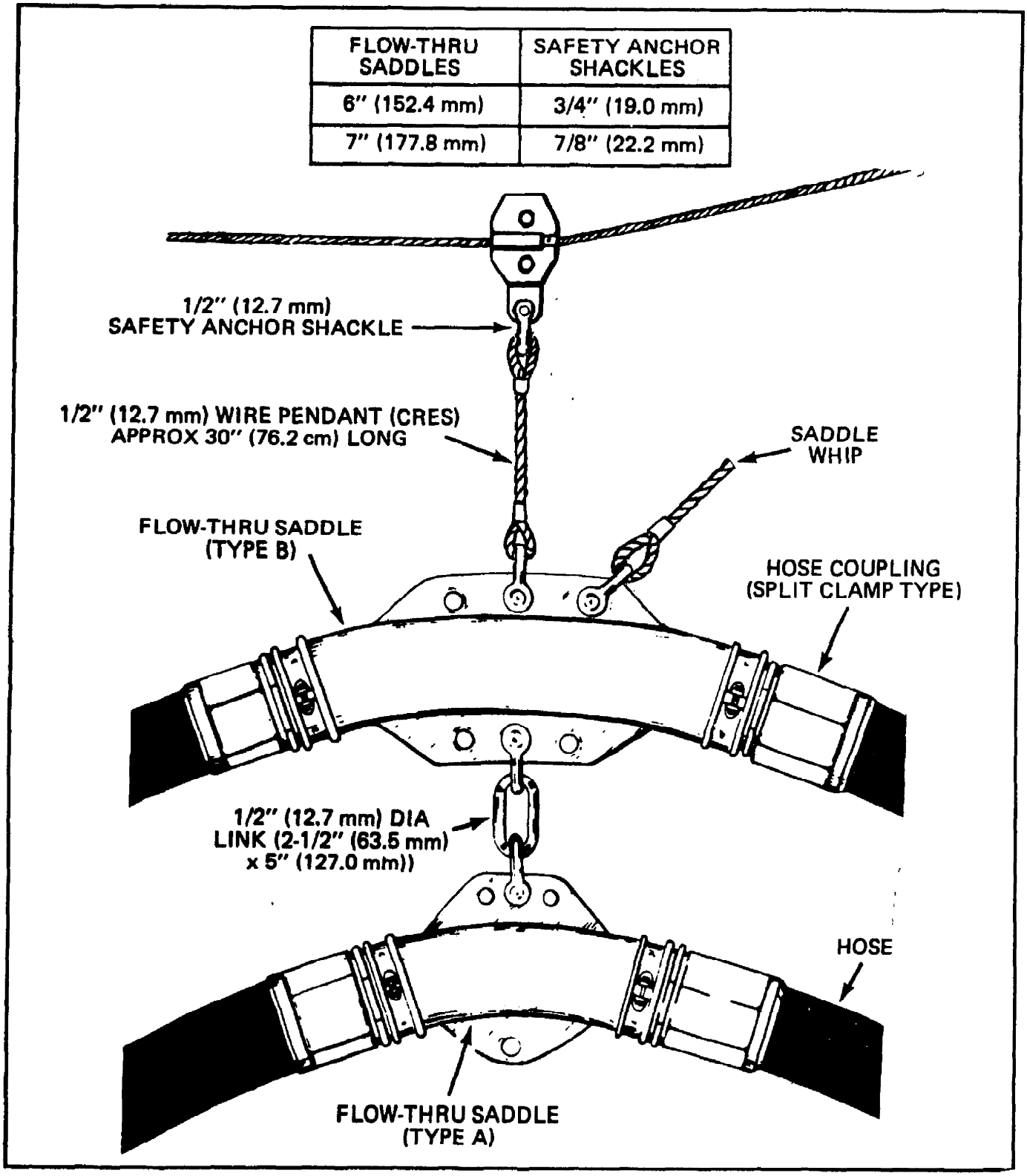


Figure 3-4. Hose Saddles

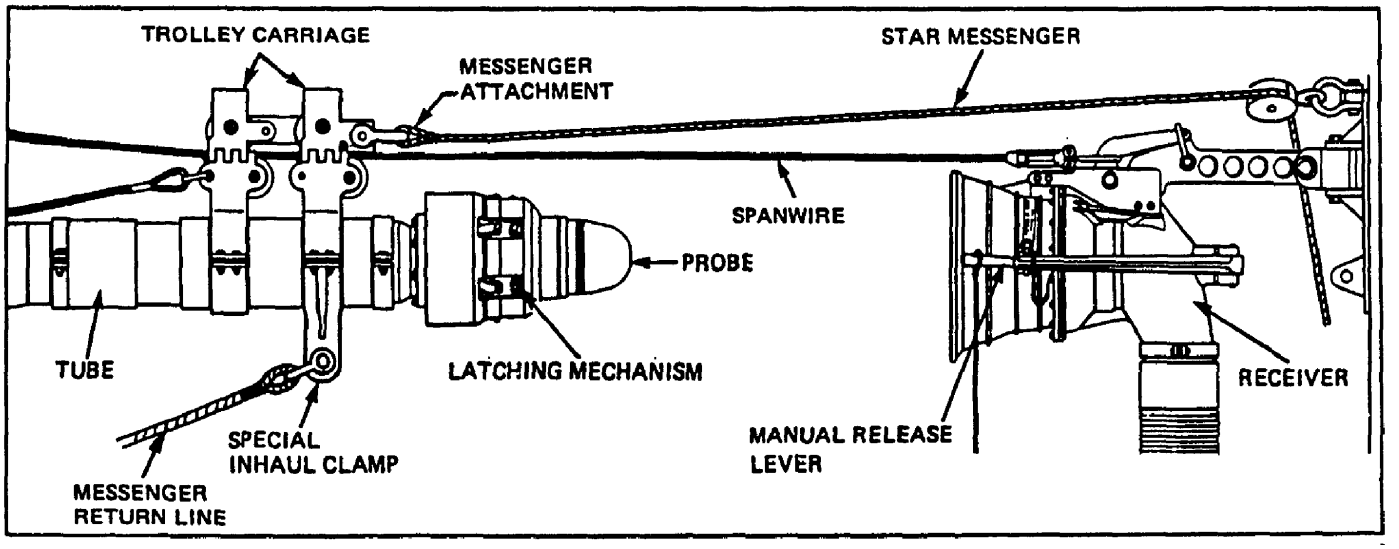


Figure 3-5. Single Probe and Receiver

3.11.1.3 Receiver Hose Assembly. The receiver hose assembly is a steel-reinforced 7 inch (177.8 mm) diameter hose with a special male fitting and flanged connector at one end and a special female fitting at the other end. It is 8 feet (2.4 m) long and connects the receiver to the fuel riser.

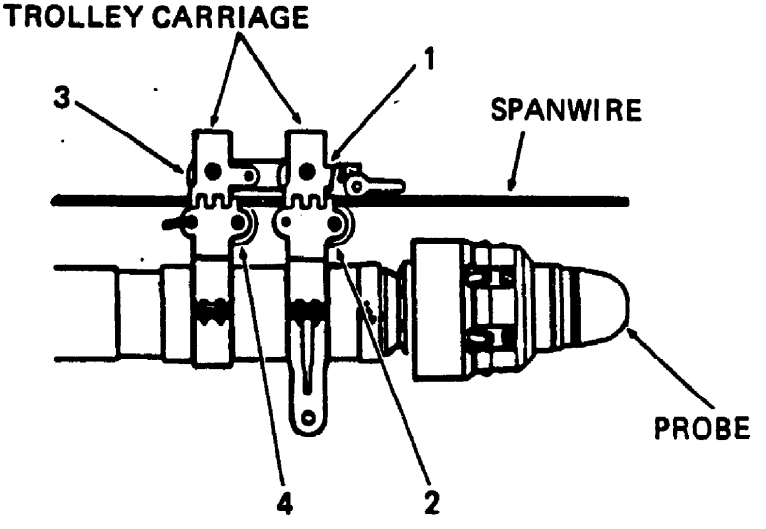
3.11.2 Double Probe. The double-probe fueling coupling consists of two fueling probes and two receivers as shown in Figure 3-7. See NAVSEA Technical Manual 0955-026-8010.

3.11.2.1 Double Probe and Carrier Assembly. The double probe and carrier assembly consists of a trolley carriage and two tube and probe assemblies. Each tube and probe assembly for the double probe is identical to and interchangeable with the single probe. Hose lengths (Figure 3-8) and the adjustment of the stress wire bridle (Figure 3-9) are critical for successful seating of double probes in double-probe receivers.

3.11.2.2 Double-Probe Receivers. The double-probe receivers consist of two receivers and a special base plate with a built-in swivel feature that permits tracking through the full working range of the receiving station. A special wire-reinforced hose connects each receiver to the fuel riser piping. Each receiver has a handle mounted on the housing to provide a means of disengaging the probe at the receiver. Latch indicator flags on each housing indicate when the probe is fully engaged in the receiver (see Figure 3-25).

3.11.2.3 Double-Probe Receivers Using Single Probe. The double-probe receivers can receive a single probe (Figure 3-10) when the single probe is equipped with the special inhaul clamp (NAVSHIPS Std Plan 80064-803-2252874A). This clamp is mounted in place of the lower half of the existing outboard clamp. It has a pip-pin for securing the messenger or remating line to the probe. The special inhaul clamp allows the messenger or remating line to fairlead between the two probe receivers to the messenger fairlead block.

SHEAVE IDENTIFICATION	SHEAVE O.D.	NAVSHIPS PART NO.	STOCK NO.
1 UPPER FORWARD	5-1/2" (139.7 mm)	2255760-5	NSN 2040-00-875-7102
2 LOWER FORWARD	3-1/2" (88.9 mm)	2255760-6	NSN 2040-00-875-7105
3 UPPER REAR	4-3/4" (120.6 mm)	2255760-7	NSN 2040-00-875-7110
4 LOWER REAR	4-1/4" (107.9 mm)	2255760-8	NSN 2040-00-875-7116



Note

To provide proper alignment of the probe and receiver, check outside diameter (O.D.) of each sheave against table to insure each sheave is installed in its correct location.

Do not tighten bolts and nuts further than required. This will pinch the trolley block which will misalign the holes for the pin and/or cause sheaves to bind.

Figure 3-6. Single-Probe Trolley Carriage Sheaves

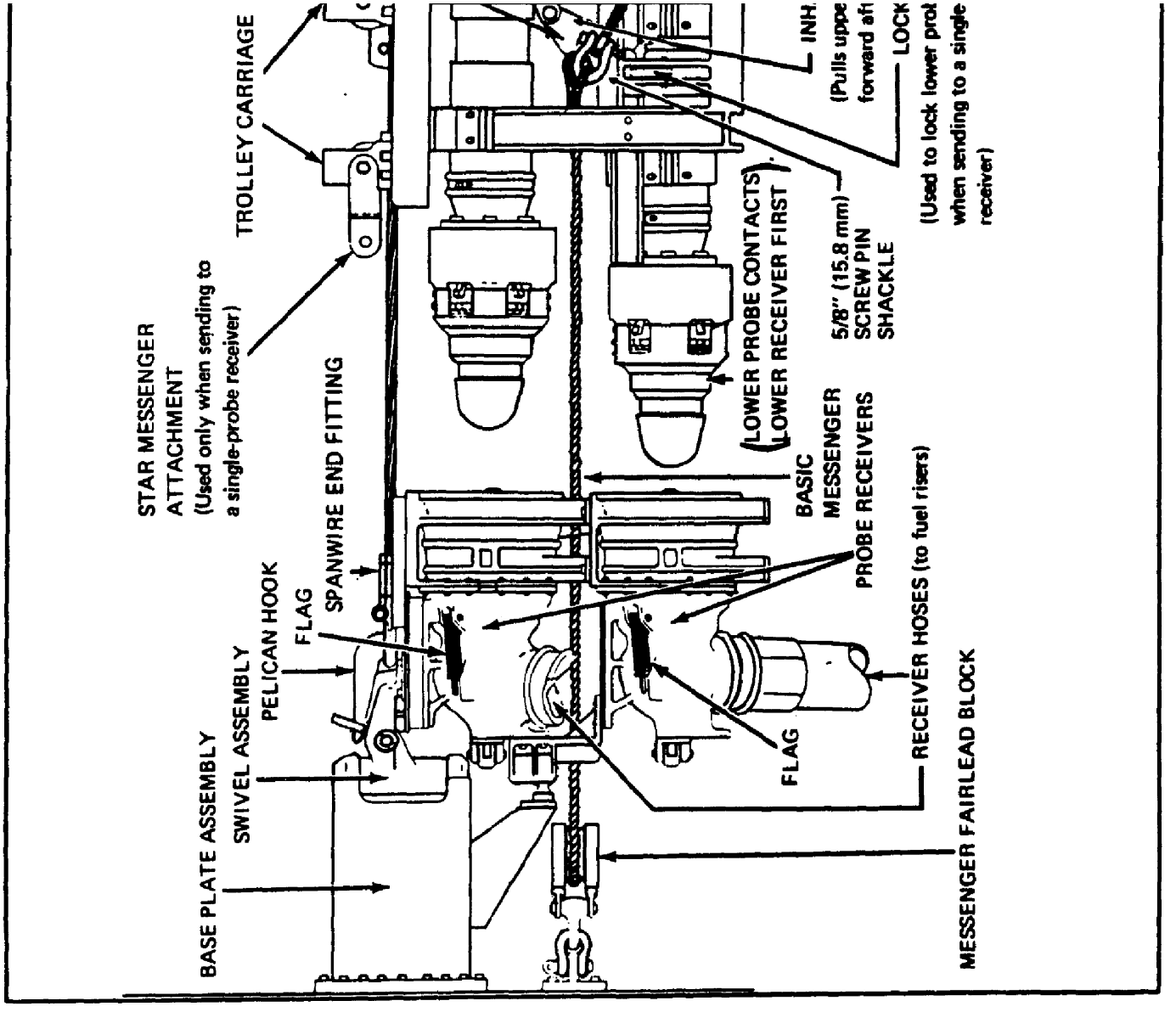


Figure 3-7. Double Probes and Double-Probe Receivers

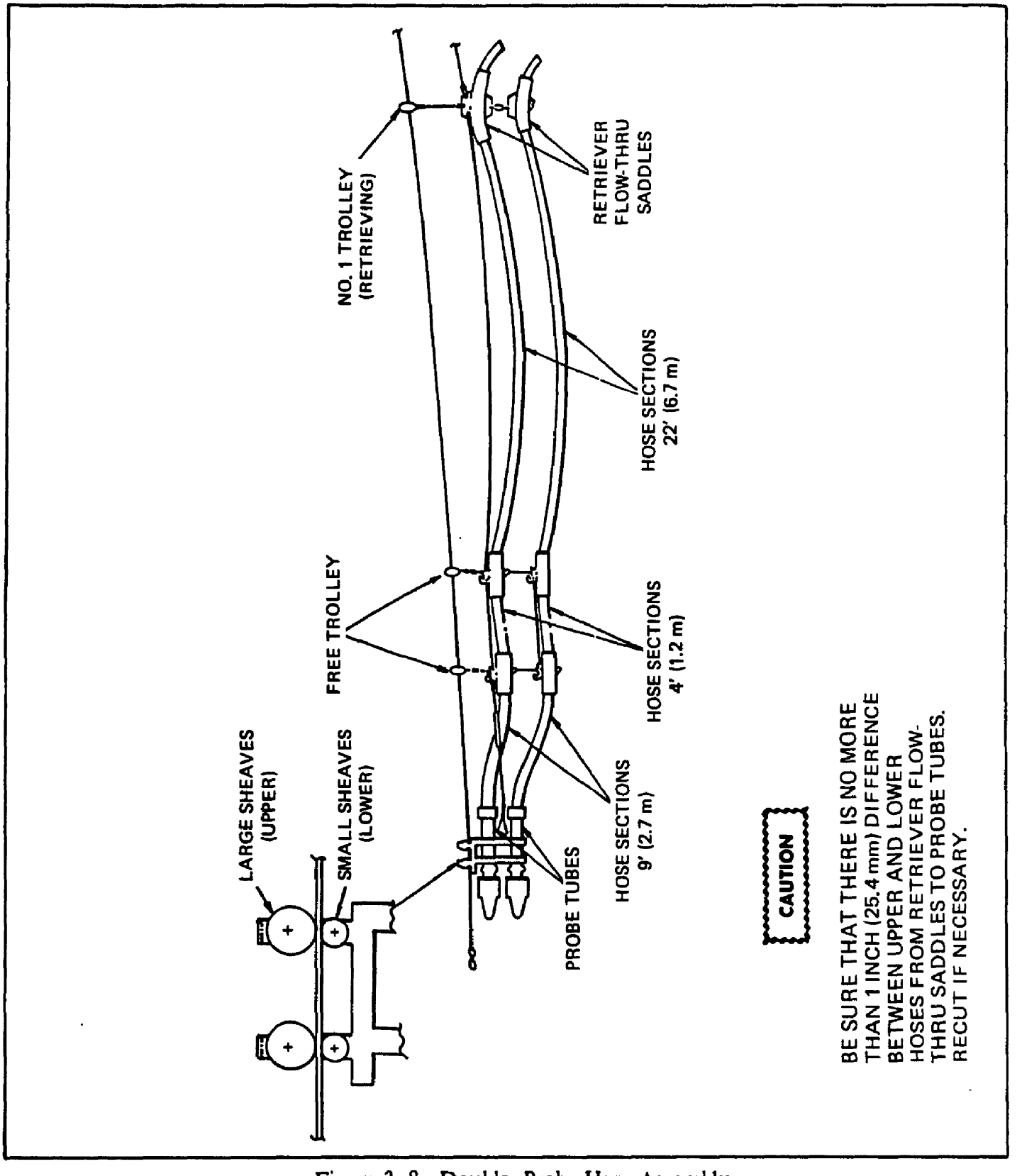


Figure 3-8. Double-Probe Hose Assembly

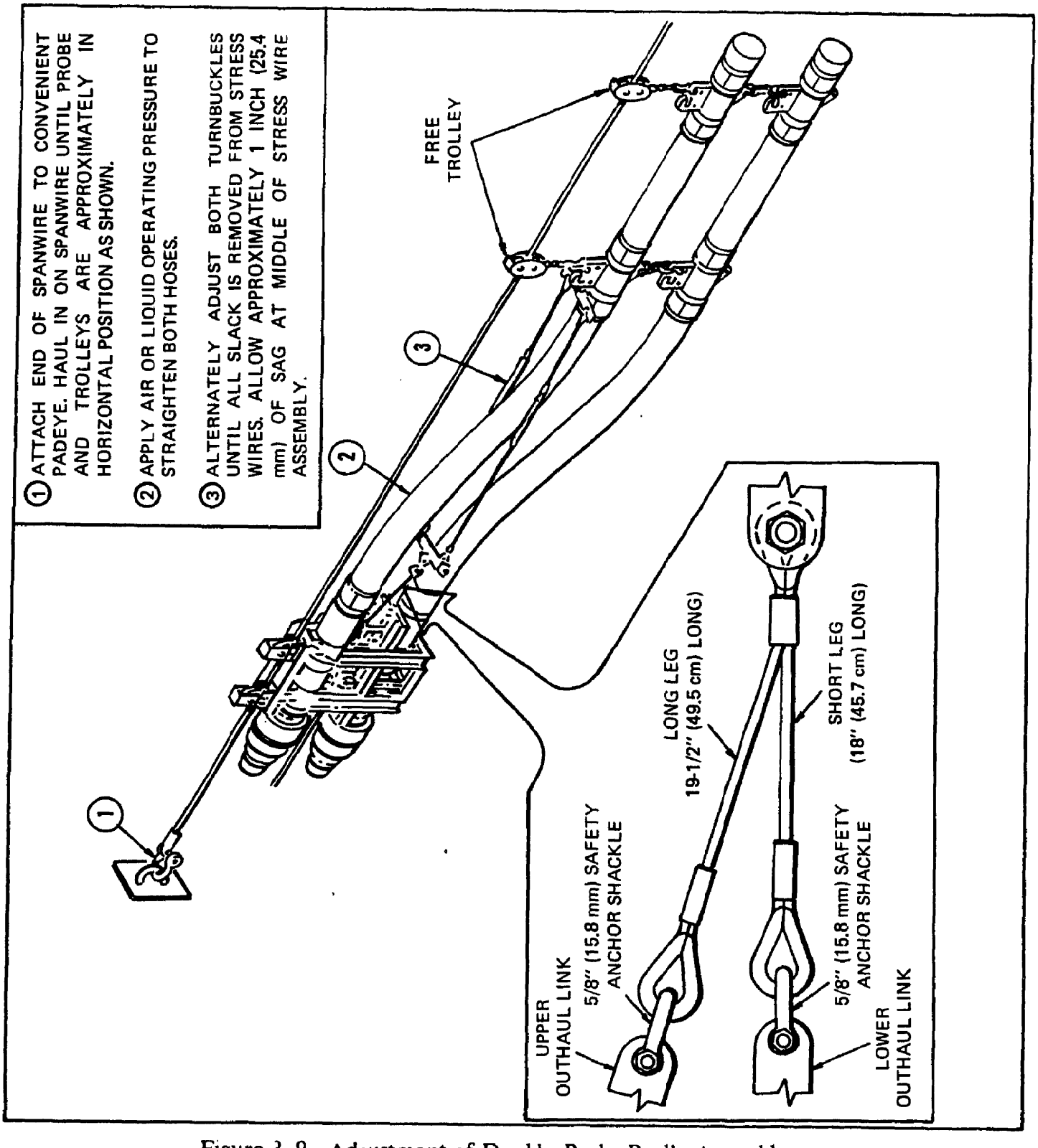


Figure 3-9. Adjustment of Double-Probe Bridle Assembly

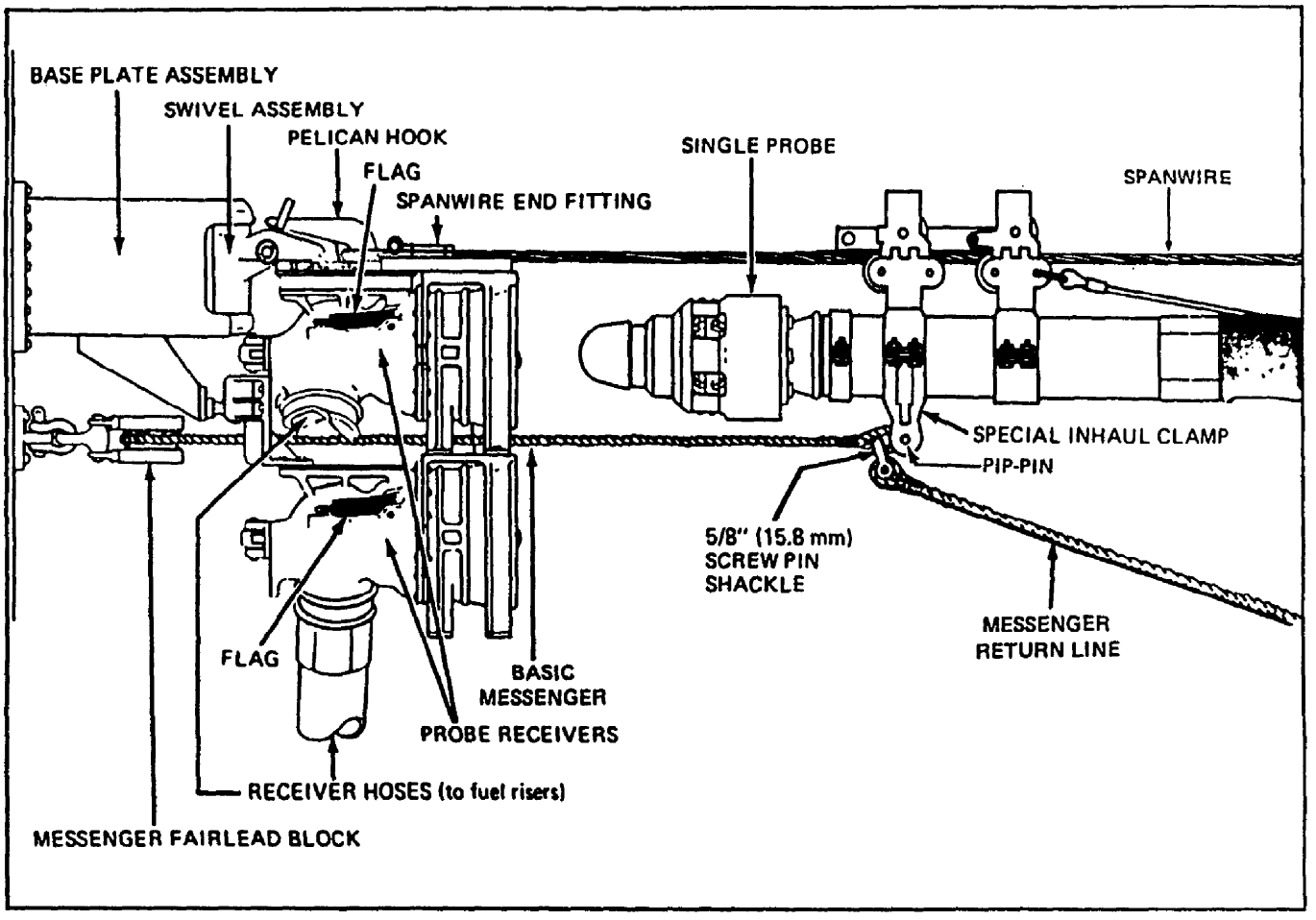


Figure 3-10. Single Probe and Double-Probe Receivers

3.11.3 Combined Quick-Release Coupling and Valve (Robb Coupling). The Robb coupling, shown in Figure 3-11, consists of (1) a male end attached to the fueling manifold on the receiving ship and (2) a female end secured to the end of the hose sent over by the delivery ship. Couplings made of steel or bronze may be used in F76 and F44 (JP-5) hose rigs.

The female end is a slightly tapered tube with a split clamp coupling adapter at one end and a machined groove near the other end. The spring-tensioned ball race in this groove lines up with the groove in the male end. When the two ends are joined, the spring-tensioned sleeve on the outside forces the balls down into the groove to hold the two ends together. A nipple gasket provides a tight joint when the two ends are joined. A valve, located in the female end, is held closed by a heavy spring, and a gasket ensures a tight seal. An operating lever in the male end is linked to the ring-shaped actuating cam in the male end. When this lever is turned to the open position, the cam is thrust forward, opening the valve in the female end.

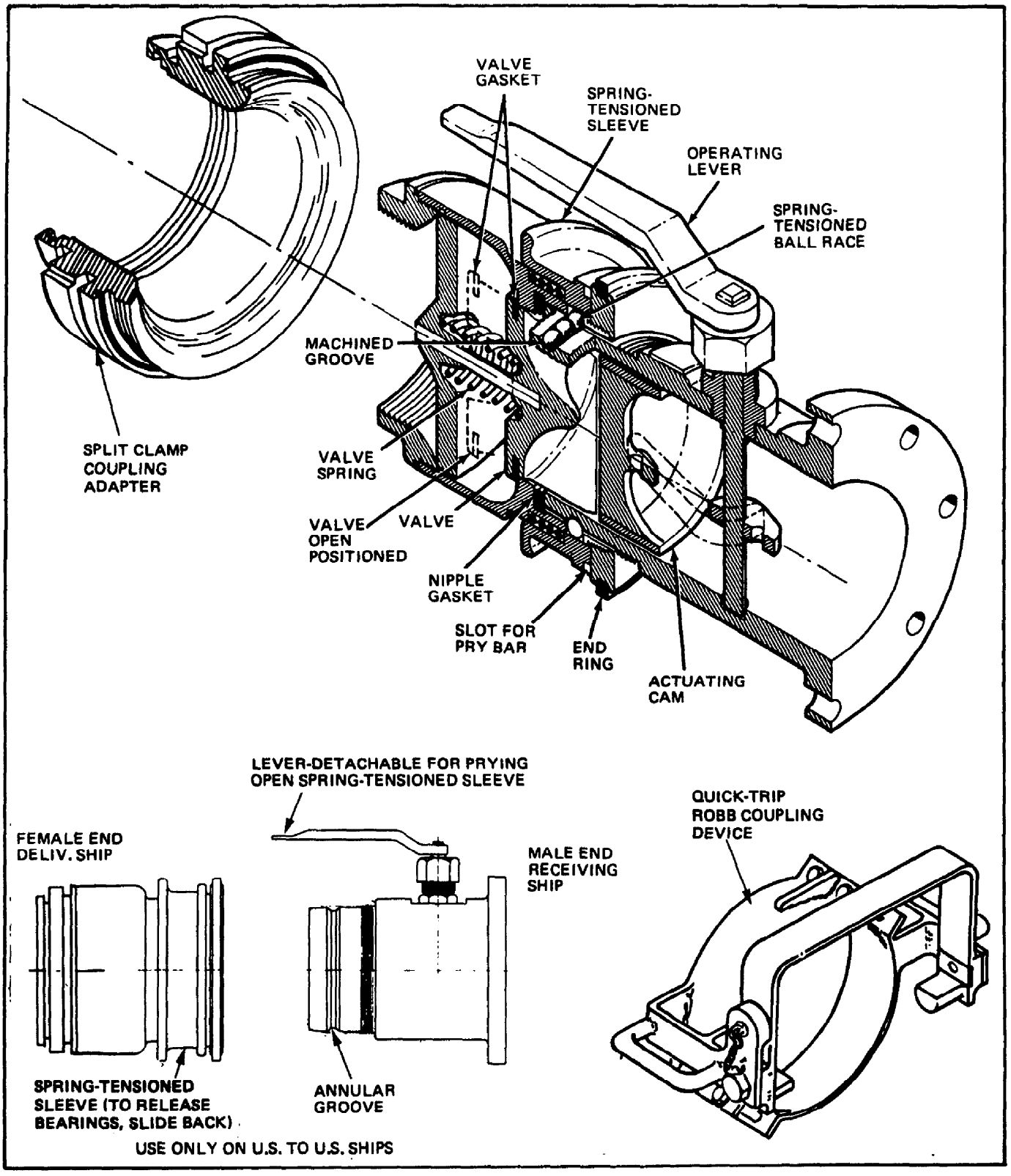


Figure 3-11. Combined Quick-Release Coupling and Valve (Robb Coupling)

Because there are both 6 inch (152.4 mm) and 7 inch (177.8 mm) split clamp coupling adapters available for the female end, the Robb coupling can be used with either the 6 inch (152.4 mm) or 7 inch (177.8 mm) hose.

Note

The Robb coupling quick-trip device (Figure 3-11) must be installed on the female end of the Robb coupling by the delivery station prior to sending the rig over.

3.11.4 Breakable-Spool, Quick-Release Coupling. This coupling, shown in Figure 3-12, is used when fueling NATO-nation, SEATO-nation, and MSC ships that are not equipped with the probe receiver.

1. The A-end, rigged by the receiving ship, is a cast-iron spool with a standard hose flange on one end and a slotted flange on the other. A groove machined around the spool weakens it sufficiently to permit its being broken easily in an emergency by a blow from a sledge hammer.

2. The B-end, attached to the end of the hose passed by the delivery ship, is a cast-iron spool with 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 quickly 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 ensures an oil-tight fit. A blank flange is attached to the B-end when the hose is passed to prevent oil from spilling and water from entering the hose.

3.11.5 Pigtail, 4 Inch (101.6 mm). This fitting is a 4 inch (101.6 mm) diameter rigid hose (MILSPEC MIL-H-0015100), 10 feet (3.0 m) long. It is used for fueling ships with an open trunk fuel system.

3.11.6 Quick-Release Coupling, 4 Inch (101.6 mm). This coupling (NAVSHIPS Std Plan 805-2556892) is attached to the 4 inch (101.6 mm) pigtail for fueling small ships fitted with 4 inch (101.6 mm) fuel risers.

3.11.7 Quick-Release Coupling, 2-1/2 Inch (63.5 mm). This coupling (NAVSHIPS Std Plan 805-2557603) is used when fueling small ships equipped with 2-1/2 inch (63.5 mm) fuel risers.

3.12 SPANWIRE END FITTINGS

The spanwire weak-link end fitting (Figure 3-13a) is installed on the outboard end of the spanwire. Use the 3/4 inch (19.0 mm) fitting (designed to fail at 30,000 lb (13,608 kg)) for a single-hose rig and the 7/8 inch (22.2 mm) fitting (designed to fail at 35,000 lb (15,876 kg)) for a double-hose rig. When delivering to double-probe receiving stations, only the spanwire weak-link end fitting shall be used. The alternate end fitting (Figure 3-13b) is not compatible with double-probe receivers.

Note

Ships with single-hose rigs and 7/8 inch (22.2 mm) spanwires will use the 7/8 inch (22.2 mm) weak-link end fitting.

For fuel delivery at stations having wire rope that is normally used for purposes other than fuel delivery, one of the following wire rope end fittings is required:

1. For probe fueling, the alternate end fitting (Figure 3-13b)

2. For fueling methods other than probe, a 5/8 inch (15.8 mm) shackle and a 1 inch (25.4 mm) pelican hook for a single-hose rig and a 3/4 inch (19.0 mm) shackle and a 1 inch (25.4 mm) pelican hook for a double-hose rig

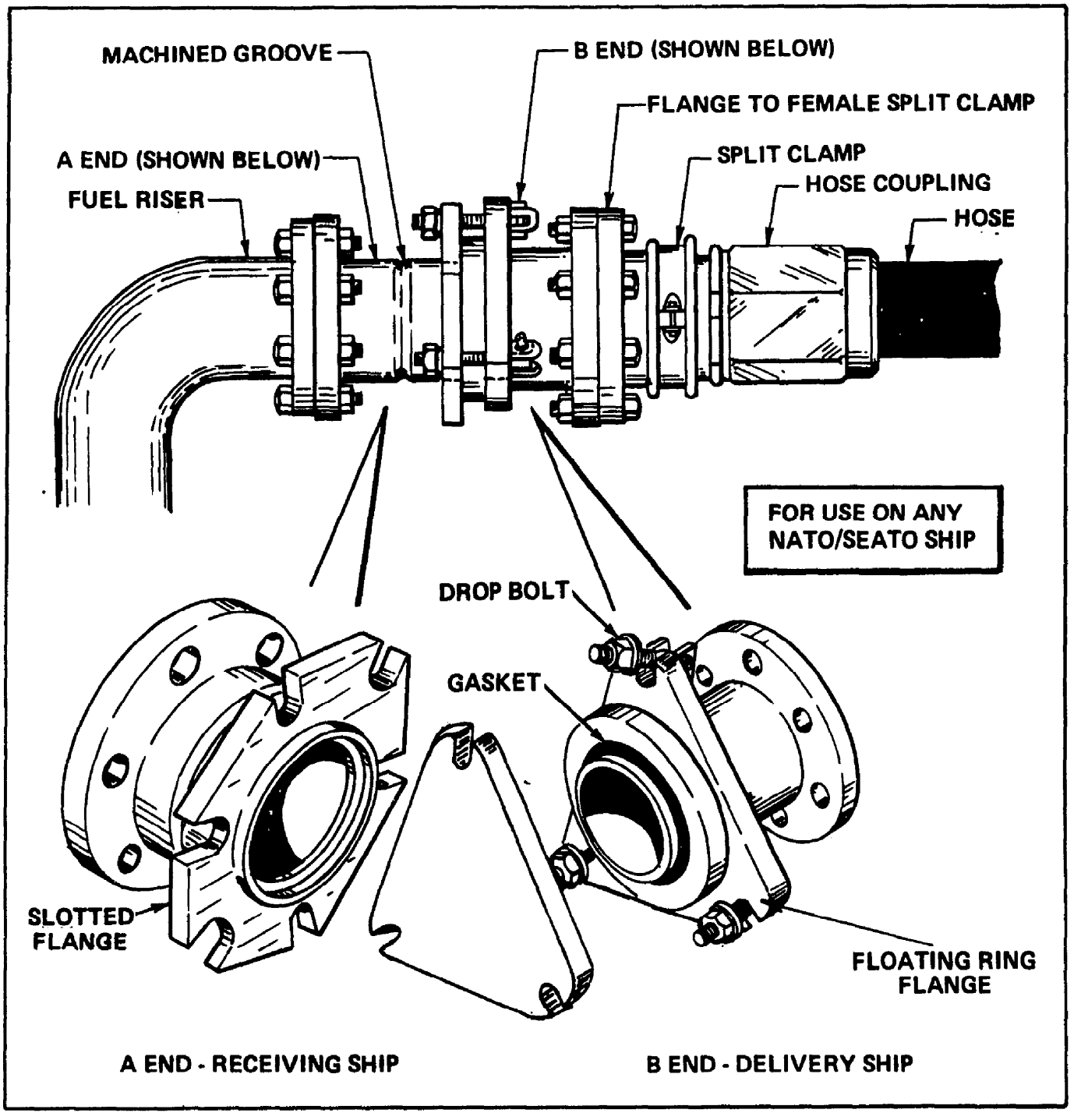


Figure 3-12. Breakable-Spool, Quick-Release Coupling

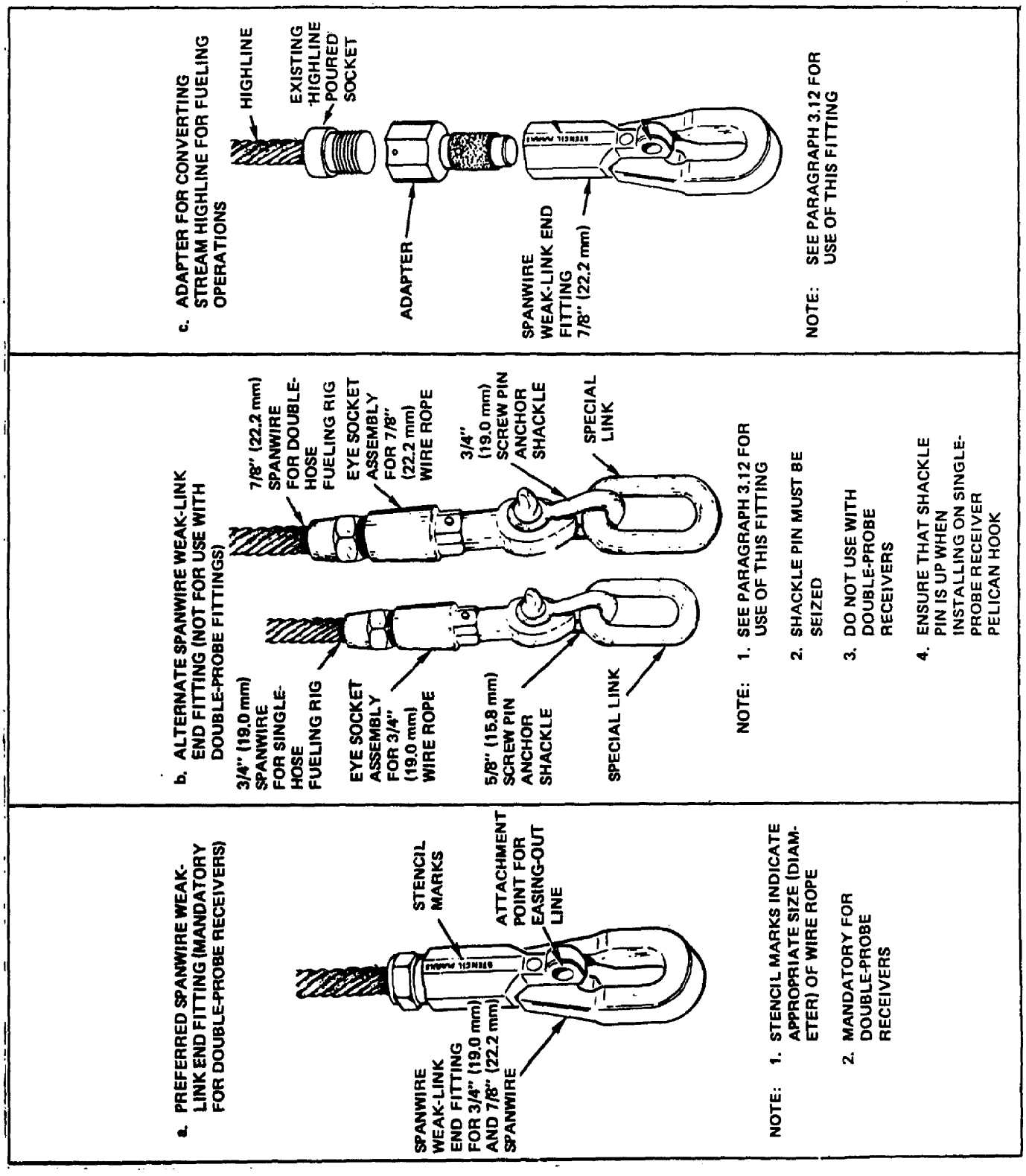


Figure 3-13. Spanwire End Fittings for Fueling Rigs

3. For fueling from a cargo STREAM highline station, the highline end fitting is removed and the FAS STREAM adapter (Figure 3-13c) is used on the highline poured socket to connect a 7/8 inch (22.2 mm) FAS spanwire weak-link end fitting.

WARNING

The FAS weak-link end fitting shall be used for FAS operations only. When the highline is to be used for cargo STREAM operations, the FAS weak-link end fitting and adapter must be removed and the highline end fitting *reinstalled.*

3.13 MISCELLANEOUS FITTINGS

1. Hose adapters — see specification MIL-C-24356.

2. Spanwire trolley blocks — see NAVSHIPS Std Plan 805-2219047.

3. Robb coupling quick-trip device — see NAVSHIPS Std Plan 805-2556863.

4. Pelican hooks — see NAVSHIPS Std Plan 805-2556852.

5. Hose crimping device — see NAVSHIPS Std Plan 805-2554813.

6. FAS special shackle — see NAVSHIPS Std Plan 805-2556884.

7. Probe relatching tool — see NAVSHIPS Std Plan 805-2250560. The probe relatching tool (Figure 3-14) is designed to provide a rapid means of relatching the probe's six lock arms simultaneously.

8. Probe sleeve retractor — see NAVSHIPS Std Plan 805-2214629. The sleeve retractor (Figure 3-15) is a special tool used to manually open the sliding sleeve valve in the probe to drain the fuel from the hose rig and to provide access for replacing the probe nose seal. The nose shield of the retractor is designed for connecting to a 7 inch (177.8 mm) jumper hose.

9. Riding line cleat — the preferred riding line cleat is the three-horn cleat (see NAVSHIPS Dwg 805-2554187). Another type, the two-horn cleat, may be found on older installations. Although not as desirable as the three-horn cleat, the two-horn cleat can be used as a riding line cleat. The two cleats are illustrated in Figure 3-16.

For additional details and information for hardware used in FAS systems, see NAVSEA S9570-AD-CAT-010, UNREP Hardware and Equipment Manual.

3.14 ALONGSIDE FUELING-AT-SEA RIGS

Fleet Underway Replenishment Guide (COMNAVSURFPACINST 3180.2 or COMNAVSURFLANTINST C9010.1) and NAVSHIPS 0905-487-2010, UNREP Station Capabilities Handbook, provide replenishment station data for selecting station and rig type.

The preferred fuel transfer rig is fuel STREAM (tensioned spanwire).

Fuel can also be transferred using the non-tensioned spanwire rig, or as a backup, the close-in rig or the astern rig.

Fueling-at-sea hardware for delivery and receiving stations are listed in Figures 3-51 and 3-52 at the end of the chapter.

3.15 FUEL STREAM RIG

In the fuel STREAM rig (Figure 3-17), the hose is supported between two ships on the ram-tensioned spanwire. The acronym given to the ram-tensioned spanwire rig is fuel STREAM (standard tensioned replenishment alongside method). The fuel STREAM rig al-

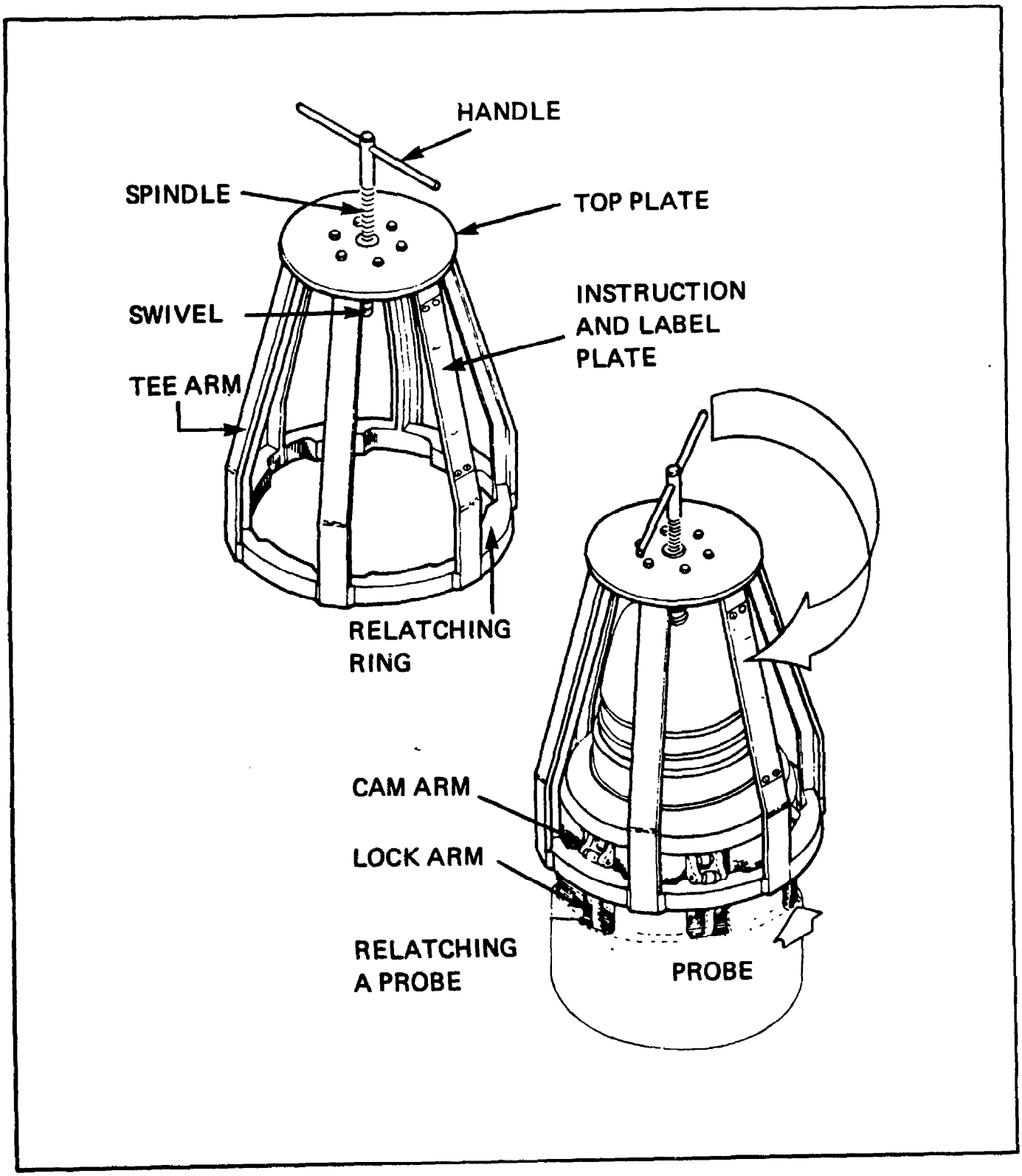
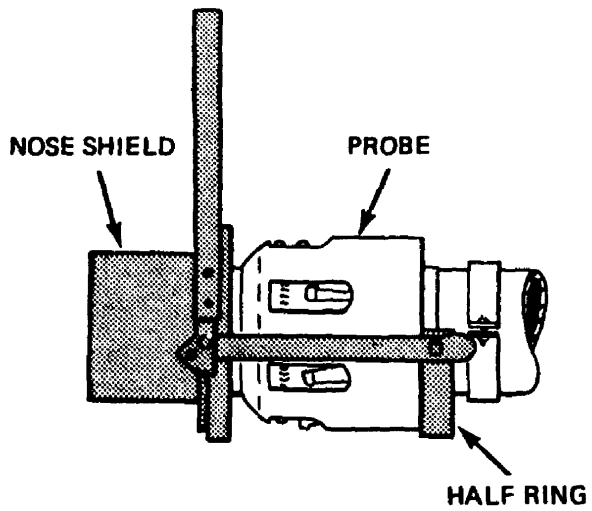
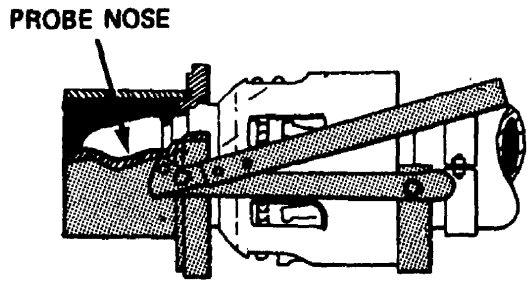


Figure 3-14. Probe Relatching Tool

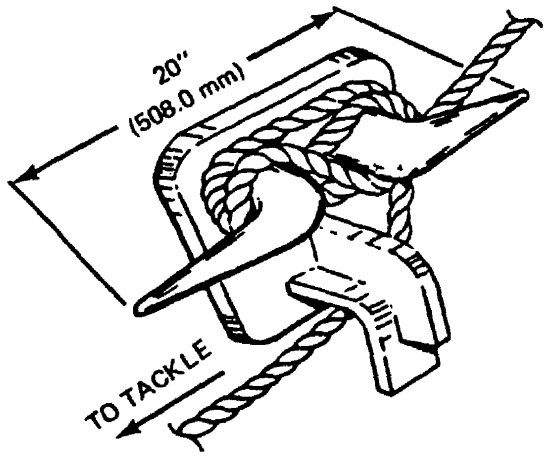


INSTALLING SLEEVE RETRACTOR

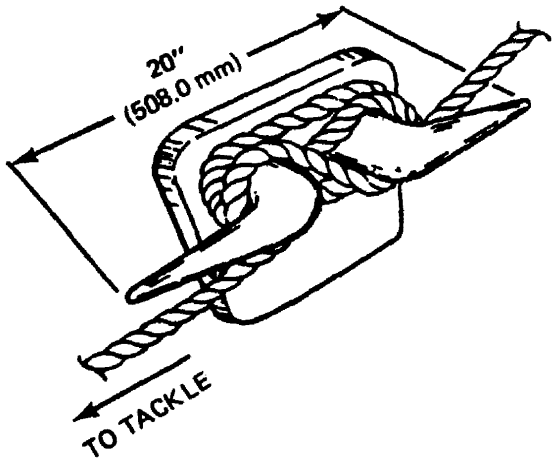


RETRACTING PROBE SLEEVE VALVE

Figure 3-15. Probe Sleeve Retractor



THREE-HORN CLEAT



TWO-HORN CLEAT

Figure 3-16. 20 Inch (508 mm) Cleats

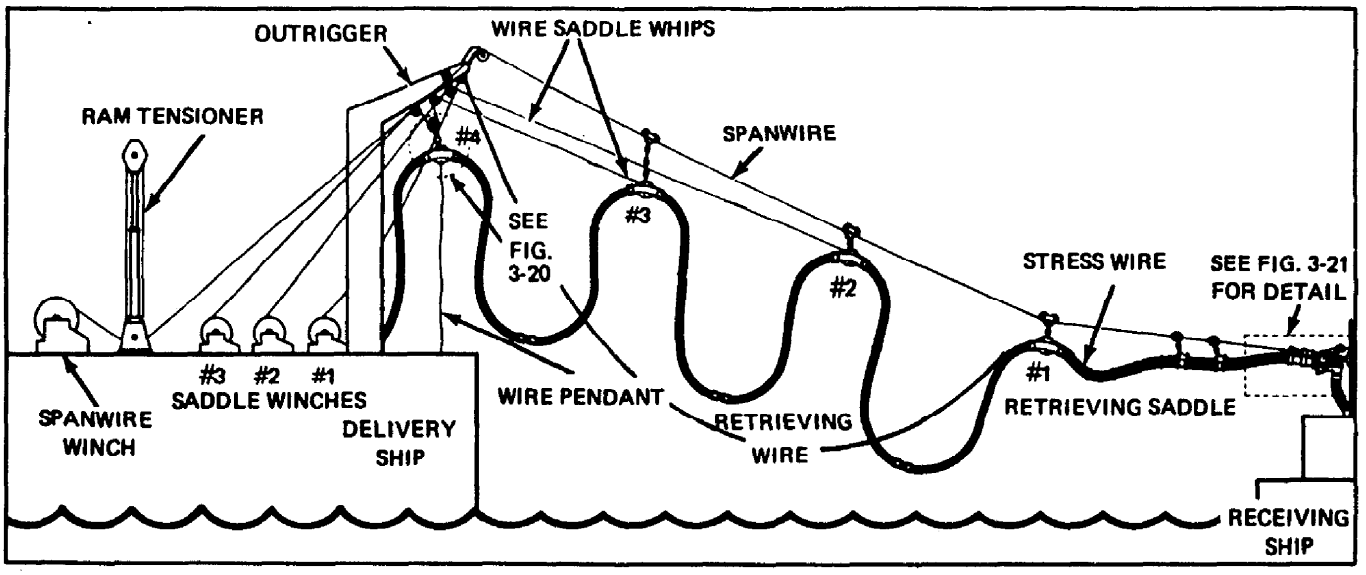


Figure 3-17. Fuel STREAM Rig — Single Hose With Probe

lows ships to open out to a greater distance than is possible with the other fueling rigs, minimizes the possibility of tightlining and parting of the spanwire, and provides for improved personnel safety.

Normal operating air pressures of ram tensioners for fuel STREAM are generally 800 psi (5,516 kPa) air (8,000 lb (3,634 kg) line tension) for the single-hose rig and 1,550 psi (10,687 kPa) air (15,500 lb (7,041.6 kg) line tension) for the double-hose rig. See Figure 3-18 for fuel STREAM ram tensioner air pressure settings.

Note

Ramless spanwire winches, such as those used on aircraft carriers and battleships to refuel escorts and those installed in newer ADs, use a hydraulic pressure compensating system instead of a ram tensioner to maintain tension on the spanwire.

The fuel STREAM rig shall be rigged with wire for all saddle whips, including the retrieving saddle, whenever winches can be made available. Otherwise, double-braided nylon line is substituted for one or more of the normally wire-rigged saddle whips (see paragraph 3.9.9). The use of a wire rope retrieving whip is mandatory when delivering a double probe.

Fuel STREAM rigs in order of preference are:

1. Fuel STREAM with probe and carrier assembly

2. Fuel STREAM with Robb or breakable-spool coupling.

SHIP	STATIONS	RAM PRESSURE (PSI) (1) (2) (3)	NORMAL RAM PRESSURE SETTING (PSI)	
			DOUBLE HOSE (3)	SINGLE HOSE (3)
AE-35	3	800 (5,516)	—	800 (5,516)
AFS-4, 7	3	800 (5,516)	—	800 (5,516)
AO-98, 99	3, 9	800 (5,516)	—	800 (5,516)
	6, 8, 10	1500 (10, 342)	1500 (10,342)	—
AO-177	1, 7	900 (6,205)	—	800 (5,516)
	2, 6, 8	1600 (11,032)	1500 (10,342)	—
T-AO-105, 107, 108	3, 4	850 (5,861)	—	800 (5,516)
	6, 9, 10	1500 (10,342)	1500 (10,342)	—
T-AO-106, 109	3, 4, 9	800 (5,516)	—	800 (5,516)
	6, 10	1400 (9,652)	1400 (9,652)	—
T-AO-143 thru 148	9	800 (5,516)	—	—
	10, 12	1400 (9,652)	1400 (9,652)	—
AOE – All	3, 4, 8, 9, 12, 16	1550 (10,686)	1550 (10,686)	800 (5,516)
AOR – All	2, 3, 6, 8, 9, 12	1550 (10,686)	1550 (10,686)	800 (5,516)

NOTE: (1) Maximum ram pressure based on winch maximum line pull.

(2) Air pressure is read with the ram in the down position (secured).

(3) Data provided in parentheses reflects units in kilopascal (kPa).

Figure 3-18. Ram Tensioner Air Pressure Settings for Fuel STREAM Rig

3.15.1 Rigging the Delivery Station for Fuel STREAM

3.15.1.1 Hose Assembly. Hose lengths are joined together by re-attachable couplings and clamps. Each hose length shall have a male clamp coupling on the outboard end and a female clamp coupling on the inboard end. The female end incorporates a rubber "O" ring seal.

When joining hose lengths, the male and female clamp ends are pushed into engagement. The joint is then secured by a split clamp and band assembly which is wrapped around each hose coupling and locked to retain both couplings. It is important to protect the surfaces of the male clamp fitting to ensure a leak-proof seal when it is made up with the female coupling. These couplings can be assembled and disassembled by fleet personnel. Damaged sections of hose may be removed, and the remaining good sections can still be used.

The fuel STREAM hose rig is approximately 300 feet (91.4 m) long with the following fittings and hose lengths coupled in succession, starting with the inboard end.

- Two 35 foot (10.6 m) lengths of hose (inboard length cut to suit)
- Flow-through saddle (No. 4)
- Two 35 foot (10.6 m) lengths of hose
- Flow-through saddle (No. 3)
- Two 35 foot (10.6 m) lengths of hose
- Flow-through saddle (No. 2)
- Two 35 foot (10.6 m) lengths of hose
- Flow-through saddle (No. 1)
- One 22 foot (6.7 m) length of hose
- Flow-through riding line fitting
- One 4 foot (1.2 m) length of hose
- Flow-through riding line fitting
- One 9 foot (2.7 m) length of hose
- Fueling probe and carrier assembly.

The 22 foot (6.7 m) outboard length may be cut to suit when using the probe system to prevent probe damage at the delivery ship's bulwark. When using double probe, both hoses from the retriever saddle to the probe tubes must be equal in length to permit seating of the probes (see Figures 3-8 and 3-9).

A stress wire connects each of the riding line fittings and the retriever saddle (No. 1) to prevent the hose from taking a strain.

3.15.1.2 Hose End Fittings. The probe, which has a 7 inch (177.8 mm) diameter, provides an improved rate of fuel transfer over the Robb coupling, which has a 6 inch (152.4 mm) diameter. Robb and probe couplings may be exchanged on the same hose to meet customer requirements, but the Robb coupling shall be removed before the probe is attached to the hose.

3.15.1.3 Rigging the Hose Assembly. The hose is suspended from the spanwire by trolley blocks. Except for the inboard saddle, one trolley is shackled to each flow-through saddle and one trolley to each riding line fitting. The trolley carriage is fitted to the spanwire.

For passing the rig, the spanwire is stopped to two beckets, 350 feet (106.5 m) from the shackle end of the messenger, as shown in Figure 3-19. Grease in the way of the stops should be removed from the spanwire.

3.15.1.4 Saddle Whips. Wire rope saddle whips are used to control the positions of the flow-through saddles on the spanwire (see Figure 3-17).

3.15.1.4.1 No 3. Saddle Whip. This whip controls both the No. 3 and No. 4 saddles. The whip end is secured to the No. 3 saddle, reeved through the three blocks supporting the No. 4 saddle, and then fairled to the No. 3 saddle winch. The runner block (normally called a yo-yo block), attached to the No. 4 saddle, is a nonswiveling block equipped with an antitoppling device (Figure 3-20). A 3/4 inch (19.0 mm) wire pendant (length to suit ship installation) is shackled to the bottom of the No. 4 saddle and to a padeye on the deck. This pendant prevents two-blocking of the No. 4 saddle. A standard high-speed block can be used as the yo-yo block, if it is modified to lock the swivel feature in a fixed position and the antitoppling device is installed.

3.15.1.4.2 No. 2 Saddle Whip. The whip end is secured to the No. 2 saddle, reeved through a block on the kingpost outrigger, and then reeved through a fairlead block to a winch.

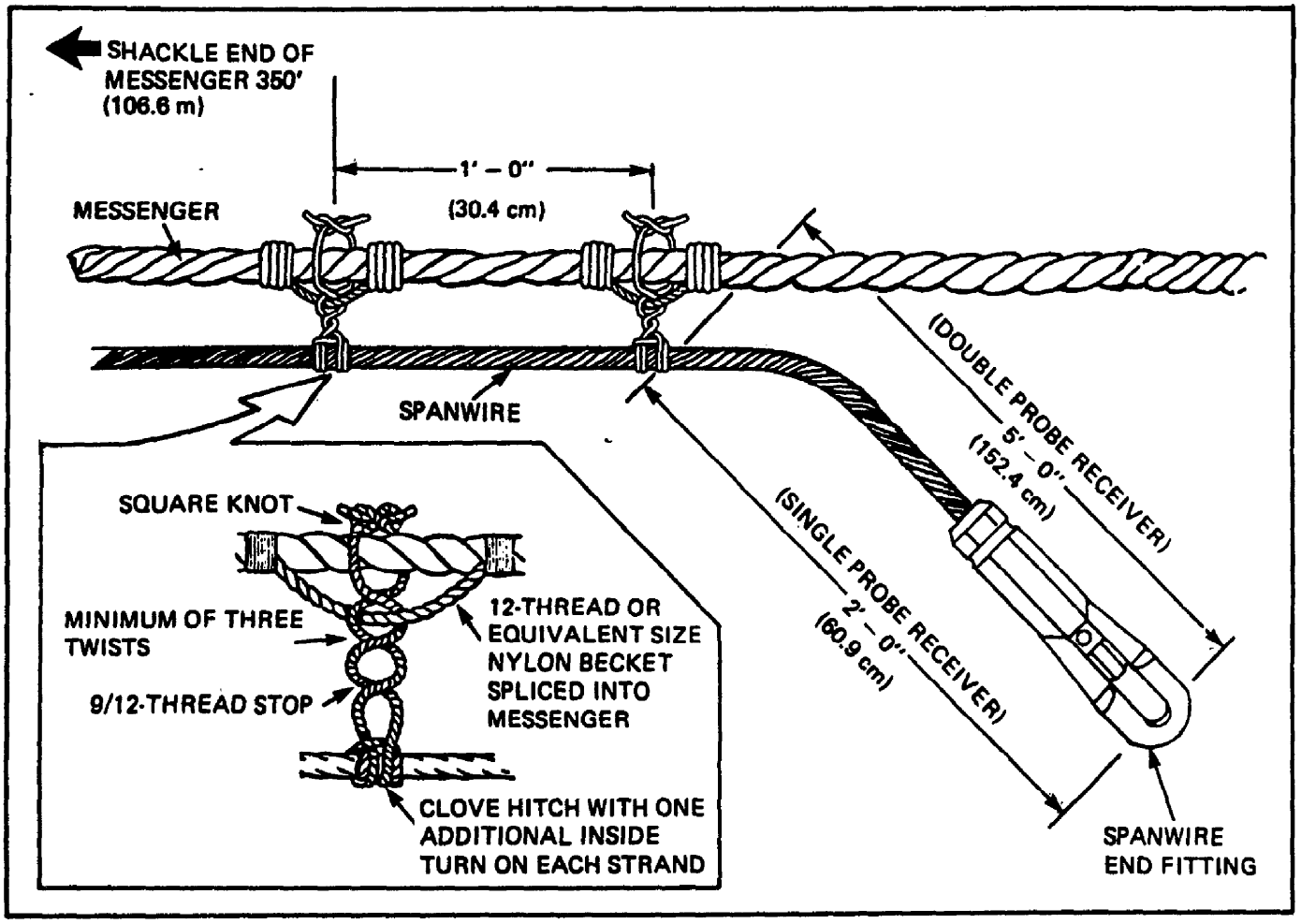


Figure 3-19. Method of Stopping the Spanwire to the Messenger

3.15.1.4.3 No. 1 (Retrieving) Saddle Whip. The whip end is secured to the outboard (No. 1) saddle, reeved through a block on the after side of the kingpost outrigger (or boom head), and then reeved through a fairlead sheave to a winch.

3.15.1.5 Fuel Transfer. Care must be taken to ensure that quick-closing valves and fuel line valves on both ships are open and remain open until pumping stops. Closing or throttling of valves on receiving ships can result in destructive pressure surges within the piping systems. The delivery ship should be kept advised of fueling time remaining at each station.

When fueling is complete, the delivery ship will (in all cases) determine the need for blowdown of hose using air to remove the excess fuel. When the delivery ship is signaled to stop pumping, the valve in the fuel oil transfer piping at the sending station is closed and low pressure air (approximately 80 psi (552 kPa)) is injected into the fuel transfer hose. This final step of blowing fuel into the receiving ship's tank requires about 3 minutes to complete. The receiving station must not disconnect the FAS coupling until the blowdown is complete. Receiving ships must also leave valves and tank vents open during blowdown so that fuel and air may move through the hose.

A second method used by delivery ships to remove fuel from the hose is commonly referred to as a back suction. This term is misleading as fuel is removed by gravity flow combined with a venturi effect. Delivery ships cannot reverse their large centrifugal pumps (which run in one direction only). The delivery ship allows fuel to cycle through a line bypassing the piping manifold to a cargo tank. As the fuel in the bypass line flows to the cargo tanks, a slight suction is created at the piping manifold. This method normally consumes considerably more time than the blowdown method.

3.16 SINGLE-HOSE FUEL STREAM RIG

The single-hose fuel STREAM rig (Figure 3-21) is a tensioned spanwire rig with the spanwire and saddle whips tended by winches at the delivery station.

The hose can be rigged with:

1. A probe to a single- or double-probe receiver (preferred method)
2. A Robb coupling to a Robb receiver
3. A pigtail for fueling to a fuel trunk.

The spanwire is passed to the receiving station by messenger and the spanwire end fitting secured at the receiving station. The spanwire is tensioned by hauling in slack wire and compressing the ram tensioner. The single-hose rig is hauled along the tensioned spanwire to the receiving station. The receiving station hooks the fuel hose to its fuel connection and the rig is ready for fuel transfer.

3.16.1 Fuel STREAM Station Rigging. Fuel STREAM station rigging varies slightly, depending on the type of connection required at the fuel riser. Rig single probe to single-probe receiver as shown in Figures 3-5 and 3-21 and single probe to double-probe receivers as shown in Figure 3-10. When the receiving station is rigged to receive a Robb coupling, rig as shown in Figure 3-22.

Rig passing procedures for all single-hose rigs are basically the same. The probe has automatic connect and disconnect features. All other couplings must be manually connected and disconnected and require a riding line to retain the hose at the receiving station.

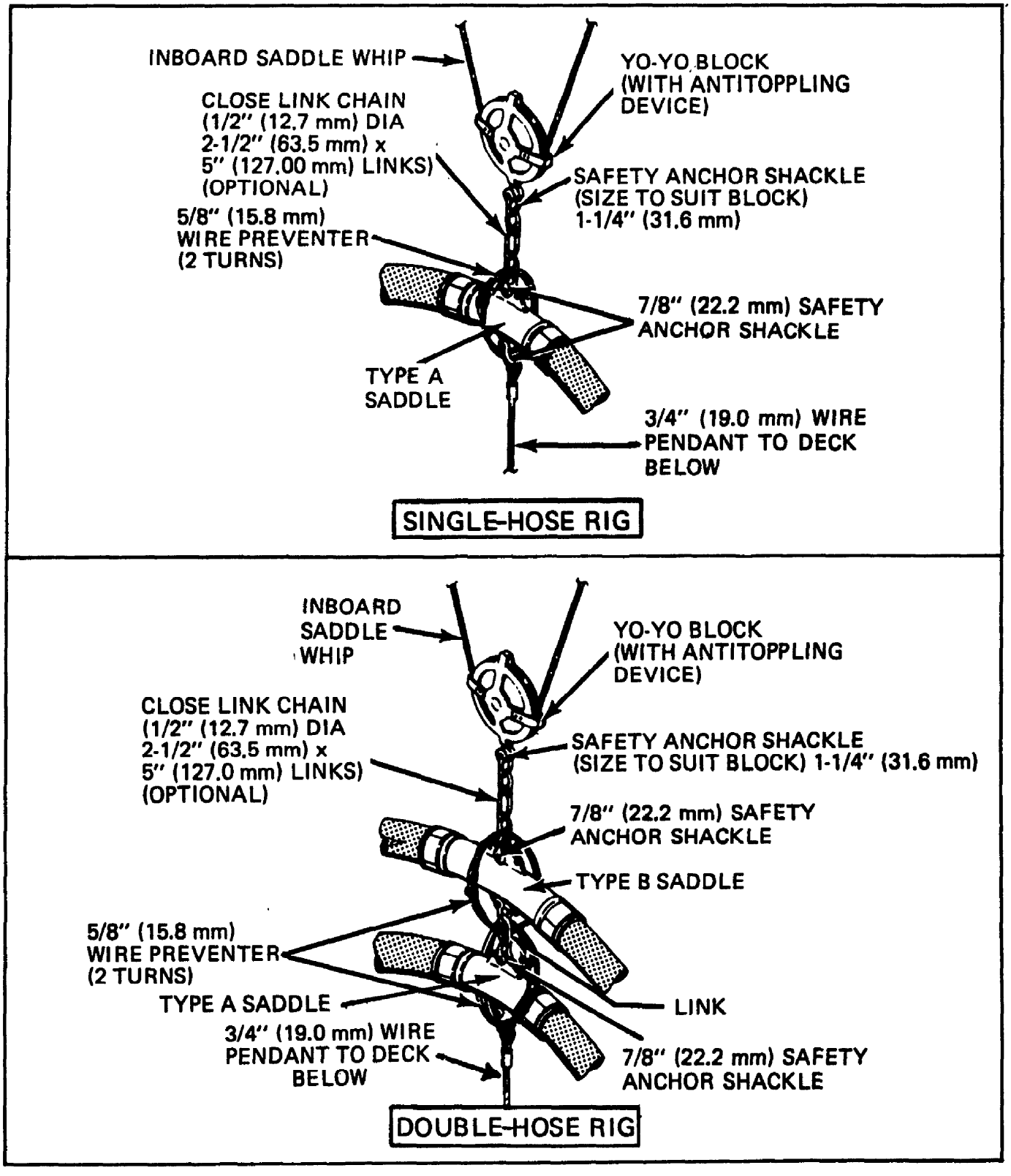


Figure 3-20. Inboard Saddle Arrangement

3.16.2 Preparing Fuel STREAM With Single Probe

(1) DELIVERY SHIP

Note

When sending single probe to a single-probe receiver, use the STAR messenger (Figure 2-10). The 60 foot (18.2 m) releasing line section of the STAR messenger will be used by the receiving station as the remating line.

1. Fake out the messenger and attach the inboard end to the trolley carriage, as shown in Figure 3-23.

Note

When sending single probe to double-probe receivers, use the basic messenger and attach it to the special inhaul clamp on the trolley carriage (Figure 3-10). Attach the messenger return line to the soft eye splice at the inboard end of the messenger.

2. Stop off the spanwire to the messenger 350 feet (106.5 m) from the inboard (shackled) end of the messenger, as shown in Figure 3-19.

3. Fake out and attach the lead line for the station phone line and the lead line messenger for the phone/distance line to the messenger (as required).

4. Secure the 6 foot (1.8 m) tail of the station phone line to a cleat at the bulwark.

5. Fake out the messenger return line and attach the shackled end around the probe tube at the trolley carriage, as shown in Figure 3-21.

6. Ensure that all probe latches are retracted.

7. Ensure that all necessary rigging, working and repair tools, and safety equipment are on station and that personnel are briefed, properly dressed, and on station.

(2) RECEIVING SHIP

1. Install a 12 inch (304.8 mm) wood or metal messenger fairlead block (see Figure 3-24 for correct installation).

2. Install deck fairlead snatch blocks (as necessary) and prereeve small stuff for the messenger lead. Riding lines are not to be used with a probe rig.

3. Remove the cover from the probe receiver and verify that the seal in the bell housing is not damaged and is lubricated.

4. Provide an easing-out line on station for the spanwire.

5. Ensure that all necessary rigging, working and repair tools, and safety equipment are on station and that personnel are briefed, properly dressed, and on station.

Note

A remating line must be provided on station when receiving at double-probe receivers.

3.16.3 Passing Fuel STREAM With Single Probe. A receiving ship with deck-loaded aircraft will provide all shot lines and bolos. When the receiving ship provides an individual shot line for a remotely located phone/distance line, it attaches the lead line messenger to the zero end of the phone/distance line and then to the shot line. The delivery ship hauls over the line.

When the delivery ship provides an individual shot line for a remotely located phone/distance line, it passes the shot line with the lead line messenger for the phone/distance line attached. When the lead line messenger is received on board, the receiving ship disconnects the lead line messenger, attaches it to light line at the zero end of the phone/distance line, and signals the delivery ship to haul in.

(1) DELIVERY SHIP

1. Position the Nos. 1, 2, and 3 saddle trolleys for smooth fairleading of the spanwire.

2. Send over the shot line and attach it to the messenger.

(2) RECEIVING SHIP

1. Receive the shot line and haul in. When the bitter end of the messenger comes aboard, attach it to the prereeved small stuff and continue to haul in the messenger through the rigging and fairlead blocks.

2. When the lead line for the station phone line and the lead line messenger for the phone/distance line are received on board, disconnect them and move them clear of the area.

3. Attach the lead line messenger for the phone/distance line to the phone/distance line and signal the delivery station to haul in.

4. Haul in the station phone line and hand tend.

(3) BOTH SHIPS

1. Connect the station phone line headsets, establish voice communication, and advise the rig captain: "We have station-to-station phone communication."

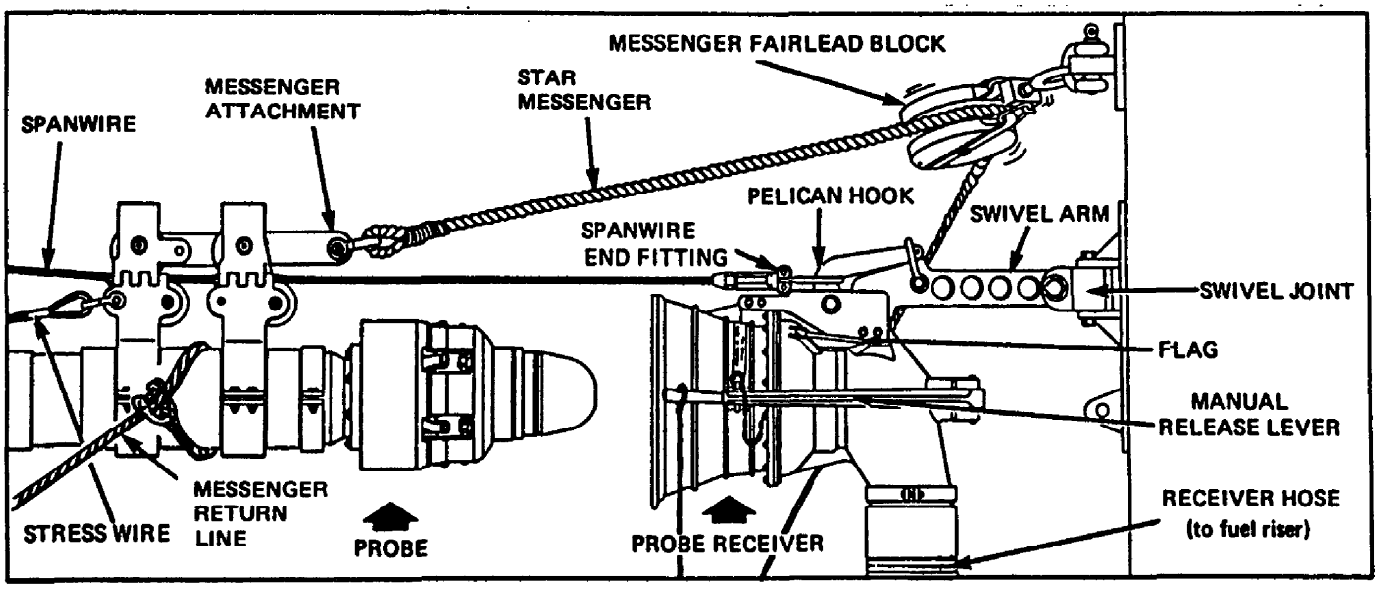


Figure 3-21. Single-Hose Fuel STREAM Rig With Probe

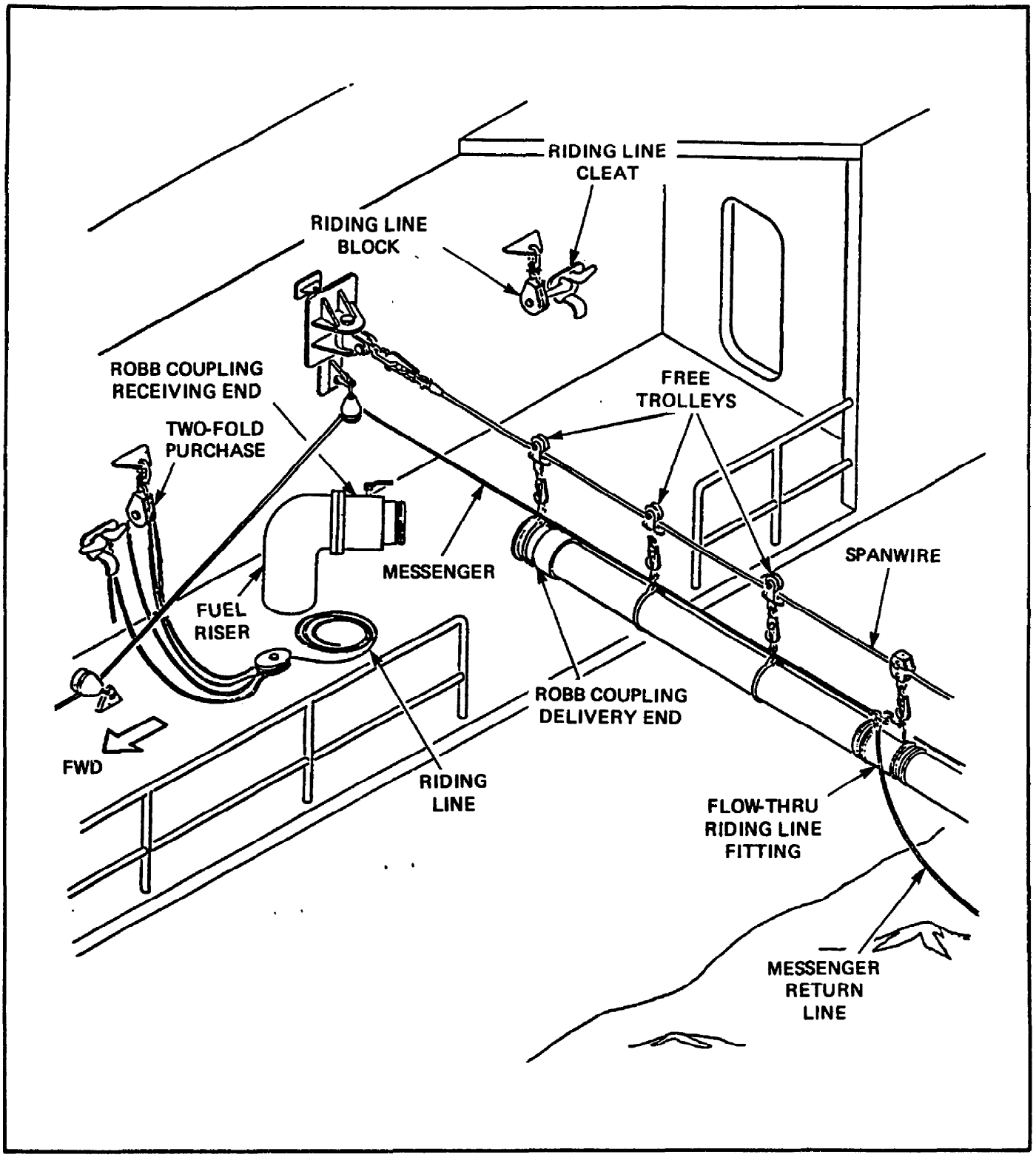


Figure 3-22. Single-Hose Fuel STREAM Rig With Robb Coupling

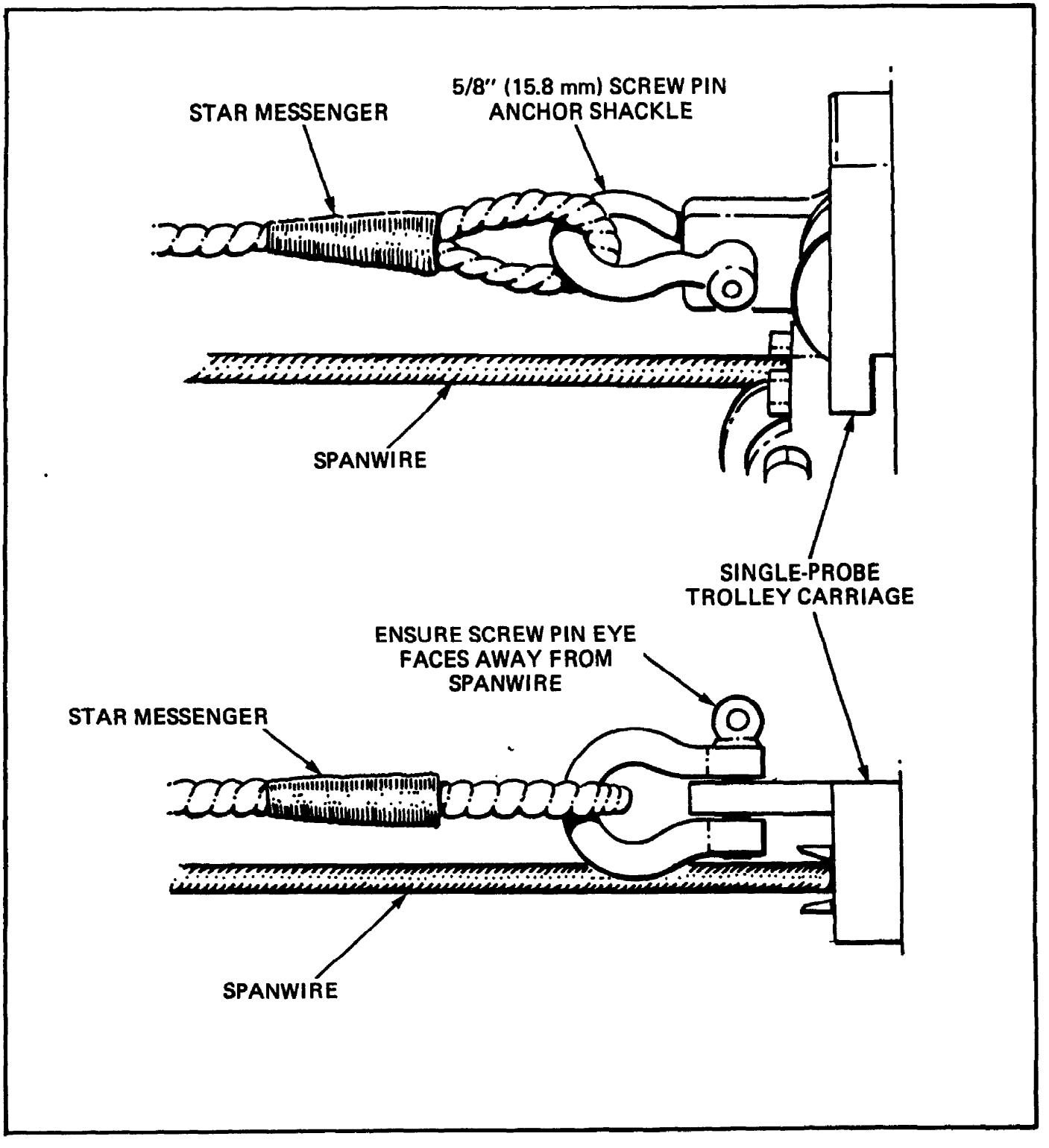


Figure 3-23. Attachment of STAR Messenger Shackle to Trolley Carriage

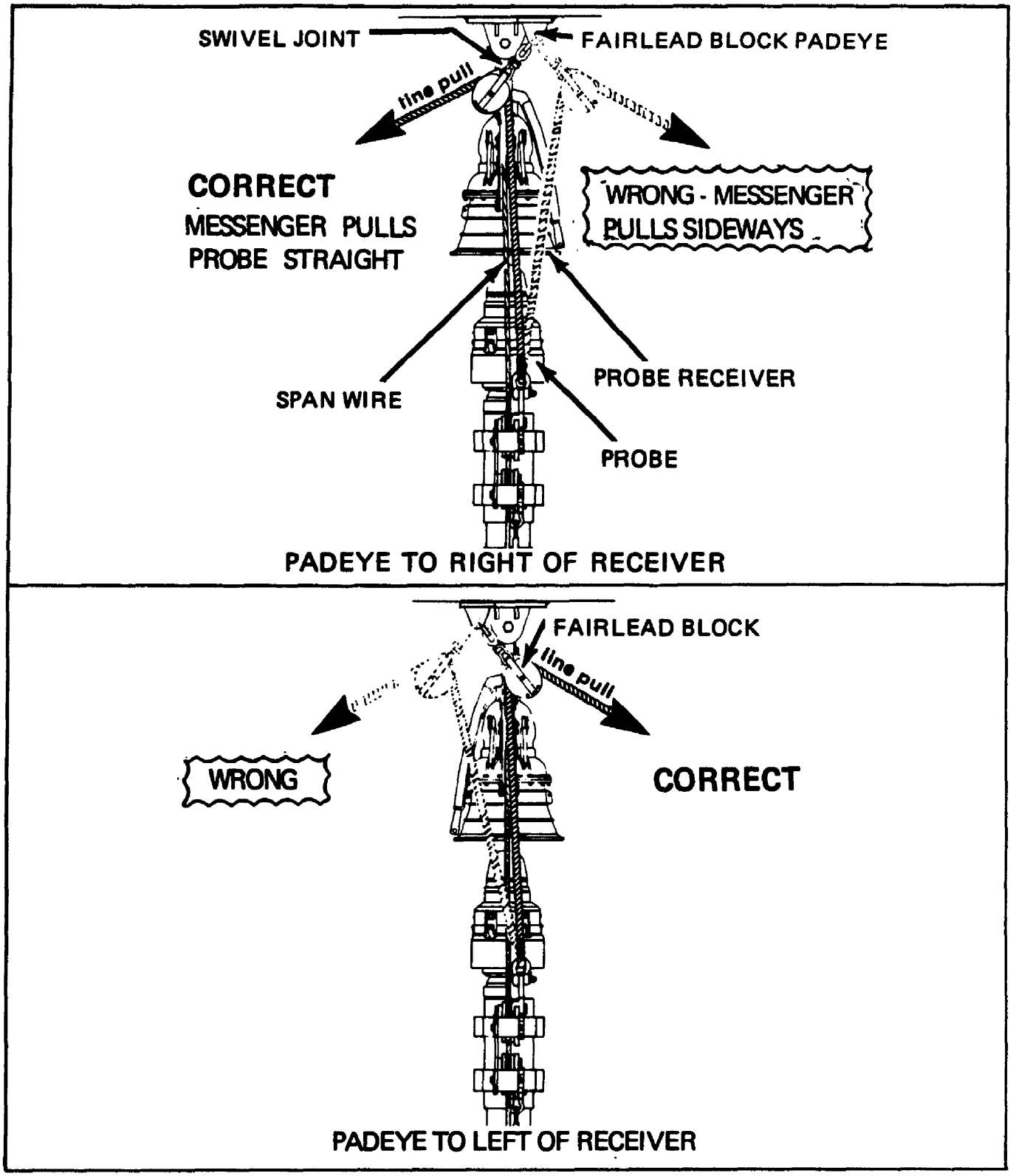


Figure 3-24. Messenger Fairlead at Receiving Station (Top View)

(4) DELIVERY SHIP

1. Haul in the lead line messenger for the phone/distance line. When the zero end of the phone/distance line is aboard, attach it to the outermost rail, clear of the transfer station.

2. Connect the phone/distance line headset, establish voice communication, and advise the bridge: "We have bridge-to-bridge phone communication."

3. Ensure that the spanwire's antislack device is turned on or that slack is pulled from the spanwire through the ram tensioner to prevent fouling of the spanwire winch drum.

(5) RECEIVING SHIP

1. Continue to haul in the messenger.

Note

Before attaching the spanwire to the pelican hook, make sure that the messenger is not twisted with the spanwire. If twisted, the probe will not seat in the receiver.

2. Cut the first stop, remove any twists of the messenger around the spanwire, and attach the spanwire end fitting to the pelican hook on the swivel arm assembly. Use the correct cotter pin (see Figure 2-21).

CAUTION

When attaching the special link of the alternate spanwire end fitting (Figure 3-13b) to the pelican hook, make sure that the eye of the screw pin on the anchor shackle is on top; otherwise, the probe will not seat.

3. Install the easing-out line on the spanwire end fitting and secure.

4. Slack the messenger to allow the pelican hook to take the strain of the spanwire, then cut the remaining stop that holds the spanwire to the messenger.

5. Clear personnel from the immediate area.

(6) BOTH SHIPS

1. The receiving station's phone talker will notify both his bridge and the delivery station: "Ready to tension spanwire at station____." This alerts his bridge that tension will be applied shortly. No response is required from the bridge, unless it is negative.

2. The delivery station's phone talker will inform his bridge: "We are tensioning the spanwire at station_____." At the same time, the rig captain instructs the winch operator to start tensioning. No response is required from the bridge, unless it is negative.

3. To complete the communication loop, the delivery ship's bridge shall *immediately* notify the receiving ship's bridge: "We are tensioning the spanwire at my station_____."

4. If either ship's bridge determines that it wants to delay tensioning the spanwire after it has received word that the stations are ready, both ship's bridges and the delivery station shall be notified *immediately*. The delivery ship's bridge shall *immediately* pass the word to the delivery station: "Do not tension at station____." The rig captain shall *immediately* instruct the winch operator to stop tensioning, slacken, and tend the spanwire.

(7) RECEIVING SHIP

1. Haul in on the messenger. When the probe gets near the receiver, haul in the

probe until it seats in the receiver. When the probe snaps in, the receiver latch indicator flags (Figure 3-25) will raise. This indicates that the probe is engaged in the receiver.

2. Once the probe is properly engaged, disconnect the STAR messenger at the brummel hooks. Leave the 60 foot (18.2 m) section attached to the trolley carriage for use as the remating line, secure the bitter end to a cleat, and coil down the remaining length. Do not take a strain on the remating line. The remating line is used to reseat the probe in the receiver, should the probe disengage. A remating line under tension while the probe is seated may damage the probe's latching mechanisms and will allow fuel to spray if the probe unlatches inadvertently. (If using the basic messenger, remove the messenger from the snatch block. Pass the remating line (provided by the receiving station) through the snatch block and shackle it to the outboard end of the trolley carriage. Secure the bitter end to a cleat and coil down the remaining length.)

3. Stand clear of the rig.

4. Signal the delivery station: "Start pumping."

(8) DELIVERY SHIP

1. Advise the bridge and cargo control: "Station_____ready to start pumping."

2. Commence pumping fuel.

(9) RECEIVING SHIP

1. After fuel transfer has started, disconnect the messenger return line from the probe tube (Figure 3-21) and connect it to the brummel hook on the long section of the STAR messenger. (If using the basic messenger, unshackle the messenger return line from the probe tube and shackle it to the messenger.)

2. Signal the delivery station to haul in the messenger return line.

3.16.4 Operating Fuel STREAM With Single Probe

(1) DELIVERY SHIP

1. The saddle winch operator positions all saddles for a smooth flow of fuel through the hose and tends the saddles. The retrieving saddle whip (No. 1) shall be tended slack during fueling operations to prevent an excessive load at the receiving station's fuel connection. The outboard saddle winch (No. 2) is tended to keep the hose bights out of the water, prevent kinking of the hose at the receiving station's fuel connection, and prevent excess strain on the hose or stress wires.

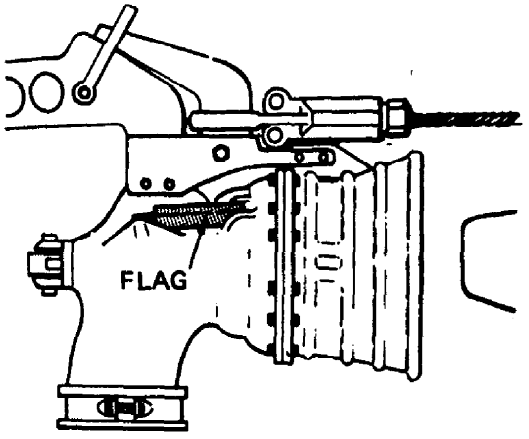
2. Haul in and coil down the messenger return line and messenger.

3.16.5 Retrieving Fuel STREAM With Single Probe. When fuel transfer is complete, the receiving station removes the 60 foot (18.2 m) section of the STAR messenger from the cleat, fairlead blocks, and all obstructions, and coils it down for running. The receiving station activates the manual release lever on the receiver (Figure 3-21) to release the probe, and then tends the 60-foot (18.2 m) section of the STAR messenger clear of the ship's side as the delivery station retrieves the hose. After the spanwire is detensioned, and on signal from the delivery station, the receiving station trips the pelican hook that holds the spanwire and eases the spanwire over the side with the easing-out line.

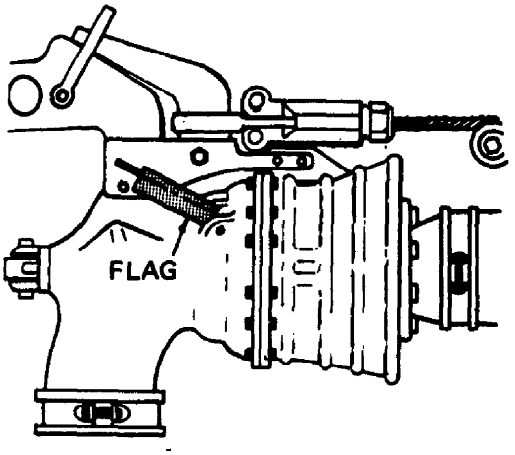
(1) DELIVERY SHIP

1. Stop pumping.

2. Complete the blowdown or back suction and secure all valves.



PROBE DISENGAGED FROM PROBE RECEIVER. LATCH INDICATOR FLAGS IN STOWED POSITION.



PROBE MATED WITH PROBE RECEIVER. LATCH INDICATOR FLAGS RAISED APPROXIMATELY 30° ABOVE THE HORIZONTAL.

Figure 3-25. Latch Indicator Flags

(2) BOTH SHIPS

1. Signalmen signal: "Replenishment completed at this station. Commence unrigging."

(3) RECEIVING SHIP

1. Remove the 60 foot (18.2 m) section of the STAR messenger from cleats, fairlead blocks, and all obstructions, and coil down free for running. Leave it attached to the trolley carriage. (If the basic messenger and remating line are used, disconnect the remating line from the trolley carriage.)

2. When advised by the delivery station's phone talker, operate the manual release lever on the receiver to release the probe. Signal the delivery station to haul in the hose.

3. Tend the 60-foot (18.2 m) section of the STAR messenger clear of the ship's side.

(4) DELIVERY SHIP

1. Haul in on the saddle whips to retrieve the hose.

(5) BOTH SHIPS

Procedures for detensioning the spanwire are as follows:

1. The receiving station's phone talker will notify both his bridge and the delivery station: "Ready to detension spanwire at station___." This alerts his bridge that the spanwire will be detensioned shortly. No response is required from the bridge, unless it is negative.

2. When the message is received at the delivery station, the phone talker there informs his bridge: "We are detensioning the spanwire at station___." At the same time, the rig captain instructs the winch operator to pay out on the spanwire, allowing the

ram tensioner to extend and slacken the spanwire. No response is required from the bridge, unless it is negative.

3. To complete the communication loop, the delivery ship's bridge shall *immediately* notify the receiving ship's bridge: "We are detensioning the spanwire at my station___."

4. If the receiving ship's bridge determines that it does not want to detension the spanwire anytime after it has received word that the receiving station is ready, both the delivery ship's bridge and the receiving station shall be notified *immediately*. The delivery ship's bridge shall *immediately* pass the word to the delivery station: "Do not detension the spanwire at station _____." The rig captain shall *immediately* instruct the winch operator to stop detensioning the spanwire.

(6) DELIVERY SHIP

1. Slack the spanwire and tend slack, but clear of the water.

WARNING

The receiving station must *not* trip the pelican hook until the spanwire is slack *and* the signal has been given by the delivery station.

(7) RECEIVING SHIP

1. Haul in on the easing-out line to take the strain off the pelican hook. The station phone talker advises the delivery station: "Ready to trip the pelican hook."

2. On signal from the delivery station, trip the pelican hook.

3. Ease the spanwire clear of the deck edge, and release the easing-out line.

4. Signal the delivery station to haul in the spanwire and station phone line.

(8) DELIVERY SHIP

1. Haul in the spanwire and station phone line.

2. Disconnect the phone/distance line.

(9) RECEIVING SHIP

1. Haul in the phone/distance line.

3.16.6 Emergency Breakaway for Fuel STREAM With Single Probe. Emergency breakaway is an accelerated breakaway using the procedures described in the preceding paragraph. The following procedures also apply:

1. Permission from the bridge to detension wires is not required.

2. Use emergency breakaway signals in Appendix C.

3. Clear station of all nonessential personnel.

4. Stop pumping immediately.

5. Clear the line used for remating, release the rig, and start retrieving all hoses.

6. Detension the spanwire and, when the spanwire is slack, trip the pelican hook.

7. If unable to disconnect the spanwire, continue to pay out until all wire is free of the drum.

WARNING

Never cut a tensioned wire.

CAUTION

Cutting of wires or lines during emergency breakway should be exercised only as a last resort. A last resort situation generally is one in which there is (1) imminent danger to the ship's structure because of fouled wire or (2) imminent danger to ship's personnel.

3.16.7 2-1/2 Inch (63.5 mm) Hose Rig. The 2-1/2 inch (63.5 mm) hose is normally rigged under the single-hose fuel STREAM rig, as shown in Figure 3-26, for the transfer of small quantities of F76, F44 (JP-5), or water. Once a hose has been used for one product, it must be dedicated to that product. The 2-1/2 inch (63.5 mm) hose can also be rigged so that it is supported on its own wire or on a synthetic line, called a spanline, similar to the nontensioned spanwire fuel rig shown in Figure 3-29.

3.17 DOUBLE-HOSE FUEL STREAM RIG

The double-hose Fuel STREAM rig (Figure 3-27) is a tensioned spanwire rig with the spanwire and saddle whips tended by winches at the delivery station. The two hoses are suspended from the spanwire, one below the other or side by side, depending on the delivery station's hardware. The hose can be rigged with:

1. Double probe to double-probe receivers (Figure 3-7) or to a single-probe receiver (preferred method)

2. A probe over a Robb coupling to a single-probe receiver and a Robb receiver (Figure 3-28)

3. Two Robb couplings for fueling two Robb receivers.

The spanwire is passed to the receiving station by messenger and the spanwire end fitting secured at the receiving station. The spanwire is tensioned by hauling in slack wire and compressing the ram tensioner. The double-hose rig is hauled along the tensioned spanwire to the receiving station. The receiving station hooks the fuel hoses to its fuel connections and the rig is ready for fuel transfer.

3.17.1 Fuel STREAM Station Rigging. Fuel STREAM station rigging varies slightly, depending on the type of connection required at the fuel riser. Rig double probe to double-probe receivers as shown in Figure 3-7. Hose lengths (Figure 3-8) and the adjustment of the stress wire bridle (Figure 3-9) are critical for successful seating of double probes in double-probe receivers.

When a single-probe receiving station is rigged to receive a probe over a Robb coupling, rig as shown in Figure 3-28; however, when sending a probe over a Robb coupling to double-probe receivers, attach the messenger to the special inhaul clamp, as shown in Figure 3-10.

Note

If rigged for a double-probe delivery and a probe-over-Robb delivery is desired, it is permissable to remove the lower probe head and attach a 10 foot (3.0 m) section of hose with Robb coupling. Lash the length of hose to the side of the double-probe frame, similar to Figure 3-28, and send the rig to the receiving station.

Rig passing procedures for all double-hose rigs are basically the same. The probes have automatic connect and disconnect features. All other coupings must be manually connected and disconnected and require a riding line to retain the hose at the receiving station.

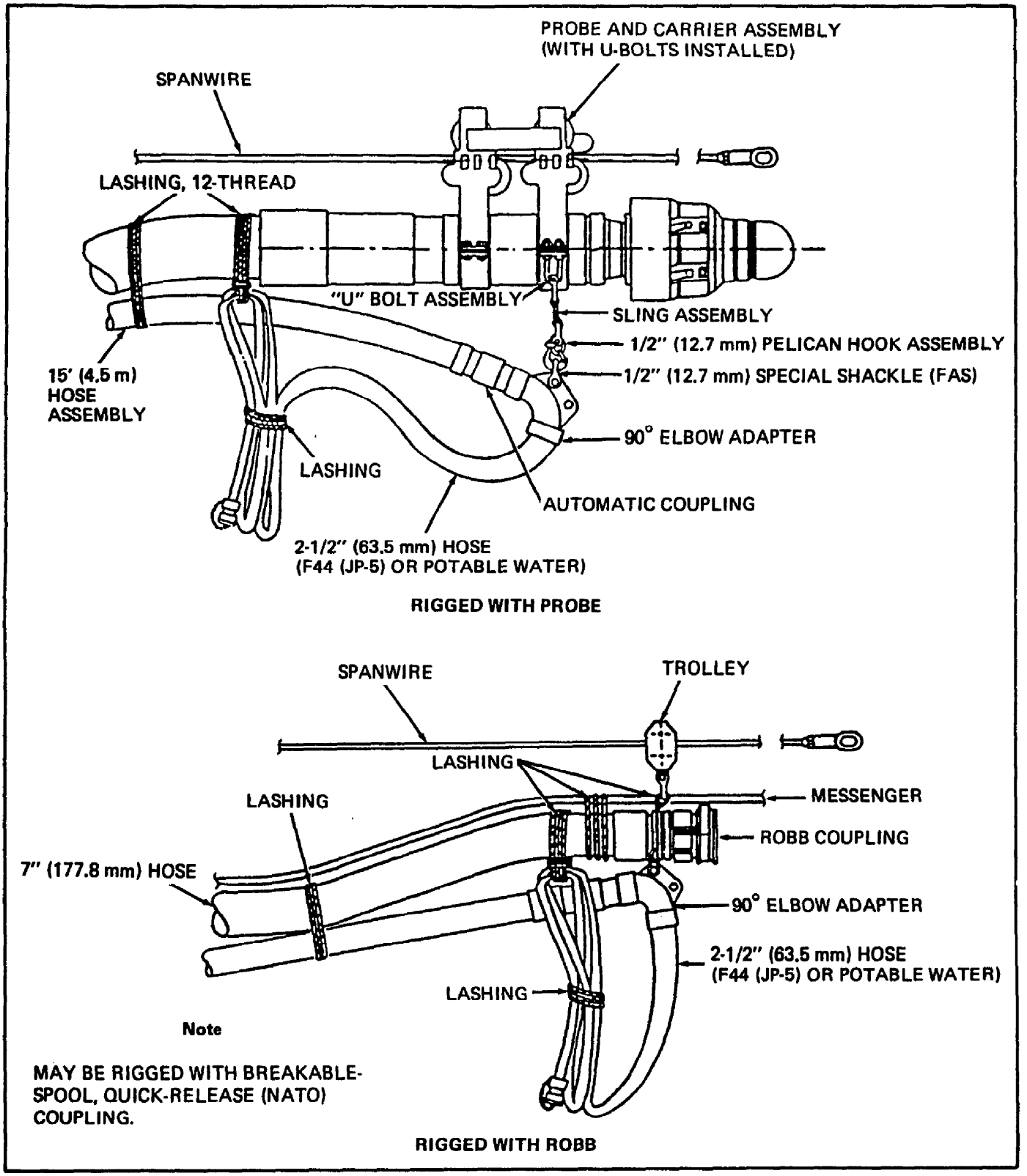


Figure 3-26. 2-1/2 Inch (63.5 mm) Hose Rigging

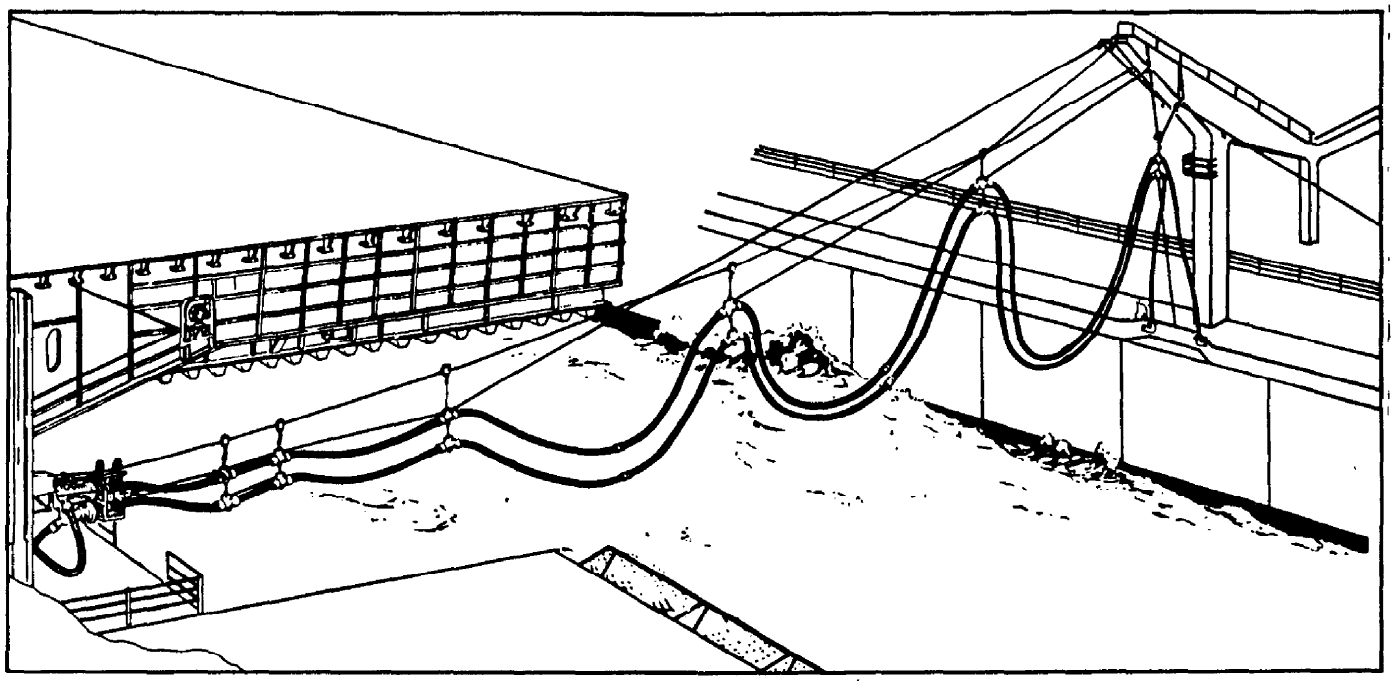


Figure 3-27. Double-Hose Fuel STREAM Rig (With Double Probe)

3.17.2 Preparing Fuel STREAM With Double Probe

(1) DELIVERY SHIP

Note

When sending double probe to double-probe receivers, use the basic messenger (Figure 2-9). The remating line must be provided by the receiving station. Do not use the alternate spanwire end fitting (Figure 3-13b).

1. Fake out the messenger and attach the inboard end to the messenger pip-pin on the trolley carriage, as shown in Figure 3-7.

Note

When sending double probe to a single-probe receiver, use the STAR messenger and attach it with a 5/8 inch (15.8 mm) screw pin shackle at the upper trolley carriage (Figure 3-28). Attach the messenger return line around the probe tube (Figure 3-28). The 60 foot (18.2 m) releasing line section of the STAR messenger will be used by the receiving station as the remating line.

2. Stop off the spanwire to the messenger 350 feet from the inboard (shackled) end of the messenger, as shown in Figure 3-19.

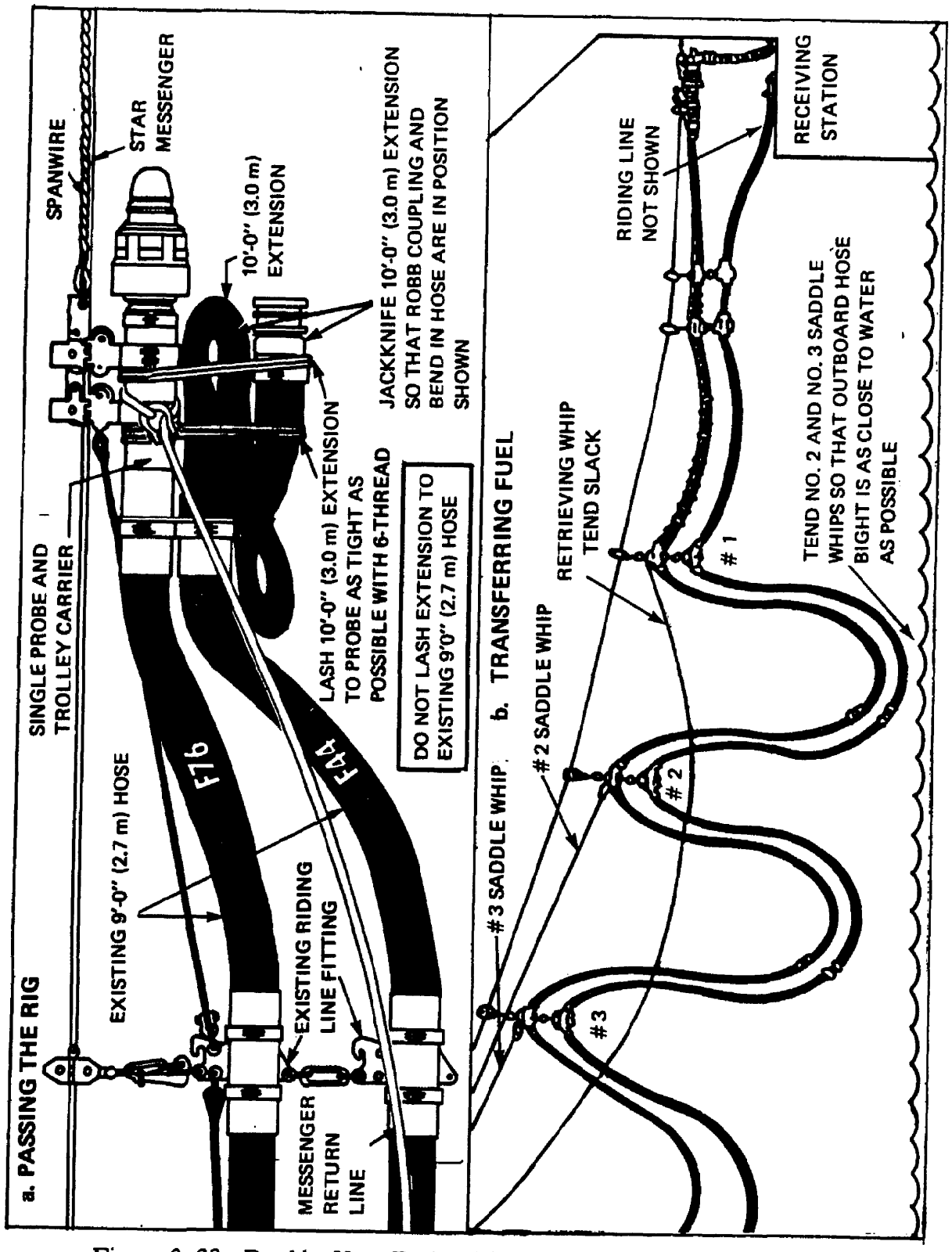


Figure 3-28. Double-Hose Fuel STREAM Rig (With Single Probe and Robb Coupling)

3. Fake out and attach the lead line for the station phone line and the lead line messenger for the phone/distance line to the messenger (as required).

4. Secure the 6 foot (1.8 m) tail of the station phone line to a cleat at the bulwark.

5. Fake out the messenger return line and attach the shackled end to the soft eye splice of the messenger at the trolley carriage pippin, as shown in Figure 3-7.

6. Ensure that all probe latches are retracted.

7. Ensure that all necessary rigging, working and repair tools, and safety equipment are on station and that personnel are briefed, properly dressed, and on station.

(2) RECEIVING SHIP

1. Install a 12 inch (304.8 mm) wood or metal messenger fairlead block (see Figure 3-7).

2. Install deck fairlead snatch blocks (as necessary) and prereeve small stuff for the messenger lead.

3. Remove the covers from the probe receivers and verify that the seals in the bell housings are not damaged and are lubricated.

4. Provide on station an easing-out line for the spanwire and a remating line.

5. Ensure that all necessary rigging, working and repair tools, and safety equipment are on station and that personnel are briefed, properly dressed, and on station.

Note

A remating line must be provided on station when receiving at double-probe receivers.

3.17.3 Passing Fuel STREAM With Double Probe. A receiving ship with deck-loaded aircraft will provide all shot lines and bolos. When the receiving ship provides an individual shot line for a remotely located phone/distance line, it attaches the lead line messenger to the zero end of the phone/distance line and then to the shot line. The delivery ship hauls over the line.

When the delivery ship provides an individual shot line for a remotely located phone/distance line, it passes the shot line with the lead line messenger for the phone/distance line attached. When the lead line messenger is received on board, the receiving ship disconnects the lead line messenger, attaches it to light line at the zero end of the phone/distance line, and signals the delivery ship to haul in.

(1) DELIVERY SHIP

1. Position the Nos. 1, 2, and 3 saddle trolleys for smooth fairleading of the spanwire.

2. Send over the shot line and attach it to the messenger.

(2) RECEIVING SHIP

1. Receive the shot line and haul in. When the bitter end of the messenger comes aboard, attach it to the prereeved small stuff and continue to haul in the messenger through the rigging and fairlead blocks.

2. When the lead line for the station phone line and the lead line messenger for the phone/distance line are received on board, disconnect them and move them clear of the area.

3. Attach the lead line messenger for the phone/distance line to the phone/distance line and signal the delivery station to haul in.

4. Haul in the station phone line and hand tend.

(3) BOTH SHIPS

1. Connect the station phone line headsets, establish voice communication, and advise the rig captain: "We have station-to-station phone communication."

(4) DELIVERY SHIP

1. Haul in the lead line messenger for the phone/distance line. When the zero end of the phone/distance line is aboard, attach it to the outermost rail, clear of the transfer station.

2. Connect the phone/distance line headset, establish voice communication, and advise the bridge: "We have bridge-to-bridge phone communication."

3. Ensure that the spanwire's antislack device is turned on or that slack is pulled from the spanwire through the ram tensioner to prevent fouling of the spanwire winch drum.

(5) RECEIVING SHIP

1. Continue to haul in the messenger.

Note

Before attaching the spanwire to the pelican hook, make sure that the messenger is not twisted with the spanwire. If twisted, the probe will not seat in the receiver.

2. Cut the first stop, remove any twists of the messenger around the spanwire, and attach the spanwire end fitting to the pelican hook on the swivel arm assembly. Use the correct cotter pin (see Figure 2-21).

3. Install the easing-out line on the spanwire end fitting and secure.

4 Slack the messenger to allow the pelican hook to take the strain of the spanwire, then cut the remaining stop that holds the spanwire to the messenger.

5. Clear personnel from the immediate area.

(6) BOTH SHIPS

1. The receiving station's phone talker will notify both his bridge and the delivery station: "Ready to tension spanwire at station____." This alerts his bridge that tension will be applied shortly. No response is required from the bridge, unless it is negative.

2. The delivery station's phone talker will inform his bridge: "We are tensioning the spanwire at station____." At the same time, the rig captain instructs the winch operator to start tensioning. No response is required from the bridge, unless it is negative.

3. To complete the communication loop, the delivery ship's bridge shall *immediately* notify the receiving ship's bridge: "We are tensioning the spanwire at my station____."

4. If either ship's bridge determines that it wants to delay tensioning the spanwire after it has received word that the stations are ready, both ship's bridges and the delivery station shall be notified *immediately*. The delivery ship's bridge shall *immediately* pass the word to the delivery station: "Do not tension at station___." The rig captain shall *immediately* instruct the winch operator to stop tensioning, slacken, and tend the spanwire.

(7) RECEIVING SHIP

1. Haul in on the messenger. When the probes get near the receivers, haul in the

probes until they seat in the receivers. When the probes snap in, the receiver latch indicator flags (Figure 3-25) will raise. This indicates that the probes are engaged in the receivers.

2. Once the probes are properly engaged, slack the messenger and disconnect it at the inhaul link pip-pin (Figure 3-8). Connect the remating line to the inhaul link pip-pin. Do not take a strain on the remating line. The remating line is used to reseat the probes in the receivers, should the probes disengage. A remating line under tension while the probes are seated may damage the probes' latching mechanisms and will allow fuel to spray if the probes unlatch inadvertently.

3. Stand clear of the rig.

4. Signal the delivery station: "Start pumping."

(8) DELIVERY SHIP

1. Advise the bridge and cargo control: "Station_____ready to start pumping."

2. Commence pumping fuel.

(9) RECEIVING SHIP

1. After fuel transfer has started, connect the messenger to the messenger return line.

2. Signal the delivery station to haul in the messenger return line.

3.17.4 Operating Fuel STREAM With Double Probe

(1) DELIVERY SHIP

1. The saddle winch operator positions all saddles for a smooth flow of fuel through the hose and tends the saddles. The retrieving saddle whip (No. 1) shall be tended slack during fueling operations to prevent an excessive load at the receiving station's fuel connection. The outboard saddle winch (No. 2) is tended to keep the hose bights out of the water, prevent kinking of the hose at the receiving station's fuel connection, and prevent excess strain on the hose and stress wires.

2. Haul in and coil down the messenger return line and messenger.

3.17.5 Retrieving Fuel STREAM With Double Probe

(1) DELIVERY SHIP

1. Stop pumping.

2. Complete the blowdown or back suction and secure all valves.

(2) BOTH SHIPS

1. Signalmen signal: "Replenishment completed at this station. Commence unrigging."

(3) RECEIVING SHIP

1. Disconnect the remating line from the trolley carriage.

2. When advised by the delivery station's phone talker, operate the manual release levers on the receivers to release the probes. Signal the delivery station to haul in the hoses.

(4) DELIVERY SHIP

1. Haul in on the saddle whips to retrieve the hoses.

(5) BOTH SHIPS

Procedures for detensioning the spanwire are as follows:

1. The receiving station's phone talker will notify both his bridge and the delivery

station: "Ready for detensioning at station__." This alerts his bridge that the spanwire will be detensioned shortly. No response is required from the bridge, unless it is negative.

2. When the message is received at the delivery station, the phone talker there informs his bridge: "We are detensioning the spanwire at station_____." At the same time, the rig captain instructs the winch operator to pay out on the spanwire, allowing the ram tensioner to extend and slacken the spanwire. No response is required from the bridge, unless it is negative.

3. To complete the communication loop, the delivery ship's bridge shall *immediately* notify the receiving ship's bridge: "We are detensioning the spanwire at my station__."

4. If the receiving ship's bridge determines that it does not want to detension the spanwire anytime after it has received word that the receiving station is ready, both the delivery ship's bridge and the receiving station shall be notified *immediately*. The delivery ship's bridge shall *immediately* pass the word to the delivery station: "Do not detension the spanwire at station___." The rig captain shall *immediately* instruct the winch operator to stop detensioning the spanwire.

(6) DELIVERY SHIP

1. Slack the spanwire and tend slack, but clear of the water.

WARNING

The receiving station must *not* trip the pelican hook until the spanwire is slack *and* the signal has been given by the delivery station.

(7) RECEIVING SHIP

1. Haul in on the easing-out line to take the strain off the pelican hook. The station phone talker advises the delivery station: "Ready to trip the pelican hook."

2. On signal from the delivery station, trip the pelican hook.

3. Ease the spanwire clear of the deck edge, and release the easing-out line.

4. Signal the delivery station to haul in the spanwire and station phone line.

(8) DELIVERY SHIP

1. Haul in the spanwire and station phone line.

2. Disconnect the phone/distance line.

(9) RECEIVING SHIP

1. Haul in the phone/distance line.

3.17.6 Emergency Breakaway for Fuel STREAM With Double Probe. Emergency breakaway is an accelerated breakaway using the procedures described in the preceding paragraph. The following procedures also apply:

1. Permission from the bridge to detension wires is not required.

2. Use emergency breakaway signals in Appendix C.

3. Clear station of all nonessential personnel.

4. Stop pumping immediately.

5. Disconnect the remating line, release the rig, and start retrieving all hoses.

6. Detension the spanwire and, when the spanwire is slack, trip the pelican hook.

7. If unable to disconnect the spanwire, continue to pay out until all wire is free of the drum.

WARNING

Never cut a tensioned wire.

CAUTION

Cutting of wires or lines during emergency breakaway should be exercised only as a last resort. A last resort situation generally is one in which there is (1) imminent danger to the ship's structure because of fouled wire or (2) imminent danger to ship's personnel.

3.17.7 Double-Hose Fuel STREAM Rig With Robb Coupling. For preparation of the double-hose, probe-over-Robb rig, see Figure 3-28. Passing, receiving, operating, and emergency breakaway procedures for this rig are essentially the same as those for the double-hose, double-probe rig, with the following exceptions:

1. Use the basic messenger to haul over the spanwire and hoses when sending to double-probe receivers. Use the STAR messenger to all other receivers.

2. When the hoses are aboard, the receiving station disconnects the 60 foot (18.2 m) section of the STAR messenger at the brummel hooks, secures the brummel hook end of this section to a cleat, and coils down the remainder for free running for use as the remating line.

3. After fuel transfer has started, the receiving station disconnects the messenger return line from the probe tube (Figure 3-28), connects the messenger return line to the brummel hook on the long section of the STAR messenger, and returns the STAR messenger to the delivery station.

3.18 NONTENSIONED SPANWIRE FUEL RIG

In the nontensioned spanwire fuel rig (Figures 3-29 and 3-30), the hose is supported between two ships on a nontensioned spanwire. The nontensioned spanwire rig shall be rigged with wire for all saddle whips, including the retrieving saddle, whenever winches can be made available. Otherwise, double-braided nylon line is substituted for one or more of the normally wire-rigged saddle whips. For substitution of wire whips, a 3-1/2 inch (88.9 mm) circumference double-braided nylon line shall be used. Use a length of 450 feet (137.1 m) for the retrieving saddle whip. Use lengths to suit the individual ship's installation for the other saddle whips.

3.18.1 Rigging the Delivery Station for Nontensioned Spanwire Fuel Rig

3.18.1.1 Hose Assembly. Hose assembly procedures for the nontensioned spanwire rig are the same as the fuel STREAM rig, as specified in paragraph 3.15.1.1, with the exceptions noted herein.

The nontensioned spanwire hose rig is approximately 245 feet (74.6 m) long with the following fittings and hose lengths coupled in succession, starting with the inboard end.

- Two 35 foot (10.6 m) lengths of hose (inboard length cut to suit)
- Flow-through saddle (No. 3)
- Two 35 foot (10.6 m) lengths of hose
- Flow-through saddle (No. 2)
- Two 35 foot (10.6 m) lengths of hose
- Flow-through saddle (No. 1)

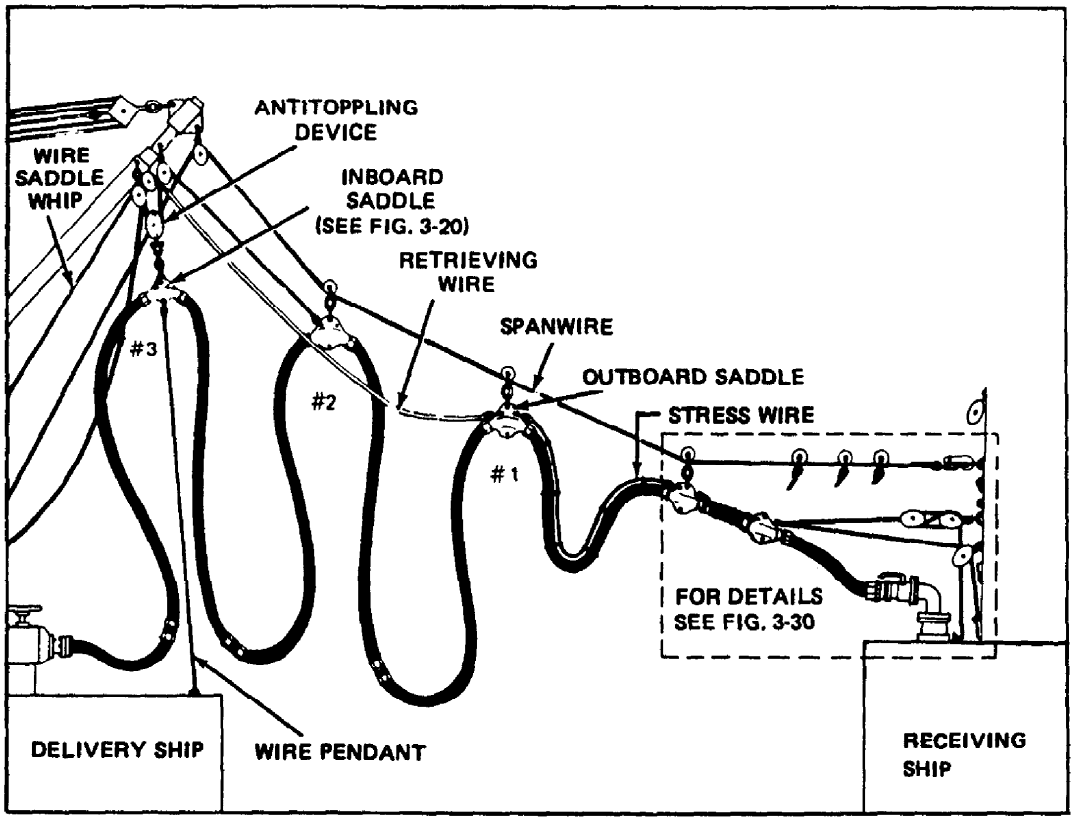


Figure 3-29. Nontensioned Spanwire Fuel Rig (Single Hose With Robb Coupling)

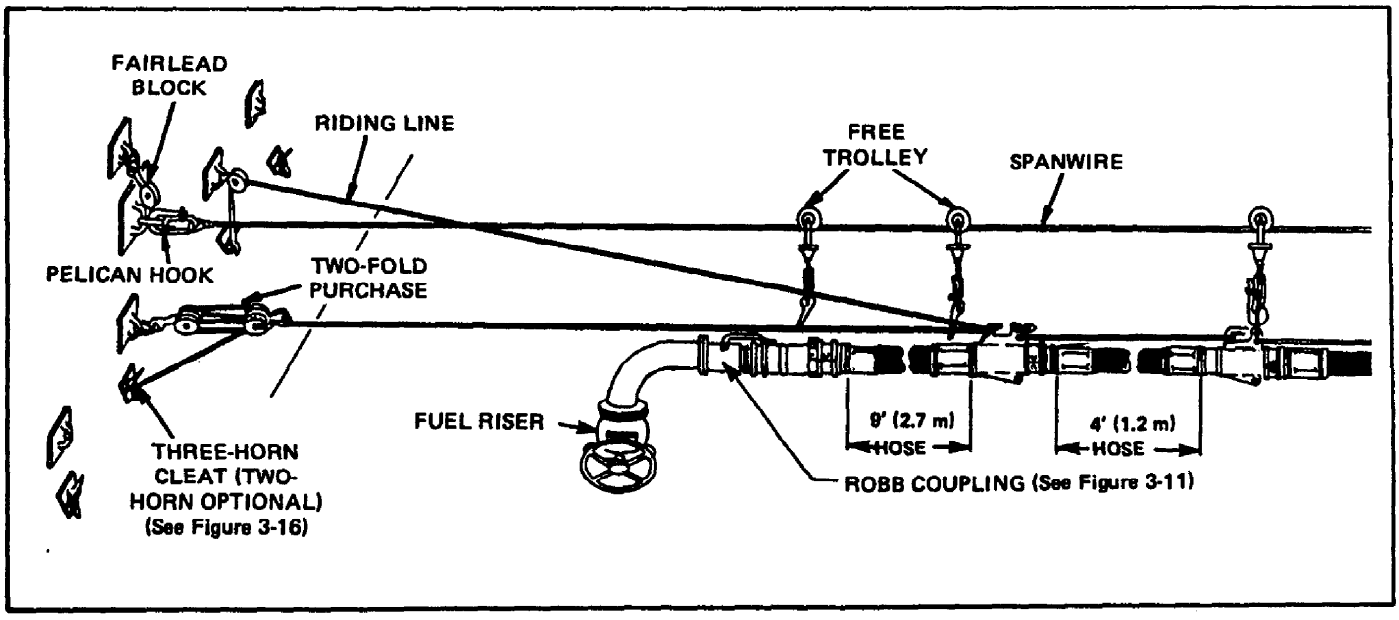


Figure 3-30. Securing the Single Hose With Robb Coupling

- One 22 foot (6.7 m) length of hose
- Flow-through riding line fitting
- One 4 foot (1.2 m) length of hose
- Flow-through riding line fitting
- One 9 foot (2.7 m) length of hose
- Fueling probe and carrier assembly.

3.18.1.2 Rigging the Hose Assembly. Rigging the hose for the nontensioned spanwire rig is the same as specified in paragraph 3.15.1.3, except that the nontensioned spanwire rig has three flow-through saddles vice four flow-through saddles. The inboard saddle whip controls the No. 2 and No. 3 saddles.

3.18.2 Preparing the Nontensioned Spanwire Fuel Rig. The fitting on the outboard end of the hose can be a probe or a Robb or breakable-spool coupling. If probe is used, the trolley carriage (Figure 3-5) supports the outboard section of the hose and no additional trolleys are required. If using a Robb coupling (Figure 3-12) or a breakable-spool coupling (Figure 3-13), free trolleys (Figure 3-22) are required to support the outboard section of the hose.

(1) DELIVERY SHIP

1. If required, secure the hose coupling and the outboard section of the hose to pelican hooks on free trolleys (see Figure 3-22).

2. Fake out the STAR messenger and shackle the inboard end to the trolley carriage (see Figure 3-21) or, for a Robb or breakable-spool coupling, to the outboard flow-through riding line fitting (see Figure 3-22).

3. Stop off the spanwire to the messenger 350 feet (106.5 m) from the inboard (shackled) end of the messenger, as shown in Figure 3-19.

4. Fake out and attach the lead line for the station phone line and the lead line messenger for the phone/distance line to the messenger (as required).

5. Secure the 6 foot (1.8 m) tail of the station phone line to a cleat at the bulwark.

6. Fake out the messenger return line and attach the shackled end around the probe tube at the trolley carriage, as shown in Figure 3-21.

7. Ensure that all probe latches are retracted.

8. Ensure that all necessary rigging, working and repair tools, and safety equipment are on station and that personnel are briefed, properly dressed, and on station.

(2) RECEIVING SHIP

1. Install a 12 inch (304.8 mm) wood or steel messenger fairlead block (see Figure 3-24).

2. Install deck fairlead snatch blocks (as necessary) and prereeve small stuff for the messenger lead.

3. When receiving probe, remove the cover from the probe receiver and verify that the seal in the bell housing is not damaged and is lubricated.

4. Provide an easing-out line on station for the spanwire.

5. Ensure that all necessary rigging, working and repair tools, and safety equipment are on station and that personnel are briefed, properly dressed, and on station.

3.18.3 Passing the Nontensioned Spanwire Fuel Rig. A receiving ship with deck-loaded aircraft will provide all shot lines and bolos. When the receiving ship provides an individual shot line for a remotely located phone/distance

line, it attaches the lead line messenger to the zero end of the phone/distance line and then to the shot line. The delivery ship hauls over the line.

When the delivery ship provides an individual shot line for a remotely located phone/distance line, it passes the shot line with the lead line messenger for the phone/distance line attached. When the lead line messenger is received on board, the receiving ship disconnects the lead line messenger, attaches it to light line at the zero end of the phone/distance line, and signals the delivery ship to haul in.

(1) DELIVERY SHIP

1. Position the Nos. 1, 2, and 3 saddle trolleys for smooth fairleading of the spanwire.

2. Send over the shot line and attach it to the messenger.

(2) RECEIVING SHIP

1. Receive the shot line and haul in. When the bitter end of the messenger comes aboard, attach it to the prereeved small stuff and continue to haul in the messenger through the rigging and fairlead blocks.

2. When the lead line for the station phone line and the lead line messenger for the phone/distance line are received on board, disconnect them and move them clear of the area.

3. Attach the lead line messenger for the phone/distance line to the phone/distance line and signal the delivery station to haul in.

4. Haul in the station phone line and hand tend.

(3) BOTH SHIPS

1. Connect the station phone line headsets, establish voice communication, and advise the rig captain: "We have station-to-station phone communication."

(4) DELIVERY SHIP

1. Haul in the lead line messenger for the phone/distance line. When the zero end of the phone/distance line is aboard, attach it to the outermost rail, clear of the transfer station.

2. Connect the phone/distance line headset, establish voice communication, and advise the bridge: "We have bridge-to-bridge phone communication."

(5) RECEIVING SHIP

1. Continue to haul in the messenger.

Note

Before attaching the spanwire to the pelican hook, make sure that the messenger is not twisted with the spanwire. If twisted, the probe will not seat in the receiver.

2. Cut the first stop, remove any twists of the messenger around the spanwire, and attach the spanwire end fitting to the pelican hook on the swivel arm assembly. Use the correct cotter pin (see Figure 2-21).

3. Install the easing-out line on the spanwire end fitting and secure.

4. Slack the messenger to allow the pelican hook to take the strain of the spanwire, then cut the remaining stop that holds the spanwire to the messenger.

(6) DELIVERY SHIP

1. Haul in on the spanwire and tend slack. Do not allow the spanwire to tightline when the ships roll apart.

(7) RECEIVING SHIP

1. When receiving probe:

(a) Haul in the probe until it seats in the receiver. When the probe snaps in, the receiver latch indicator flags (Figure 3-25) will raise. This indicates that the probe is engaged in the receiver.

(b) Disconnect the 60 foot (18.2 m) section of the STAR messenger at the brummel hooks and secure the brummel hook end of this section to a cleat. Coil down the remainder free for running for use as the remating line.

(c) Signal the delivery station: "Start pumping."

(d) After fuel transfer has started, disconnect the messenger return line from the probe tube (Figure 3-21) and connect it to the brummel hook on the long section of the STAR messenger.

(e) Signal the delivery station to haul in the messenger return line.

2. When receiving a Robb or breakable-spool coupling:

(a) Haul the hose coupling on board.

(b) Trip the first free trolley and haul in the first flow-through riding line fitting.

(c) Slip a bight of the riding line on the hook of the riding line fitting.

(d) Haul in on the riding line until the coupling is in position for attachment, then secure the riding line.

(e) Attach the coupling. For the Robb coupling, move the operating lever (Figure 3-12) to the open position.

CAUTION

It is not possible to engage the Robb coupling's female end with the male end if the operating lever is in the open position, or to move the operating lever to the open position once pumping has started.

(f) Signal the delivery station: "Start pumping."

(g) After fuel transfer has started, disconnect the messenger at the flow-through riding line fitting.

(h) Signal the delivery station to haul in the messenger return line.

(8) DELIVERY SHIP

1. Advise the bridge and cargo control: "Station_____ready to start pumping."

2. Commence pumping fuel.

3.18.4 Operating the Nontensioned Spanwire Fuel Rig

(1) DELIVERY SHIP

1. The saddle winch operator positions and maintains all saddles for a smooth flow of fuel through the hose and tends the saddles. The retrieving saddle whip (No. 1) shall be tended slack during fueling operations to prevent an excessive load at the receiving station's fuel connection. The outboard saddle winch (No. 2) is tended to keep the hose bights out of the water, prevent kinking of the hose at the receiving station's connection, and prevent excess strain on the hose and stress wires.

2. Haul in and coil down the messenger return line and messenger.

3.18.5 Retrieving the Nontensioned Spanwire Fuel Rig

(1) DELIVERY SHIP

1. Stop pumping.

2. Complete the blowdown or back suction and secure all valves.

(2) BOTH SHIPS

1. Signalmen signal: "Replenishment completed at this station. Commence unrigging."

(3) RECEIVING SHIP

1. For probe:

   (a) Verify that the 60 foot (18.2 m) section of the STAR messenger is free for running and the brummel hook end is turned on a cleat.

   (b) When advised by the delivery station's phone talker, operate the manual release lever on the receiver (Figure 3-21) to release the probe.

2. For Robb or breakable-spool coupling:

   (a) For Robb coupling, move the operating lever (Figure 3-12) to the closed position.

CAUTION

Uncoupling the Robb is impossible if the fitting is under strain. Therefore, all strain must be taken by the riding line.

   (b) Haul in on the riding line to take the strain off the coupling (if required).

   (c) Disconnect the coupling.

   (d) Secure the coupling to the first free trolley (Figure 3-22).

   (e) Prepare the riding line for use in easing out the hose.

(4) DELIVERY SHIP

1. Haul in on the saddle whips to retrieve the hose.

(5) RECEIVING SHIP

1. For probe, remove the 60 foot (18.2 m) section of the STAR messenger from all fairlead blocks and tend clear of the ship.

2. For a Robb or breakable-spool coupling, use the riding line to ease the hose clear of the deck edge, and release the bitter end of the riding line.

(6) DELIVERY SHIP

1. When the hose has been secured, tend slack in the spanwire and signal the receiving station to prepare to trip the spanwire pelican hook.

(7) RECEIVING SHIP

1. Haul in on the easing-out line to take the strain off the pelican hook. The station phone talker advises the delivery station: "Ready to trip the pelican hook."

2. On signal from the delivery station, trip the pelican hook.

3. Ease the spanwire clear of the deck edge, and release the easing-out line.

4. Signal the delivery station to haul in the spanwire and station phone line.

(8) DELIVERY SHIP

1. Haul in the spanwire and station phone line.

2. Disconnect the phone/distance line.

(9) RECEIVING SHIP

1. Haul in the phone/distance line.

3.18.6 Emergency Breakaway for Non-tensioned Spanwire Fuel Rig. Emergency breakaway is an accelerated breakaway using the procedures described in the preceding paragraph: The following procedures also apply:

1. Use emergency breakaway signals in Appendix C.

2. Clear station of all nonessential personnel.

3. Stop pumping immediately.

4. Release the rig and start retrieving all hoses.

5. Trip the spanwire pelican hook.

6. If unable to disconnect the spanwire, continue to pay out until all wire is free of the drum.

7. If unable to disconnect the coupling:

(a) If the connection has a breakable spool, hit the coupling with a sledge hammer until the coupling breaks.

(b) If the connection does not have a breakable spool, permit the hose to part.

3.19 CLOSE-IN FUEL RIG

In the close-in fuel rig (Figure 3-31), the hose is supported by whips leading from three hose saddles to booms, kingposts, or other high projections on the delivery ship. When the rig is used to fuel a large ship, the hose may also be supported by an outer bight line led from the outboard saddle to a high point on the receiving ship.

3.19.1 Rigging the Close-In Fuel Rig. Figure 3-32 contains information about the saddle whips, retrieving line, and outer bight line (optional). The outer bight line is used only when fueling ships larger than destroyers.

When the hose and lines are properly made up, swing the fueling boom out 90° and hoist the head of the boom just clear of the ship's rail. Hoist the hose inboard to outboard by:

1. Two-blocking the inboard saddle

2. Hoisting the No. 1 and No. 2 saddles to a point just below the inboard saddle

3. Using the retrieving line saddle whip, hoisting the bight of hose, which is supported by the inboard riding line fitting, to a point just below the outboard No. 1 saddle.

3.19.2 Preparing the Close-In Fuel Rig. The fitting on the outboard end of the hose can be a Robb coupling (Figure 3-12) or a breakable-spool coupling (Figure 3-13).

(1) DELIVERY SHIP

1. Fake out the messenger and attach the inboard end with a 7/8 inch (22.2 mm) shackle to the outboard flow-through riding line fitting.

2. Stop off the messenger with 12-thread to the outboard 9 foot (2.7 m) section of hose at three places. One of the stops will be a courtesy stop on the Robb or breakable-spool coupling.

3. Fake out the messenger return line and shackle it to the inboard eye of the messenger.

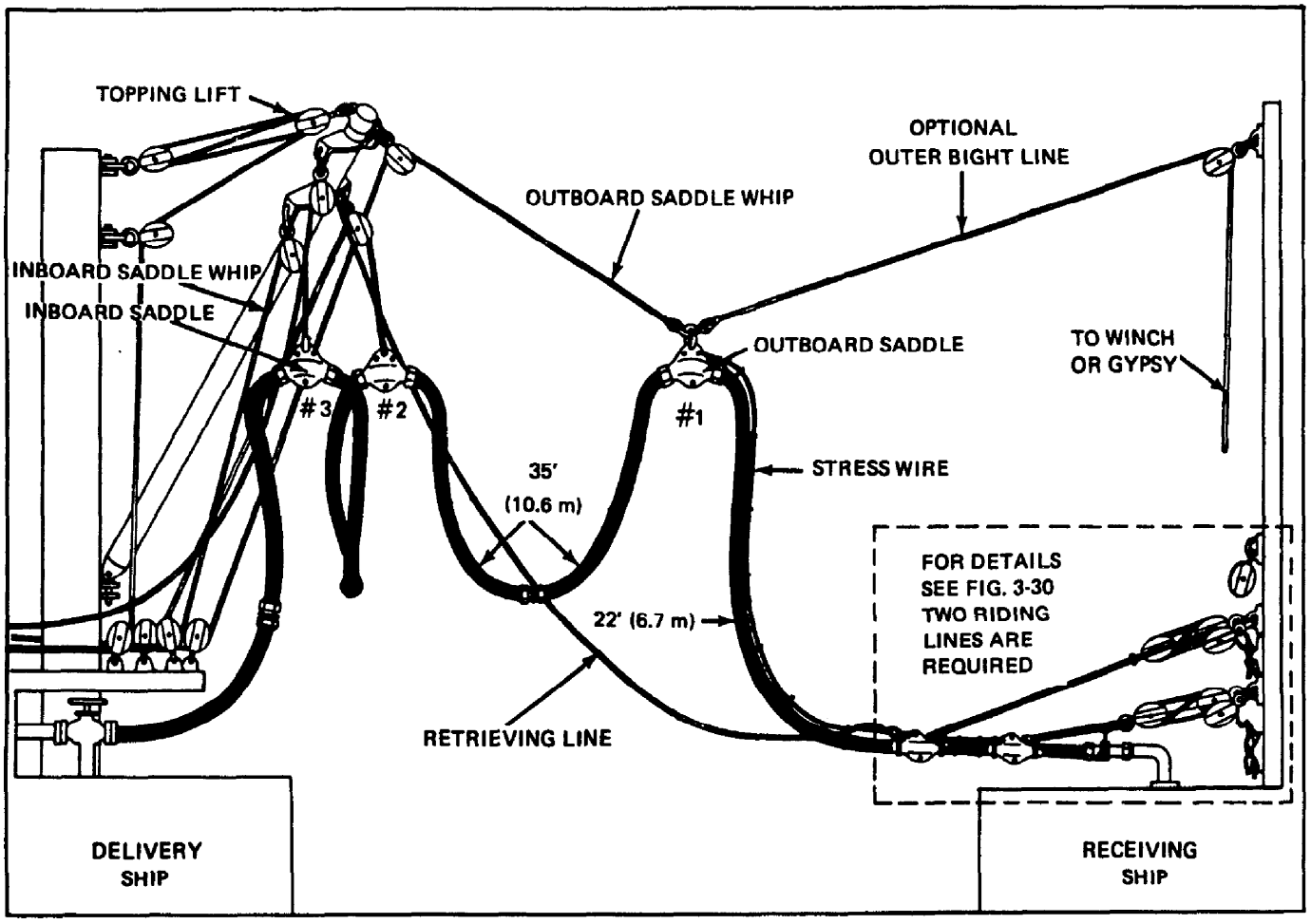


Figure 3-31. Close-In Fuel Rig

4. If an outer bight line is used, fake out the outer bight line and shackle the inboard end to the outboard saddle (see Figure 3-31). Stop off the outboard end of the outer bight line to the outboard becket on the messenger.

5. Fake out and attach the lead line for the station phone line and the lead line messenger for the phone/distance line to the messenger (as required).

6. Secure the 6 foot (1.8 m) tail of the station phone line to a cleat at the bulwark.

7. Ensure that all necessary rigging, working and repair tools, and safety equipment are on station and that personnel are briefed, properly dressed, and on station.

Equipment	Type of Material	Length	Remarks
No. 1 (Outboard) Saddle Whip	1/2" (12.7 mm) or 3/4" (19.0 mm) wire rope or 3-1/2" (88.9 mm) CIRC braided nylon line	450' (137.1 m)	This whip, fitted with a thimble eye and 7/8" (22.2 mm) shackle at one end, is shackled to the outboard saddle, rove through an appropriate size block shackled to a padeye below the head block (shackle pin goes from forward to aft), then through a fairlead to a winch.
No. 2 and No. 3 Saddle Whips	1/2" (12.7 mm) or 3/4" (19.0 mm) wire rope or 3-1/2" (88.9 mm) CIRC braided nylon line	450' (137.1 m)	These two whips, each fitted with a thimble eye and 7/8" (22.2 mm) shackle at one end, are shackled to the No. 2 and No. 3 saddles respectively, rove through blocks on kingpost or boom, then through fairleads to winches.
Retrieving Line	3-1/2" (88.9 mm) CIRC braided nylon line	450' (137.1 m)	One end of the line is fitted with a thimble eye which is shackled by a 3/4" (19.0 mm) shackle to the inboard riding line fitting. The line is rove through a 12" (304.8 mm) or 14" (355.6 mm) snatch block on the after side of the boom head, then through a fairlead to a gyspy head which may be used alternately for both the retrieving line and inboard saddle whip.
Outer Bight Line (Optional)	4" (101.6 mm) double-braided spun polyester or 4" (101.6 mm) braided nylon line	300' (91.4 m)	This line is fitted with a thimble eye and 7/8" (22.2 mm) shackle at one end and has 90 feet (27.4 m) of 2-1/4" (57.2 mm) three-strand nylon, 90 feet (27.4 m) of 1-1/2" (38.1 mm) three-strand nylon, and 180 feet (54.8 m) of 3/4" (19.0 mm) three-strand nylon taper spliced in succession to the other end. The thimble eye is shackled to the outboard side of the outboard saddle.

Figure 3-32. Lines for Close-In Fuel Rig on Delivery Station

(2) RECEIVING SHIP

1. Install a 12 inch (304.8 mm) wood or steel messenger block.

2. Install deck fairlead snatch blocks (as necessary) and prereeve small stuff for the messenger lead.

3. Install the two-fold purchases and coil down the riding lines (see Figure 3-22). Two riding lines are required for the close-in rig.

4. If an outer bight line is used, install fairlead blocks rigged with the messenger fairlead to lead the outer bight line to a high

point on the ship's structure (see Figure 3-31).

5. Rig the Robb male end or breakable-spool A-end to the fuel riser.

6. Ensure that all necessary rigging, working and repair tools, and safety equipment are on station and that personnel are briefed, properly dressed, and on station.

3.19.3 Passing the Close-In Fuel Rig

(1) DELIVERY SHIP

1. Send over the shot line and attach it to the messenger.

(2) RECEIVING SHIP

1. Receive the shot line and haul in. When the bitter end of the messenger comes aboard, attach it to the prereeved small stuff and continue to haul in the messenger through the rigging and fairlead blocks.

2. When the lead line for the station phone line and the lead line messenger for the phone/distance line are received on board, disconnect them and move them clear of the area.

3. Attach the lead line messenger for the phone/distance line to the phone/distance line and signal the delivery station to haul in.

4. Haul in the station phone line and hand tend.

5. If an outer bight line is used, disconnect it from the messenger, attach it to the messenger fairlead, and reeve it through the fairlead blocks to the high point on the ship's structure. Personnel on the outer bight line will assist in hauling in the hose.

(3) BOTH SHIPS

1. Connect the station phone line headsets, establish voice communication, and advise the rig captain: "We have station-to-station phone communication."

(4) DELIVERY SHIP

1. Haul in the lead line messenger for the phone/distance line. When the zero end of the phone/distance line is aboard, attach it to the outermost rail, clear of the transfer station.

2. Connect the phone/distance line headset, establish voice communication, and advise the bridge: "We have bridge-to-bridge phone communication."

(5) RECEIVING SHIP

1. Continue to haul in the messenger to haul in the hose.

(6) DELIVERY SHIP

1. Pay out saddle whips as the receiving station hauls in the hose.

(7) RECEIVING SHIP

1. As the end of the hose comes on board, cut the courtesy stop on the coupling.

2. Cut other stops as required to reach the first flow-through riding line fitting.

3. Slip a bight of the riding line on the hook of the riding line fitting.

4. Haul in on the riding line until the coupling is in position for attachment, then secure the riding line.

5. Attach the coupling. For the Robb coupling, move the operating lever (Figure 3-12) to the open position.

CAUTION

It is not possible to engage the Robb coupling's female end with the male end if the operating lever is in the open position, or to move the operating lever to the open position once pumping has started.

5. Signal the delivery station: "Start pumping."

6. After fuel transfer has started, disconnect the messenger at the flow-through riding line fitting.

7. Signal the delivery station to haul in the messenger return line.

(8) DELIVERY SHIP

1. Advise the bridge and cargo control: "Station___ready to start pumping."

2. Commence pumping fuel.

3.19.4 Operating the Close-In Fuel Rig

(1) DELIVERY SHIP

1. The delivery station tends the hose during fuel transfer by paying out or taking in the saddle whips as the distance between the ships increases or decreases, being careful to keep the hose clear of the water.

2. Haul in and coil down the messenger return line and messenger.

(2) BOTH SHIPS

1. When an outer bight line is used, the delivery and receiving stations must coordinate to maintain an upright "V" between the outboard saddle whip and the outer bight line in order to prevent a tightline situation.

3.19.5 Retrieving the Close-In Fuel Rig

(1) DELIVERY SHIP

1. Stop pumping.

2. Complete the blowdown or back suction and secure all valves.

(2) BOTH SHIPS

1. Signalmen signal: "Replenishment completed at this station. Commence unrigging."

(3) RECEIVING SHIP

1. For Robb coupling, move the operating lever (Figure 3-12) to the closed position.

CAUTION

Uncoupling the Robb is impossible if the fitting is under strain. Therefore, all strain must be taken by the riding lines.

2. Haul in on the riding lines to take the strain off the coupling (if required).

3. Disconnect the coupling.

4. Prepare a riding line for use in easing out the hose.

(4) DELIVERY SHIP

1. Haul in on the saddle whips to retrieve the hose.

(5) RECEIVING SHIP

1. Ease out the hose, riding line, and outer bight line.

(6) DELIVERY SHIP

1. Haul in the saddle whips and two-block the hose saddles.

2. Haul in the retrieving line to retrieve the rest of the hose.

3. Haul in the outer bight line and the station phone line.

(7) RECEIVING SHIP

1. Haul in the phone/distance line.

3.19.6 Emergency Breakaway for Close-In Fuel Rig. Emergency breakaway is an accelerated breakaway using the procedures described in the preceding paragraph. The following procedures also apply:

1. Use emergency breakaway signals in Appendix C.

2. Clear station of all nonessential personnel.

3. Stop pumping immediately.

4. Release the rig and start retrieving all hoses.

5. If unable to disconnect the coupling:

(a) If the connection has a breakable spool, hit the coupling with a sledge hammer until the coupling breaks.

(b) If the connection does not have a breakable spool, permit the hose to part.

3.19.7 Blowdown of Hose for Close-In Fuel Rig. The blowdown/back suction is the most thorough means of clearing fuel hoses after fueling and should, as a minimum, be conducted after the last fueling evolution (when hoses will not be used for several days), or at such other times as the delivery ship considers necessary. While applying blowdown pressure, the following steps should be taken to effect maximum clearing of the hose:

1. Extend the No. 2 saddle whip to minimize the inboard catenary of hose between the No. 2 and No. 3 flow-through saddles.

2. With No. 3 saddle in close to the delivery ship, haul in the No. 2 saddle whip to flatten the catenary between the No. 1 and No. 2 saddles.

3. Heave in the No. 1 saddle slightly to clear fuel from the outer length of hose.

4. Cease blowdown and commence back suction.

3.20 AIRCRAFT CARRIER-TO-ESCORT (MODIFIED 240 FOOT (73.1 m)) FUEL RIG

Aircraft carriers may be equipped to deliver fuel by a modified 240 foot (73.1 m) rig. The rig may be a STREAM rig (if the spanwire is tensioned) or a spanwire rig (if the spanwire is not tensioned).

3.20.1 Hose Assembly. Hose assembly for the 240 foot (73.1 m) rig is the same as specified in paragraph 3.15.1 with the exceptions noted herein. The rig is approximately 240 feet (73.1 m) long with the following fittings and hose lengths coupled in succession, starting with the inboard end of the hose rig. (See Figure 3-17.)

- One 35 foot (10.6 m) length of hose (modified to riser requirements)
- Flow-through saddle (No. 4)
- One 25 foot (7.5 m) length of hose
- One 35 foot (10.6 m) length of hose
- Flow-through saddle (No. 3)
- One 25 foot (7.5 m) length of hose

- One 35 foot (10.6 m) length of hose
- Flow-through saddle (No. 2)
- One 25 foot (7.5 m) length of hose
- One 35 foot (10.6 m) length of hose
- Flow-through saddle (No. 1)
- One 22 foot (6.7 m) length of hose (may be modified to ensure outboard section remains clear of water and probe mating)
- Flow-through riding line fitting
- One 4 foot (1.2 m) length of hose
- Flow-through riding line fitting
- One 9 foot (2.7 m) length of hose
- Fueling probe and carrier assembly.

3.20.2 Rigging and Unrigging the Aircraft Carrier-to-Escort Fuel Rig

1. The procedures for rigging, operating, unrigging, and emergency breakaway of the aircraft carrier-to-escort fuel STREAM rig are the same as those for the single-probe fuel STREAM rig in paragraph 3.16.

2. The procedures for rigging, operating, unrigging, and emergency breakaway of the aircraft carrier-to-escort nontensioned spanwire fuel rig are the same as those for the nontensioned spanwire fuel rig in paragraph 3.18.

3.21 SPECIAL PROCEDURES

Procedures to be followed during special fueling operations are presented in the following paragraphs.

3.21.1 Consolidation Between Oilers. In an underway replenishment force, it often becomes necessary to consolidate cargo between replenishment ships. This permits some replenishment ships to remain on station to service fleet units while others shuttle to supply points to reload fuel. The procedure and rigging for consolidation are the same as for other transfers.

The fleet oiler that provides the fueling rig normally is designated the control ship. The other oiler makes the approach and maintains station alongside. Station-keeping distance should be 100 to 180 feet (30.4 to 54.8 m), but 125 feet (38.1 m) is usually optimum.

The number of products that can be pumped simultaneously between the ships is limited only by the number of rigs available. When large quantities of F76 or F44 (JP-5) are to be transferred, the operation can be expedited if the delivery ship passes the maximum number of hoses and the receiving ship passes all possible hoses.

If consolidation is to take place between a fleet oiler and civilian-manned tanker, the following action is recommended prior to rendezvous. (See Chapter 10 for detailed procedures.)

1. Establish communications on voice radio, and firm up replenishment procedures.

2. Offer to furnish the tanker master with experienced personnel to assist him. A deck petty officer, a signalman familiar with replenishment signals, and a helmsman may be helpful.

3. Rig fuel hoses with end fittings that are compatible with the tanker's equipment.

4. Be ready to provide sound-powered phones for communications if required.

5. Be prepared to furnish blocks, lines, tackles, shackles, and other deck equipment, if the tanker should require them.

3.21.2 Emergency Fueling Between Small Ships. If an emergency develops that requires a destroyer or frigate to refuel another ship, 250 to 300 feet (76.2 to 91.4 m) of 2-1/2 inch (63.5 mm) fire hose can be passed by means of a messenger to the receiving ship.

3.21.3 Fueling Landing Craft. Landing craft that are large enough and capable of sufficient speed to maintain station alongside may receive fuel through a 2-1/2 inch (63.5 mm) hose using one of the standard methods. Smaller landing craft must tie up alongside and fuel as boats do.

3.21.4 Fueling Boats. Boats are fueled by coming alongside the delivery ship and tying up at designated stations. The delivery ship provides riding lines, stern lines, and station markers at each fueling connection. The delivery ship rigs 1-1/4 inch (31.7 mm) hoses at each station and fits the hoses with quick-closing nozzles.

3.21.5 Delivery by Ships Other Than Oilers. In addition to the individual ship plans that are adaptable to the situation, the instruction applicable to oilers can be used as a guide when fuel is to be delivered by a ship which is not an oiler.

3.22 CASUALTY CONTROL

If ships become widely separated, fuel rig lines may be in danger of tightlining. Personnel must make every effort to avoid parting the saddle whips. On a probe rig, the probe will pull out of the probe receiver if the hose tightlines. On a Robb coupling rig, permit the hose to part—rather than parting a saddle whip.

If the inboard saddle whip does part, recover the rig as follows:

1. The delivery station leads the wire pendant to a winch, and hoists the inboard saddle clear of the water.

2. The receiving station casts off its end of the hose.

3. The delivery station hauls in on the retrieving line saddle whip until the hose bights are alongside. No attempt should be made to two-block saddles to the boom or outrigger head.

4. The spanwire, kept as taut as practicable throughout the previous steps, then is cast free by the receiving station.

5. After the hose bights have been stopped off, the delivery station uses the spanwire to recover the remainder of the hose.

3.23 SPANWIRE CASUALTY FOR NON-TENSIONED RIGS

Should the spanwire become fouled on the winch drum or in fairlead rigging, or otherwise cannot be controlled, the following procedure should be used:

1. Delivery ship takes a strain on the saddle whips and retrieving line.

2. Receiving ship closes to appropriate distance for the close-in method.

3. On signal, receiving ship trips the spanwire pelican hook.

4. If practicable, ships proceed with the fueling, tending the rig as in the close-in method. (Large ships should not use this procedure in heavy weather, but should make a breakaway.)

3.24 ASTERN FUELING RIGS

Astern fueling is not normally conducted by oilers. However, selected fleet oilers and selected merchant tankers may be equipped with this capability. When astern fueling is conducted by a merchant tanker, the hose terminal fitting will be the NATO breakable-

spool coupling. The receiving ship should be prepared to receive this coupling.

3.25 ASTERN FUELING OF ESCORT SHIPS FROM FLEET OILERS AND MERCHANT TANKERS — FLOAT METHOD

In the astern method of fueling, the merchant tanker streams a single 6 inch (152.4 mm) hose rig (through a stern roller assembly) and the escort ship maintains station astern and outboard to starboard of the delivery ship while receiving fuel. The astern fuel rig's characteristics dictate employment at a forward fuel receiving station. No attempt should be made to receive the rig at an after station. Figure 3-33 is a plan-view drawing of a typical astern fueling operation. It illustrates the most desirable location of the receiving station relative to the marker buoy. The fueling preparations outlined in paragraphs 3.6.1 through 3.6.3 are particularly valid in their specific application to astern fueling. Deballasting and fuel redistribution requirements are emphasized in order to permit maximum efficient flow through the single-hose rig.

3.25.1 Communications. Basic communications and rendezvous procedures will be conducted as outlined in Chapter 10. (Sound-powered telephone lines will not be passed.) The flag hoist signals (see Figure 2-15) will be used during astern fueling operations in addition to the control signals designated in Figure 3-34. The signals will be displayed at the appropriate fueling station in both ships. The station flags indicated shall consist of 3 foot (91.4 cm) squares of bunting of the designated color. Wands or appropriate colored-lens flashlights shall be used for night operations.

3.25.2 Maneuvering

1. The fueling course and speed will be determined by the OTC. Variations in speed assume more importance than steering a steady course when an escort is fueling astern of a tanker. Because the receiving ship's judgment of relative speed and distance is more difficult in the astern method than in the alongside method, great care must be taken in giving speed adjustments. Astern fueling can be carried out between 8 and 15 knots, but the best normal speed is 12 knots.

2. In all cases, it is the responsibility of the tanker to maintain a steady course and speed as prescribed by the OTC. The escort being refueled is responsible for adjusting her course and speed to maintain correct station on the tanker.

3. During the fuel transfer phase of astern fueling, the receiving ship maintains a safe distance astern of the tanker by station keeping on a position buoy that is towed about 600 feet (184.5 m) astern and to port of the tanker. At that time, the receiving ship's horizontal position, in relation to the tanker, is ideally about 40 feet (12.1 m) outboard of a line extended aft from the tanker's starboard beam (Figure 3-33). That condition should prevail in a relatively calm sea and with no adverse effect from sea or wind. Actually, station keeping in a horizontal plane is a function of maintaining station on the hose; because, at times, wind and sea action prevent the hose from streaming directly astern of the tanker's stern roller. Normally, the tanker's stern roller is installed about 30 feet (9.1 m) inboard. Therefore, the receiving ship will be about 70 feet (21.3 m) from the streamed line of the hose at the receiving station.

4. It is the responsibility of the tanker to keep the escort informed of any alterations in course and speed. In the event of a major change in course, the entire force should change course in 20° steps, with each fueling unit (tanker and astern replenishing ship) accomplishing each step in 5° increments. The tanker is the controlling ship for this maneuver. When the OTC signals to alter course 20°, the master of the tanker will execute the following:

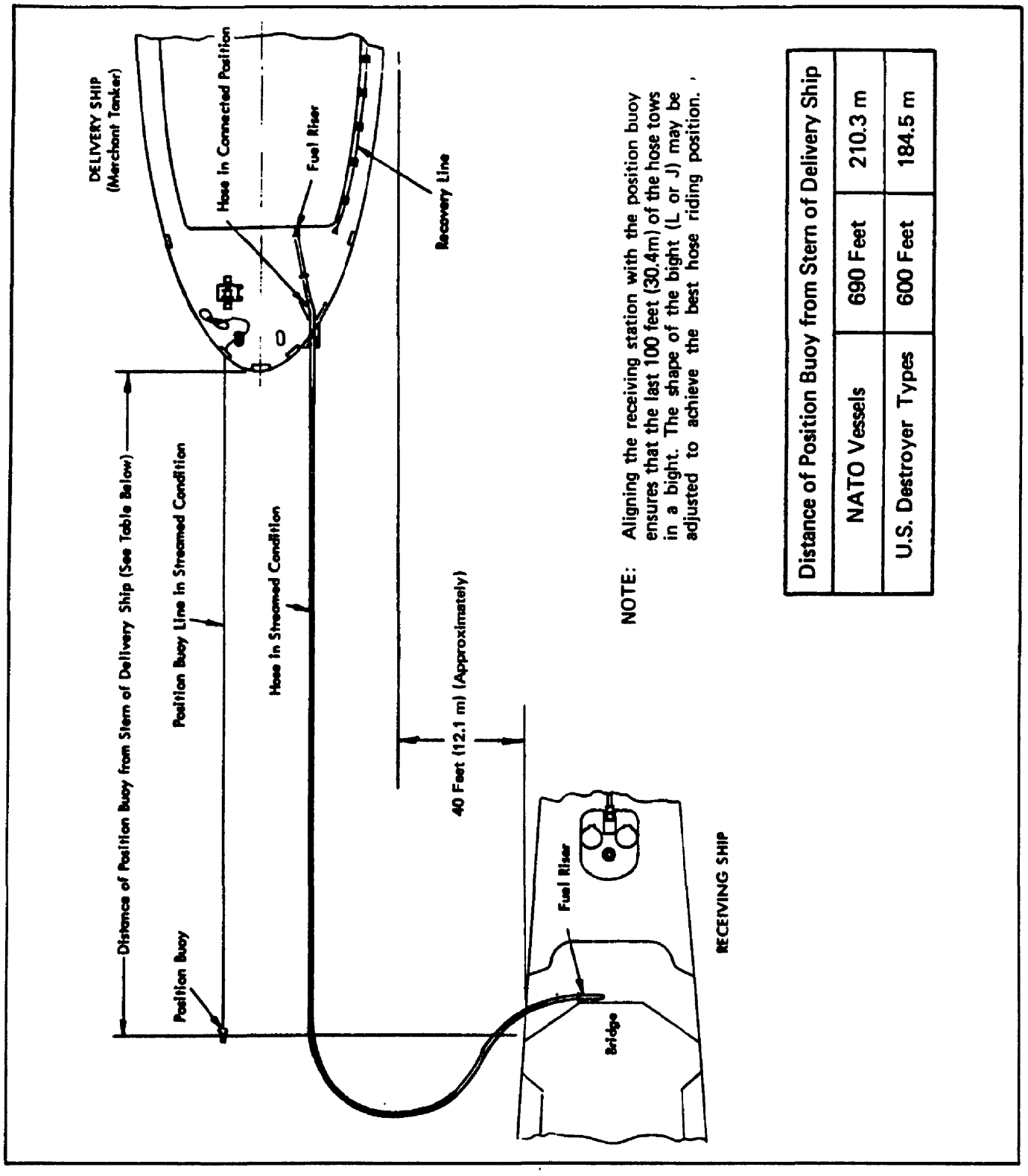


Figure 3-33. Typical Astern Fueling Station Keeping

SIGNAL		MEANING	
DAY	NIGHT	RECEIVING SHIP	DELIVERING SHIP
Green Flag	Green Light	Hose connected. Start pumping.	Pumping started.
Red Flag	Red Light	Stop pumping or blowing hose.	Pumping or blowing through has stopped.
White Flag	Amber Light	Blow down the hose.	Blowing down started.

Figure 3-34. Control Signals for Astern Fueling

(a) Indicate *commencement* of each 5° increment by waving a flag (red for port turns, green for starboard turns) in a *circular* motion above the head.

(b) Hold the flag *steady* while the ship is swinging to the new course.

(c) Wave the flag *up and down* when steady on each new 5° increment.

(d) Hold the flag in *horizontal* position, arm outstretched, on completion of the last 5° increment.

The commanding officer of the escort will execute similar signals to indicate the movements of his ship. During the course change, the escort will maintain her relative position astern by careful use of engine and rudder. The OTC should not order any subsequent alteration of 20° until he is satisfied that all units have steadied on the previously signaled course.

5. Alterations in speed by the tanker should be made in increments of 1 knot. The receiving ship keeps accurate station on the quarter of the tanker by keeping her bridge abreast of a marker buoy towed by the tanker and by staying about 40 feet (12.1 m) clear of the tanker's wake. While picking up the hose, speed should be not more than 10 knots.

3.25.3 Rigging the Receiving Ship

1. If installed, remove the probe receiver assembly at the station to be rigged for receiving the astern fueling rig.

(a) Disconnect the probe receiver assembly by removing the horizontal bolt that secures the swivel arm to the swivel joint. Retain the bolt and nut with the swivel joint (for attaching the easing-out line).

(b) Disconnect the probe receiver's hose assembly fitting from the flange on the fuel riser.

(c) Remove the probe receiver to temporary stowage, clear of the station.

2. Install an adapter ell on the fuel riser to adapt the flange on the riser to the 6 inch

(152.4 mm) flange on the A-end of the breakable-spool coupling (Figure 3-35).

3. Install the A-end of the breakable-spool coupling on the adapter (Figure 3-35).

4. Shackle a 12 inch (304.8 mm) wooden snatch block to the messenger fairlead padeye, using an upset safety shackle. This will be used as the *hose messenger fairlead block* (Figure 3-35). Fairlead the hose messenger to power when available.

5. Shackle a 12 inch (304.8 mm) wooden snatch block (using an upset safety anchor shackle through the block's oblong swivel eye) to the padeye located below the probe receiver's swivel joint. This will be used as

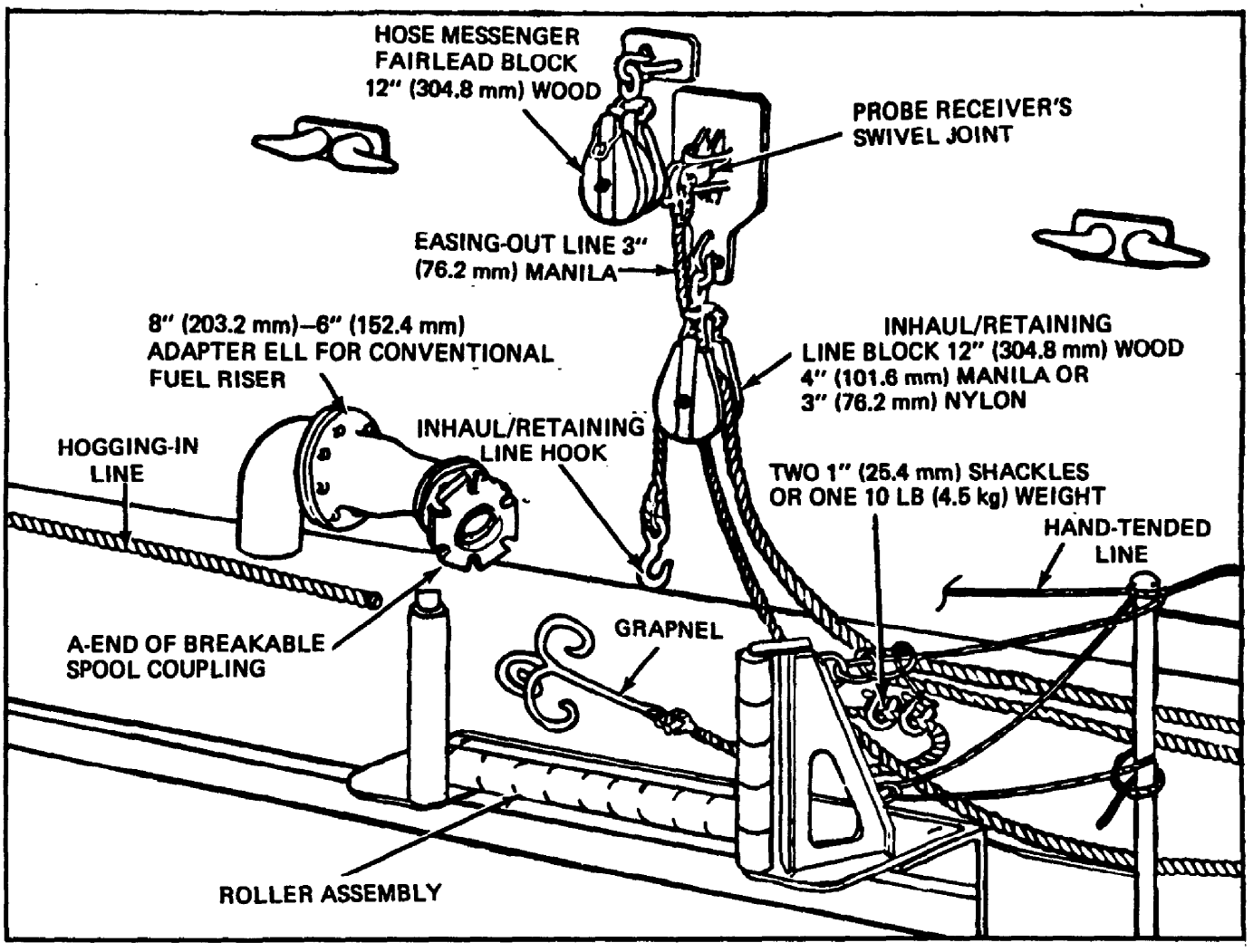


Figure 3-35. Receiving Station Ready to Receive Astern Fueling Rig

an *inhaul/retaining line fairlead block* (Figure 3-35).

6. The *inhaul/retaining line* is 4 inch (101.6 mm) manila or 3 inch (76.2 mm) nylon, 50 feet (15.2 m) long. One end of the line has a thimble eye spliced to the eye of a standard No. 27 safety hook. A bight of the line at the hook end is inserted in the inhaul block (Figure 3-35).

7. Shackle a 3 inch (76.2 mm) manila line to the probe receiver's swivel joint, using a regular safety anchor shackle. Attach the shackle to the swivel joint's horizontal bolt, and secure the shackle's safety bolt through a thimble eye spliced in the manila line. This will be used as the *easing-out line*. The easing-out line should be twice as long as the distance from the messenger fairlead block to the waterline. An additional 50 feet (15.2 m) of the line is required for deck handling to a cleat and for easing-out operations.

8. Prepare a 3 inch (76.2 mm) manila *grapnel line*, 50 feet (15.2 m) long. Splice a thimble eye in one end of the line. Shackle a grapnel hook to the thimble eye. Secure two 1 inch (25.4 mm) free running shackles or one 10 lb (45 kg) free running weight around the line. Secure the bitter end to an on-station bitt or cleat.

9. Coil down a 50 foot (15.2 m) length of 2 inch (50.8 mm) manila for use as a *hose hogging-in line*.

10. Install temporary lifelines of 2 inch (50.8 mm) circumference manila rope, and disconnect wire lifelines in the way of the rig at the receiving station.

11. The receiving ship must provide antichafing gear for all sharp edges on which the hose may ride during replenishment. Secure a small boat fender or the equivalent, inboard of the deck edge, to provide a nonabrasive, rounded surface at the point the hose is brought aboard.

12. The following special equipment is required on station (both ships) — in addition to the tools listed in paragraph 2.3.9:

(a) Signal flags (3 foot (91.4 cm) squares of bunting) for daytime use: 1 each — red, green, and white.

(b) Signal wands (or flashlights with cone fixtures): 1 each — red, green, and amber.

(c) Sledge hammer (for use on the breakable-spool coupling during emergency breakaway).

(d) Socket wrench and 1-1/2 inch (38.1 mm) socket (for the air valve in the conical cap on the hose end fitting).

(e) Oil drip pan to catch spillage.

(f) Rags or fiber waste.

3.25.4 Grappling and Securing the Astern Fueling Rig

1. The receiving ship approaches the hose messenger buoy from astern and normally maneuvers at a speed 3 to 4 knots greater than base speed (12 knots). The closure rate (about 300 to 400 feet (91.4 to 121.9 m) per minute) is reduced as the buoy comes down close-aboard, on the port side.

2. A 2-1/2 inch (63.5 mm) reeving line messenger will be laid out from the forward port receiving station to the bow, outboard of all stanchions and obstructions. The messenger buoy will be grappled forward of the bow wash.

3. With the bitter end of the grapnel line secured to a nearby cleat, take the grapnel line in hand so that the free running shackles are at the bottom of a bight just above the water (Figure 3-36). Heave the grapnel across the hose messenger before the float enters the bow wash. The free riding

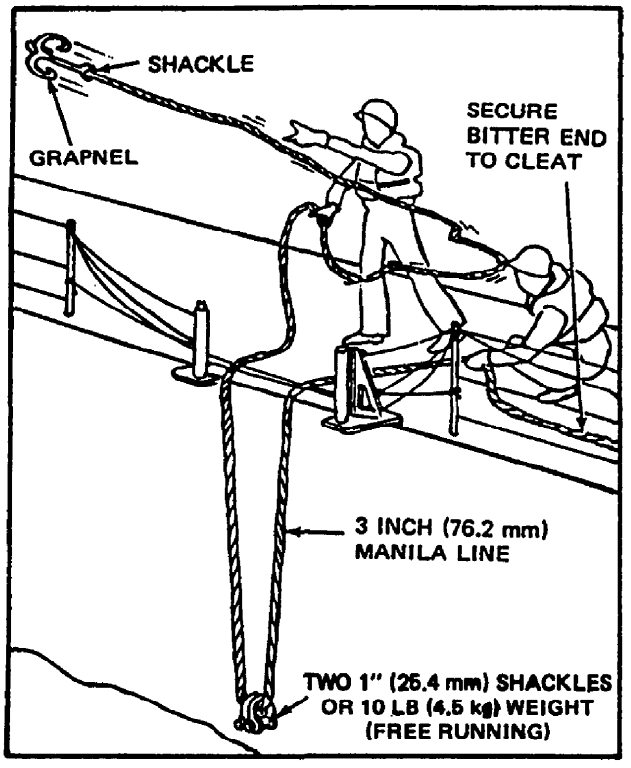


Figure 3-36. Heaving the Grapnel Line

shackles should tend to sink between the ship and the hose messenger, and cause the ship's grapnel to contact the hose messenger's grapnel. Slack the grapnel line until the two grapnels make contact.

4. Haul the hose messenger and float assembly up to the deck until both can be taken in hand safely.

CAUTION

Do not bring the float assembly inboard of the rail.

5. With the hose messenger and float assembly firmly in hand, outboard of the life lines, disconnect the messenger from the float and grapnel at the swivel hook and hose messenger connection (Figure 3-37). Do not attempt to disassemble any other component of the float assembly. Secure the reeving line messenger to the hose messenger end with three turns of 21-thread.

6. The receiving ship then increases speed about 5 turns and slowly moves up on station, as slack is heaved in on the hose messenger at the receiving station to bring aboard the hose messenger.

7. Haul in on the hose messenger until a safe working bight of the manila can be reeved in the hose messenger fairlead block. Lock the snatch block when the messenger can be made free for running.

8. Disconnect the hose messenger from the reeving line messenger and haul the messenger through the fairlead block, while the receiving ship continues to approach (at about 1 to 5 turns over base speed) the streamed hose end fitting. The ship's closure rate should not exceed the inhaul rate of the messenger and hose and should be such that neither messenger nor hose are towed in a bight prior to connection of the breakable-spool coupling.

9. Belay the hose messenger to a cleat when it is close-up in the fairlead block.

10. Pass the bitter end of the easing-out line through the pear-shaped link that connects the hose messenger to the conical cap. Remove slack from the easing-out line and belay the line to a cleat (Figure 3-38).

11. Secure the hogging-in line around the hose (Figure 3-38), and use it to haul the hose in as the hose is brought aboard by the inhaul line (step 12).

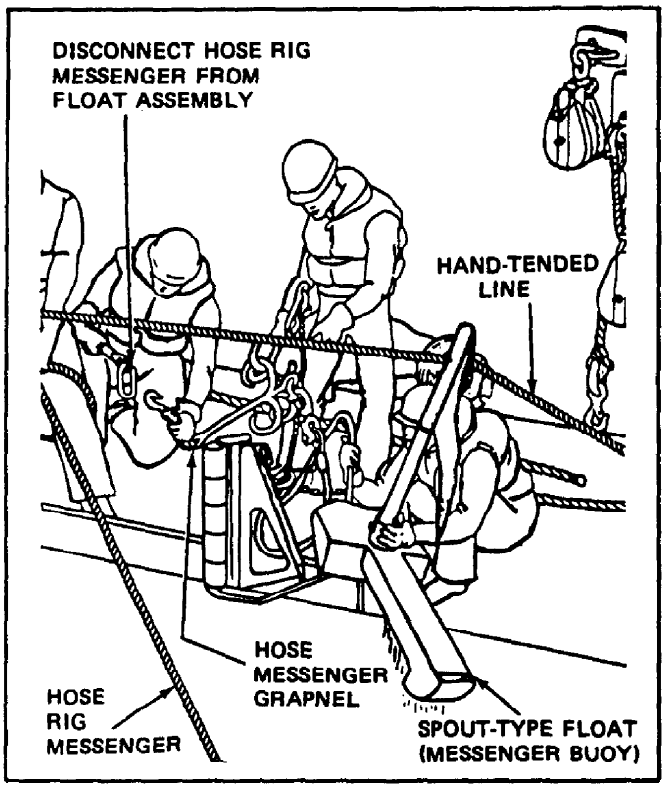


Figure 3-37. Disconnecting the Hose Messenger

12. Engage the hook on the inhaul line (Figure 3-38) with the most outboard hose bridle (flounder plate) link that can be safely reached. Haul the bridle in until the inhaul line is close-up in its fairlead block. Belay the free end of the inhaul line to a cleat.

13. Use a socket wrench with a 1-1/2 inch (38.1 mm) socket to open the air valve in the conical cap and bleed the (flotation) air from the hose. Close the valve after the air has been bled off (Figure 3-39).

14. Ensure that the inhaul line is securely engaged with the flounder plate link and that the hogging-in line handlers have the hose tending toward the riser. Disconnect the conical cap from the B-end of the breakable-spool coupling by unscrewing the three drop bolt nuts located around the outside of the modified breakable-spool coupling (Figure 3-40).

15. Manually position the hose so that the drop-bolts on the modified B-end of the coupling can be engaged with the corresponding lugs in the A-end of the coupling fixed to the fuel riser, and join the two ends (Figure 3-41).

CAUTION

Because of the inherent danger of fuel loss caused by damage to the hose or fittings, it is essential to detect losses as soon as possible. A visual observation of the hose rig during daylight should reveal any leakage; however, during night fueling, the delivery ship should report immediately if a sudden pressure drop indicates a faulty hose rig.

16. Ensure that all valves in the fuel receiving system are correctly positioned. Signal the delivery ship to commence pumping by displaying a green flag during daylight or a green wand at night. The delivery ship will display a green signal when pumping has started.

17. With the end of the hose messenger (with the conical cap) secured in the fairlead block, rig the remaining line in preparation for breakaway operations. Pass the line outboard, and stop if off with small stuff in long bights with the link for the float connection leading aft (Figures 3-42 and 3-43).

18. Walk the hose float assembly aft to a location suitable for rigging breakaway operations (Figure 3-43).

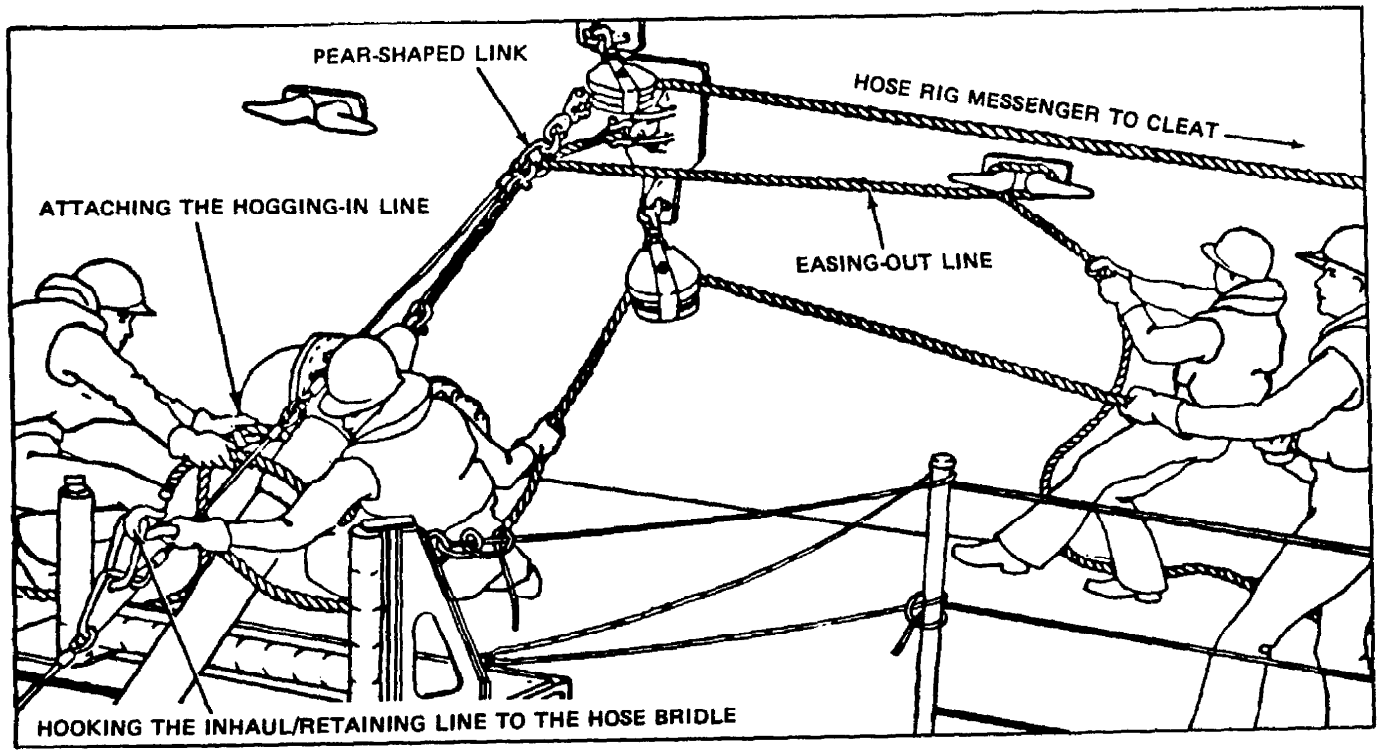


Figure 3-38. Securing the Hose Rig

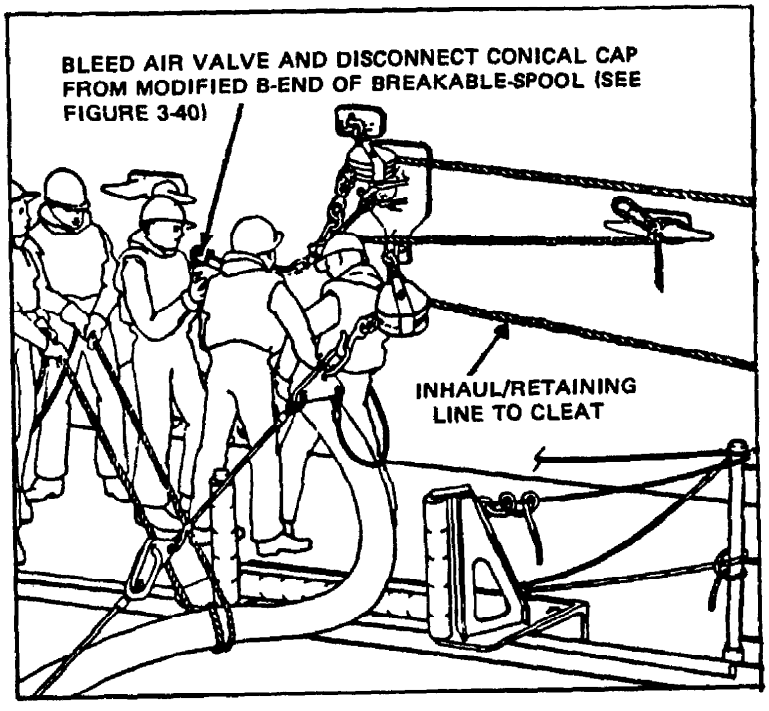


Figure 3-39. Disconnecting the Conical Cap

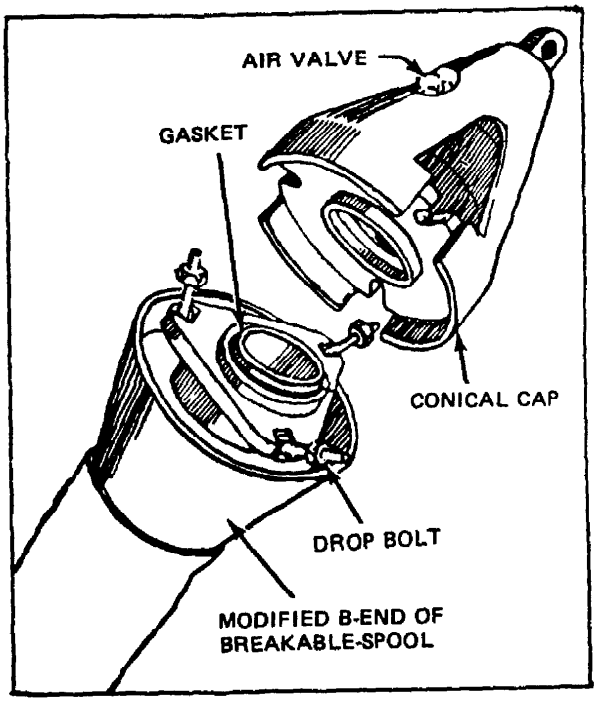


Figure 3-40. Conical Cap and Modified B-End of Breakable-Spool Coupling

19. Reconnect the hose messenger link with the float assembly swivel hook. Rig the messenger float over the side, below the deck level, ready for immediate water entry as part of breakaway operations. Remove the bight of the hose messenger from the fairlead block. Position the conical cap to permit rapid connection before breakaway operations.

3.25.5 Disengaging the Astern Fueling Rig

1. When within about 500 gallons (1.9 m^3) of the fuel required to complete the transfer, signal the delivery ship to "cease pumping" by displaying the red signal indicated in Figure 3-34. The delivery ship will display a red signal when pumping has stopped.

2. Upon receipt of "stopped pumping," display the white flag (or amber light) to order "start blowdown." Blowdown will continue until the receiving ship displays a red signal indicating "stop blowdown." The blowdown is normally completed in 5 to 10 minutes.

3. When the delivery ship displays the signal indicating "blowdown stopped," close the riser valve and disconnect the A-end and

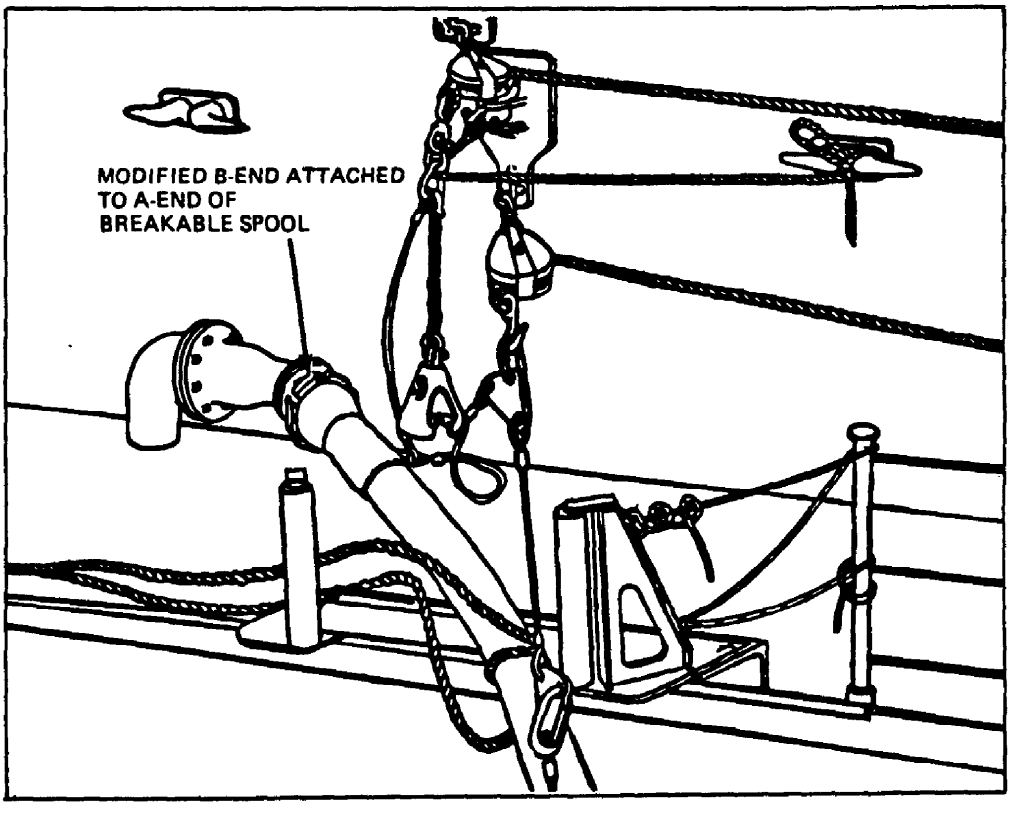


Figure 3-41. Receiving Station Rigged for Fuel Transfer

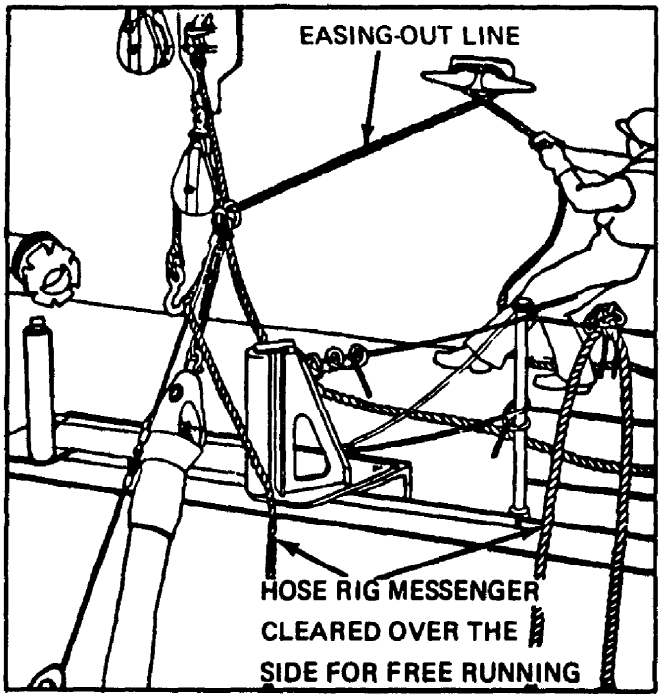


Figure 3-42. Easing the Hose Overboard

B-end of the breakable-spool coupling.

4. Position the hose to reconnect the conical cap to the B-end of the breakable-spool coupling.

5. Disconnect the hogging-in line from the hose, and ease hose slack overboard.

6. Gradually slack off on the inhaul line while the easing-out line accepts the load. Remove the hook from the bridle (flounder plate) link. The easing-out line is now holding the hose rig load (Figure 3-42).

7. Ensure that slack in the messenger line is adequate to permit the conical cap and hose to ride free of the ship's side when the easing-out line is released.

8. Surge the easing-out line until the hose and breakable-spool coupling are clear of the ship's side.

9. Gradually reduce ship's speed to reduce the bight of hose in the towed rig. When the hose is tending forward, ease the hose overboard and allow the bitter end of the easing-out line to run free when the coupling enters the water. Haul in the easing-out line to prevent fouling the rig.

10. Cut the small stuff stops (Figure 3-43) securing the bights of the hose messenger, and allow the messenger and hose to be pulled away from the ship's side. Stops must be cut in succession from hose end to float assembly to reduce the hazard of fouling the ship's propulsion or steering gear. The hose and messenger are veered as the receiving ship drops astern and clear of the rig.

Note

See Figure 3-44 for details of float assembly, hose rig messenger, and hose bridle assembly.

3.25.6 Astern Fueling Hose Cleanout. A pigging system, developed for cleanout of the astern fueling hose, can be used in place of the air blowdown. The pigging system consists of a polyethelyne pig, launching and receiving stations, associated hardware, and air supplied from the delivery ship's service air system.

Pigging of the astern fueling hose commences after fueling has been completed and the receiving ship has signaled the delivery ship to commence blowdown. The pig is manually inserted into the hose at the quick-disconnect coupling located at the launching station on the delivery ship. A controlled quantity of air is then admitted to the hose upstream of the pig, which causes the pig to be propelled through the hose. As the pig travels through the hose, it forces the fuel ahead of it from the hose and

into the receiving ship's fuel tanks. During this period, the pig travels at a relatively constant rate that is controlled by a fixed orifice located in the air supply line to the hose.

The pig travels through the hose until it reaches the strainer-like pig receiver mounted in the breakable-spool coupling at the end of the hose. The pig receiver catches the pig, preventing it from being discharged into the receiving ship's fuel tanks. On catching the pig, the receiver automatically vents the air past the pig and into the ship's fuel tanks. Venting continues until the pressure in the hose is brought to atmospheric pressure, at which time the astern fueling hose can be disconnected from the receiving ship's riser. When the hose is disconnected from the riser, the pig is removed and discarded. (See Appendix J for details.)

3.25.7 Summary of Float Method Procedures. Figures 3-45 and 3-46 summarize the procedures for passing the gear and disengaging.

3.25.8 Emergency Breakaway. The general emergency breakaway procedures and requirements outlined in paragraphs 2.2.5 through 2.2.5.11 apply to astern fueling operations from a merchant tanker. In general, it is the responsibility of the escort in an emergency breakaway situation to expedite a normal breakaway or to use a sledge hammer to break the A-end of the breakable-spool coupling. In making that determination, the receiving ship must weigh the advantages of recapping the hose prior to releasing the rig as opposed to the distinct hazard in creating a voluminous oil spill when the coupling is broken with a head of liquid in the hose.

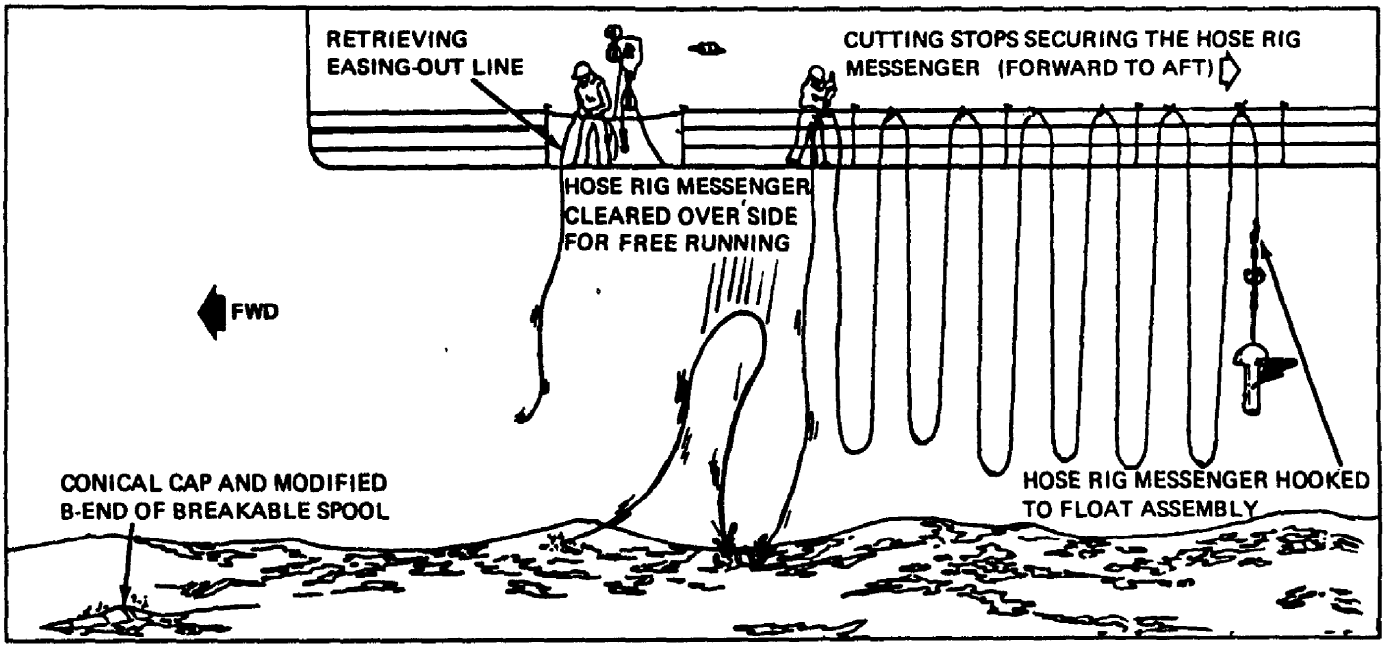


Figure 3-43. Hose Messenger Rigged for Disengaging

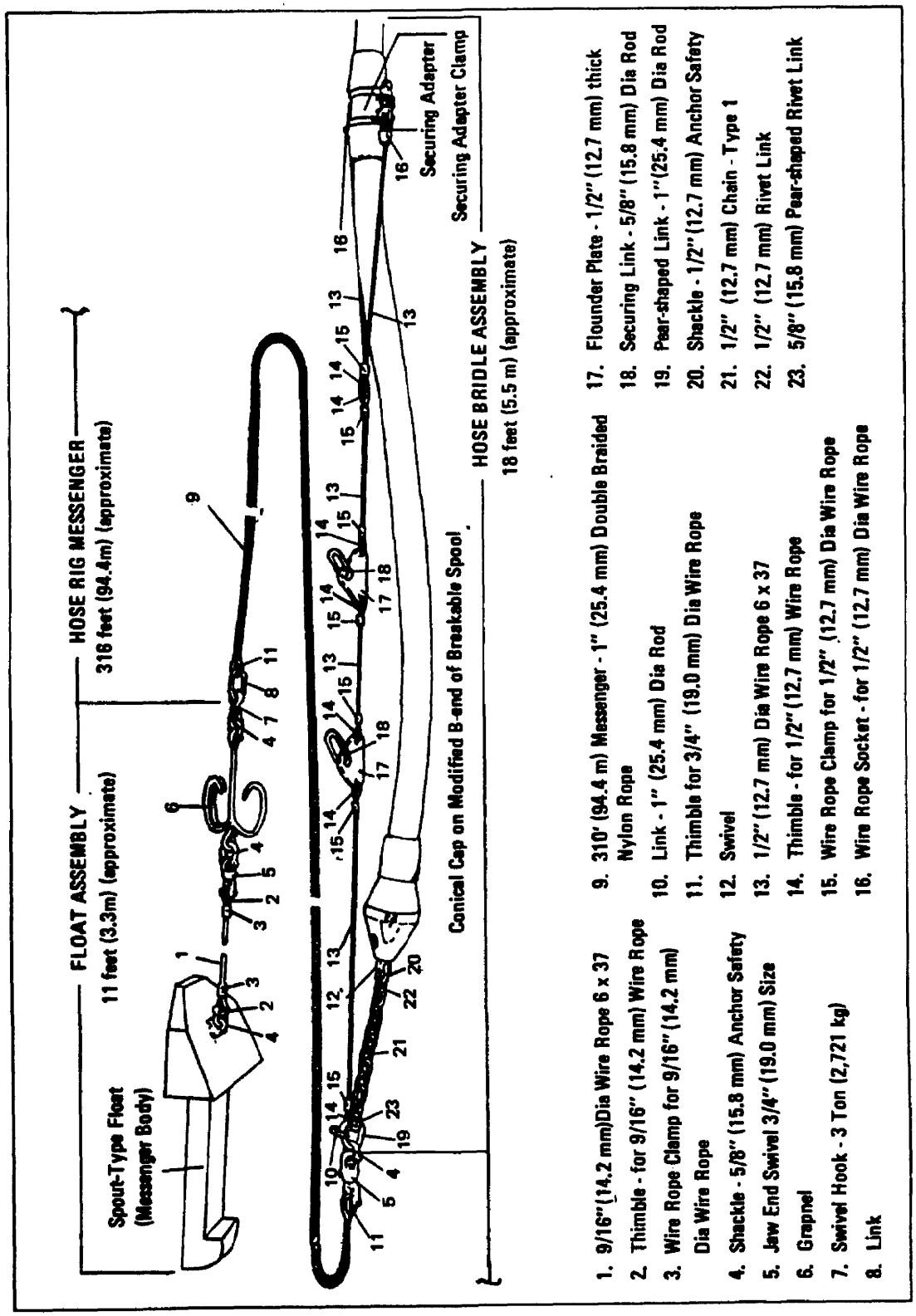


Figure 3-44. Float Assembly, Hose Messenger, and Hose Bridle Assembly Details

DELIVERING SHIP	RECEIVING SHIP
1. When ready for receiving ship to approach, hoist flag ROMEO close up.	1. Hoist flag ROMEO close up on the side where the hose will be received when commencing approach.
	2. Approach the spout float from astern.
	3. Grapple the hose line. This should be done at a distance from the float, not at the float itself.
	4. Haul in the hose line, and bring hose aboard.
2. Haul down flag ROMEO when receiving ship hauls ROMEO down.	5. Haul down flag ROMEO when hose is on deck.
	6. Hang hose by inhaul line, and stop hose line to the guard rails.
	7. Remove conical cap, and connect up the hose.
3. Acknowlege signal to start pumping.	8. When ready to receive oil, make hand signal to delivering ship, "Start pumping."
4. Hoist flag BRAVO and start pumping.	9. As soon as oil starts to flow, hoist flag BRAVO.

Figure 3-45. Summary of Float Method — Passing the Gear

DELIVERING SHIP	RECEIVING SHIP
1. Stop pumping, on receipt of signal from receiving ship.	1. Hoist flag PREP at the dip 15 minutes before time of expected completion of fueling.
2. Blow through hose with compressed air.	2. When within about 500 gal (1.9 m^3) of the desired amount of fuel, signal "Stop pumping" to leave room for the fuel left in the hose to be blown through to the receiving ship by compressed air.
3. On receipt of signal, stop blowing through.	3. When hose is clear of oil, signal "Stop blowing through."
4. Haul down flag BRAVO.	4. Haul down flag BRAVO.
5. When conical cap has been replaced, inflate hose.	5. Hoist PREP close up.
	6. Disconnect hose and replace conical cap. Signal delivering ship when cap is replaced.
	7. Take weight on the easing-out line.
	8. Release the hose messenger from the fairlead block.
	9. Disconnect the inhaul line hook from the flounder plate link.
	10. Veer the hose while dropping astern.
	11. Cut hose line stops on guard rail, and let go.
	12. Haul down flag PREP, and proceed clear of delivering ship.

Figure 3-46. Summary of Float Method — Disengaging

The delivery ship must be able to stop pumping instantly when there is an emergency or when the "breakaway" order is given. In the event of a situation requiring emergency breakaway, the danger signal (at least five short blasts) shall be sounded on the ship's whistle by the ship initiating the emergency breakaway to alert all ships in the vicinity.

3.26 ASTERN FUELING WITH 2-1/2 INCH (63.5 mm) HOSE

3.26.1 Delivery Ship Rig Assembly and Preparations. Determine the side of the delivery ship from which the hose will be streamed. On this side, lay out and assemble 400 feet (121.9 m) of 2-1/2 inch (63.5 mm) hose lengths. Ensure that all hose gaskets are in place and that the couplings are tight. Fake the 400 feet (121.9 m) of hose on deck as shown in Figure 3-47. Fit a hose cap to the bitter end and connect the other end to the hose from the fuel riser. A 4 inch (101.6 mm) hose may be used in the delivery ship from the fuel riser to the transom; however, the 4 inch (101.6 mm) to 2-1/2 inch (63.5 mm) reducer must always be located inboard of the transom when streaming the rig.

Attach the special hose clamp (Figure 3-48) to the hose 9 feet (2.7 m) from the bitter end of the hose assembly. Secure a 3-1/2 inch (88.9 mm) braided nylon support line with thimble eye to the inboard end of the special hose clamp, using a 5/8 inch (15.8 mm) safety shackle. Marry the support line to the hose at each hose coupling with at least four turns of 15-thread, and use intermediate 9-thread stops between the hose couplings, as shown in Figure 3-48. (Ensure that stoppers do not crush or crimp the hose.) Keep the inboard section of the hose assembly free to allow for connecting the hose to the fuel riser.

Insert a becket in the nylon support line adjacent to the last (inboard) marriage, to receive the 3 inch (76.2 mm) nylon riding line. Use the nylon riding line to stop off the hose and the support line, as shown in Figure 3-47.

Secure a 10 foot (3.0 m) pendant with a 3 inch (76.2 mm) by 8 inch (203.2 mm) long link to the special hose clamp, using a 5/8 inch (15.8 mm) safety shackle, and lead the long link out to the hose cap. Secure 100 feet (30.4 m) of 3 inch (76.2 mm) polypropylene messenger to the special hose clamp, using a 5/8 inch (15.8 mm) shackle, and lead the messenger out through the stern chock and back on deck. Marry the messenger connecting pendant to the hose with 9-thread near the bitter end of the hose. (See Figures 3-47 and 3-48.)

Secure a 25 foot (7.6 m) section of 1 inch (25.4 mm) polypropylene to the bitter end of the 100 foot (30.4 m) long 3 inch (76.2 mm) polypropylene messenger. Secure the messenger pick-up float to the end of the 25 foot (7.6 m) messenger, and fake the messenger on the fantail ready for streaming. (See Note at end of paragraph.)

Prepare the position marker buoy for streaming from the opposite side of the ship from which the fueling rig will be streamed. Attach a flagstaff displaying an international orange or red flag to the marker buoy. For night streaming, add a minesweeping light. Secure the buoy to a sufficient length of 1-1/2 inch (38.1 mm) circumference double-braided nylon rope to permit streaming the position marker buoy 300 feet (91.4 m) astern. Place a marker at the 300 foot (91.4 m) point on the 1-1/2 inch (38.1 mm) double-braided nylon to ensure proper positioning of the buoy astern of the delivery ship.

Note

- Paint the outboard 50 foot (15.2 m) length of hose international orange.

- The messenger pickup float may be one of several buoyant objects. Metal spheres, such as those used

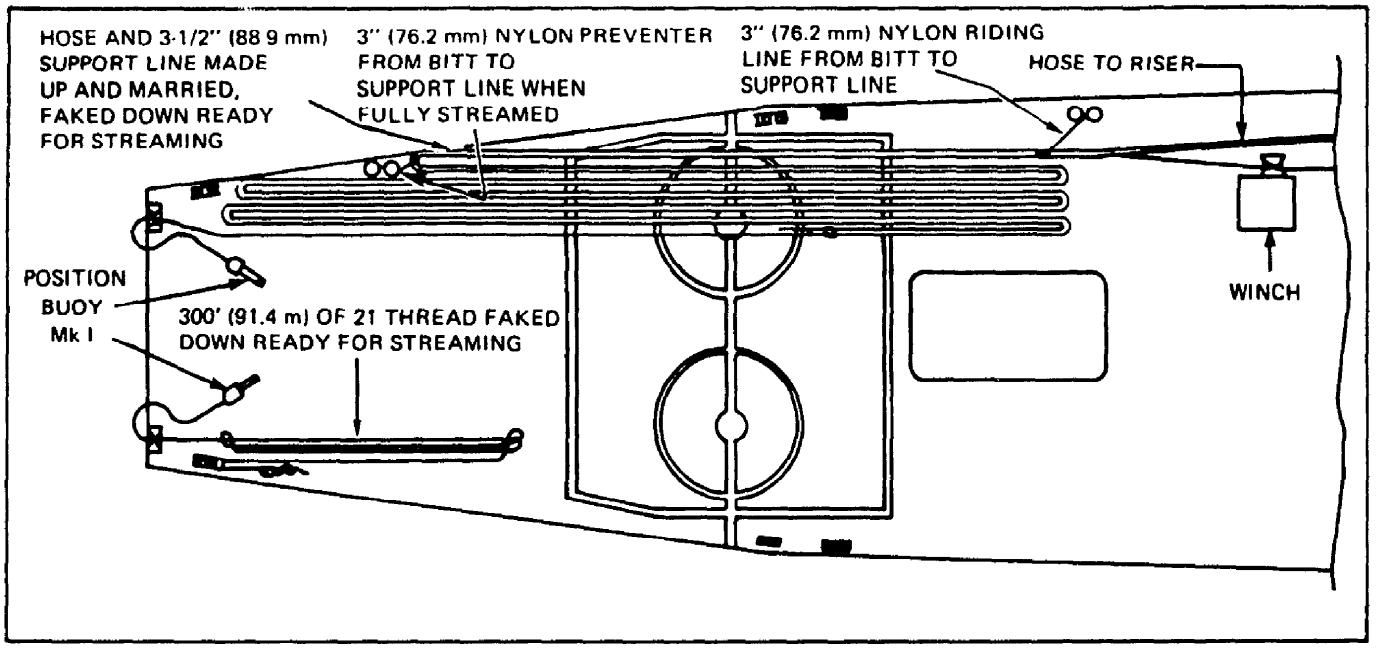


Figure 3-47. Astern Fueling Rig (2-1/2 Inch (63.5 mm) Hose) Ready for Streaming

on ATF and ARS, are small, light, and ideal for day use. However, there is no practical way of securing adequate lighting for night refueling. The position buoy Mk I is recommended because it is stable and can be fitted with a flagstaff or lights.

3.26.2 Streaming Procedures. The OTC will order course and speed for fueling. Stream the rig at 6 knots to permit hand streaming. The receiving ship should be kept well clear of the fueling station while the rig is being streamed to avoid possible damage to the rig and/or receiving ship should the rig carry away.

With the inboard end of the 3-1/2 inch (88.9 mm) support line led to a winch, and the 3 inch (76.2 mm) nylon riding line secured at a point adjacent to the first inboard hose connection and stopped off at a bitt, streaming can begin. The pickup float is launched and streamed to the length of the 100 foot (30.4 m) messenger. The hose and support line are lifted by hand and walked aft until the hose is afloat astern. The hose will then normally be slowly dragged astern and will run free until fully streamed. Should the hose fail to ease out, an additional bight can be lifted and walked aft. The light weight of the rig, slow speed of the ship, and short distance astern when fully streamed will prevent the rig from running away.

When the rig is fully streamed and riding to the 3 inch (76.2 mm) nylon riding line, secure an additional nylon preventer around the hose and support line at the stern. Stop off the preventer to the quarter bitts. Connect the hose to the 4 inch (101.6 mm) to 2-1/2 inch (63.5 mm) reducer at the fuel oil discharge fitting.

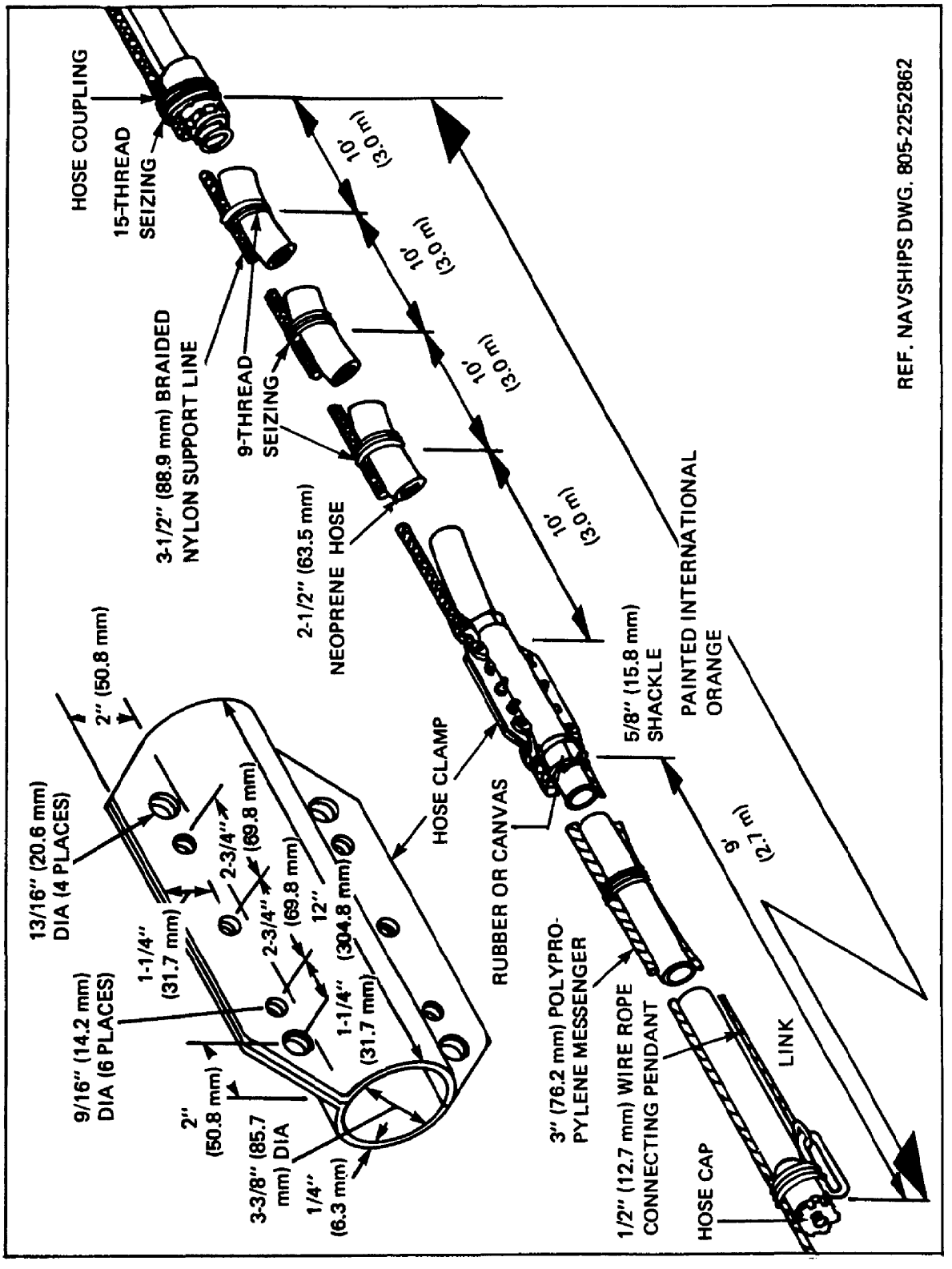


Figure 3-48. Arrangement of Outboard End of Hose Assembly

When the hose rig has been fully streamed and stopped off on deck, launch the position marker buoy on the opposite side of the ship and stream astern until the 300 foot (91.4 m) marker on the 1-1/2 inch (38.1 mm) double-braided nylon line is even with the stern. The rig is now ready to be picked up by the receiving ship (Figure 3-49).

3 26.3 Receiving Ship Procedures. From the fueling trunk, lead forward a 2-1/2 inch (63.5 mm) jumper hose to within 10 feet (3.0 m) of the forward bitts and on the side that fuel will be received. Fit both halves of the 2-1/2 inch (63.5 mm) quick-release coupling to the outboard end of the jumper hose. Have fire axe, two grappling hooks, and a sledge hammer for the pelican hook readily available on the forecastle. Secure a pelican hook to the towing pad between the anchor chains, with the pelican hook pointed to the bitts on the receiving side of the ship (Figure 3-49).

Note

For units with a 4 inch (101.6 mm) male threaded riser, a 4 inch (101.6 mm) to 2-1/2 inch (63.5 mm) adapter will be required in conjunction with a 2-1/2 inch (63.5 mm) to 2-1/2 (63.5 mm) double female coupling. For units with a 2-1/2 inch (63.5 mm) male threaded riser, only the 2-1/2 inch (63.5 mm) to 2-1/2 inch (63.5 mm) double female coupling will be needed.

Make approach on the pickup float (position buoy Mk I), and retrieve the float. Lead the messenger to the capstan, and heave around until the hose cap is on deck. Cut the 9-thread stopper, and lead the 10 foot (3.0 m) connecting pendant to the pelican hook and secure the long link in the pendant to the pelican hook. Lead the hose to the quick-release coupling, and connect the fuel hose to the coupling. Ensure that sufficient chafing gear is inserted around the fuel hose between the bitts. An additional preventer may be secured at the bitts to reduce chafing.

When the hose is stopped off on deck and connected to the quick-release coupling, the position buoy messenger is disconnected and stopped off to stanchions with loops outboard of all obstructions. The bitter end of the messenger is stopped off adjacent to bitts with the pickup float located some distance aft of the fueling station.

When fueling and blowdown are completed, disconnect the hose from the quick-release coupling and secure the hose cap. Secure the marker buoy messenger to the special hose clamp and lead in to the pelican hook. Secure hose, messenger, and connecting pendant with 9-thread and lead the messenger outboard of the stanchions; break the connections at the pelican hook and release the hose. The messenger and pickup float can be released as the ship pulls away.

3.26.4 Recovery Procedures. Prior to recovery, give the rig a complete blowdown and, if feasible, take a back suction. Upon completion of fueling, recover the position marker buoy to avoid fouling the fuel rig.

Using the 3-1/2 inch (88.9 mm) braided nylon support line on the winch, heave in until all strain is off the preventer and riding line. Disconnect the hose, and remove the preventer and riding line. As the rig is recovered and the hose approaches the winch, remove the 9-thread and 15-thread stops. Fake the hose on deck, and store the support line on the reel.

As the hose clamp is brought on board, disconnect the 3 inch (76.2 mm) polypropylene messenger and recover the messenger and recovery float by hand.

3.26.5 Control Signals. The control signals used shall be in accordance with Figure 3-34.

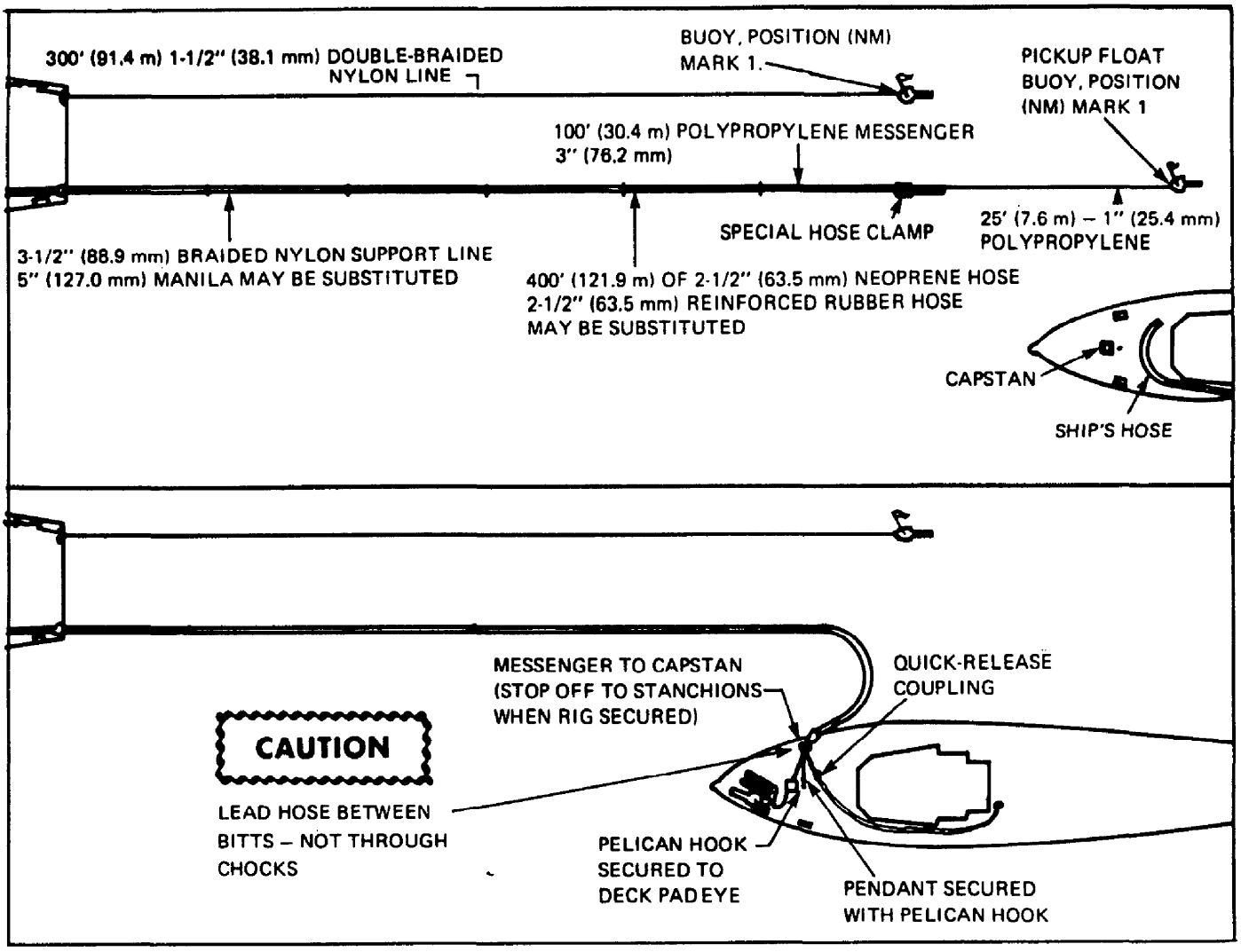


Figure 3-49. Streaming Astern Fueling Rig (Sheet 1 of 2)

3.26.6 Required Parts. Required parts are shown in Figure 3-50.

3.27 REFERENCES

ATP 16, Replenishment at Sea

Damage Control/Casualty Control Book

Naval Ships Technical Manual

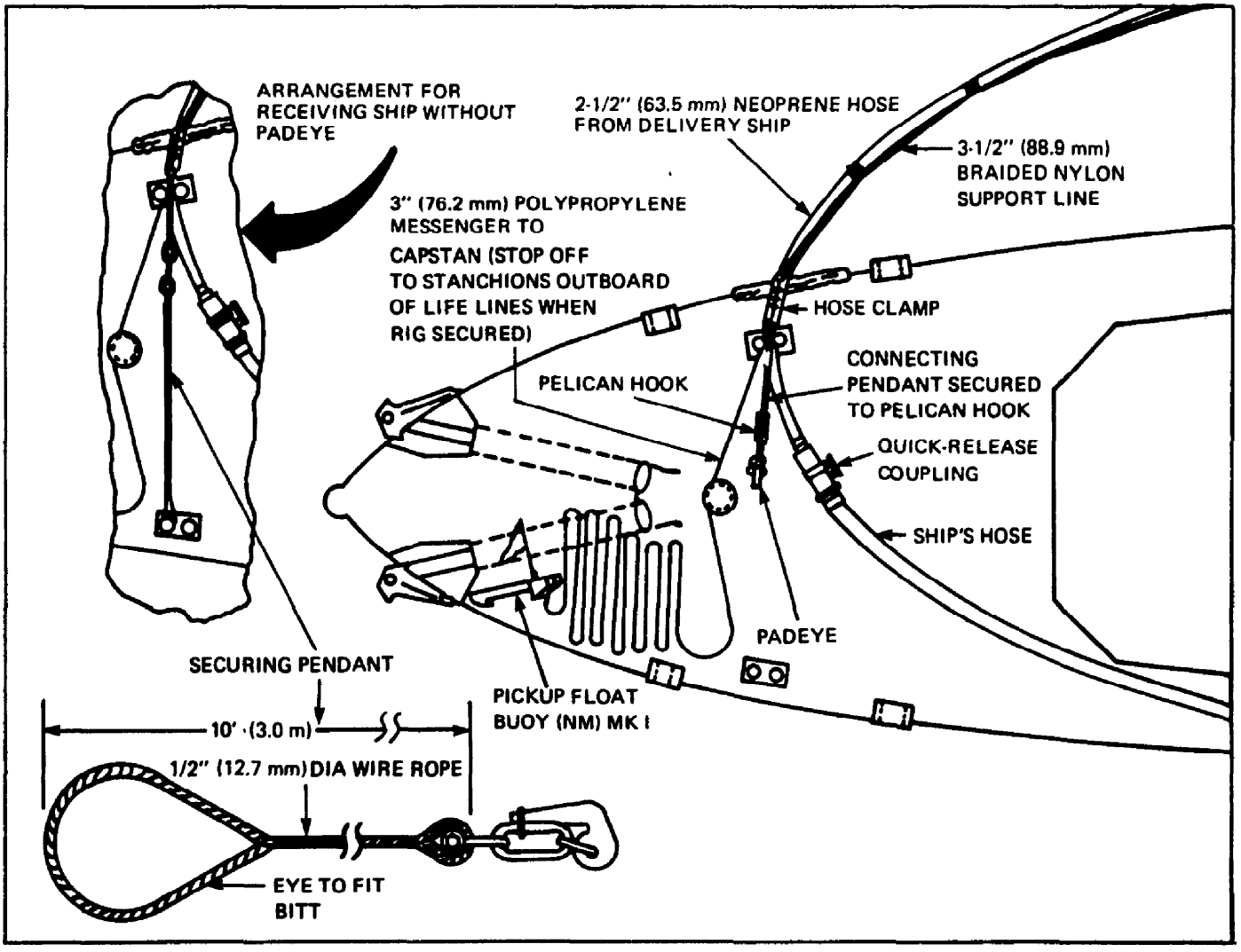


Figure 3-49. Streaming Astern Fueling Rig (Sheet 2 of 2)

NAVSEA S9570-AD-CAT-010, UNREP Hardware and Equipment Manual

NAVSEA 0920-103-2010, Shipboard Level Maintenance of Probe Fueling Hardware Technical Manual

NAVSEA 0955-026-8010, Instruction Manual

NAVSEA 0978-LP-035-3010, Instruction Manual

NAVSHIPS 0920-046-3010, Single-Probe Fueling Operator's Handbook

NAVSHIPS 0955-003-7010, Instruction Manual — The Fleet Oiler Manual

ITEM	NOMENCLATURE	FSN	QUANTITY REQUIRED	SPARES REQUIRED
1	2-1/2" (63.5 mm) Neoprene fueling hose	1H 4720-00-837-7178	12	5
1a	2-1/2" (63.5 mm) Fueling hose (NOTE 1)	9C 4720-00-230-6583	24	10
2	2-1/2" (63.5 mm) Quick-release coupling	1H 4730-00-369-4603	1	1
3	2-1/2" (63.5 mm) Hose cap	9C 4730-00-240-5540	1	1
4	Buoy, position (NM) Mark 1	1H 2050-00-272-2423	2	1
5	12' (3.6 m) Rubber float cells	1H 1075-00-372-6128	2	2
6	3-1/2" (88.9 mm) Braided nylon	9Z 4020-00-519-7916	600' (182.8 m)	300' (91.4 m)
6a	5" (127.0 mm) Manila Line (NOTE 2)	9Z 4020-00-184-9805	900' (274.3 m)	
7	1-1/2" (38.1 mm) Braided Nylon	9Z 4020-00-106-9361	1	
8	Coil 9 thread	9Z 4020-00-231-9021	1	
9	3" (76.2 mm) Polypropylene	9Z 4020-00-968-1355	100' (30.4 m)	100' (30.4 m)
10	1" (25.4 mm) Polypropylene	9Z 4020-00-599-7529	25' (7.6 m)	25' (7.6 m)
11	Coil 15 thread	9Z 4020-00-231-9007	1	
12	Special Hose Clamp	STD PLAN 805-2252862		
13	3" by 8" (76.2 by 203.2 mm) long link	STD PLAN 805-2252862		

NOTES: (1) May be substituted for neoprene hose if neoprene is not available.
(2) May be substituted for 3-1/2" (88.9 mm) braided nylon if nylon is not available.

Figure 3-50. Required Parts for 2-1/2 Inch (63.5 mm) Astern Fueling Hose Rig

EQUIPMENT*	FUEL STREAM RIG			NONTENSIONED SPANWIRE RIG			CLOSE-IN RIG		
	WITH PROBE	WITH ROBB COUPLING	WITH 4 INCH (101.6 mm) PIGTAIL	WITH PROBE	WITH ROBB COUPLING	WITH 4 INCH (101.6 mm) PIGTAIL	WITH ROBB COUPLING	WITH 4 INCH (101.6 mm) PIGTAIL	REMARKS
Adapter, Hose	(Note 1)	(Note 1)	(Note 1)	(Note 1)	(Note 1)	(Note 1)	(Note 1)	(Note 1)	Size and type to suit hose and rig
Adapter, Highline (Cargo STREAM to FAS)	–	–	–	–	–	–	–	–	For connecting highline to 7/8" (22.2 mm) FAS spanwire weak-link end fitting (see paragraph 3.12)
Block, Fiber Rope	(Note 1)	(Note 1)	(Note 1)	(Note 1)	(Note 1)	(Note 1)	(Note 1)	(Note 1)	Size and type to suit station and rig
Block, Wire Rope	(Note 1)	(Note 1)	(Note 1)	(Note 1)	(Note 1)	(Note 1)	(Note 1)	(Note 1)	Size and type to suit station and rig
Block, Wire Rope (Yo-Yo) w/Anti-toppling Straps	1	1	1	1	1	1	–	–	To support inboard saddle
Bolo w/Shot Line	2	2	2	2	2	2	2	2	(Note 2)
Cap, Hose; 4" (101.6 mm) or 2-1/2" (63.5 mm)	–	–	2 per ship	–	–	1	–	1	
Clamp, Hose, Riding Line; 4" (101.6 mm)	–	–	2 per ship	–	–	1	–	1	
Clamp, Hose w/Handles; 4" (101.6 mm)	–	–	2 per ship	–	–	1	–	1	
Coupling, Hose, NATO Breakable-Spool – B-End	–	–	–	–	–	–	–	–	To send to NATO- or SEATO-nation ship or MSC ship with A-end of coupling
Coupling, Hose, Quick-Release; 4" (101.6 mm) or 2-1/2" (63.5 mm)	–	–	1	–	–	1	–	1	
Coupling, Hose, Robb – Female End	[1]	1	–	[1]	1	–	1	–	For rig with probe: probe on upper hose, Robb coupling on lower hose
Coupling, Hose, Split Clamp and Band; 7" (177.8 mm) 6" (152.4 mm) or 4" (101.6 mm)	(Note 1)	(Note 1)	(Note 1)	(Note 1)	Note 1)	(Note 1)	(Note 1)	(Note 1)	

Figure 3-51. Fueling-at-Sea Hardware for Delivery Ship — One Station (Sheet 1 of 3)

EQUIPMENT*	FUEL STREAM RIG			NONTENSIONED SPANWIRE RIG			CLOSE-IN RIG		
	WITH PROBE	WITH ROBB COUPLING	WITH 4 INCH (101.6 mm) PIGTAIL	WITH PROBE	WITH ROBB COUPLING	WITH 4 INCH (101.6 mm) PIGTAIL	WITH ROBB COUPLING	WITH 4 INCH (101.6 mm) PIGTAIL	REMARKS
Crimper, Hose	1	1	1	1	1	1	1	1	
Crook, Hose	1	1	1	1	1	1	1	1	NAVSHIPS Std Plan 805-2554182
End Fitting, Spanwire Weak-Link; 3/4" (19.0 mm)	1	1	1	1	1	1	–	–	Preferred end fitting (see paragraph 3.12)
End Fitting, Spanwire Weak-Link; 7/8" (22.2 mm)	[1]	[1]	[1]	[1]	[1]	[1]	–	–	Preferred end fitting (see paragraph 3.12)
Gun, Line-Throwing NAVSEA SW-350-AL-MMO-010	1	1	1	1	1	1	1	1	(Note 2)
Hook, Pelican; 1/2" (12.7 mm)	2	3	4	2	3	4	–	–	
Hook, Pelican; 1" (25.4 mm)	–	–	–	–	–	–	–	–	Used when spanwire is to be connected to a long link
Hose, FAS	(Note 1)	(Note 1)	(Note 1)	(Note 1)	(Note 1)	(Note 1)	(Note 1)	(Note 1)	Size and length to suit rig
Line, Station Phone	1	1	1	1	1	1	1	1	
Line, Messenger Return	1	1	1	1	1	1	1	1	
Link, End	(Note 1)	(Note 1)	(Note 1)	(Note 1)	(Note 1)	(Note 1)	(Note 1)	(Note 1)	Size to suit application
Link, Special (Probe Fueling)	(Note 1)	–	(Note 1)	–	–	–	–	–	Used with eye socket spanwire end fitting (see Note 3)
Marker or Light Box, Transfer Station	1	1	1	1	1	1	1	1	
Messenger	1	1	1	1	1	1	1	1	
Messenger, Distance Line	1	1	1	1	1	1	1	1	Only for station nearest bridge when more than one station is rigged
Paddles, Signal (Set) or Wands (Set)	1	1	1	1	1	1	1	1	
Pendant Wire, 3/4" (19.0 mm) (Restrainer Wire)	1	1	1	1	1	1	–	–	Rigged from yo-yo block to deck (length to suit application)

Figure 3-51. Fueling-at-Sea Hardware for Delivery Ship — One Station (Sheet 2 of 3)

EQUIPMENT*	FUEL STREAM RIG			NONTENSIONED SPANWIRE RIG			CLOSE-IN RIG		
	WITH PROBE	WITH ROBB COUPLING	WITH 4 INCH (101.6 mm) PIGTAIL	WITH PROBE	WITH ROBB COUPLING	WITH 4 INCH (101.6 mm) PIGTAIL	WITH ROBB COUPLING	WITH 4 INCH (101.6 mm) PIGTAIL	REMARKS
Phone, Sound-Powered	2	2	2	2	2	2	2	2	
Pins, Cotter, Steel	(Note 1)	(Note 1)	(Note 1)	(Note 1)	(Note 1)	(Note 1)	(Note 1)	(Note 1)	Size and type to suit shackle
Probe, Double	[1]	–	–	–	–	–	–	–	Send to receiving ship with double- or single-probe receiver(s)
Probe, Single	1	[1]	–	1	[1]	–	–	–	Send to receiving ship with double- or single-probe receiver(s)
Projectile, Gun Line w/Shot Line	2	2	2	2	2	2	2	2	(Note 2)
Riding Line Fitting, Flow-Thru	2[4]	2[4]	2	2[4]	2[4]	2	2	2	Size to suit hose
Saddle, Hose, Flow-Thru – Type A	4[4]	4[4]	4	3[3]	3[3]	3	3	3	Size to suit hose
Saddle, Hose, Flow-Thru – Type B	[4]	[4]	–	[3]	[3]	–	–	–	Used as upper saddle on double-hose rig; size to suit hose
Seal, O-Ring	(Note 1)	(Note 1)	(Note 1)	(Note 1)	(Note 1)	(Note 1)	(Note 1)	(Note 1)	Size to fit hose
Shackle, Safety or Screw Pin	(Note 1)	(Note 1)	(Note 1)	(Note 1)	(Note 1)	(Note 1)	(Note 1)	(Note 1)	Size and type to suit application
Shackle, Special FAS	2	2	2	2	2	2	–	–	Used on riding line fittings
Tools, UNREP Working and Repair (Set)	1	1	1	1	1	1	1	1	See paragraph 2.3.9 and Fig. 2-14
Trolley, Free	–	3	4	–	3	4	–	–	
Trolley, Spanwire	5	3	3	5	2	2	–	–	

*Refer to UNREP Hardware and Equipment Manual, NAVSEA S9570-AD-CAT-010

[ ] Quantity shown is for double-hose rig.

NOTES: 1. Quantity as required.
2. See paragraph 2.3.4 for use limitation to CV, LHA, LPH, or ship with aircraft on deck.
3. For single-hose rig, requires 5/8" (15.8 mm) shackle and special link.
For double-hose rig, requires 3/4" (19.0 mm) shackle and special link.

Figure 3-51. Fueling-at-Sea Hardware for Delivery Ship — One Station (Sheet 3 of 3)

EQUIPMENT*	FUEL STREAM RIG			NONTENSIONED SPANWIRE RIG			CLOSE-IN RIG		REMARKS
	WITH PROBE	WITH ROBB COUPLING	WITH 4 INCH (101.6 mm) PIGTAIL	WITH PROBE	WITH ROBB COUPLING	WITH 4 INCH (101.6 mm) PIGTAIL	WITH ROBB COUPLING	WITH 4 INCH (101.6 mm) PIGTAIL	
Block, Snatch; 10" (254.0 mm) or 12" (304.8 mm)	(Note 1)	(Note 1)	(Note 1)	(Note 1)	(Note 1)	(Note 1)	(Note 1)	(Note 1)	
Block, Snatch; 12" (304.8 mm) Rig 25 w/Upset Shackle	1	–	–	1	–	–	–	–	
Bolo w/Shot Line	2	2	2	2	2	2	2	2	(Note 2)
Coupling, Hose, NATO Breakable-Spool – A-End	–	1	–	–	1	–	1	–	NATO- or SEATO-nation ship or MSC ship without probe receiver or Robb coupling
Coupling, Hose, Robb – Male End	[1]	1[2]	–	[1]	1[2]	–	1	–	For rig with probe: station has single-probe receiver and two fuel risers
Gun, Line-Throwing NAVSEA SW-350-AL-MMO-010	1	1	1	1	1	1	1	1	(Note 2)
Hose, Reinforced Wire; 7" (177.8 mm)	1[2]	–	–	1[2]	–	–	–	–	For probe receiver to fuel piping
Line, B/B Phone/ Distance Line	1	1	1	1	1	1	1	1	Only for station nearest bridge when more than one station is rigged
Line, Easing-Out	1	1	1	1	1	1	–	–	
Line, Remating	[1]	–	–	[1]	–	–	–	–	Use releasing line section of STAR messenger for single-probe receiver
Line, Riding	–	1	1	–	1	1	2	2	
Marker or Light Box, Transfer Station	1	1	1	1	1	1	1	1	
Paddles, Signal (Set) or Wands (Set)	1	1	1	1	1	1	1	1	
Phone, Sound-Powered	2	2	2	2	2	2	2	2	
Pins, Cotter, Steel	(Note 1)	(Note 1)	(Note 1)	(Note 1)	(Note 1)	(Note 1)	(Note 1)	(Note 1)	Size and type to suit shackle and pelican hook (see Fig. 2-21)

Figure 3-52. Fueling-at-Sea Hardware for Receiving Ship — One Station (Sheet 1 of 2)

EQUIPMENT*	FUEL STREAM RIG			NONTENSIONED SPANWIRE RIG			CLOSE-IN RIG		REMARKS
	WITH PROBE	WITH ROBB COUPLING	WITH 4 INCH (101.6 mm) PIGTAIL	WITH PROBE	WITH ROBB COUPLING	WITH 4 INCH (101.6 mm) PIGTAIL	WITH ROBB COUPLING	WITH 4 INCH (101.6 mm) PIGTAIL	
Projectile, Gun - Line w/ Shot Line	2	2	2	2	2	2	2	2	(Note 2)
Receiver for Single Probe	1	–	–	1	–	–	–	–	Receives single probe or upper probe of double probe
Receivers for Double Probe	1	–	–	1	–	–	–	–	Receives single or double probe
Shackles, Screw Pin or Safety	(Note 1)	(Note 1)	(Note 1)	(Note 1)	(Note 1)	(Note 1)	(Note 1)	(Note 1)	Size and type to suit application
Tackle, Two-Fold	–	1	1	–	1	1	2	2	
Tools, UNREP Working and Repair (Set)	1	1	1	1	1	1	1	1	See paragraph 2.3.9 and Fig. 2-14

*Refer to UNREP Hardware and Equipment Manual, NAVSEA S9570-AD-CAT-010

[ ] Quantity shown is for double-hose rig.

NOTES: 1. Quantity as required.
2. See paragraph 2.3.4 for use limitation to CV, LHA, LPH, or ship with aircraft on deck.

Figure 3-52. Fueling-at-Sea Hardware for Receiving Ship — One Station (Sheet 2 of 2)

CHAPTER 10

Replenishment From Tankers

10.1 SCOPE OF TANKER REPLENISHMENT

The United States military services regularly use tankers to transport petroleum products from point to point throughout the world. These tankers, including both government-owned and industry-owned ships, are operated by shipping companies under a contract or a charter with the Military Sealift Command (MSC). These tankers have limited fueling-at-sea equipment installed for transferring petroleum products at sea by the alongside method. ("Limited" in that they can refuel only those fleet units which can pass a spanwire or fuel STREAM rig.) Selected tankers are also equipped for delivering fuel by the astern method. The U.S. Navy supports the installation of such equipment in order to increase national defense capabilities. This fueling-at-sea capability contributes to fleet readiness and provides increased flexibility during emergencies. By supplying petroleum products to Navy ships at sea, tankers make it possible for fleet units to remain on station instead of having to break off operations and return to port for refueling.

10.1.1 Tanker Characteristics and Capabilities. MSC and U.S. flag tankers presently equipped with a limited fueling-at-sea capability are listed in Figures 10-11 and 10-12 at the end of the chapter.

10.1.1.1 Alongside Refueling. For alongside refueling, tankers are equipped to receive the spanwire or fuel STREAM rig (see Figure 10-1). Installed equipment includes:

1. Tripods and fittings mounted on the weather or platform decks to accommodate the rig sent over by the fleet unit. On some tankers, existing kingposts are used in lieu of tripods.
2. Quick-closing valves at cargo manifolds.
3. Pipeline extensions to transfer stations.

Most tankers have four discharge stations, two on each side. (A few tankers have six stations, three on each side.)

Tankers can transfer bulk petroleum products to fleet ships from two stations on one side and, on a few hours' notice, can rig jumper hoses on deck to handle double hoses at each station on one side. In most cases, lack of manpower prevents tankers from transferring cargo from both sides at the same time. However, to expedite refueling, a tanker's merchant marine crew may be augmented by additional personnel prior to sailing. If additional personnel are not assigned, a tanker normally cannot connect or disconnect more than one hose at a time.

10.1.1.2 Astern Refueling. Some U.S. flag tankers are presently equipped for delivering fuel by the astern method. All MSC USNS tankers will eventually be equipped with astern refueling rigs.

10.1.2 Personnel Duties. A tanker's crew varies from 24 to 32 men, depending on the ship's design and automation. The master must ensure that his crew is adequately trained and prepared prior to a refueling operation and that all stations are manned with the most capable personnel.

Along with normal sea and discharging functions, other duties include phone talking, line handling, visual communications, rigging/unrigging, and adequate officer supervision.

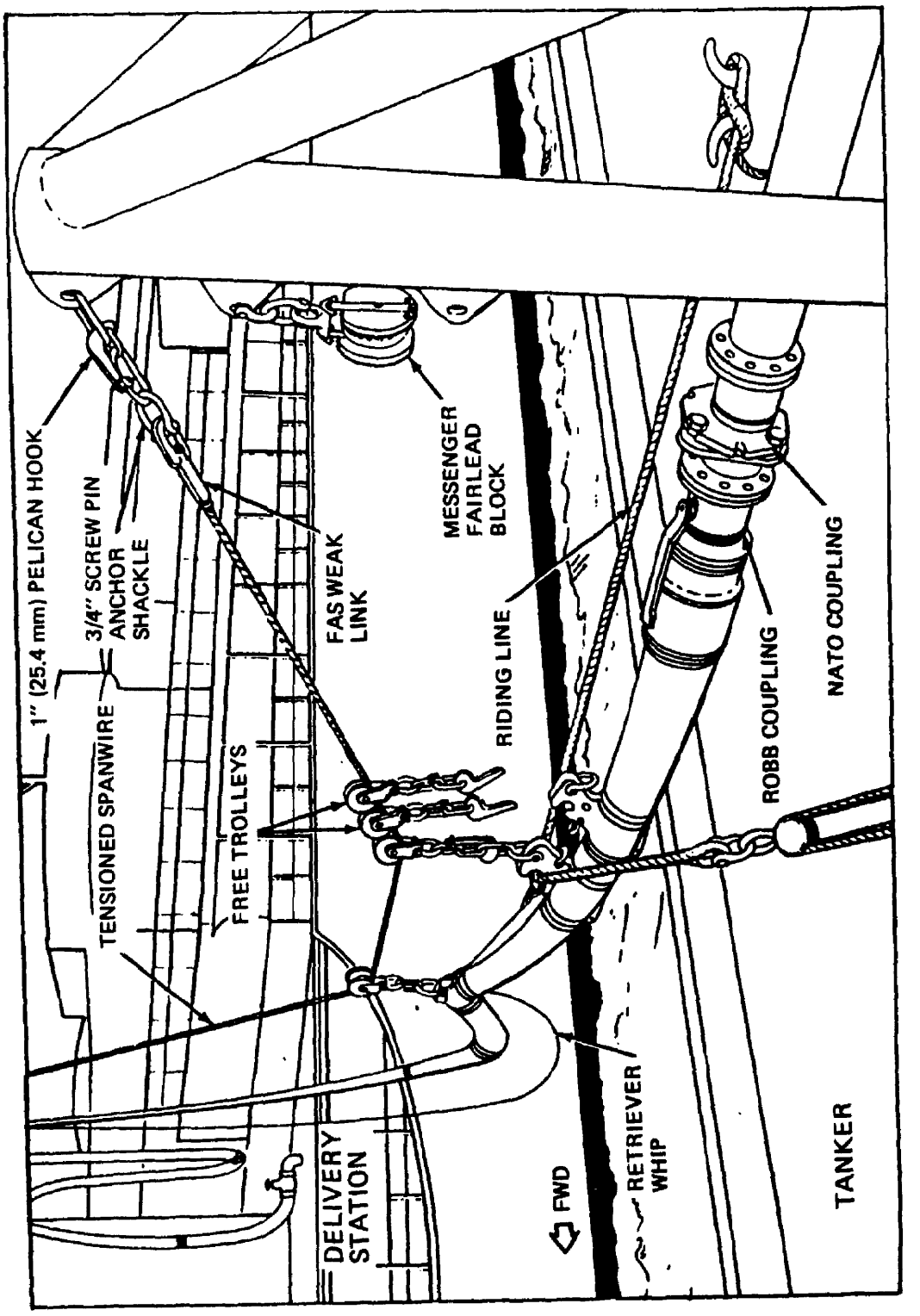


Figure 10-1. Spanwire Rig Connection on Tanker

The chief engineer should be located in the machinery spaces. He should be prepared to answer bells promptly and handle any possible emergency.

10.2 COMMUNICATIONS AND RENDEZVOUS PROCEDURES

When assigned to a replenishment operation, the tanker may be directed to rendezvous with a naval unit or the naval unit will rendezvous along the tanker's track. To expedite rendezvous and facilitate preparations necessary for an efficient transfer of cargo, communications must be established between the tanker and fleet unit well in advance of the scheduled rendezvous.

Communication methods used by tankers for replenishment operations include radiotelegraph and radiotelephone, sound-powered phone, megaphone, flags, and light signals.

Messages addressed to tankers must have plain language headings. Tankers do not hold Navy call sign publications or call sign encryption devices, and they do not have cryptographic capability.

If radio silence is prescribed, tankers will not transmit by radio except in case of distress.

When weather or operations require it, the naval commander may change the time and place of rendezvous by direct liaison with the tanker. He may also direct the tanker to enter port to accomplish or complete the operation.

10.2.1 Communication Plan. When a rendezvous is scheduled, the tanker shall submit a communication plan to the fleet unit by priority message at least 72 hours prior to rendezvous or immediately upon receipt of a consolidation message. The communication plan will include:

1. Primary communication guard
2. Radio officer's working hours
3. Radio call sign and international maritime satellite (INMARSAT) identification
4. Position and intended movement (PIM)
5. Working frequency guarded in the MF-HF range (for ship-to-ship communications during the hours stipulated by the tanker).

10.2.2 Communication Methods

10.2.2.1 Frequencies. Primary means for sending and receiving long-range communications will be by INMARSAT. When about 48 hours away from rendezvous or as directed in the tanker's sailing orders and during the time the tanker's radio officer is on watch, contact should be established on the frequencies promulgated in the sailing orders to the tanker. Communications may be shifted to the bridge-to-bridge circuit when ships are within range.

10.2.2.2 Tanker. A tanker which is scheduled to consolidate cargo with a fleet unit will continue to maintain guard on the assigned primary long-range communications system. Additional guard will be maintained on circuits in accordance with a prearranged schedule with the fleet unit.

10.2.2.3 Fleet Unit. After a tanker is assigned to a replenishment-at-sea operation, the fleet unit will communicate with the tanker as appropriate. An early message addressed to the tanker will indicate:

1. Position and intended movement (PIM)
2. Frequency or time interval of PIM exchanges
3. Radio call sign
4. First call time for establishing ship/ship circuit, including frequency, CW, or voice

5. Additional information or instructions as desired (such as side and stations to be used, need for rigging jumper hose to handle double-hose rig, coupling arrangement, type and amount of product from each station, desired temperature of cargo, and flag approach and ready signals).

10.2.3 PIM Reports. When a tanker submits PIM reports, this format is used:

1. Position

2. Time of position in whole hours

3. Course

4. Speed

5. Period in whole hours for which preceding course and speed are in force. (If the period covered by the PIM includes several changes of course and speed, additional numerals for 3, 4, and 5 may be signaled.)

10.2.4 Movement Reports. These reports are submitted in accordance with COMSCINST 3125.5 series. Reports will vary according to the type of control exercised over the tanker.

10.2.4.1 MSC Control. When a tanker is scheduled to a specific replenishment-at-sea operation and is not assigned to a fleet command for an extended period of time, the normal movement reports are made, except when COMSC issues special instructions.

10.2.4.2 Fleet Command Control. When a tanker is scheduled to report to a fleet command for operational control for an extended period of time, the normal movement reports are not made. Instead, only the following reports are submitted:

1. Special Departure Report, using the following format: UNCLAS, MSCMR 21Ø64Ø-Z3 USNS AMERICAN EXPLORER TAO 165//DEP NAPLES, ITALY 21Ø64ØZ3 DI 14.5K OPS IAW COMSERVFORSIX FLT OPORD 2Ø1-66//END

2. The usual Arrival Report after completion of the operation.

10.3 COMMUNICATION FACILITIES AND TANKER EQUIPMENT

10.3.1 Sound-Powered Portable Phone Units. Four units, complete with plugs, receptacles, and cables, are provided. These are used for bridge-to-station and station-to-station communications on the tanker. Phone lines for use between the tanker and the fleet unit are passed over by messenger from the fleet unit.

10.3.2 Megaphone. A portable electric megaphone is provided as an emergency standby means of communication; it may also be used in the final stage of the approach before telephones have been connected.

10.3.3 Radio Equipment. Radio equipment consists of:

1. One main radio transmitter; minimum frequency range 405 to 535 kHz, with crystals for 410, 425, 432, 444, 454, 480, and 500 kHz. Industry tankers may not have 425, 454, and 480 kHz crystals.

2. One reserve radio transmitter capable of battery operation, with frequency range and crystals the same as for the main radio transmitter.

3. One HF radio transmitter; minimum frequency range 2 to 24 MHz.

4. One transmitting automatic alarm keyer system.

5. One main radio receiver; minimum frequency ranges and types of reception are 100 to 200 kHz, A-1/A-2; 405 to 535 kHz, A-1/A-2; 485 to 515 kHz, Class B.

6. One reserve radio receiver capable of battery operation; minimum frequency ranges and types of reception are 405 to 535 kHz, A-1/A-2; 485 to 515 kHz, Class B.

7. Two HF radio receivers; minimum frequency range 2 to 24 MHz, with types A-1/A-2/A-3 reception. Industry tankers may have only one such receiver separate from the main receiver.

8. One receiving automatic alarm system.

9. One HF radiotelephone set; minimum frequency range 2 to 30 MHz; with A3J emission and reception.

10. One VHF FM radiotelephone set; frequency range 156 to 162 MHz, with type F3 emission and reception. Preferred channels are 13 or 16.

11. One HF radioteletype transmit/receive system with type F1 emission and with selective calling (SELCAL) and error correction (SITOR) devices installed in the system. Minimum frequency range is 2 to 30 MHz and minimum transmitter RF power output is 1,000 watts.

12. One international maritime satellite (INMARSAT) terminal with bridge voice remote unit.

10.3.4 Cryptosystem. MSC USNS and industry-owned tankers do NOT have cryptographic capability. USNS tanker masters hold clearance for Confidential material. Classified messages to these tankers can be relayed via a shore establishment boarding officer if operational schedule permits.

10.3.5 Communication Publications. Tankers hold H.O. 102, International Code of Signals. Tankers do not hold ACP 131, Communication Instructions — Operating Signals.

10.4 REPLENISHMENT COURSE AND SPEED FOR ALONGSIDE REFUELING

When rendezvous has been effected, the naval commander designates the course and speed for the replenishment operation. The course and speed most favorable for the tanker are preferred, because the tanker's refueling stations are often on the main deck. It is preferable for the tanker to be on the lee side of the fleet unit. The fleet unit makes the approach and adjusts course and speed to maintain station on the tanker.

10.4.1 Course

10.4.1.1 The Tanker Maintains the Prescribed Course and keeps the fleet unit informed at all times of the course being steered. The helmsman must maintain heading within one or two degrees of the designated course.

10.4.1.2 Experienced Helmsmen must be used during refueling operations. Normally, the three best helmsmen should be used to relieve each other every half hour, except when it appears more advantageous to use a different arrangement because of the estimated refueling time or the availability of experienced helmsmen. An experienced helmsman should be assigned to monitor the actions of the helmsman.

10.4.1.3 Steering Control should be by hand. The automatic gyropilot may be used if conditions are such that the master determines he can maintain safe and effective steering control. When the automatic gyropilot is used, an experienced helmsman must be on station, alert, and ready to shift to hand-steering (either electric or hydraulic if necessary).

10.4.2 Speed. The tanker maintains the prescribed speed as agreed upon with the naval commander. Normally, a refueling speed of 12 to 14 knots will allow (1) the tanker to use maximum pumping rates and (2) the fleet unit to maneuver and maintain station effectively.

Higher speeds may be obtained, depending on the capabilities of units involved.

10.4.3 Station Keeping Alongside

10.4.3.1 Distance Between Ships. The distance between ships which is best for safety and operational purposes varies with the wind and sea conditions, the maneuverability of the ship alongside, and the type of transfer rig. See Figure 2-3 for prescribed distances between ships for the transfer rig used. Optimum distance between ships is 100 feet (30.4 m) for the normal spanwire rig. When using the fuel STREAM rig, distance between ships should be 150 to 200 feet (45.7 to 60.9 m).

10.4.3.2 Rudder Required. To maintain course when a ship is alongside, it is usually necessary to continuously carry a small amount of rudder. The amount depends on the size of both ships, their loads, sea and wind conditions, refueling speed, and the distance between ships. As cargo is transferred and the trim of the ship changes, the amount of rudder required to maintain a steady course will change.

10.5 REPLENISHMENT PROCEDURES

Tankers are not equipped to pass alongside fueling rigs to receiving ships. They are, therefore, limited to refueling fleet units which can pass the spanwire or fuel STREAM rig to them. Information about these rigs was provided in Chapter 3. To apply this information to refueling by tankers, substitute the word TANKER for receiving ship and the word OILER or words FLEET UNIT for delivery ship. Paragraph 10.5.1 contains additional details on the spanwire rig.

10.5.1 Merchant Tanker Spanwire Refueling

10.5.1.1 Tanker Hose. Tankers have 6 inch (152.4 mm) or 8 inch (203.2 mm) hoses with the necessary reducers. Minimum hose allowance per ship is 140 feet (42.6 m) in 10 foot (3.0 m) and 20 foot (6.0 m) lengths. When practicable, a length of hose is used to make a flexible extension to the cargo manifold, thus facilitating hook-up to the fleet unit's gear. The extra hose lengths are spares and are used for inport loading and discharging.

10.5.1.2 Use of Quick-Release Couplings by Tankers. A 6 inch (152.4 mm) breakable-spool quick-release (NATO) coupling and/or combined quick-release coupling and valve (Robb coupling) are used in refueling. They are shown in Figures 3-11 and 3-12. Masters of tankers should ensure that crewmembers stationed at refueling stations know how to use these couplings. If tanker personnel require practical instruction on using the Robb coupling, a request may be made to the fleet unit to send over Navy personnel to instruct the tanker crew.

10.5.1.3 Breakable-Spool Quick-Release Coupling. All tankers are supplied with both the A-end and the B-end of this coupling. Tankers normally have the A-end installed on the cargo manifold or the hose extension to the manifold. The fleet unit sends over the hose fitted with the B-end of the coupling.

10.5.1.4 Robb Coupling. Some tankers may be supplied with the male end of the Robb coupling. Like the A-end of the breakable-spool coupling, it is installed on the manifold or the hose extension, ready for connection to the female end that comes over with the hose from the fleet unit. Care should be taken to avoid dropping and damaging the Robb coupling; particular care is required when the pelican hook is released.

10.5.1.5 Breakable-Spool and Robb Coupling Combined. This combination is recommended for use to allow disconnect in the event of an emergency, as the Robb coupling will not disconnect when under a strain. The A-end and B-end of the breakable-spool coupling are bolted together, and the coupling is fitted to the tanker's fuel manifold. The male end of the Robb coupling is attached to the outboard end of the breakable-spool coupling.

10.5.1.6 Fleet Unit Procedures. The fleet unit supplies the rig and passes all lines (including the phone/distance line) to the tanker. Because of the shortage of manpower on the tanker, only one rig should be passed at a time. The fleet unit tends all lines.

As the fleet unit comes alongside, it passes a shot line to the tanker by means of a line-throwing gun or bolo (a padded weight, heaved by hand). The shot line is attached to the 3-1/2 inch (88.9 mm) or 4 inch (101.6 mm) synthetic hose messenger by suitable lengths of 3/4 inch (19.0 mm) and 1-1/2 inch (38.1 mm) nylon, taper-spliced together. The phone/distance line, station phone line, and spanwire are attached to the hose messenger.

10.5.1.7 Passing the Rig. As the fleet unit passes the lines and the rig, the tanker receives using these procedures:

1. Hauls in the shot line and the first messenger.

2. Secures the phone/distance line with the zero mark at the rail or on a stanchion directly below the navigation bridge.

3. Hooks up the telephone.

4. Continues to haul in until the rig messenger comes aboard, places the end of the messenger into a 12 inch (304.8 mm) snatch block below the padeye for the spanwire, and leads the end to a winch.

5. Continues to haul in on the messenger until the pelican hook on the spanwire comes aboard.

6. Secures the pelican hook to the padeye on the tripod or kingpost and detaches the messenger from the spanwire. (The fleet unit takes up slack in the spanwire.)

7. Resumes heaving in on the messenger to bring the hose on board.

8. Pulls the hose in until a bight (not an eye) of one riding line can be slipped over the riding line hook.

9. Cuts the stops which secure the hose to the messenger.

10. Attaches the riding line as soon as practicable. The riding line must be attached before pumping commences.

11. Removes the blank flange or cap on the hose and connects the hose to the coupling.

12. Attaches the messenger to the retrieving line and immediately returns the messenger to the fleet unit.

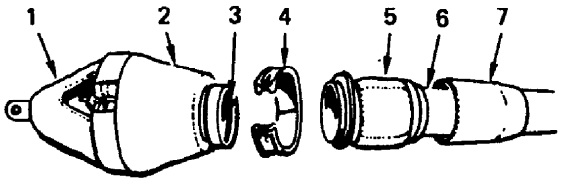
10.5.2 Merchant Tanker Astern Refueling of Escort Ships — Float Method. U.S. flag tankers are currently being configured with an astern refueling capability. That capability is expected to provide a more readily available source of fuel for mobile logistic support of escort ships. Astern refueling procedures, such as communications, maneuvering, emergency breakaway, and other concepts that are common in delivery and receiving ships, were described in detail in Chapter 2 and may be referred to in this chapter.

The procedures outlined in this paragraph describe the operation of an astern refueling system using the float method. The delivery ship (merchant tanker) is not configured or equipped to use a gunline method of passing the rig and should not be expected to employ that method.

10.5.2.1 Delivery Ship System Description

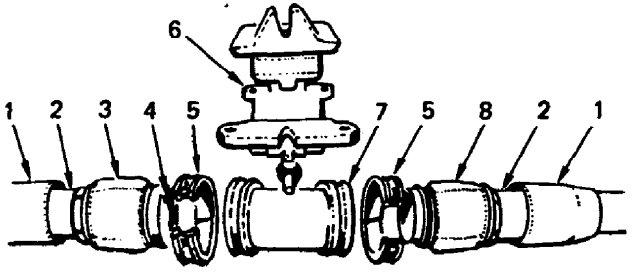
10.5.2.1.1 Astern Refueling Hose Assembly. The astern refueling hose is made up of three flights to permit stowage of the partially assembled rig and to provide a greater degree of handling ease. Figure 10-2 shows the hose assembly. Total length of all three flights is 745

DETAIL: MODIFIED BREAKABLE SPOOL ATTACHMENT



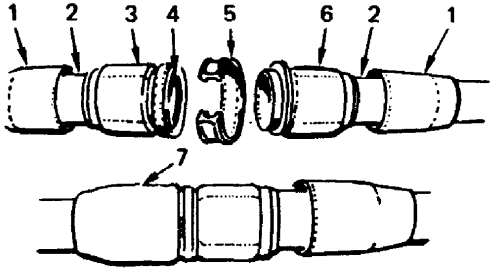
1. CONICAL CAP
2. MODIFIED B-END OF BREAKABLE SPOOL
3. "O" RING
4. SPLIT CLAMP
5. SEGMENTED MALE HOSE COUPLING
6. 6-INCH (152.4 mm) HOSE
7. PROTECTIVE JACKET

DETAIL: SECURING ADAPTER CLAMP ATTACHMENT



1. PROTECTIVE JACKET
2. 6-INCH (152.4 mm) HOSE
3. SEGMENTED FEMALE HOSE COUPLING
4. "O" RING
5. SPLIT CLAMP
6. SECURING ADAPTER CLAMP
7. SECURING ADAPTER
8. SEGMENTED MALE HOSE COUPLING

DETAIL: HOSE COUPLING ATTACHMENT



1. PROTECTIVE JACKET
2. 6-INCH (152.4 mm) HOSE
3. SEGMENTED FEMALE HOSE COUPLING
4. "O" RING
5. SPLIT CLAMP
6. SEGMENTED MALE HOSE COUPLING
7. PROTECTIVE JACKET SECURED OVER COUPLING

FLIGHT 1 + 2 - 535' (163 m)
FLIGHT 1 + 2 + 3 = 745' (227 m)

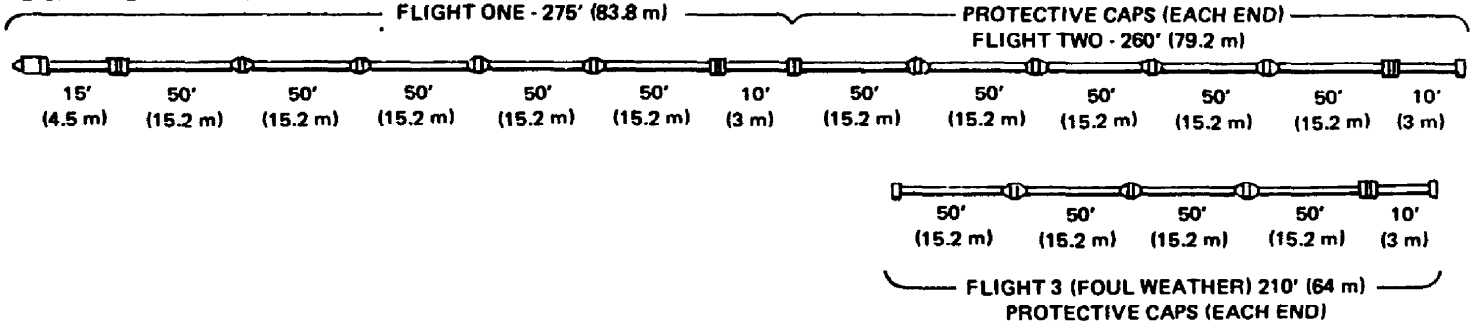


Figure 10-2. Astern Refueling Hose Assembly (Merchant Tanker)

feet (227.0 m). Each flight consists of the following components:

FLIGHT 1

1. One 15 foot (4.5 m) length of hose with coupling on outboard end

2. Five 50 foot (15.2 m) lengths of hose

3. One 10 foot (3.0 m) length of hose with securing adapter

4. Length of Flight 1 is 275 feet (83.8 m).

FLIGHT 2

1. Five 50 foot (15.2 m) lengths of hose

2. One 10 foot (3.0 m) length of hose with securing adapter

3. Length of Flight 2 is 260 feet (79.2 m).

FLIGHT 3

1. Four 50 foot (15.2 m) lengths of hose

2. One 10 foot (3.0 m) length of hose with securing adapter

3. Length of Flight 3 is 210 feet (64.0 m).

Flight 3 is intended, when required, to provide an additional flight of hose for foul-weather operations. Flight 3 is not normally streamed during fair-weather operations. The three flights are stowed ready for streaming. Flight 1 is stowed in horizontal rollers along the poop deck and walkways. Flights 2 and 3 are lashed in stowage racks adjacent to the horizontal rollers.

10.5.2.1.2 Conical Cap, Messenger Bridle, Securing Adapter, and Hose End Assembly. Flight 1 is fitted on the outboard end with the modified B-end of the breakable-spool coupling and a removable conical cap for the coupling (Figure 10-3). One end of the messenger bridle is attached to the conical cap's outboard end (Figure 10-4). The other end of the messenger bridle is attached to the securing adapter, using a securing adapter clamp (Figure 10-5). The inboard end is fitted with an inboard conical cap for attachment of the forward recovery wire (Figure 10-5). Each end of Flights 2 and 3 is fitted with protective caps to prevent any contamination of the hose's interior from an exterior source.

10.5.2.1.3 Delivery Ship Preparations for Streaming the Hose. A 3/4 inch (19.0 mm) recovery wire is fairled from a block that is in line with the path of the hose. The recovery wire will be shackled to the conical cap on the inboard end of each flight streamed (Figure 10-5). It controls the rate at which the hose is payed out as the hose is streamed and is hauled in to recover the hose at the end of the replenishment operation. Two securing pendants are installed — they are attached to the securing adapter clamp to restrain each flight as it is streamed.

The stern of the delivery ship is fitted with a closed stern roller (Figure 10-6). A fairlead block, strapped to the top of the stern roller and in line with the hose, provides a fairlead for the easing-out messenger. The easing-out line is 2-1/2 inch (63.5 mm) nylon. Various blocks provide a fairlead for the easing-out messenger to the gypsy head of a stern winch (Figure 10-6).

A fuel oil riser, located on the stern, is fitted with (1) a gate valve for controlling fuel flow and (2) an air supply system for inflating the hose, once it has been streamed, and for blowdown of the hose, when refueling has been completed. There are appropriate valves fitted for controlling the air supply and a "dump valve" fitted for rapidly releasing air from the hose if required. Appropriate gauges are also fitted.

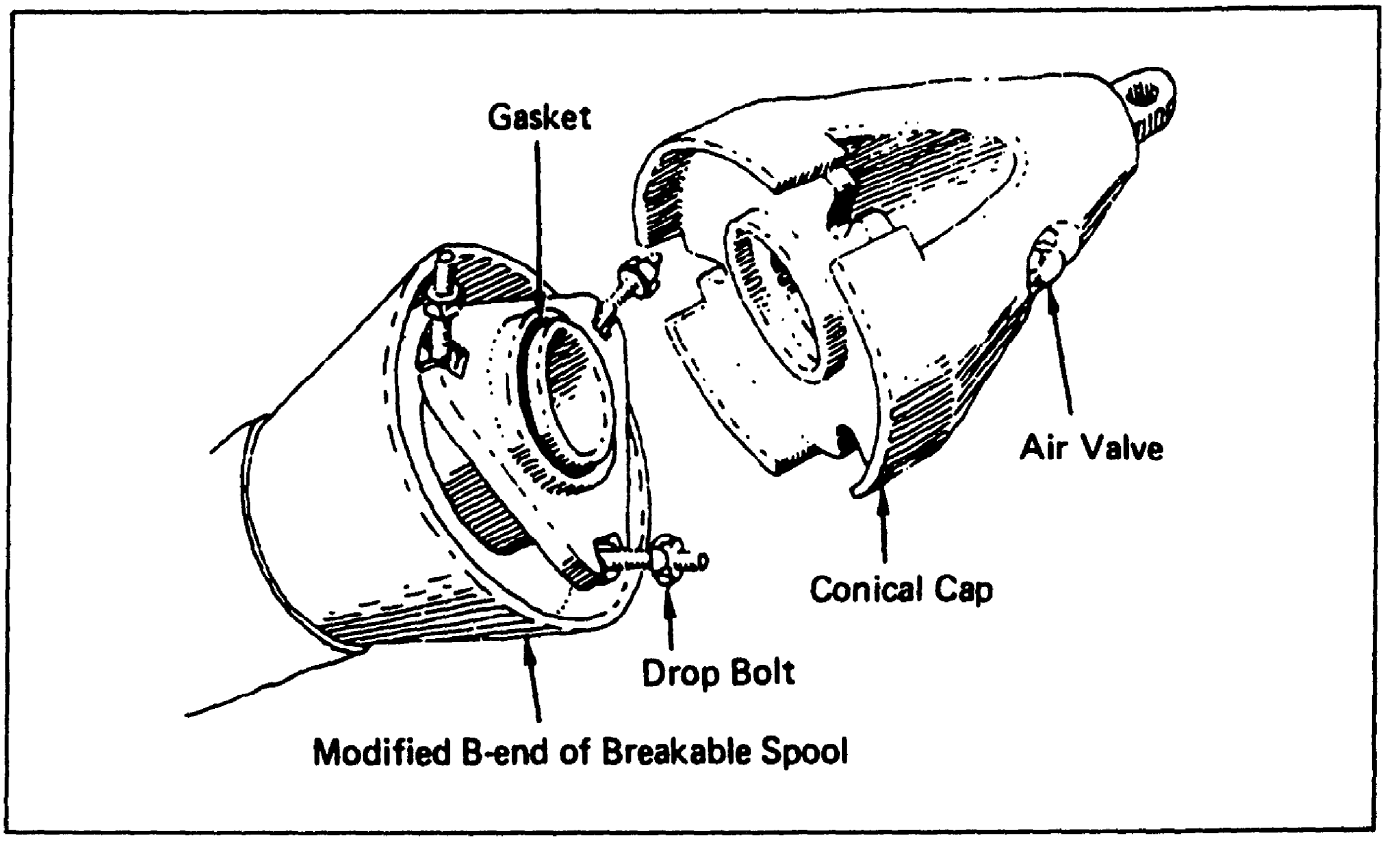


Figure 10-3. Hose End (Outboard) Conical Cap Assembly

A jumper hose, rigged to the termination of the fuel riser, serves as the final connection between the fuel riser and the astern hose, once the hose has been streamed.

10.5.2.1.4 Hose Messenger and Position Buoy Assemblies. The delivery ship provides a hose messenger which consists of 310 feet (94.4 m) of 1 inch (25.4 mm), double-braided, nylon rope (Figure 10-7). A spout-type float, a length of 9/16 inch (14.2 mm) wire rope, and a grapnel are attached to the outboard end by a snap hook. The inboard end is shackled to the pear-shaped link on the messenger bridle.

The delivery ship also provides a position buoy line which consists of 800 feet (243.8 m) of 3/8 inch (9.5 mm) wire rope (Figure 10-7). A spout-type float is shackled to the outboard end. Swaged markers are attached to the line at 100 foot (30.4 m) intervals to indicate how much line has been streamed.

10.5.2.2 Rigging the Delivery Ship

1. Rig one end of the easing-out line through its deck fairleads, the fairlead on the stern roller, and along Flight 1 for about 50 feet (15.2 m). Stop off the line to the hose with small stuff every 3 to 5 feet (91.4 to 152.4 cm). Fake down the other end near the gypsy. (See Figure 10-8.)

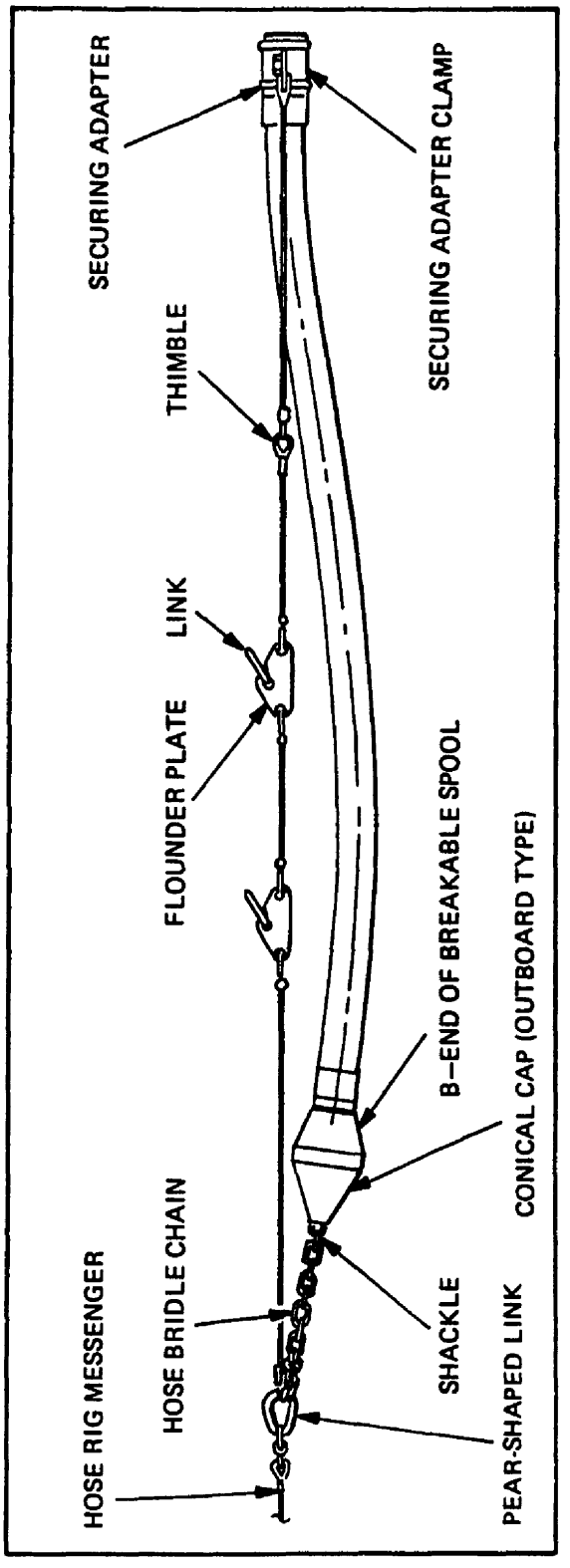


Figure 10-4. Messenger Bridle and Hose End Assembly

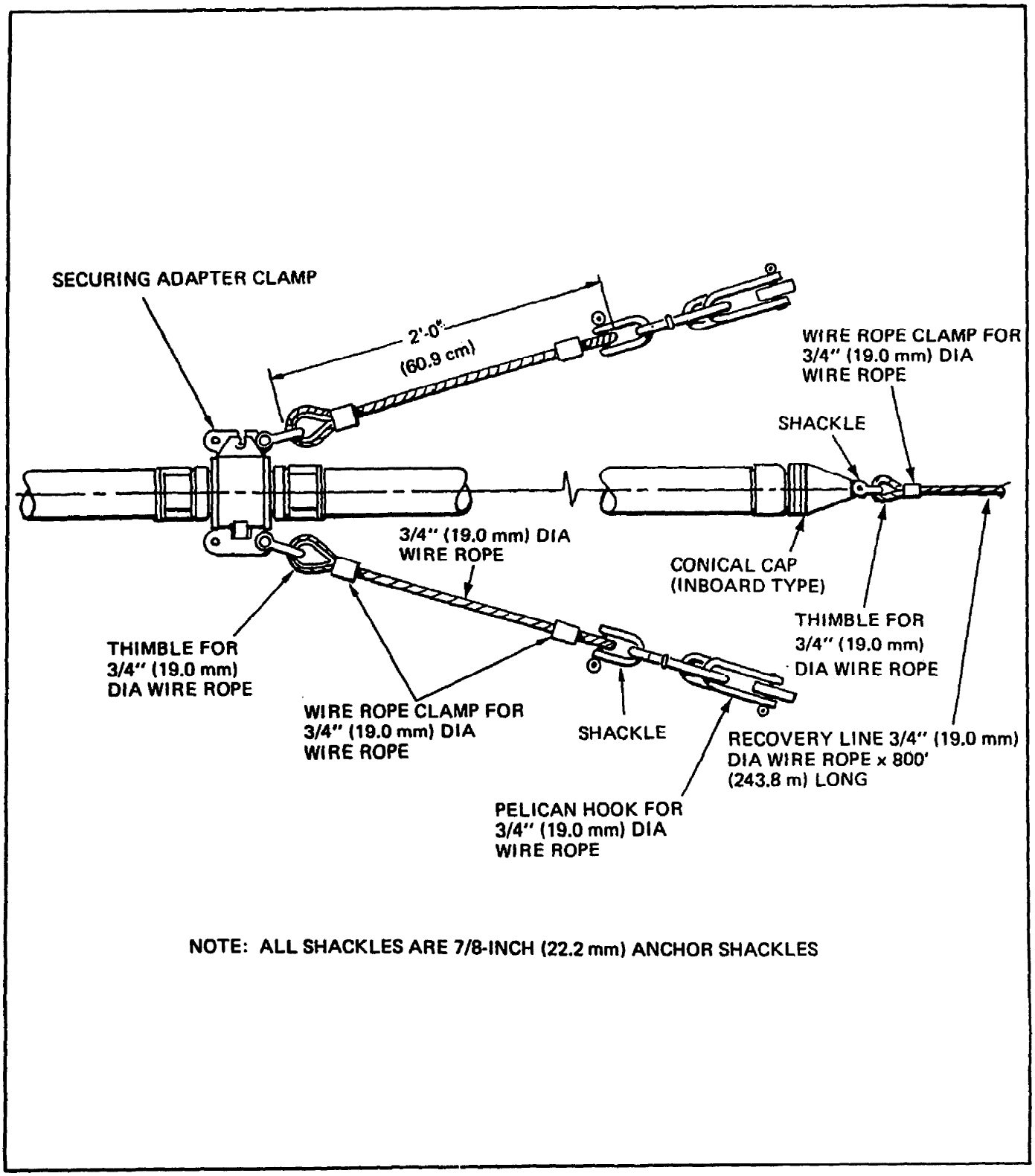


Figure 10-5. Hose Securing Pendant and Adapter

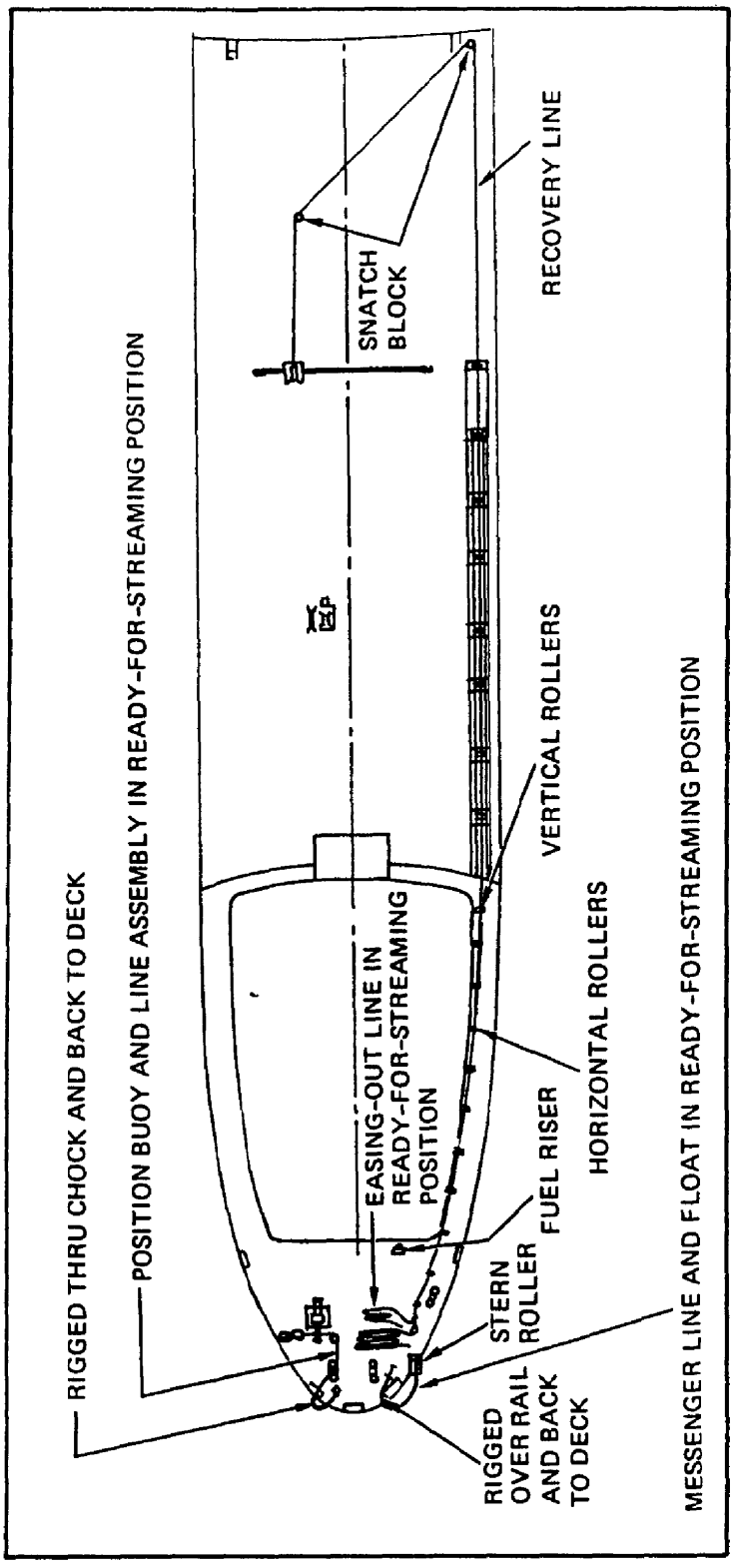


Figure 10-6. Delivery Ship Rigged for Streaming

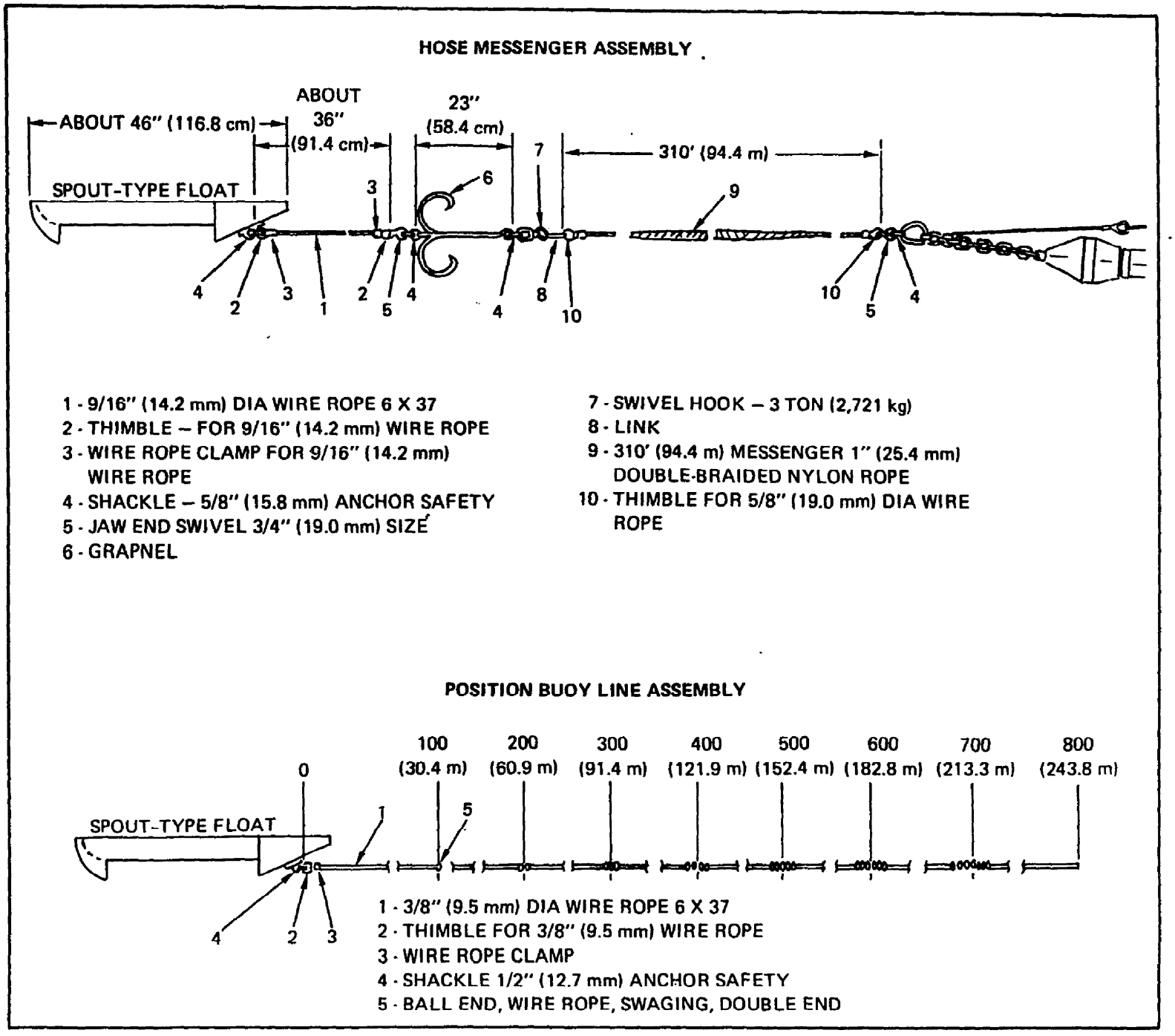


Figure 10-7. Hose Messenger and Position Buoy Assemblies

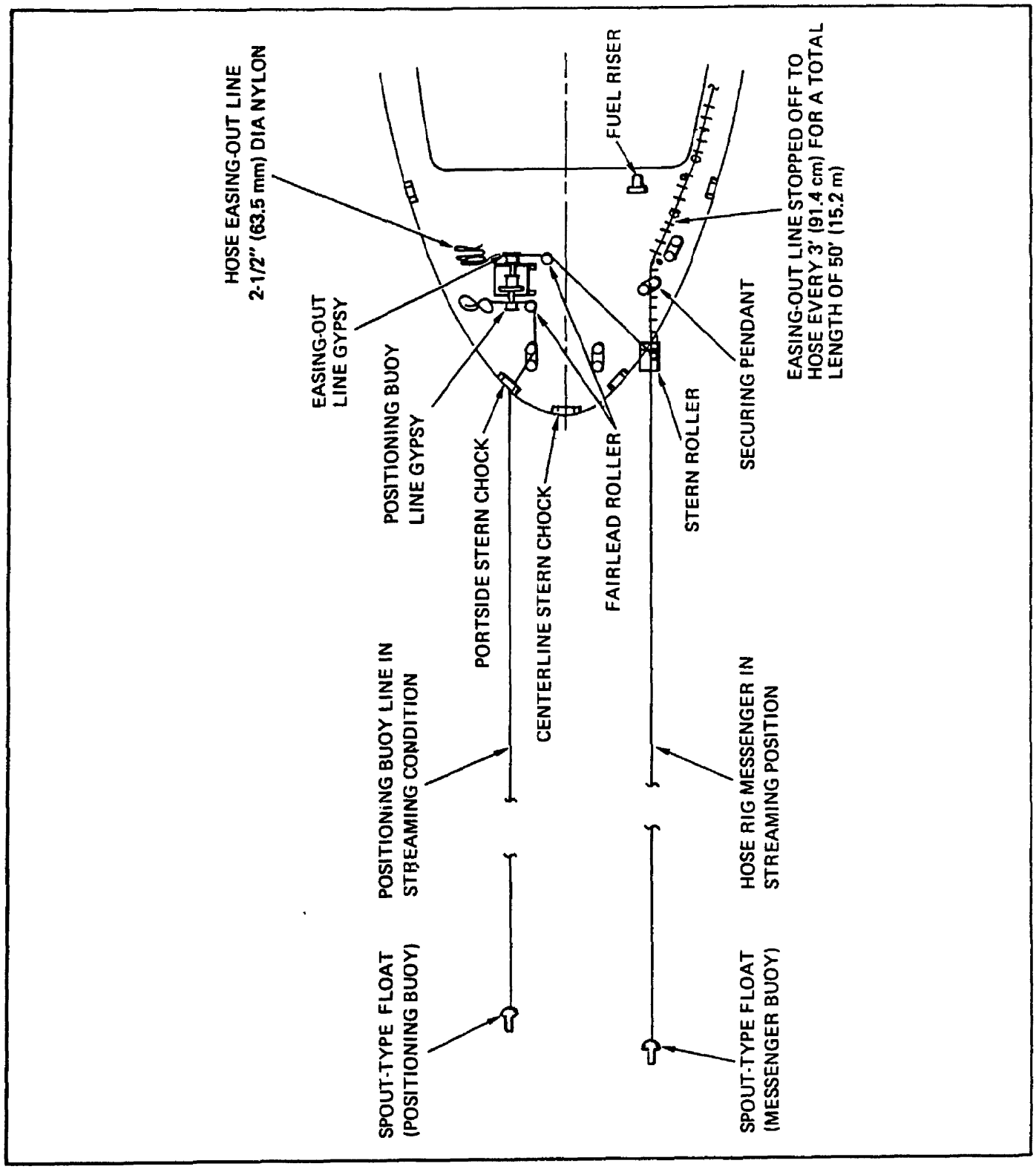


Figure 10-8. Easing Hose Through Stern Roller

2. Pass the outboard end of the position buoy line through a portside stern chock and fairleads and back on deck over the life rail. Attach the float. Fake down the inboard end near the gypsy. (See Figure 10-6.)

3. Pass the outboard end of the hose messenger through the stern roller and back on deck over the life rail. Attach the float, wire, and grapnel to the outboard end. Fake down the remainder of the messenger for free running through the stern roller. Shackle the inboard end to the pear-shaped link of the hose bridle. Insert the cotter pin in the shackle and spread the ends. (See Figure 10-6.)

4. Open the securing adapter clamp on the securing pendants by loosening the toggle bolt.

5. Rig the jumper hose to the fuel riser.

6. Connect the recovery wire to the conical cap on the inboard end of Flight 1.

7. Pass the retrieving wire from the drum of the stern winch, outboard through the centerline stern chock, and back inboard through the stern roller. Shackle the end to the pear-shaped link on the messenger bridle.

8. Check to ensure that the conical cap and the air valve are tight.

9. Remove any portable steps over the hose.

10.5.2.3 Streaming the Rig

1. Lower the position float, with line attached, over the rail and into the water.

2. Veer the float to the proper distance (Figure 10-8), using the gypsy head to restrain it. From the most stern point, sight the ball swaging on the line. Once veered, belay to a cleat.

3. Lower the messenger float over the rail and into the water by hand. Ease the remaining line out, using an available bitt or cleat, or allow the line to run free once it is in the water.

WARNING

Stand clear of faked-down messenger.

4. Pass the free end of the easing-out line around the gypsy and begin veering Flight 1. Simultaneously ease out on the recovery wire's winch. Cut each stop as it reaches the stern roller. When sufficient hose is in the water, drag will cause the hose to veer on its own. Ease out the remainder of Flight 1 with the recovery wire.

5. When the securing adapter (10 feet (3.0 m) from the inboard end of Flight 1) nears the securing pendants, attach the securing adapter clamp to the securing adapter and tighten the toggle bolt. Continue to ease out on Flight 1 until the pendants are holding the hose. Then remove the conical cap from the inboard end of the hose by removing the split clamps. Retrieve the recovery wire and prepare for attaching it to the inboard end of Flight 2.

6. Remove the protective caps from the ends of Flight 2. Cut the stowage rack lashing, allowing Flight 2 to roll into the horizontal rollers. Attach the conical cap to the inboard end of Flight 2.

7. Using the easing-out messenger, pull Flight 2 along the horizontal rollers until its outboard end can be connected to the 10 foot (3.0 m) pigtail of Flight 1. Couple the hose ends using the split clamp provided. Check to ensure that an "O" ring is installed before clamping.

8. Take a strain on the recovery wire until the securing adapter clamp can be removed from Flight 1. Remove the clamp by loosening the toggle bolt.

9. Ease the remainder of Flight 2 out until the securing adapter clamp can be attached to the securing adapter on Flight 2. Attach the clamp and tighten the toggle bolt.

10. Continue to ease out on the hose until the pendants are holding the hose, then disconnect the conical cap. Do not retrieve the recovery wire.

11. Attach the jumper hose from the fuel riser to the 10 foot (3.0 m) pigtail of Flight 2. Check to ensure that an "O" ring is installed before clamping.

Note

If required, Flight 3 is streamed in the same manner as Flight 2.

12. Open fuel riser air valve and inflate hose to 8 to 10 psi (55.1 to 68.9 kPa) pressure. Close air valve.

13. Stand by for hose pickup and signal to "Commence pumping."

14. On signal, open fuel riser valve and commence pumping.

Figure 10-9 is a plan-view of a typical astern refueling operation. It illustrates the most desirable location of the receiving station relative to the marker buoy.

10.5.2.4 Retrieving the Rig

1. Stand by to receive signal to "Cease pumping."

2. Close fuel riser valve and stand by to receive signal to "Start blowdown."

3. On signal, open riser blowdown valve until signaled "Stop blowdown" (about 5 minutes), then close blowdown valve.

4. When rig is all clear on receiving ship, disconnect jumper hose from astern hose. Reattach inboard conical cap and recover the rig in the reverse sequence as that used in streaming the rig.

5. If additional ships are to be fueled with the same fuel commodity, the rig shall remain streamed for additional refueling operations.

10.5.2.5 Communications Required in Delivery Ship

1. Between stern and forward winch operator

2. Between stern and bridge

3. Between stern and pumproom

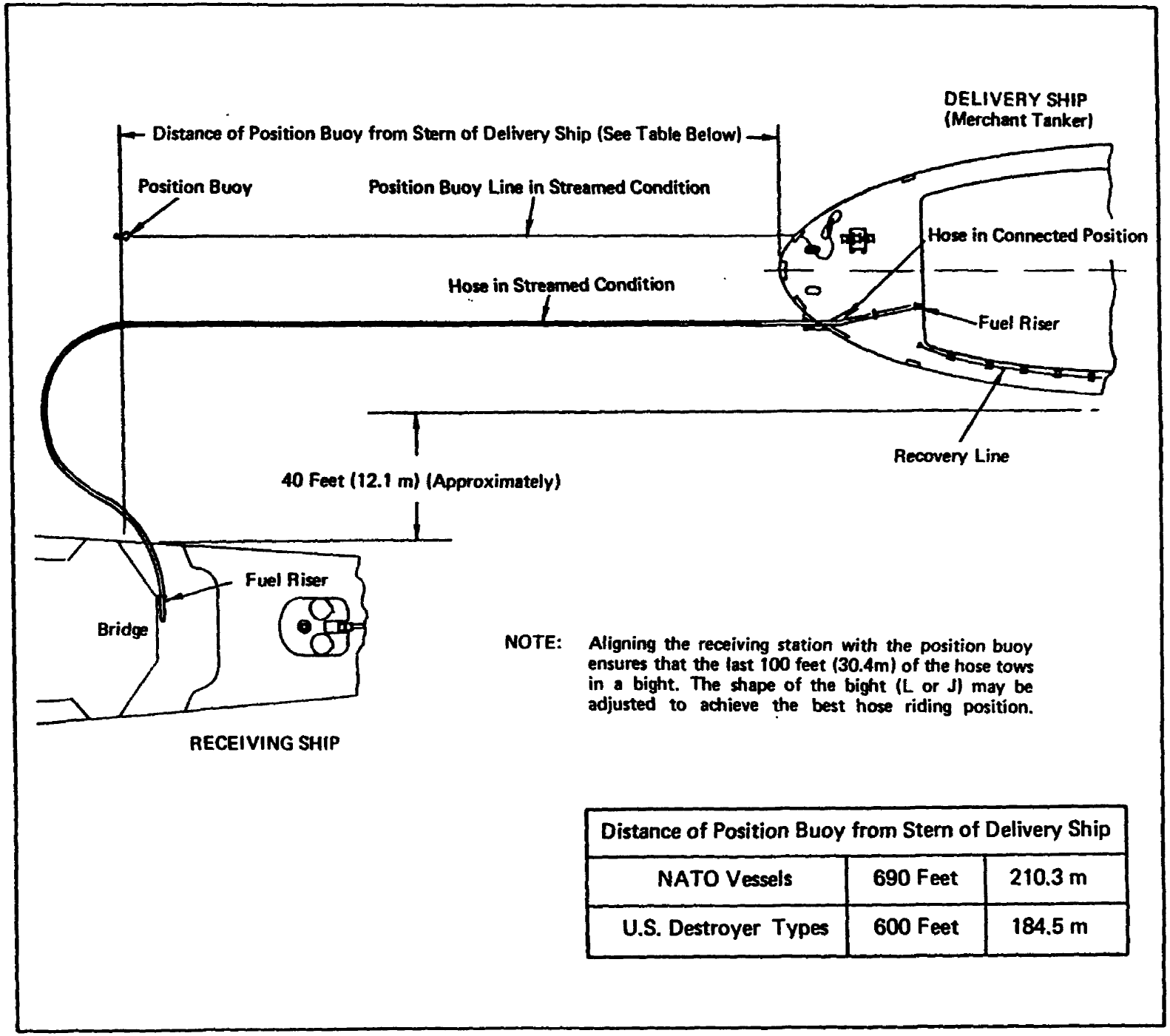
4. Between bridge and pumproom.

10.5.3 Checkoff Lists. The master is responsible for ensuring that the tanker is ready in all respects for refueling operations. Use Figure 10-13 at the end of the chapter as a guide for items to be checked. Figure 10-14 at the end of the chapter is a list of minimum loose hardware requirements for each refueling station.

10.5.4 Pumping. Using two 7 inch (177.8 mm) hoses, tankers (depending on individual design) are capable of pumping 4,000 to 8,000 bbl/h (636 to 1,272 m^3/h). Refueling operations can be expedited as follows:

1. To avoid product contamination from bottom sediment and water, take the following precautionary measure before pumping fuel to the receiving ship:

Take a low suction on the designated tank(s) from which the product is to be



Distance of Position Buoy from Stern of Delivery Ship		
NATO Vessels	690 Feet	210.3 m
U.S. Destroyer Types	600 Feet	184.5 m

Figure 10-9. Typical Astern Refueling Station Keeping

transferred. Pump the product through all lines to be used for the transfer to flush out any water or sediment, and then through the opened drop valve to other tanks not scheduled to be used in the transfer operation and which have sufficient ullage.

2. Tankers should have the pumps running and be recirculating the cargo through a drop line while ships are connecting up. When the connection is completed and the fleet unit signals "Commence pumping," the tanker opens the discharge valve and closes the drop line valve, thereby commencing cargo transfer.

3. The fleet unit may use its pump to take a suction to expedite transfer.

4. The tanker strips tanks continuously into an after tank, but final stripping is not done during the refueling operation.

10.5.5 Maintaining Trim

1. The tanker should load to arrive at the rendezvous point with at least a 2 foot (60.9 cm) trim by the stern.

2. For best maneuvering, proper trim should be maintained throughout the operation. This may require taking on ballast while cargo is being discharged; therefore, a main cargo line should be cleared as soon as possible.

3. If conditions warrant, pumping may be stopped to shift cargo, ballast, or adjust trim. Whether or not ships remain hooked up during such delays will depend on prevailing conditions.

10.5.6 Clearing the Hose

10.5.6.1 For Alongside Refueling

1. The fleet unit notifies the tanker prior to closing any fuel line valve so that the tanker can adjust the pumping rate.

2. Before disconnecting and while the valves on the tanker are still open, the hose is blown down. Normally the blowdown is done by the fleet unit because some tankers may not have sufficient compressed air for this operation. It requires about 3 minutes. Tankers cannot take a back suction.

10.5.6.2 For Astern Refueling. A complete description of the required operation is set forth in Appendix J.

10.5.7 Oil Spill Prevention. It is imperative that all precautions be taken to prevent pollution of the sea by an oil spill. At a minimum, the following safeguards should be taken during a refueling operation. The tanker master and fleet unit commanding officer should take any additional precautionary measures deemed necessary.

1. Ensure that standard dockside transfer procedures are in effect. This includes scupper plugs being in place (if seas permit), drip pans, rags, sawdust, proper tools at manifold, and so forth.

2. Adequate lookouts should be posted so as to spot any inadvertent discharge of oil over the side.

3. Prior to commencement of transfer, all cargo and overboard discharge valves and lines should be rechecked by responsible personnel to ensure proper alignment.

10.6 DEPARTURE

10.6.1 Normal Departure

1. After blowdown, the tanker closes the valve, disconnects the hose, and replaces the blank flange or cap.

2. A bight of the riding line is used to ease out the hose as the fleet unit heaves in. A line attached to the end of the hose assists in passing it over the side.

3. After tension has been released and the fleet unit has given the signal, the pelican hook is tripped and the spanwire is eased over the side with an easing-out line.

CAUTION

This can be dangerous if tension has not been released from a tensioned rig or if the hose has not been retrieved. Do not trip the pelican hook prior to the signal from the fleet unit.

4. After the gear has been recovered, the fleet unit increases speed and pulls away from the tanker.

5. The tanker holds course and speed until the fleet unit is well clear.

10.6.2 Emergency Breakaway. Tanker personnel should be instructed in the emergency breakaway procedures given in Chapter 2.

Men must be assigned specific emergency breakaway duties in advance. Knives, marlinespikes, wrenches, axes, and sledge hammers must be on hand. At no time should refueling stations be left unattended.

If an emergency breakaway is ordered, the following procedures are of major importance:

1 Stop pumping immediately.

2 Clear the transfer station of all unnecessary men. The hose may whip around when released. Also, since a blowdown is not possible, oil spillage from the hose may create slippery footing.

3. If a breakable-spool coupling is used, break it by striking the groove a sharp blow with a sledge hammer. If a Robb coupling is used, force back the sleeve on the coupling with two marlinespikes until it releases. When both the breakable-spool and Robb coupling are used in combination, strike the groove of the breakable spool a sharp blow with a sledge hammer.

4. Ease out the hose with the riding line. If necessary, cut the riding line.

5. If possible, trip the pelican hook after the fleet unit has slacked the spanwire. The man tripping the pelican hook must be inboard and forward of the hook, especially if there is no opportunity to use an easing-out line on the spanwire.

6. Return the phone/distance line and station-to-station phone line after the hose and spanwire are clear.

10.7 LOGISTIC SUPPORT

When a tanker is under the operational control of a fleet unit, the fleet unit will provide logistic support.

10.7.1 Mail. The naval commander arranges for mail delivery to the tanker.

10.7.2 Pilot and Tugs. When consolidation is to be performed in port, the naval commander arranges for tugs and pilot, if such assistance is required by the tanker.

10.7.3 Supplies. Only MSC USNS tankers are authorized to draw supplies and material from

Navy supply activities. All industry-owned tankers under time charter and certain tankers under consecutive-voyage charter are authorized to bunker from government stock.

10.8 BILLING AND REPORTS

Transportation costs for cargo delivered to fleet units at sea are billed at rates required to recover costs. Cost is based on the applicable MSC point-to-point tariff rate, less the trade route distance/time diversion (if any) from the trade route to the shore destination point. To this is added an amount based on the per diem rate for the time consumed from time of arrival at rendezvous until the time the tanker is released, including diversion time. In cases where no point-to-point rate applies, a straight per diem rate is charged.

When cargo transfer has been completed, the tanker advises the fleet unit of the amount and temperature of cargo transferred. This information should be reported as soon as possible after completion of the transfer by sending a visual or radiotelephone message to the fleet unit. The fleet unit is then to provide the tanker master with a completed DD Form 1149 or message acknowledging receipt and indicating the milstrip document number on the DD 1149. This will be turned into the DFSC representative at the next terminal.

10.8.1 MSC 4020-4 Discharge Report. This modified message report shall be made by the tanker upon completion of cargo transfer. The following format is to be used:

FROM: (Note: Use ROUTINE precedence)
TO: COMSC WASHINGTON DC
INFO: DFSC CAMERON STATION VA
NAVPETOFF ALEXANDRIA VA
(Ship's owner or operator)
(Petroleum inspector and/or
MSC Rep at next discharge point)

UNCLAS
MSC 4020-4

A. Tanker name
B. Radio call letters
D. Name of ship receiving cargo
K. Cargo number
L. Product
M. Barrels of product transferred
N. Long tons of product transferred
Q. Next port of call
R. ETA next port
S. Milstrip document number on the DD 1149 obtained from the receiving ship
T. Whether awaiting next discharge or completed final discharge
U. Time expended to discharge
V. Remarks.

10.8.2 Loading Report. When cargo is transferred between two tankers, the one being loaded makes a loading report (MSC Report 4020-3); the discharging tanker makes a discharge report.

10.8.3 Operational Reports. On completion of each refueling operation, masters of tankers submit an operational report (MSC Report 3180-1) to COMSC, with a copy to the owner-operator. There is no official form for this report. It is sent as a letter, using the format shown in Figure 10-10. Also, commanding officers of fleet units are requested to furnish COMSC a narrative evaluation of the operation, unclassified if possible.

10.9 EMERGENCY SAFETY MEASURES

The possibility of deteriorating weather conditions makes it mandatory that both ships be prepared for emergencies, such as man overboard.

10.9.1 Man Overboard Procedures. When practicable, station a lifeguard ship astern to rescue personnel who may fall overboard. Both ships must have lifebuoys ready for use, if required. If a man falls overboard:

1. A lifebuoy is dropped, and at least six short blasts are sounded on the ship's whistle.

From:_____
(name of tanker)

To: Commander, Military Sealift Command, Navy Department, Washington, D.C. 20390

Subj: MSC Report 3180-1

Transferred cargo to:_____ Date:_____
(name of ship)

Local time_____ Location (Lat/Long)_____ Speed during fueling_____

Course during fueling_____ Original track course_____

Times of:

Diversion from Original Track_____

Alongside (Stbd/Port)_____

First Hose Aboard_____

First Hose Connected_____

Second Hose Connected_____

Commenced Transfer First Hose_____

Stopped Transfer_____

Resumed Transfer_____

Finished Transfer Last Hose_____

Total Discharge Time_____

All Hoses Disconnected_____

Departed_____

Back on Original Track_____

Cargo:

Product(s)_____ Amount each Product Transferred (BBL and L/T)_____

Average pumping rate_____ BBL/hr

Draft (Estimated on arrival): FWD_____ AFT_____

Comments (Provide specific and positive comments on these and any other item which can be used for improvement of procedures and equipment):

Operations

Communications (long and short range)

Equipment

Crew efficiency

Other

Accidents or Injuries: Any occur? YES____ NO____. If yes, give description and reason

Photos Submitted: YES____ NO____

Signature_____ Date_____

(Copies to: owner/operator and tanker's files)

Figure 10-10. Refueling Report

2. If a lifeguard ship is on station, the tanker and the fleet unit maintain course and speed while the lifeguard ship effects the rescue.

3. If no lifeguard ship is assigned, an emergency breakaway must be made. After breakaway, the fleet unit maneuvers to recover the man, while the tanker maintains course. When safely clear, the tanker also maneuvers as necessary to assist in recovering the man.

10.9.2 Heavy Weather Procedures. Safety of personnel on the tanker is vested in the master. In heavy weather, the master shall ensure that appropriate personnel safety precautions are taken. The master also decides if refueling should be postponed because conditions are too hazardous for personnel on the tanker.

10.10 NONTENSIONED HIGHLINE TRANSFERS

Tankers can transfer light freight, stores, and personnel. All USNS tankers have special padeyes and links for highline transfer installed at two stations, one on each side. The highline padeyes and links have been tested to a horizontal pull of 22,500 lb (10,204 kg) and the inhaul padeyes to 8,000 lb (3,628 kg). Some industry-owned tankers have special padeyes and links installed, while others have some high attachment point to which a highline can be rigged. None of the tankers have transfer rigs or containers; they rig the lines provided by the fleet ship. A wire or synthetic highline is used to transfer freight or mail.

Only 4 inch (101.6 mm), double-braided, polyester line (MIL-R-24536) may be used as a highline to transfer personnel. A 1 inch (25.4 mm) shackle is used instead of a pelican hook to secure the synthetic highline to the tanker's padeye. During personnel transfers, all lines must be tended by hand; winches and capstans must not be used. The synthetic highline has a maximum safe transfer load of 600 lb (272 kg).

10.11 TENSIONED HIGHLINE TRANSFERS

Selected USNS cargo ships have been equipped with sliding padeyes to which the UNREP ship's tensioned highline STREAM rig can be connected. These ships can use the personnel STREAM transfer method described in Chapter 7.

10.12 EXTENDED FLEET OPERATIONS

Appendix E contains standard operating procedures for MSC-controlled tankers assigned to extended fleet operations.

Tanker (1) (USNS)	T-AOT NO.	Radio Call Sign	DWT (5)	LOA (4)	Beam (4)	Draft (4)
AMERICAN EXPLORER (9)	165	NTUG	24,226 [24,614]	615'0" [187.5]	80'1" [24.4]	36'0" [11.0]
MAUMEE	149	NSNF	26,875 [27,305]	620'0" [189.0]	83'9" [25.5]	33'7" [10.2]
POTOMAC (2) (9)	181	NBLM	27,467 [27,906]	620'0" [189.0]	83'6" [25.5]	33'7" [10.2]
SEALIFT ANTARCTIC (2) (8)	176	NTYT	27,200 [27,635]	587'0" [178.9]	84'0" [25.6]	34'7" [10.5]
SEALIFT ARABIAN SEA (2) (8)	169	NFKQ	27,200 [27,635]	587'0" [178.9]	84'0" [25.6]	34'7" [10.5]
SEALIFT ARCTIC (2)(7)	175	NQST	27,200 [27,635]	587'0" [178.9]	84'0" [25.6]	34'7" [10.5]
SEALIFT ATLANTIC (2) (8)	712	NIKA	27,200 [27,635]	587'0" [178.9]	84'0" [25.6]	34'7" [10.5]
SEALIFT CARIBBEAN (2) (8)	174	NKRV	27,200 [27,635]	587'0" [178.9]	84'0" [25.6]	34'7" [10.5]
SEALIFT CHINA SEA (2) (8)	170	NHAR	27,200 [27,635]	587'0" [178.9]	84'0" [25.6]	34'7" [10.5]
SEALIFT INDIAN OCEAN (2) (8)	171	NGYK	27,200 [27,635]	587'0" [178.9]	84'0" [25.6]	34'7" [10.5]
SEALIFT MEDITERRANEAN(2)(8)	173	NMHT	27,200 [27,635]	587'0" [178.9]	84'0" [25.6]	34'7" [10.5]
SEALIFT PACIFIC (2) (8)	168	NENC	27,200 [27,635]	587'0" [178.9]	84'0" [25.6]	34'7" [10.5]
SHOSHONE (9)	151	NJTH	26,875 [27,305]	620'0" [189.0]	83'9" [25.5]	33'7" [10.2]
YUKON (7)	152	NUOP	26,875 [27,305]	620'0" [189.0]	83'9" [25.5]	33'7" [10.2]

NOTES:

(1) Tankers are United States Naval Ships, contract operated by private ship operators. All cargo tanks are coated.
(2) Ship possesses two raised centerline stations fore and aft which can transfer to either port or starboard.
(3) Average capacity for full load of F76 (DFM). The actual load depends on loadline limitations and variation in specific gravity of product loaded. Ships are capable of carrying four separate products simultaneously.
(4) Data contained in brackets reflects units in meters.
(5) Data contained in brackets reflects units in metric tons.
(6) Data contained in brackets reflects units in cubic meters per hour.
(7) Equipped with reel type of astern FAS rig.
(8) Equipped with lay-on-deck type of astern FAS rig.
(9) In NDRF/RRF. Ships have fuel oil manifold on stern, but are not equipped with astern reel, hoses, and rollers for astern refueling.

Figure 10-11. MSC Tankers Equipped for Limited Refueling
(As of 1 March 1984) (Sheet 1 of 2)

Normal Speed (Kt)	Height of (4) Highest Radar to Load Line	Max. Refuel Rate Per Station (bbl/h) (6)	Stations (per side)	Distance from (4) Bow to Station		Cargo Capacity (3) (Thousands of bbl) (5)
				FWD	AFT	
20.0	85'0" [25.9]	4000 [636]	2	312' [95.1]	410' [125.0]	174 [23,467]
18.5	86'0" [26.2]	4000 [636]	2	296' [90.2]	412' [125.6]	186 [25,085]
18.5	97'0" [29.6]	4000 [636]	2	256' [78.0]	416' [126.8]	186 [25,085]
16.0	111'0" [33.8]	4000 [636]	2	280' [85.3]	409' [124.7]	195 [26,299]
16.0	111'0" [33.8]	4000 [636]	2	280' [85.3]	409' [124.7]	195 [26,299]
16.0	111'0" [33.8]	4000 [636]	2	274. [83.5]	446' [135.9]	195 [26,299]
16.0	111'0" [33.8]	4000 [636]	2	271' [82.6]	416' [126.8]	195 [26,299]
16.0	111'0" [33.8]	4000 [636]	2	284' [86.6]	422' [128.6]	195 [26,299]
16.0	111'0" [33.8]	4000 [636]	2	278' [84.7]	424' [129.2]	195 [26,299]
16.0	111'0" [33.8]	4000 [636]	2	280' [85.3]	409' [124.7]	195 [26,299]
16.0	111'0" [33.8]	4000 [636]	2	284' [86.6]	422' [128.6]	195 [26,299]
16.0	111'0" [33.8]	4000 [636]	2	280' [85.3]	409' [124.7]	195 [26,299]
18.5	86'0" [26.2]	4000 [636]	2	301' [91.7]	396' [120.7]	186 [25,085]
18.5	86'0" [26.2]	4000 [636]	2	284' [86.6]	403' [122.8]	186 [25,085]

Figure 10-11. MSC Tankers Equipped for Limited Refueling (As of 1 March 1984) (Sheet 2 of 2)

Figure 10-12. Industry-Owned U.S. Flag Tankers Equipped for Limited Refueling (As of 1 March 1984) (Sheet 1 of 6)

Tanker MS/SS	Radio Call Sign	DWT (2)	LOA (3)	Beam (3)	Draft (3)	Norm Speed (Kt)	Ht of Highest Radar to Load Line (3)	Max Refuel Rate Per Sta (bbl/h) (4)	Sta (per Side)	Distance from Bow to Station (3)			Cargo Capacity (2) (5) (Thousands of bbl)
										FWD	MID	AFT	
AMERICAN HERITAGE (C) (6)	KVFM	91,849 (93,319)	894'0" (272.5)	105'9" (32.23)	49'1" (14.96)	16.5	111'6" (33.98)	4000 (635.96)	2	573'2" (174.70)	–	655' (199.64)	662 (89,282)
AMERICAN TRADER (C)	KVKV	27,615 (28,057)	633'6" (193.1)	74'0" (22.56)	33'2" (10.11)	14.5	86'0" (26.21)	4000 (635.96)	2	318' (96.93)	–	465' (141.73)	203 (27,378)
ARCO INDEPENDENCE	KLHV	262,376 (266,574)	1100'0" (335.3)	178'0" (54.25)	67'2" (20.47)	15.2	113'0" (34.42)	4000 (635.96)	3	512' (156.06)	688' (209.70)	929' (283.16)	2014 (271,622)
ARCO SPIRIT	KHLD	262,376 (266,574)	1100'0" (335.3)	178'0" (54.25)	67'2" (20.47)	15.2	113'0" (34.42)	4000 (635.96)	3	512' (156.06)	688 (209.70)	929' (283.16)	2014 (271,622)
BALDBUTTE (C)	WKIY	33,521 (34,057)	665'8" (202.9)	84'0" (25.60)	36'7" (11.15)	17.5	83'0" (25.30)	4000 (635.96)	2	330' (100.58)	–	440' (134)	233 (27,378)
BAY RIDGE (C)	WPTP	225,090 (228,691)	1098'0" (334.7)	143'6" (43.74)	70'6" (21.48)	16.8	113'0" (34.44)	4000 (635.96)	2	516' (157.28)	–	708' (215.80)	1654 (223,070)
BEAVER STATE (C) (6)	KCBM	91,849 (93,319)	894'0" (272.5)	105'9" (32.23)	49'1" (14.96)	16.5	111'6" (33.99)	4000 (635.96)	2	573'2" (174.70)	–	655' (199.64)	662 (89,282)
BORDEAUX (C)	KIOJ	27,154 (27,588)	624'0" (190.20)	74'0" (22.56)	32'0" (9.75)	14.5	89'0" (27.12)	4000 (635.96)	2	317' (96.62)	–	457' (139.29)	198 (26,704)
BROOKLYN (C)	KGDB	226,100 (229,718)	1094'0" (333.5)	144'0" (43.89)	70'0" (21.34)	17.5	113'0" (34.44)	4000 (635.96)	2	516' (157.28)	–	708' (215.80)	1550 (209,043)
CHELSEA (C) (6)	KNCX	39,740 (40,376)	688'6" (209.85)	90'2" (27.48)	35'1" (10.69)	16.5	103'0" (31.39)	4000 (635.96)	2	366' (111.56)	–	481' (146.61)	272 (36,683)
CHERRY VALLEY (C) (6)	WIBK	39,675 (40,310)	688'6" (209.85)	90'2" (27.48)	35'0" (10.67)	16.5	103'0" (31.39)	4000 (635.96)	2	366' (111.56)	–	481' (146.61)	272 (36,683)
CHESAPEAKE (C)	KNFE	50,023 (50,823)	736'4" (224.43)	102'0" (31.09)	39'9" (12.12)	16.5	82'0" (24.99)	4000 (635.96)	2	373' (113.69)	–	527' (160.63)	355 (47,877)
CHESTNUT HILL (C) (6)	WVFX	91,295 (92,756)	894'0" (272.49)	105'9" (32.23)	49'0" (14.94)	16.5	114'0" (34.74)	4000 (635.96)	2	482' (146.91)	–	657' (200.25)	625 (84,291)
CORONADO (C) (6)	KPSB	39,712 (40,347)	688'6" (209.85)	90'2" (27.48)	35'1" (10.69)	16.5	103'0" (31.39)	4000 (635.96)	2	366' (111.56)	–	481' (146.61)	272 (36,683)

Tanker MS/SS	Radio Call Sign	DWT (2)	LOA (3)	Beam (3)	Draft (3)	Norm Speed (Kt)	Ht of Highest Radar to Load Line (3)	Max Refuel Rate Per Sta (bbl/h) (4)	Sta (per Side)	Distance from Bow to Station (3)			Cargo Capacity (2) (5) (Thousands of bbl)
										FWD	MID	AFT	
COURIER (C) (6)	KCBK	35,100 (35,662)	711'3" (218.79)	84'0" (25.60)	34'5" (10.49)	16.0	101'0" (30.78)	4000 (635.96)	2	328' (99.97)	–	538' (163.98)	281 (35,200)
COVE SAILOR (C)	WHJK	34,865 (35,423)	661'0" (201.47)	90'0" (27.43)	35'8" (10.87)	16.5	83'0" (25.30)	4000 (635.96)	2	296' (90.22)	–	464' (141.43)	274 (36,953)
EXXON BATON ROUGE (C)	WAFA	76,160 (77,379)	809'10" (246.84)	125'0" (38.1)	41'4" (12.60)	16.5	98'8" (30.07)	4000 (635.96)	2	325' (99)	–	473'5" (144.3)	637 (85,910)
EXXON HOUSTON (C)	KHBA	71,540 (72,685)	800'0" (243.84)	116'0" (35.36)	42'1" (12.83)	16.5	94'0" (28.65)	4000 (635.96)	2	409' (124.66)	–	565' (172.21)	510 (68,782)
EXXON NEW ORLEANS (C)	WNDM	71,508 (72,652)	800'0" (243.84)	116'0" (35.36)	42'1'. (12.83)	16.5	94'0" (28.65)	4000 (635.96)	2	409' (124.66)	–	565 (172.21)	510 (68,782)
EXXON PHILADELPHIA (C)	WNFJ	75,649 (76,859	809'10" (246.84)	125'0" (38.1)	41'4" (12.60)	16.5	98'8" (30.07)	4000 (635.96)	2	325' (99)	–	473'5" (144.3)	637 (85,910)
EXXON SAN FRANCISCO (C)	KAAC	75,649 (76,859)	809'10" (246.84)	125'0" (38.1)	41'4" (12.60)	16.5	98'8" (30.07)	4000 (635.96)	2	325' (99)	–	473'5" (144.3)	637 (85,910)
FALCON CHAMPION (C) (1) (7)	WFJN	33,542 (34,078)	668'1" (203.63)	84'0" (25.6)	36'0" (10.97)	16.0	110'2" (33.58)	4000 (635.96)	2	358'8" (109.32)	–	490' (149.35)	224 (30,210)
FALCON COUNTESS (C) (6)	KRCN	37,276 (37,872)	672'0" (204.82)	89'0" (27.13)	36'4" (11.07)	16.0	97'0" (29.56)	4000 (635.96)	2	274' (83.51)	–	394' (120.09)	281 (37,898)
FALCON DUCHESS (C) (6)	KRCJ	37,276 (37,872)	672'0" (204.82)	89'0" (27.13)	36'4" (11.07)	16.0	97'0" (29.56)	4000 (635.96)	2	274' (83.51)	–	394' (120.09)	281 (37,898)
FALCON LADY (C) (6)	KRCE	37,276 (37,872)	672'0" (204.82)	89'0" (27.13)	36'4" (11.07)	16.0	97'0" (29.56)	4000 (635.96)	2	274' (83.51)	–	394' (120.09)	281 (37,898)
FALCON LEADER (C) (1) (7)	WFJM	33,542 (34,078)	668'1" (203.63)	84'0" (25.6)	36'0" (10.97)	16.0	110'2" (33.58)	4000 (635.96)	2	358'8" (109.32)	–	490' (149.35)	224 (30,210)
FALCON PRINCESS (C) (6)	KRCP	37,276 (37,872)	672'0" (204.82)	89'0" (27.13)	36'4" (11.07)	16.0	97'0" (29.56)	4000 (635.96)	2	274' (53.51)	–	394' (120.09)	281 (37,898)
FRIO (C)	KDYC	26,900 (27,330)	633'6" (193.1)	75'0" (22.86)	33'11" (10.33)	14.0	75'0" (22.86)	4000 (635.96)	2	310' (94.49)	–	476' (145.08)	200 (26,973)
GOLDEN ENDEAVOR (C) (6)	WDBU	91,849 (93,364)	894'0" (272.5)	105'9" (32.23)	49'1" (14.96)	16.5	111'6" (33.98)	4000 (635.96)	2	573'2" (174.70)	–	655' (199.64)	662 (89,282)

Figure 10-12. Industry-Owned U.S. Flag Tankers Equipped for Limited Refueling (As of 1 March 1984) (Sheet 2 of 6)

Tanker MS/SS	Radio Call Sign	DWT (2)	LOA (3)	Beam (3)	Draft (3)	Norm Speed (Kt)	Ht of Highest Radar to Load Line (3)	Max Refuel Rate Per Sta (bbl/h) (4)	Sta (per Side)	Distance from Bow to Station (3)			Cargo Capacity (2) (5) (Thousands of bbl)
										FWD	MID	AFT	
GOLDEN MONARCH (C) (6)	KLGF	91,894 (93,364)	894'0" (272.5)	105'9" (32.23)	49'1" (14.96)	16.5	111'6" (33.96)	4000 (635.96)	2	573'2" (174.70)	–	655' (199.64)	662 (89,282)
KITTANNING (C) (6)	KGPK	91,344 (92,806)	894'0" (272.5)	105'9" (32.23)	49'1" (14.96)	16.5	114'0" (34.75)	4000 (635.96)	2	482' (146.91)	–	657' (200.25)	625 (84,291)
MANHATTAN	WJAF	113,919 (115,742)	1005'6" (306.48)	132'0" (40.23)	52'9" (16.08)	17.5	103'0" (31.39)	4000 (635.96)	3	528' (160.93)	592' (180.44)	672' (204.83)	892 (120,301)
MARYLAND	WMBZ	264,073 (268,298)	1100'0" (335.28)	178'0" (54.25)	67'1" (20.45)	15.2	116'0" (35.36)	4000 (635.96)	1	–	678' (206.65)	–	1820 (245,458)
MASSACHUSETTS	WNHJ	264,073 (268,298)	1100'0" (335.28)	178'0" (54.25)	67'1" (20.45)	15.2	116'0" (35.36)	4000 (635.96)	1	–	678' (206.65)	–	1820 (245,458)
MONTPELIER VICTORY	WJCS	49,451 (50,242)	736'4" (224.43)	102'0" (31.09)	40'2" (12.24)	17.3	87'0" (26.52)	4000 (635.96)	3	346' (105.46)	435' (132.59)	510' (155.49)	375 (50,575)
MORMACSKY (C) (6)	WMBQ	39,232 (39,860)	688'6" (209.85)	90'0" (27.43)	35'1" (10.69)	16.0	102'9" (31.32)	4000 (635.96)	2	366'6" (111.71)	–	481'3" (146.69)	268 (36,144)
MORMACSTAR (C) (1) (6)	KGDF	39,232 (39,860)	688'6" (209.85)	90'0" (27.43)	35'1" (10.69)	16.0	102'9" (31.32)	4000 (635.96)	2	366'6" (111.71)	–	481'3" (146.69)	268 (36,144)
MORMACSUN (C) (6)	WMBK	39,232 (39,860)	688'6" (209.85)	90'0" (27.43)	35'1" (10.69)	16.0	102'9" (31.32)	4000 (635.96)	2	366'6" (111.71)	–	481'3" (146.69)	268 (36,144)
MOUNT VERNON VICTORY	KCDF	49,240 (50,028)	736'4" (244.43)	102'2" (31.09)	40.2 (12.24)	16.5	84'0" (25.6)	4000 (635.96)	2	352' (107.29)	–	525 (160.02)	375 (50,575)
MOUNT WASHINGTON	KMWJ	49,471 (50,263)	736'4" (224.43)	102'0" (31.09)	40'2" (12.24)	17.3	87'0" (26.52)	4000 (635.96)	3	346' (105.46)	435' (132.59)	510' (155.49)	375 (50,575)
NEW YORK	WSDB	264,073 (268,298)	1100'0" (335.28)	178'0" (54.25)	67'1" (20.45)	15.2	116'0" (35.36)	4000 (635.96)	1	–	678' (206.65)	–	1820 (245,458)
NEW YORK SUN (C) (1) (6)	WSKD	34,434 (34,985)	612'0" (186.53)	91'0" (27.73)	36'9" (11.20)	15.3	108'0" (32.91)	4000 (635.96)	2	244' (74.37)	–	384' (117.04)	254 (34,260)

Figure 10-12. Industry-Owned U.S. Flag Tankers Equipped for Limited Refueling (As of 1 March 1984) (Sheet 3 of 6)

Tanker MS/SS	Radio Call Sign	DWT (2)	LOA (3)	Beam (3)	Draft (3)	Norm Speed (Kt)	Ht of Highest Radar to Load Line (3)	Max Refuel Rate Per Sta (bbl/h) (4)	Sta (per Side)	Distance from Bow to Station (3)			Cargo Capacity (2) (5) (Thousands of bbl)
										FWD	MID	AFT	
OGDEN CHAMPION (C)	KIGP	37,874 (38,480)	660'0" (201.16)	90'0" (27.43)	36'8" (11.18)	16.2	120'0" (36.58)	4000 (635.96)	3	316' (96.32)	397' (121)	474' (144.48)	281 (37,898)
OGDEN CHARGER (C)	KMLK	37,807 (38,412)	660'0" (201.17)	90'0" (27.43)	36'8" (11.18)	16.0	85'4" (26.01)	4000 (635.96)	3	304' (92.66)	382' (116.43)	461' (140.51)	281 (37,898)
OGDEN LEADER (C)	KMLD	37,807 (38,412)	660'0" (201.17)	90'0" (27.43)	36'8" (11.18)	16.0	85'4" (26.01)	4000 (635.96)	3	304' (92.66)	382' (116.43)	461' (140.51)	281 (37,898)
OGDEN WABASH (C)	WCWC	37,853 (38,459)	660'0" (201.16)	90'0" (27.43)	36'8" (11.18)	16.2	88'0" (26.82)	4000 (635.96)	3	309' (94.18)	389' (118.57)	464' (141.43)	281 (37,898)
OGDEN WILLIAMETTE (C)	WGWA	37,853 (38,459)	660'0" (201.16)	90'0" (27.43)	36'8" (11.18)	16.2	88'0" (26.82)	4000 (635.96)	3	309' (94.18)	389' (118.57)	464' (141.43)	281 (37,898)
OVERSEAS ALICE (C) (1) (7)	WOVL	37,814 (38,419)	660'2" (201.22)	90'1" (27.45)	36'8" (11.18)	16.0	85'0" (25.90)	4000 (635.96)	2	316' (96.31)	–	472' (143.86)	281 (37,898)
OVERSEAS CHICAGO (C)	KBCF	90,637 (92,087)	894'0" (272.49)	105'9" (32.23)	49'1" (14.96)	16.5	111'10" (34.09)	4000 (635.96)	1	–	–	634' (193.24)	620 (83.618)
OVERSEAS NATALIE	WLEB	72,677 (73,840)	860'0" (262.13)	104'5" (31.83)	46'2" (14.07)	16.0	94'10" (28.91)	4000 (635.96)	2	–	412' (125.58)	572' (174.34)	547 (73,772)
OVERSEAS NEW YORK	WMCK	90,394 (91,840)	894'0" (272.49)	105'9" (32.23)	49'0" (14.93)	16.5	111'11" (34.11)	4000 (635.96)	1	–	–	634' (193.24)	618 (83,348)
OVERSEAS OHIO (C)	WJBG	90,568 (92,017)	894'0" (272.49)	105'11" (32.28)	49'0" (14.93)	16.5	114'0" (34.75)	4000 (635.96)	1	–	–	634' (193.24)	619 (83,483)
OVERSEAS VALDEZ (C) (1) (7)	WOVS	37,814 (38,419)	660'2" (201.22)	90'1" (27.45)	36'8" (11.18)	16.0	85'0" (25.90)	4000 (635.96)	2	316' (96.31)	–	472' (143.86)	281 (37,898)
OVERSEAS VIVIAN (C) (1) (7)	KAAZ	37,814 (38,419)	660'2" (201.22)	90'2" (27.48)	36'8" (11.18)	16.0	85'0" (25.90)	4000 (635.96)	2	316' (96.31)	–	472' (143.86)	281 (37,898)
OVERSEAS WASHINGTON (C)	WFGV	90,515 (91,963)	894'0" (272.49)	105'9" (32.23)	49'1" (14.96)	16.5	111'10" (34.09)	4000 (635.96)	1	–	–	634 (193.24)	619 (83,483)
PATRIOT (C) (1)	KGBQ	35,100 (35,662)	711'3" (216.79)	84'0" (25.60)	34'5" (10.49)	16.0	101'0" (30.78)	4000 (635.96)	2	328' (99.97)	–	538' (163.98)	261 (35,200)

Figure 10-12. Industry-Owned U.S. Flag Tankers Equipped for Limited Refueling (As of 1 March 1984) (Sheet 4 of 6)

Tanker MS/SS	Radio Call Sign	DWT (2)	LOA (3)	Beam (3)	Draft (3)	Norm Speed (Kt)	Ht of Highest Rader to Load Line (3)	Max Refuel Rate Per Sta (bbl/h) (4)	Sta (per Side)	Distance from Bow to Station (3)			Cargo Capacity (2) (5) (Thousands of bbl)
										FWD	MID	AFT	
PETERSBURG	WJDC	50,065 (50,866)	736'4" (224.43)	102'0" (31.08)	38'5" (11.71)	17.5	85'0" (25.90)	4000 (635.96)	2	370' (112.78)	–	534' (162.78)	357 (48,148)
RANGER (C) (6)	KCBG	35,100 (35,662)	711'3" (216.79)	84'0" (25.60)	34'5" (10.49)	16.0	101'0" (30.78)	4000 (635.96)	2	328' (99.97)	–	538' (163.98)	261 (35,200)
RED RIVER (C)	KIEC	26,900 (27,330)	633'6" (193.09)	75'0" (22.86)	33'11" (10.34)	14.0	76'0" (23.16)	4000 (635.96)	2	293' (89.31)	–	448' (136.55)	184 (24,816)
ROVER (C) (6)	KCBH	35,100 (35,662)	711'3" (216.79)	84'0" (25.60)	34'5" (10.49)	16.0	101'0" (30.78)	4000 (635.96)	2	328' (99.97)	–	538' (163.98)	261 (35,200)
SAN JACINTO (C)	KYSF	26,912 (27,343)	633'6" (193.09)	75'0" (22.86)	32'9" (9.98)	14.0	76'0" (231.16)	4000 (635.96)	2	293' (89.31)	–	448' (136.55)	190 (25,629)
SAN MARCOS (C)	KSNP	28,684 (29,143)	628'0" (191.41)	82'9" (25.22)	33'7" (10.24)	16.0	92'3" (28.12)	4000 (635.96)	2	288' (87.78)	–	476' (145.08)	196 (26,434)
SPIRIT OF LIBERTY (C) (1)	WNGI	38,238 (38,850)	660'2" (201.22)	90'0" (27.43)	36'8" (11.18)	16.5	83'0" (25.30)	4000 (635.96)	2	220' (67.06)	–	385' (117.35)	280 (37,763)
STUYVESANT (C)	WTHF	224,670 (228,265)	1095'0" (333.76)	144'0" (43.89)	70'4" (21.44)	17.5	113'0" (34.44)	4000 (635.96)	2	516' (157.28)	–	708' (215.80)	1540 (207,695)
TEXACO GEORGIA (C)	WLDW	26,333 (26,754)	604'8" (184.30)	78'0" (23.77)	34'11" (10.64)	17.5	81'1" (24.71)	4000 (635.96)	1	–	326.8" (99.57)	–	181 (24,411)
TEXACO MARYLAND (C)	KADG	26,547 (76,972)	604'8" (184.30)	78'0" (23.77)	34'11" (10.64)	17.5	81'1" (24.71)	4000 (635.96)	1	–	326'8" (99.57)	–	181 (24,411)
TEXACO MASSACHUSETTS (C)	KAAD	26,547 (26,972)	604'8" (184.30)	78'0" (23.77)	34'11" (10.64)	17.5	81'1" (24.71)	4000 (635.96)	1	–	326'8" (99.57)	–	181 (24,411)
TEXACO MONTANA (C)	KFYM	26,550 (26,975)	604'8" (184.30)	78'0" (23.77)	34'11" (10.64)	17.5	81'1" (24.71)	4000 (635.96)	1	–	326'8" (99.57)	–	181 (24,411)
TEXACO RHODE ISLAND (C)	WFDW	26,547 (26,972)	604'8" (184.30)	78'0" (23.77)	34'10" (10.62)	17.5	81'1" (24.71)	4000 (635.96)	1	–	326'8" (99.57)	–	181 (24,411)
TEXAS TRADER (C) (1) (6)	KTHC	27,500 (27,940)	633'0" (192.94)	74'0" (22.56)	33'2" (10.11)	14.0	86'0" (26.21)	4000 (635.96)	2	318' (96.93)	–	465' (141.73)	203 (27,378)

Figure 10-12. Industry-Owned U.S. Flag Tankers Equipped for Limited Refueling (As of 1 March 1984) (Sheet 5 of 6)

Tanker MS/SS	Radio Call Sign	DWT (2)	LOA (3)	Beam (3)	Draft (3)	Norm Speed (Kt)	Ht of Highest Rider to Load Line (3)	Max Refuel Rate Per Sta (bbl/h) (4)	Sta (per Side)	Distance from Bow to Station (3)			Cargo Capacity (2) (5) (Thousands of bbl)
										FWD	MID	AFT	
ULTRAMAR	WHDI	82,199 (83,514)	892'6" (272.03)	105'9" (32.23)	45'10" (13.97)	16.5	111'6" (33.99)	4000 (635.96)	2	573'2" (174.70)	–	655' (199.64)	562 (75,795)
ULTRASEA	WJCG	82,199 (83,514)	892'6" (272.03)	105'9" (32.23)	45'10" (13.97)	16.5	111'6" (33.99)	4000 (635.96)	2	573'2" (174.70)	–	655' (199.64)	562 (75,795)
WASHINGTON TRADER (C)	KMJH	41,620 (42,286)	712'0" (217.02)	93'0" (28.35)	36'7" (11.15)	17.2	96.5" (29.39)	4000 635.96)	3	310' (94.49)	390' (118.87)	470' (143.26)	304 (40,999)
WILLIAMSBURGH (C)	WGOA	225,090 (228,691)	1095'0" (333.76)	144'0" (43.89)	70'4" (21.44)	17.5	113'0" (34.44)	4000 (635.96)	2	516' (157.28)	–	708' (215.80)	1540 (207,695)
WORTH (C) (6)	WLHC	91,849 (93,319)	894'0" (272.49)	105'9" (32.23)	49'1" (14.96)	16.5	111'6" (33.99)	4000 (635.96)	2	573'2" (174.70)	–	655' (199.64)	662 (89,282)

NOTES:

(1) Indicates tankers under charter to MSC on 1 March 1984.

(2) Data contained in parentheses reflects units in metric tons.

(3) Data contained in parentheses reflects units in meters.

(4) Data contained in parentheses reflects units in cubic meters per hour.

(5) Average capacity for full load of F76 (DFM). The actual load depends on loadline limitations and variation in specific gravity of product loaded. Ships are capable of carrying three to four separate products simultaneously.

(6) Fuel oil manifold and valve on stern. Ships not equipped with necessary astern FAS hoses, rollers, fittings, and so forth, required for astern refueling.

(7) Equipped with reel type of astern FAS rig.

(C) Ship has coated tanks.

General: Tankers under charter to MSC are required to meet static-test load for attachment points.

Figure 10-12. Industry-Owned U.S. Flag Tankers Equipped for Limited Refueling (As of 1 March 1984) (Sheet 6 of 6)

DECK DEPARTMENT

1. Purge and check telemotor system
2. Check steering system and gyro error (all steering stations)
3. Have megaphone ready for use on the bridge and fueling station
4. Lead out and inspect necessary firefighting equipment
5. Take ullages and temperatures of cargo tanks
6. Rig in life boats, and remove sea painter on fueling side
7. Have all men on deck wear life jackets and protective helmets
8. Clear unnecessary men from fueling stations
9. Provide anti-chafing gear in the area where hoses come across. (Old canvas, cargo nets, used manila line or boat fenders will suffice.)
10. Provide tools at each station for making connections, for opening valves, and for cutting the lines and breaking the rigs in case of emergency
11. Mark transfer stations with 3-foot (91.4 cm) square pieces of bunting: red for fuel oil, blue for diesel oil, yellow-blue triangles for F44 (JP-5), red-blue triangles for F76 (DFM), green with white vertical stripes for stores, and white for water
12. Illuminate transfer stations for night operations with lights having yellow lenses or filters. Never use white lights at night because of their blinding effect.
13. Have drip pans, rags, sawdust, and so forth ready for controlling oil spillage
14. Use red, green, and amber paddles/flags or flashlights/wands at each station for hand singals
15. Prior to using a hose, check it visually and test it by compressed air for leaks
16. Rig a temporary manila lifeline when a section of the railing is removed
17. Prepare sound-powered telephones with watertight jackboxes for use between fueling stations and bridge
18. Connect length of hose to cargo manifold if required for a straight lead, more flexibility, or for jumper hose from one side of the tanker to the other side
19. In the event of icy conditions, have sand or other suitable material ready

ENGINE DEPARTMENT

1. Have maximum power available
2. Test and have pumps ready
3. Cut in steam and warm up deck machinery
4. Check that there is air pressure for blowing through hoses and that there are no leaks
5. Subject cargo pipeline system and valves to a hydrostatic test of approximately 75 psi (517.1 kPa) for tightness on the ballast leg of the voyage prior to loading cargo for transfer at sea. This is necessary because the cargo tanks, pipelines, and valves must be tight to prevent contamination by sea water which may be loaded as ballast to maintain trim during refueling.

Figure 10-13. Refueling Checkoff List—Tankers

DECK DEPARTMENT

1. Two 14-inch (355.6 mm) snatch blocks for fairleading messenger

2. One 4-inch (101.6 mm) manila line, 45 feet (13.7 m) long, for riding line

3. Two 2½-inch (63.5 mm) manila lines, 120 feet (36.5 m) long; two 8-inch (203.2 mm) double blocks rig 2 with becket; and two 8-inch (203.2 mm) double blocks rig 2 without becket for twofold

4. One flanged reducer (6-inch (152.4 mm) flange outboard for attaching breakable spool)

5. One breakable-spool coupling, A-end

6. One set signal paddles

7. One set flashlight signal wands

8. Portable electric megaphone

9. One sound-powered phone set

10. One 8-inch (203.2 mm) or 6-inch (152.4 mm) hose for flexible extension to cargo manifold

11. One tool kit, consisting of:

(a) One axe

(b) One hammer, machinist, 2½-pound (1.1 kg)

(c) One hatchet, hand

(d) One pliers, gas, 8-inch (203.2 mm)

(e) One marlinespike, 8-inch (203.2 mm)

(f) Two marlinespikes, 16-inch (406.4 mm)

(g) One hammer, sledge, 10-pound (4.4 kg)

(h) Two end wrenches, adjustable, 10-inch (254.0 mm)

12. One 3-inch (76.2 mm) manila line, 50 feet (15.2 m) long, with safety snap hook on one end for safety line

13. Three-foot square (91.4 cm) bunting--red for fuel oil, blue for diesel oil, red-blue triangles for F76 (DFM), yellow-blue triangles for F44 (JP-5), and white for water, for station marking.

Figure 10-14. Loose Hardware for Each Refueling Station—Tankers

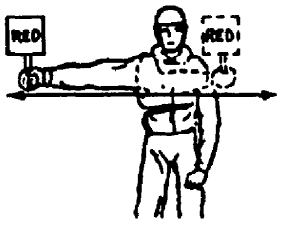
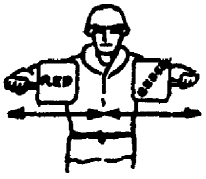
APPENDIX C

Replenishment Operation Signals

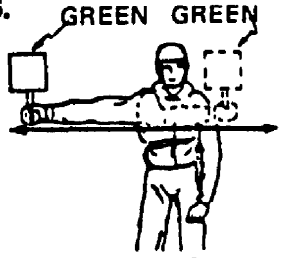
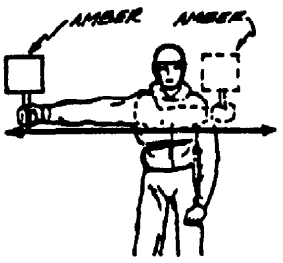
Hand signals must be used to parallel all orders passed over sound-powered (S/P) phones. Hand signals will be given with 12 inch by 12 inch (30.4 cm by 30.4 cm) paddles or 12 inch (30.4 cm) diameter paddles during the day or with colored wands on flashlights at night. The standard hand signals used during replenishment operations are illustrated in this appendix. (See paragraph 2.4.4.3.)

Note

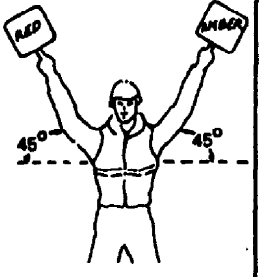
Red and amber paddles will be of solid colors. Green paddles will contain a 1 inch (25.4 mm) wide, white, diagonal stripe running from the upper left corner to the bottom right corner.

ALONGSIDE - - HAND SIGNALS (Paralleled by S/P phone)	
STANDARD PROCEDURES	
SIGNAL	REMARKS
1.  HEAVE AROUND	Signalman moves red signal device in a continuous complete circle in front of body, and keeps the proper color visible to the other ship at all times. When/where appropriate, the other ship answers with the "Slack off" signal.
2.  AVAST	Signalman moves red signal device horizontally in front of body, and keeps the proper color visible to the other ship at all times, meaning for the other ship to stop, cease heaving or slacking as appropriate.
3.  SLACK OFF	Signalman moves red signal device vertically in front of body, meaning for the other ship to slack off the appropriate line, wire, or hose until another signal is given.
4.  HOOKED-UP or CONNECTED	Signalman, with red signal device in right hand and green* signal device in left hand, touches devices moving horizontally in front of body at shoulder height, meaning "Hooked-up or connected." Repeated by receiving ship until acknowledged by delivery ship with same signal.

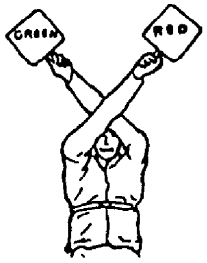
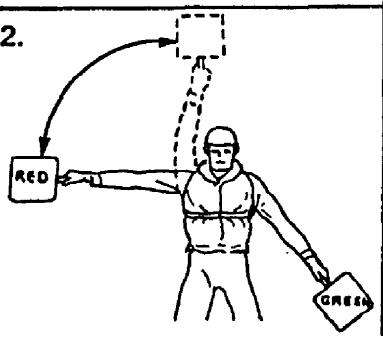
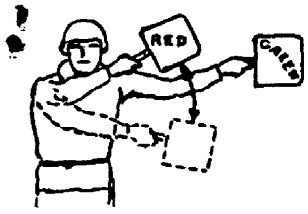
*See NOTE, page C-1.

ALONGSIDE - - HAND SIGNALS (Paralleled by S/P phone)	
STANDARD PROCEDURES	
SIGNAL	**REMARKS**
5.  **START PUMPING or COMMENCE TRANSFER**	Signalman moves green* signal device in a continuous complete circle in front of body, and keeps the proper color visible to the other ship at all times. This signal, executed by either ship, indicates" I am ready to start pumping" or "I am ready to commence transfer." It is used only for the beginning of the pumping/transfer operation. When repeated by the other ship, begin transfer and commence signaling with red paddle. If not ready to commence operation, the red AVAST signal is used.
6.  **STOP PUMPING or CEASE TRANSFER**	Signalman moves green* signal device horizontally in front of body. This signal, executed by either ship, indicates "STOP pumping" or "CEASE transfer" and is used only to signal the completion of the pumping/transfer operation. When repeated by the other ship, immediately shift to amber or red signal devices as appropriate.
7.  **START BLOW THROUGH**	Signalman moves amber signal device in a circle in front of body. The signal, meaning "Start blow through now," is repeated until the delivery ship acknowledges with a "Blow through" signal, indicating that it has commenced blow down (fueling-at-sea use only).
8.  **STOP BLOW THROUGH**	Signalman moves amber signal device horizontally in front of body, and keeps the proper color visible to the other ship at all times. The signal, given by the receiving ship to indicate "Stop blow through," is acknowledged by the "Stop blow through" signal from the delivery ship, indicating that it has stopped the blow down (fueling-at-sea use only).

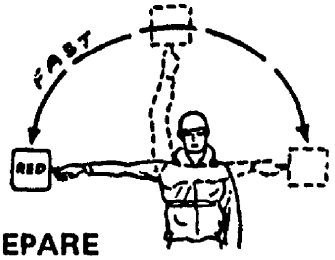
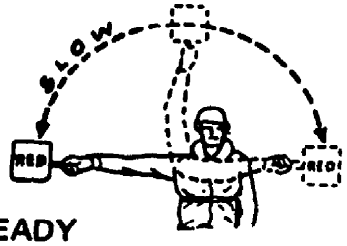
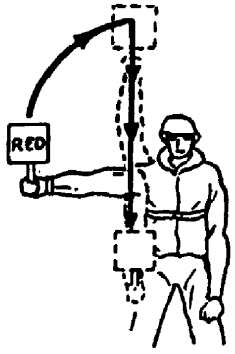
*See NOTE, page C-1.

ALONGSIDE - - HAND SIGNALS (Paralleled by S/P phone)	
STANDARD PROCEDURES	
SIGNAL	REMARKS
9.  TEST S/P PHONE LINE	Signalman raises two green* signal devices overhead to form a "steeple," meaning "Test your phones/phone line."
10.  RE-PLACE S/P PHONE LINE	Signalman moves two green* signal devices vertically in front of body, meaning "Replace your phone line."
11.  DETENSION	Signalman, with red signal device in right hand and amber signal device in left hand, arms extended vertically over head, waves both signal devices vertically in front of body until acknowledged by other ship. Initiated by receiving ship means "Detension." Answered by delivery ship or initiated by delivery ship, signal means "I am detensioning."
12.  TENSION	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 delivery ship, signal means "I am tensioning."

*See NOTE, page C-1.

ALONGSIDE - - HAND SIGNALS (Paralleled by S/P phone)	
COMPLETION OF OPERATION	
SIGNAL	REMARKS
1.  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 over his head.
2.  PELICAN HOOK TO BE TRIPPED	Signalman, with red signal device in right hand, makes chopping motion with right hand from over head to shoulder height. In left hand he holds green* signal device steady at 45° angle from body. Signal, given by delivery ship, indicates "I am ready to trip pelican hook." If receiving ship is not ready, the "avast" signal is given until such time as ship is ready.
3.  TRIP PELICAN HOOK	Signalman holds red signal device in right hand and green* one in left hand. He makes chopping motion with right arm on left elbow which is raised about shoulder height. Signal given by delivery ship indicates "Trip pelican hook." Signal answered by receiving ship indicates "I am tripping pelican hook." When pelican hook is tripped, receiving ship gives "heave around" signal.

*See NOTE, Page C-1.

ALONGSIDE - - HAND SIGNALS (Paralleled by S/P phone)	
EMERGENCY BREAKAWAY	
SIGNAL	**REMARKS**
1.  **PREPARE FOR EMER-GENCY BREAKAWAY**	The delivery ship or the receiving ship may initiate an emergency breakaway. Once initiated, the delivery ship assumes control. Signalman of delivery ship rapidly waves red signal device in a semicircular arc overhead, meaning "Prepare for emergency breakaway." Other ship acknowledges by repeating the signal with a green* signal device, meaning "Understood. I am preparing for emergency breakaway."
2.  **READY FOR BREAKAWAY**	When ready for emergency breakaway, the signalman of the delivery ship slowly waves red signal device in a semicircular arc overhead, meaning "Ready for breakaway." Other ship acknowledges by repeating the signal with a green* signal device, meaning "Signal understood." Keep proper color visible to all other ships at all times.
3.  **EXECUTE BREAKAWAY**	The signalman of the delivery ship raises red signal device to overhead position, then drops it straight down, meaning "Execute emergency breakaway NOW."

*See NOTE, Page C-1.

APPENDIX E

Standard Operating Procedures for MSC-Controlled Tankers Assigned to Extended Fleet Operations

E.1 BACKGROUND

At any one time, Military Sealift Command (MSC) point-to-point tankers are engaged in carrying DOD petroleum products to Army, Navy, and Air Force installations worldwide. Charger Log IV, a CNO-sponsored program, evaluates and exercises the inherent replenishment capability of these tankers to extend and support Navy operations by opportune tanker fuel transfers (consolidations) to fleet oilers or major combatant ships. COMSC (Commander, Military Sealift Command) and fleet directives were developed to provide guidance for these exercises.

Middle East contingency operations have made unusual demands on fuel support to units operating in the Indian Ocean and Mediterranean Sea. MSC-controlled tankers were diverted from point-to-point operations and were used over an extended period to shuttle fuel from shore depots to the mobile logistic support force (MLSF) oilers under direct control of the fleet operational commander. Fuel replenishments were carried out underway and at anchor. The value of this capability in the event of future contingencies has been recognized. However, the prolonged assignment of tankers to direct fleet support missions generates unique problems not covered in the abbreviated Charger Log IV exercise situations; therefore these procedures have been developed to enhance the efficient transition of MSC-controlled tankers assigned to extended fleet operations.

E.2 CONCEPT OF OPERATIONS

Once the fleet commander has generated a requirement for MSC tanker support beyond a single opportune replenishment, a message request will initiate the administrative procedures outlined herein. Depending on the urgency of the initial rendezvous, the ship will normally be positioned for POL load-out and for inspections, briefings, and outfitting with special communications equipment under the supervision of MSC representatives. A combined MSC/fleet briefing team will provide the ship with all necessary instructions and will coordinate required material augmentation from fleet and MSC resources.

E.3 TANKER CAPABILITIES

E.3.1 Underway Replenishment (UNREP). The merchant tanker shall be prepared to receive two spanwire fueling rigs at two stations on one side and to pump at least two products to any fleet replenishment ship or major combatant capable of providing the necessary hoses while underway. Any additional fuel delivery capability will depend on the individual characteristics and capabilities of the selected merchant tanker. For example, some tankers have sufficient hose to rig "jumpers" and receive two double rigs, thus enabling the tankers to pump back through four hoses simultaneously at fuel rates of approximately 12,000 bbl/h (1,900 m^3/h).

E.3.2 At-Anchor Replenishments. In addition to UNREP of fleet oilers and major combatants, the merchant tanker shall be able to provide two hoses for simultaneous fueling of two tankers alongside at anchor. It may also be necessary to consolidate fuel from another MSC point-to-point tanker at anchor. Since the consolidation may take place in international waters at anchorages far from any port facilities or tug services, the nicest sense of judgment and preplanned procedures for coming alongside must prevail, with special regard for the wind, sea, and current conditions. For ship control purposes in some situations, it may be desirable to have the delivering tanker underway at very slow speed while the extended fleet support tanker makes a cautious approach to put over the necessary mooring lines. When properly aligned and made fast, both ships reduce way and, on signal, the loaded tanker will let go the anchor. This "underway" approach method should be attempted only when both ships are adequately fendered and the masters have thoroughly discussed and preplanned the approach.

E.4 ADMINISTRATIVE PROCEDURES

E.4.1 Request for Extended Operations. When a fleet commander-in-chief determines the need for the use of an MSC-controlled tanker to augment or supplement the MLSF for extended operations, a message will be sent to COMSC Washington, D.C.; information to CNO, Washington, D.C.; the Defense Fuel Supply Center (DFSC), Alexandria, Va; and appropriate fleet, force, and MSC area commanders, providing the following minimum information:

1. Duration of operations, location of the operation area, estimated POL cargo by types

2. Primary rendezvous information and alternate, if possible

3. Speed and draft limitations

4. Planned operational control (OPCON) arrangements

5. Funding arrangement to reimburse COMSC for services.

E.4.2 Selection of Tanker. COMSC considers the following factors in selecting the tanker for the mission:

1. Determination of the availability of the ship in conjunction with DFSC cargo lift requirements

2. Specific capabilities of available ships to be obtained from general characteristics listed in Figures 10-11 and 10-12 and the following additional factors:

(a) Pumping rate for each product, cargo split, and tank heating system available (if necessary for cargo cold-weather transfer)

(b) Load limitations

(c) Number and location of fuel transfer stations

(d) Communication capabilities, equipment, and emission

(e) Fuel consumption rates

3. Charter terms and/or necessary modifications

4. Date of, and condition of ship at, last inspection

5. Prior ship experience.

E.4.3 Report of Ship Nomination. COMSC's report of ship nomination to the requesting fleet commander will include:

1. ETA of ship at primary or alternate rendezvous

2. Ship characteristics (if other than those listed in Figures 10-11 or 10-12)

3. Any special communications procedures

4. Funding data; cost per day plus estimated cost for entire operation, if available

5. Owner's or operator's cable and mail address

6. Any pertinent provisions of contract.

E.4.4 Presail Inspection, Briefing, and Outfitting

E.4.4.1 Inspection. A joint inspection shall be held by representatives from COMSC, owner or operator, and commander of the surface force to facilitate an on-site determination of the ship's condition and readiness for extended fleet support operations. If time permits and depending on the date of the last periodic inspection, this event will occur at the first port of call.

E.4.4.2 Briefing. The briefing will be scheduled at the first opportunity after ship nomination. Participants will be MSC and surface force designated representatives.

E.4.4.3 Outfitting. Simultaneously with the briefing, or as soon thereafter as possible, the MSC officer will:

1. Supply such additional publications, instructions, and operation orders as may be pertinent to the mission

2. Provide fuel-testing equipment and instruction manual.

E.4.5 Review of NWP 14, Chapter 10. Thorough familiarization with Chapter 10 of this manual is mandatory whenever a Navy unit is scheduled for UNREP with an MSC tanker (MSC tankers hold NWP 14-2, which contains pertinent extracts from this publication). As a matter of routine, the briefing team will review Chapter 10 with the master and cognizant ship's officers and men.

E.5 CHAIN OF COMMAND

When the tanker is nominated by COMSC and is ready to proceed, the fleet commander-in-chief will designate either a fleet operational commander or COMSC to exercise operational control. In either case, CTF 63 or CTF 73 as COMSIXTHFLT's or COMSEVENTHFLT's logistic coordinator will control all movements and coordinate all requirements, either through COMSC or directly to the ship, depending on the OPCON status. CTF 63/73 will respond to the requirements of the combatant task group commander for whom the merchant tanker is providing support. The merchant tanker administrative commander remains COMSC; however, appropriate MSC area commands will be included on all message traffic to facilitate local support.

E.6 OPERATING INSTRUCTIONS

E.6.1 Check In/Out of Fleet Operational Control. Upon reporting to fleet operational control, as directed by COMSC, the merchant tanker will check out of the MSC Movement Report System. Upon leaving the fleet commander's operational control, as directed by COMSC, the merchant tanker will ensure that all commanders concerned are kept informed of the ship's operating area. Procedures for checking in or out of the MSC Movement Report System are contained in COMSCINST 3123.5.

E.6.2 Movement/Sail Orders. Sail orders (SAILORDs) will be issued to the merchant tanker using an unclassified, modified, MERCO System. The system uses classified ocean reference points, designated by two-letter groups, which will be originated by fleet or force commanders and will be provided to the ship by the briefing team. The following sample SAILORD format may be used.

FROM: CTF SEVEN THREE
TO: SS TANKER
INFO: COMSCFE YOKOHAMA JA/
COMSCPAC OAKLAND CA/
COMSC WASHINGTON DC/
COMSEVENTHFLT/
TG commanders as
appropriate

BT
UNCLAS
SAILORD
ALFA — Ship's name.
ALFA ONE — References (if required).
BRAVO — Location of point of departure (true bearing and range in nautical miles from reference point; i.e., 180 AB 50).
CHARLIE — Departure time.
ECHO — Destination (referring to reference point).
GOLF ONE — Route (incorporating as appropriate OTSR, ETA, and tactical implications).
GOLF TWO — Reference diversion points.

Note

Reference diversion points are dispersed throughout the applicable ocean area and, once promulgated, will be used in tanker SAILORDs until changed by the OPCON commander. References to position shall be made to reference points only; i.e., 270 AK 18 means position bearing 270° true, distance 18 nm, from reference diversion point ALFA KILO.

JULIETT ONE — Scheduled speed (speed of advance).
LIMA ONE — MERCAST or radio guard.
NOVEMBER — Intermediate ports (as appropriate).
OSCAR — Escorts.
ZULU — Remarks.

E.6.3 Reports. Example (Action to CTF 73, Info to COMSC WASHINGTON DC/ COMSCFE YOKOHAMA JA.)

E.6.3.1 Departure Reports. Departure reports will be sent by the tanker in response to a SAILORD or prior to leaving port. Departure reports shall include estimated time of departure, speed of advance and estimated time of arrival (ETA), and amount of bunkers (barrels) and water (tons) on hand. Departure reports shall be transmitted 24 hours prior to departure or as soon as a firm departure time is known. (Reference only points or ports listed in the SAILORD.)

E.6.3.2 Pre-Arrival (Port) Reports. Pre-arrival reports will be made in accordance with COMSCINST 3121.3 for all port visits as during normal commercial operations unless otherwise directed.

E.6.3.3 Arrival Reports. Arrival reports shall be transmitted immediately upon arrival at destination and shall include bunkers and water on hand. If transmission is not allowed in the port, the pre-arrival report shall suffice.

E.6.3.4 Noon Position Reports. Local time noon position reports shall be filed daily, using true bearing and range from the nearest reference diversion point listed in the SAILORD. Any change in anticipated ETA of over 4 hours shall be indicated.

E.6.3.5 Storm Evasion Reports. Unless otherwise directed by the fleet operational commander, anticipated merchant tanker commitments are not of such importance as to risk hazard to the ship. When involved in storm evasion or when directed, report every 6 hours by immediate precedence message: position (reference point), course, speed, wind speed and direction, sea height and direction, bunkers and water aboard, and an assessment of the situation and intentions. Addressees will include appropriate fleet weather centers.

E.6.3.6 Fuel Transfer/Load Reports. A status report shall be made on completion of each consolidation or inport refueling evolution. This report will contain, as applicable:

1. Ship consoled and/or refueled

2. Amount of each product transferred (Mbbls)

3. Amount of each product remaining (Mbbls)

4. Amount of each product loaded

5. Total of each product aboard.

In addition, a report of each bunkering from ship's cargo shall be made (Mbbls), including the applicable cargo fuel remaining.

E.6.3.7 Material and Personnel Casualty Reports. Merchant ships will report all material casualties affecting the consolidation; refueling; and communication capability, mobility, and/or safety of the ship. Personnel casualties will be reported in the same manner. The precedence of the report will be according to the effect of the casualty on operations and judgment of the master. It is imperative that all concerned are informed of these casualties. The following sample message formats may be used.

E.6.3.7.1 CASREP (Casualty Report)

FROM: SS TANKER
TO: CTF SEVEN THREE/
Senior naval commander in area/(e.g., CTF SEVEN SEVEN POINT FIVE)/
COMSC WASHINGTON DC/
COMSCFE YOKOHAMA JA
INFO: MSCO SUBIC BAY PI/
NAVSEAREPFAC SUBIC BAY RP
BT
UNCLAS
CASREP
ALFA — Nature of casualty (include complete identifying data of failed part . . . manufacturer, voltage, horsepower, AC or DC, current rating . . . and so forth.)
BRAVO — Extent of damage to cargo, if any.
CHARLIE — Extent of ship or equipment damage on movements of the ship or cargo handling capability. Actions, if any, being taken by crewmembers to correct material failure. Example:

ABLE TO CARRY OUT MISSION WITH REDUCED CAPABILITY. NUMBER ONE PUMPING STATION INOPERATIVE. UNABLE TO REPAIR BY SHIP'S FORCE BECAUSE OF LACK OF REPAIR PARTS.

DELTA — Estimated time of completion of repairs. Example:

EIGHT HOURS AFTER RECEIPT OF PARTS.

ECHO — Other information considered appropriate. Example:

REQUEST PARTS ON ARRIVAL SUBIC, NO OUTSIDE ASSISTANCE DESIRED.

FOXTROT — Location (bearing and range to nearest reference diversion point).

Note

Be specific. State problem and exactly what parts and services you require to be fully operational.

E.6.3.7.2 SITREP (Situation Report). (Use same addressees as for CASREP.)

UNCLAS
SITREP. NO. 1 SHAFT BEING REPLACED. PROCEEDING IAW SAILORD AT REDUCED SPEED OF 6 KT. WILL ADVISE WHEN FULL SPEED IS AVAILABLE.

E.6.3.7.3 CASCOR (Casualty Corrected). (Use same addressees as for CASREP.)

UNCLAS
MY (DATE-TIME-GROUP OF CASREP).
CASCOR. PROCEEDING AT FULL POWER. REPAIR TIME 23 HOURS.

E.6.3.8 Port Visits. Merchant tanker port visits will be unclassified and arranged in accordance with normal merchant tanker procedures. The merchant tanker and its owner or operator will be informed of planned port visits by the operational commander about one week prior to the visit.

E.7 COMMUNICATIONS

Communications will be in accordance with NTP-10. The extracts herein provide the broad communications concept.

Note

These instructions provide special communications instructions to MSC-controlled tankers (USNS and chartered) providing extended logistical support directly to the fleet. These instructions do not apply to oilers with military communications departments aboard.

E.7.1 Communications Guard. All MSC-controlled tankers are equipped with international maritime satellite (INMARSAT) terminals that shall remain activated at all times. Messages to and from ships are processed through the Navy Communications Processing and Routing System (NAVCOMPARS) via a torntape interface at MSC headquarters. This is the ship's primary communications system, as described in NTP-10; secondary communications guard arrangements may be made using HF SITOR, Coast Guard or commercial stations, or MERCAST.

E.7.2 Communications Guard Shift. Ships will not secure INMARSAT terminals when in port, unless inport operation is prohibited by the host country. A guard shift message will be sent in accordance with NTP-10 each time there is a change in the primary guard (INMARSAT) or the secondary guard (commercial back-up or inport agent). This allows MSC Headquarters interface to reroute messages immediately if a casualty occurs to the INMARSAT terminal.

E.7.3 Ship-to-Shore Circuits. INMARSAT shall be the primary method of clearing outgoing message traffic.

US Coast Guard worldwide AMVER and SITOR circuits are a secondary means of sending ship-to-shore messages. Frequencies are listed in the AMVER bulletin.

If INMARSAT, AMVER, or SITOR circuits are not available, commercial circuits may be utilized.

E.7.4 Task Group Common (Voice). The ship shall maintain voice communications with the task group (TG) as directed by the TG commander. Transmissions shall be kept to a minimum consistent with operations. Transmitter power shall not exceed that required for reliable communications. UHF or VHF FM marine radiotelephone shall be used wherever possible and shall be used as the primary means of voice communications when in company or when rendezvousing with Navy ships. The ship's voice call sign will be the ship's name unless assigned a separate distinct call sign. A secondary HF single-sideband task group common frequency may be designated for emergency coordination by higher authority.

E.7.5 Interim Command Switchboard Circuits. Interim command switchboard (ICSB) circuits provide a means whereby ships can communicate directly with shore-based commands via means of a radiotelephone circuit patched through a naval communication station. ICSB is limited to those ships having a single-sideband capability, and standard procedures for placing an ICSB call must be adhered to. ICSB stations, frequencies, and call-up procedures will be provided by the briefing team.

E.7.6 Amateur Radio Transmissions. A unit under the operational control of a fleet commander may, at the discretion of the master, conduct amateur radio operations provided the ship is in international waters.

E.7.7 Radiotelephone Procedures. Transmissions will be short, concise, and clear, consistent with clarity. Adherence to prescribed procedures is mandatory. The following basic rules shall be strictly observed on all radiotelephone circuits:

1. No transmission shall be made which has not been authorized by the proper authority (master).

2. Classified information will not be discussed over nonsecure circuits regardless of the frequency used.

3. Directed radio silence must not be violated.

4. Unofficial conversation between operators is forbidden.

5. Permission must be obtained before transmitting on a controlled net.

6. Operator's personal name or call sign must not be transmitted.

7. Use of plain language in place of applicable prowords or operating signals is unauthorized.

8. Profane, indecent, or obscene language must not be transmitted.

E.7.8 Communication Operating Signals. NTP-10 contains the communication operating signals.

E.7.9 Geographic Locations in Message Addresses. The geographic locations of message addressees are required and must include the city or town — spelled out — and the state, country, or territory — abbreviated. The abbreviations are found in NTP-3, NTP-3 SUPP 1, and NTP-10.

E.8 MAINTENANCE AND REPAIRS

E.8.1 Responsibility for Maintenance and Repairs. The owner of the ship(s) will remain responsible for all maintenance and repairs, however, if urgent requirements exist and Navy afloat ship assets can be of assistance, the ship should requisition from the naval unit and notify the owner of any assistance received.

E.8.2 Fleet Technical Assistance. The merchant tanker can request technical personnel assistance from fleet units. This assistance will be provided if other fleet maintenance priorities permit.

E.8.3 Tender Repair Work. The merchant tanker may request repair services from Navy tenders subject to approval by the fleet commander and only when other sources, such as ship repair facilities, are not available. Tender repair services are provided on a reimbursable basis.

E.9 MERCHANT TANKER LOGISTICS SUPPORT

The merchant tanker is authorized to requisition provisions and consumables from fleet logistics support units as required. The ship's owner or operator is responsible for payment.

E.10 REFERENCES

COMSCINST 3121.3, Tanker Operating Instructions

NWP 14, Replenishment at Sea

NWP 14-2, MSC Handbook for Refueling at Sea

NTP-3, Telecommunications Users Manual

NTP-3 SUPP 1, Plain Language Address Directory

NTP-10, Communications Instructions for Ships Controlled by the Military Sealift Command and the U.S Flag Merchant Fleet

APPENDIX J

Astern FAS Hose Cleanout System

J.1 EQUIPMENT DESCRIPTION

Cleaning fuel hose with pigs is to be performed as an integral part of fueling at sea. The fueling station on the delivery ship is used as a *launching* station and the fueling station on the receiving ship is used as a *catching* station. Description of the fueling stations and related hose hardware, as well as detailed fueling instructions, can be found in this publication.

The following paragraphs describe specific equipment used with the pig cleanout system.

J.1.1 Pig. The pigs used in this system are Knapp "Poly-Pigs," style 5, type B or equal, which are coated on both ends with polyurethane elastimer and sized for use in a 6 inch (152.4 mm) nominal diameter hose (Figure J-1). Essentially, they are polyethelyne foam cylinders whose outside diameter is slightly larger than the inside diameter of the fuel hose. The pig is propelled by air pressure through the hose (similar to a piston in a cylinder), thereby displacing the fluid in the hose.

Pigs are expendable; therefore, they are used once and discarded. They should be stored in a cool, dry, dark place; useful shelf life is approximately 1 year.

J.1.2 Pig Receiver. The pig receiver, also shown in Figure J-1, is a strainer-like steel fabrication which is placed inside the B-end of the NATO coupling at the end of the hose connected to the receiving ship. The pig receiver catches the pig and prevents it from entering the receiving ship's fuel system. The receiver is designed to vent the blowdown air after it catches the pig. MSC Standard Drawing, STD-528-4840155, In-Line Astern FAS Pig Receiver Assembly, shows details of the receiver assembly.

J.1.3 Hose Crimper. The hose crimper is a clamp-like device used to seal off the fuel hose. Sealing the fuel hose on the delivery ship is required while inserting the pig. NAVSHIPS Dwg 805-2554813, Fueling at Sea Hose Crimper, shows a typical hose crimper design suitable for this application.

J.1.4 Orifice. The orifice, Figure J-2, is a 1/4 inch (6.35 mm) diameter opening that restricts the flow of the blowdown air. The orifice is located inside the air line and is used to limit the airflow rate which regulates the speed of the pig as it travels through the hose.

J.2 SYSTEM OPERATION

Cleanout of the astern FAS hose is required after each fueling operation. The following instructions describe how pigs are used to accomplish this task. Part numbers listed in the instructions refer to Figures J-3 and J-4.

J.2.1 Operating Instructions for Delivery Ship

J.2.1.1 Pre-Operation Inspection. The pre-operation inspection must be performed prior to sending the astern FAS hose to the receiving ship.

1. Ensure that pig receiver (14) is inserted into NATO coupling B-end (13), which is located at the end of the hose to be connected to the receiving ship.

2. Secure conical cap (12) to NATO coupling B-end (13).

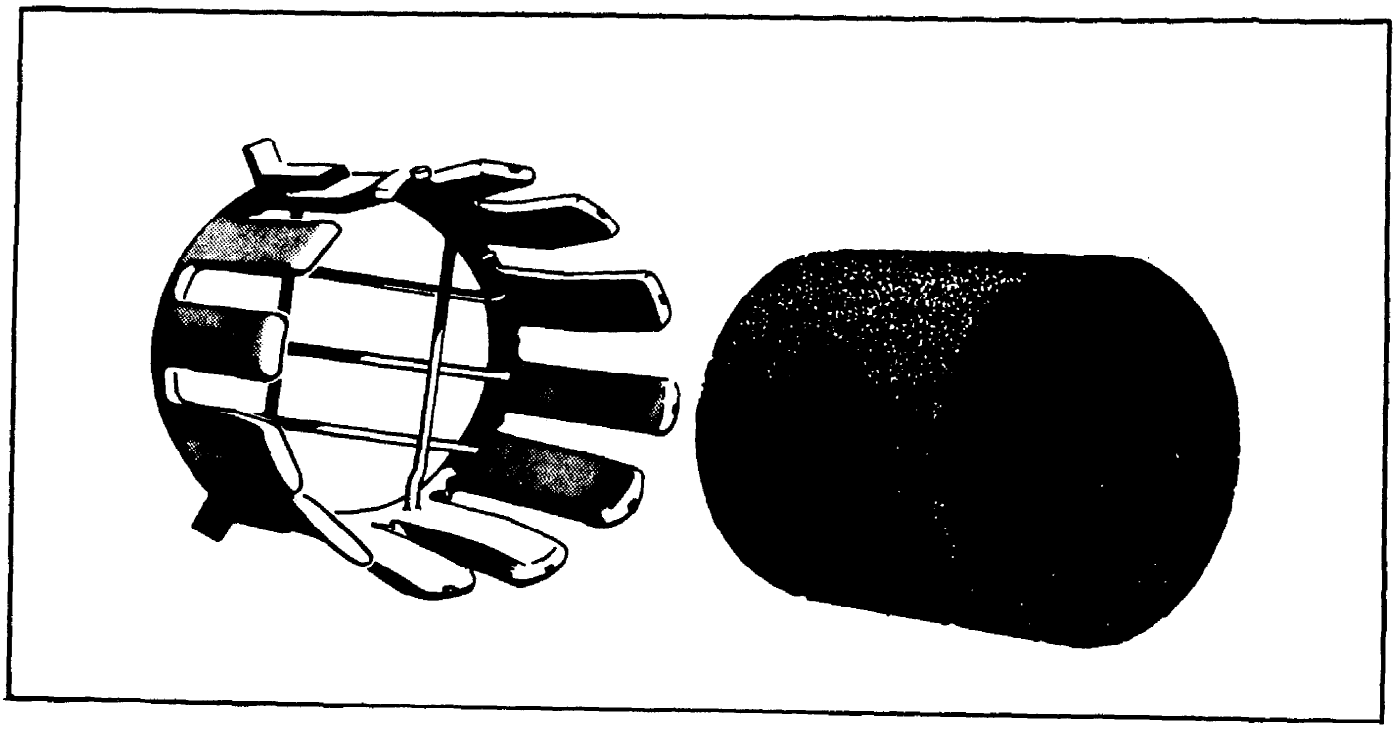


Figure J-1. Pig Assembly (Left) and Pig (Right)

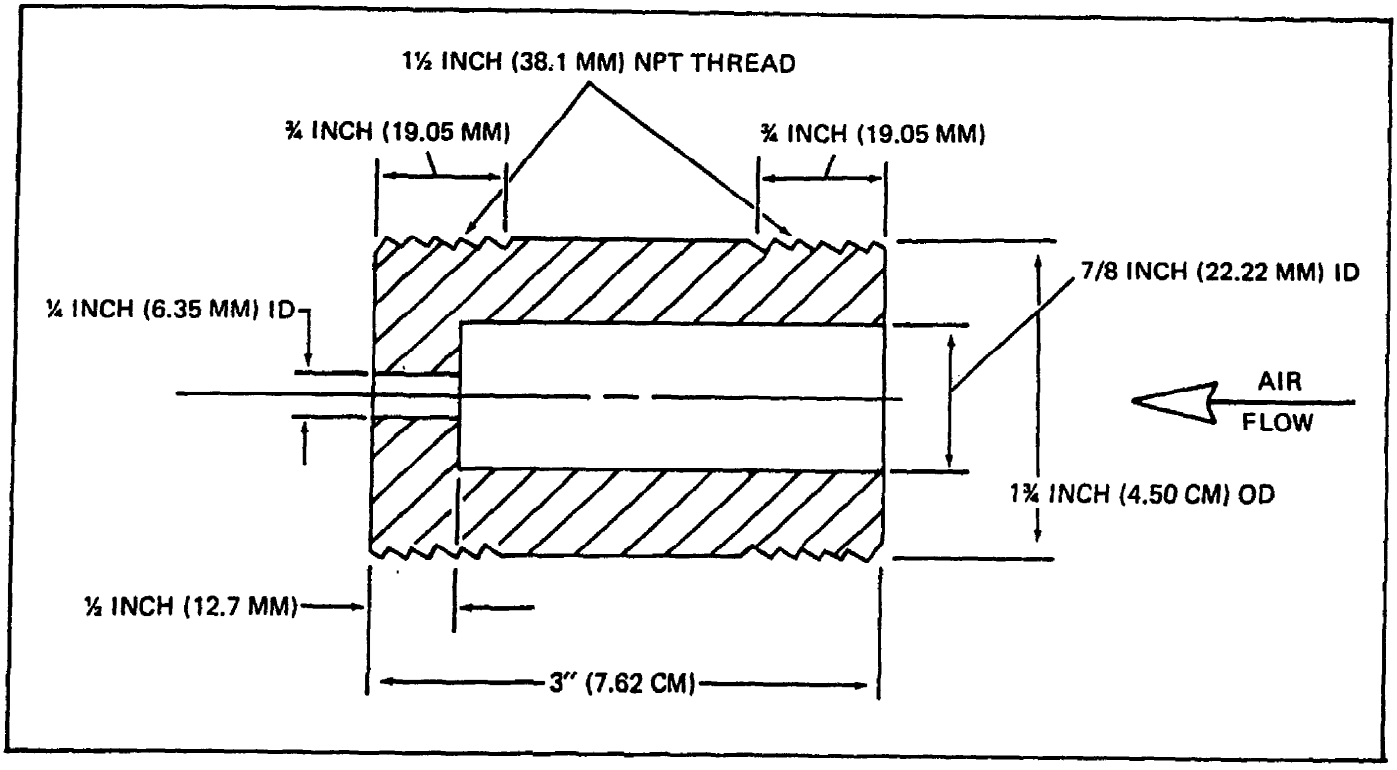
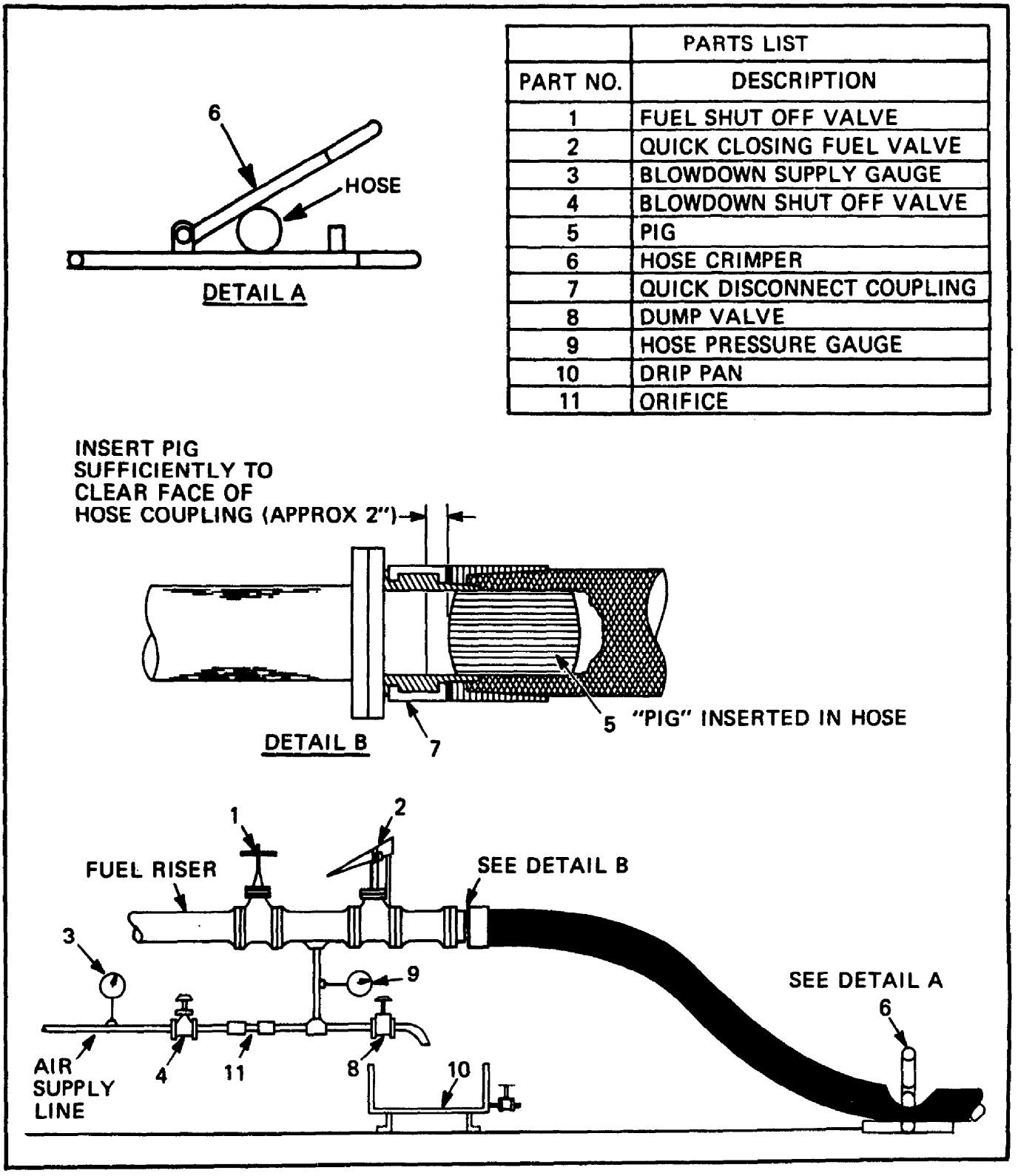


Figure J-2. Orifice for Blowdown Air Line



	PARTS LIST
PART NO.	DESCRIPTION
1	FUEL SHUT OFF VALVE
2	QUICK CLOSING FUEL VALVE
3	BLOWDOWN SUPPLY GAUGE
4	BLOWDOWN SHUT OFF VALVE
5	PIG
6	HOSE CRIMPER
7	QUICK DISCONNECT COUPLING
8	DUMP VALVE
9	HOSE PRESSURE GAUGE
10	DRIP PAN
11	ORIFICE

Figure J-3. Astern Refueling Station — Delivery Ship

PARTS LIST	
PART NO.	DESCRIPTION
12	CONICAL CAP
13	NATO COUPLING B-END
14	PIG RECEIVER
15	NATO COUPLING A-END (SUPPLIED BY RECEIVING SHIP)

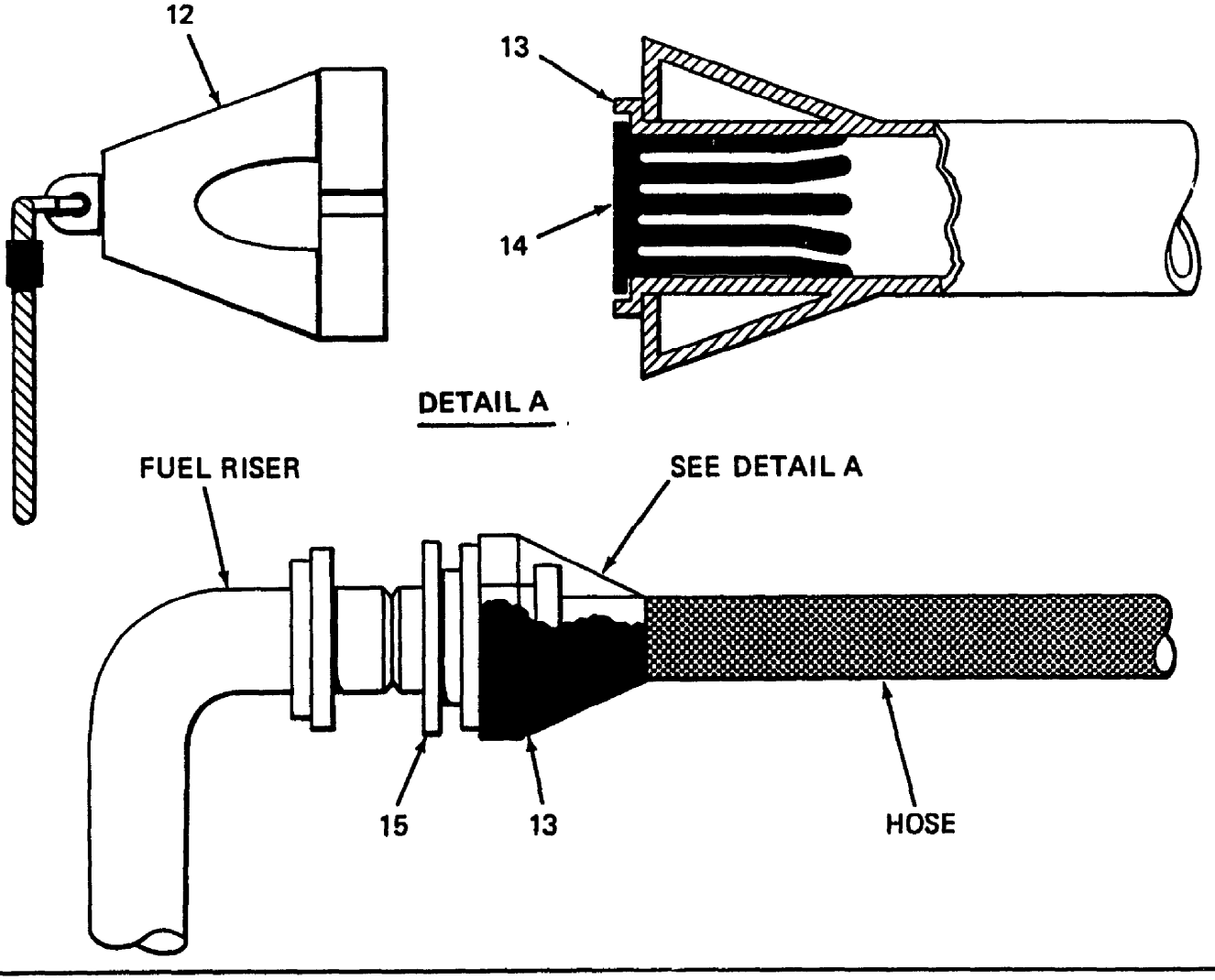


Figure J-4. Astern Refueling Station — Receiving Ship

3. Ensure that air supply is available for blowdown. Blowdown supply gauge (3) should read, at a minimum, 75 psig.

4. The fueling operation can now proceed as previously set forth in this publication.

J.2.1.2 Blowdown Operation. The blowdown operation proceeds after fueling is complete and the "Start Blowdown" signal has been received.

1. Close fuel shutoff valve (1) and keep quick-closing fuel valve (2) open.

2. Open blowdown shutoff valve (4) for about 15 seconds to blow out fuel riser before inserting pig (5), then close blowdown shutoff valve.

3. Place hose crimper (6) on hose near the quick disconnect coupling (7). Open air dump valve (8) to ensure that fuel riser is free of oil, then close air dump valve.

4. Open quick disconnect coupling (7) and manually insert pig (5) into hose. *The end of the pig should clear the face of the coupling by about 2 inches (50.8 mm) to prevent interference when recoupling.*

5. Reconnect coupling (7) and remove hose crimper (6).

6. Open blowdown shutoff valve (4).

Note

At this time, fuel shutoff valve (1) and air dump valve (8) should be closed and quick-closing fuel valve (2) and blowdown shutoff valve (4) should be open.

7. Monitor hose pressure gauge (9) until measured pressure starts to drop.

Note

The pressure at the hose pressure gauge will remain basically constant as the pig (5) travels through the hose. The actual pressure reading indicated depends on the supply of air pressure and the elevation of the fuel riser on the receiving ship and will normally be between 5 and 35 psig. When the pig reaches the receiver (14) (3 to 5 minutes after launching), the air in the hose will vent past the pig and the pressure reading on the hose pressure gauge will start to fall. This is the signal that the pig has entered the pig receiver and procedures for terminating the blowdown can commence.

8. When hose pressure starts to drop, close blowdown shutoff valve (4). Open air dump valve (8) to hasten venting of air from hose.

9. When hose pressure gauge (9) reads zero psig, secure filling station by closing all valves (1, 2, 4, and 8).

J.2.2 Operating Instructions for Receiving Ship

J.2.2.1 Preliminaries to Blowdown Operation

1. Ensure that pig receiver (14) is present in NATO coupling B-end (13) prior to connecting astern FAS hose to fuel riser.

2. After fueling operations are completed, signal delivery ship to "Start Blowdown."

CAUTION

The astern FAS hose may contain up to 1,200 gal (4,542 l) of fuel which will be removed by the blowdown operation. The

receiving ship must therefore reserve sufficient fuel tank capacity to contain this additional quantity of fuel.

J.2.2.2 Post-Blowdown Operation. The post-blowdown operation proceeds after the "Stop Blowdown" signal is received from the delivery ship.

1. Disconnect hose at NATO coupling (13) and remove the pig receiver (14) from the end of hose.

2. Remove pig (5) from pig receiver (14) and dispose of pig.

3. Replace pig receiver (14) in NATO coupling B-end (13) and secure conical cap (12) to coupling.

4. The astern FAS hose may now be disengaged from the receiving ship as set forth in this publication.

J.3 REQUIRED MODIFICATIONS

The following paragraphs describe the modifications to be made on tankers to permit use of pigs for hose cleanout. The tankers must already be equipped with astern refueling stations and blowdown air supplies.

J.3.1 Orifice Installation. The orifice (see paragraph J.1.4) is to be installed in the existing blowdown air supply line downstream of the shutoff valve, as shown in Figure J-3.

J.3.2 NATO Coupling Modification. Modification of the NATO coupling B-end is necessary to allow fitting the pig receiver into the coupling. The modification, which adds three reliefs in the sealing ridge of the coupling's face, is detailed in Figure J-5.

J.3.3 Storage Facilities. A designated storage locker should be provided for cool and dry storage of the pigs, hose crimper, pig receiver, and associated hardware. This locker should be able to screen most of the light, since sustained exposure of the pigs to light (especially ultraviolet) will cause chemical break-down of the polyurethane foam material and result in flaking.

J.3.4 Instruction Placard. An instruction placard should be provided on each tanker that uses the pig system. It should list briefly the necessary operating instructions explained in paragraph J.2. The placard should be of durable material with clear, legible writing and located at the astern refueling station. An example of the essential instructions which should appear on the placard is shown in Figure J-6.

J.4 MAINTENANCE

J.4.1 Inspection. The pig method of cleaning fuel hose uses simple, passive equipment which should give reliable performance. To help ensure proper operation of the system, the following items should be given attention:

1. The orifice located in the blowdown air supply line should be inspected once every 6 months. The orifice should be checked for blockage by dirt or corrosion and cleaned or replaced as necessary.

2. Pigs should be checked for flaking before use by briskly rubbing the outside surface of the foam material and checking to see if foam particles come loose. Flaking is undesirable because the dislodged particles could possibly block fuel system filters.

3. When performing a blowdown operation, ensure that the pressure gauge for the blowdown air supply reads, at a minimum, 75 psig.

4. Severe kinks should be removed from the hose prior to commencing blowdown to permit unrestricted flow of the pig.

J.4.2 Troubleshooting. The following troubleshooting guidelines are remedies to some operating difficulties that may be encountered.

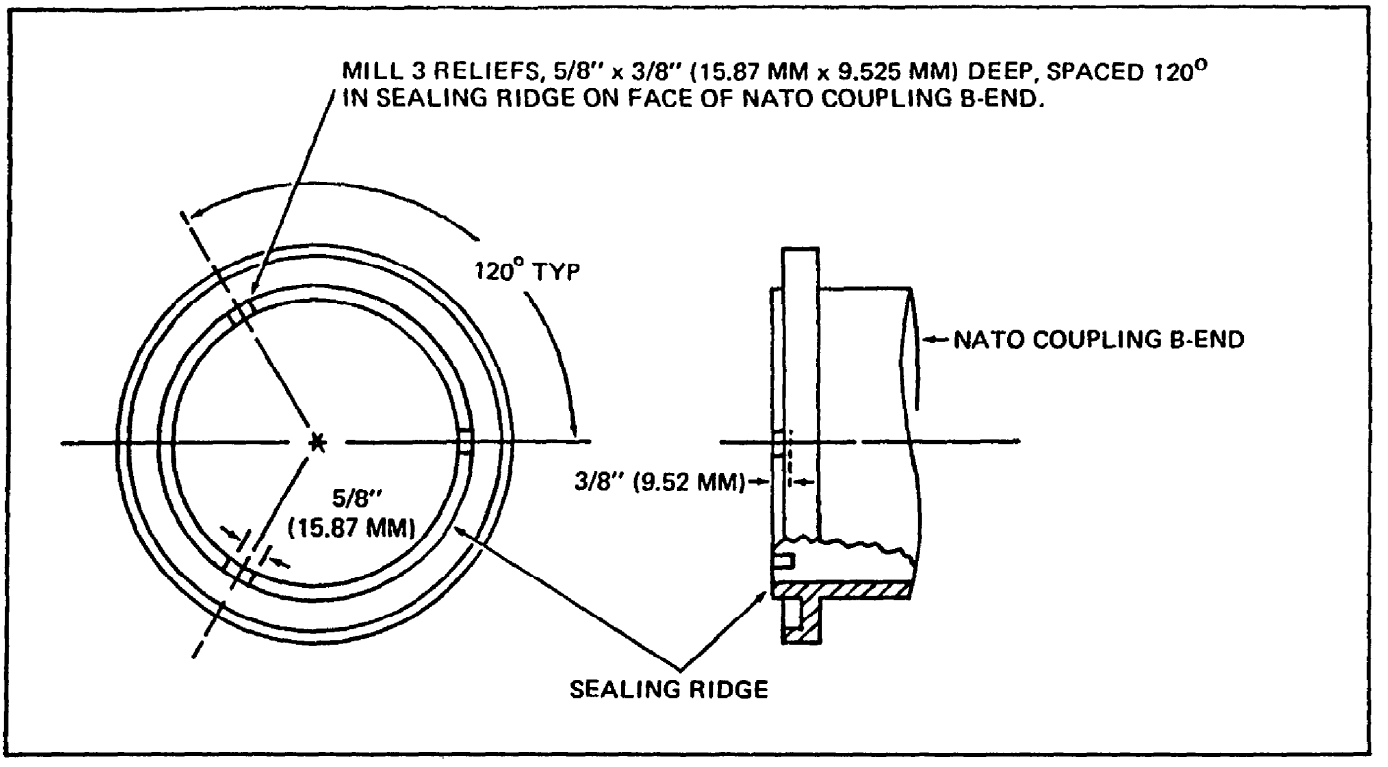


Figure J-5. Modification to NATO Coupling

Part numbers refer to Figures J-3 and J-4.

J.4.2.1 Entire Hose Appears Uninflated During Initial Pig Launch

J.4.2.1.1 Cause

1. No blowdown air supply.

2. Valves not properly aligned.

3. Pig is stalled in coupling.

J.4.2.1.2 Remedy

1. Check blowdown air supply. Blowdown air supply gauge (3) should read, at a minimum, 75 psig.

2. Ensure that fuel shutoff valve (1) and dump valve (8) are closed and that quick-closing fuel valve (2) and blowdown shutoff valve (4) are open. Also ensure that hose crimper (6) is removed from hose.

3. Close blowdown shutoff valve (4) and open dump valve (8) to bleed air from fuel riser. Open quick disconnect coupling (7) and ensure that end of pig (5) has been inserted far enough into hose (about 2 inches (50.8 mm)) so as not to interfere with quick disconnect coupling. Pig should fit tightly inside hose. Reconnect coupling and proceed with cleanout operation.

J.4.2.2 Part of Hose Length Appears Inflated. Part of hose appears inflated and part

OPERATING INSTRUCTIONS FOR THE
CLEANOUT OF ASTERN FAS HOSE

THE CLEANOUT OPERATION SHALL BE CONDUCTED UNDER THE SUPERVISION OF THE SHIP'S OFFICERS.

Note

ALL PERSONNEL INVOLVED WITH THE CLEANOUT OPERATION SHOULD BE FAMILIAR WITH THE "OPERATING MANUAL FOR THE ASTERN FAS HOSE CLEANOUT SYSTEM." COMSC PUBLICATION MSC-7.

PRE-OPERATION INSPECTION

1. BEFORE SENDING THE ASTERN FAS HOSE TO THE RECEIVING SHIP VERIFY THAT THE PIG RECEIVER IS PROPERLY POSITIONED IN THE B-END OF THE NATO COUPLING. THE CONICAL CAP SHOULD THEN BE SECURELY FASTENED TO THE B-END OF THE NATO COUPLING.
2. CHECK THAT THE 1/4 INCH (6.35mm) ORIFICE IN THE AIR SUPPLY LINE IS INSTALLED AND CLEAR OF OBSTRUCTIONS.
3. CHECK THAT AIR FOR BLOWDOWN IS AVAILABLE AT THE FUELING STATION.

BLOWDOWN OPERATION

AFTER RECEIVING THE *START BLOWDOWN* SIGNAL PROCEED AS FOLLOWS:

1. CLOSE MAIN FUEL VALVE AT STATION
2. CHECK THAT QUICK-CLOSING FUEL VALVE IS OPEN
3. OPEN AIR BLOWDOWN VALVE FOR 15 SECONDS THEN CLOSE
4. PLACE HOSE-CRIMPER ON HOSE
5. OPEN AIR DUMP VALVE TO ENSURE RISER IS FREE OF FUEL, THEN CLOSE
6. OPEN QUICK-DISCONNECT COUPLING AT THE FUELING STATION AND MANUALLY INSERT THE PIG INTO THE HOSE
7. RECONNECT THE COUPLING
8. REMOVE HOSE CRIMPER
9. OPEN AIR BLOWDOWN VALVE
10. MONITOR THE HOSE PRESSURE GAUGE UNTIL PRESSURE STARTS TO DROP

Note

THREE TO FIVE MINUTES AFTER LAUNCHING THE PIG, THE PRESSURE READING ON THE HOSE PRESSURE GAUGE WILL START TO FALL. THIS IS THE SIGNAL THAT THE PIG HAS ENTERED THE PIG RECEIVER, AND PROCEDURES FOR TERMINATING THE SLOWDOWN CAN COMMENCE.

11. CLOSE AIR BLOWDOWN VALVE AND OPEN AIR DUMP VALVE
12. WHEN HOSE PRESSURE GAUGE READS ZERO PSIG, SIGNAL RECEIVING SHIP THAT BLOWDOWN IS COMPLETED, AND SECURE STATION.

Figure J-6. Instruction Placard

appears uninflated. Hose pressure gauge (9) indicates steadily rising pressure.

J.4.2.2.1 Cause. Pig stuck in hose.

J.4.2.2.2 Remedy. Remove all severe kinks in hose, and lift and drop hose on the deck to help start pig moving through hose.

J.4.2.3 Entire Length of Hose Appears Inflated. Entire length of hose appears inflated (up to NATO coupling). Hose pressure gauge (9) indicates steadily rising pressure.

J.4.2.3.1 Cause. Pig receiver (14) not venting air from hose.

J.4.2.3.2 Remedy. Close blowdown shutoff valve (4) and open dump valve (8) to manually vent hose. When hose pressure gauge (9) reads zero psig, signal receiving ship that blowdown is completed.