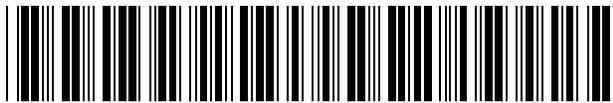


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March 2001

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Replenishment at Sea

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APPENDIX K — STATION-KEEPING AID

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LIST OF ACRONYMS/ABBREVIATIONS

A

AFFF. Aqueous film forming fluid (light water)

AIULP. Auto inflatable utility life preserver

ASD. Antislack device

B

B/B. Bridge-to-bridge

C

CCO. Combat cargo officer

CDR. Cargo drop reel

cG. Center of gravity

CIC. Combat information center

CLF. Combat Logistics Force

CNO. Chief of Naval Operations

COD. Carrier onboard delivery

COMSC. Commander, Military Sealift Command

CONREP. Connected replenishment

E

EMCON. Emission control

F

FAS. Fueling at sea

FDO. Flight deck officer

FLC. Fleet logistic coordinator

FLSR. Forward logistic site representative

FOD. Foreign object damage

H

HCO. Helicopter control officer

HELT. Helicopter external load team

HERO. Hazards of electromagnetic radiation to ordnance

I

ICS. Interphone communications system

ICSB. Interim command switchboard

IFR. Instrument flight rules

IMC. Instrument meteorological conditions

INMARSAT. International maritime satellite

IWRC. Independent wire rope core

J

JOOD. Junior officer of the deck

L

LALC. Local air logistic coordinator

LC. Logistic coordinator

LHC. LOGHEAD coordinator

LSE. Landing signalman enlisted

M

MAGTF. Marine air-ground task force

MLSF. Mobile Logistics Support Force

MSC. Military Sealift Command

N

NATOPS. Naval air training and operating procedures standardization program

NSN. National stock number

O

OCE. Officer conducting the exercise

OOD. Officer of the deck

OTC. Officer in tactical command

P

PIM. Position and intended movement

PMS. Planned maintenance system

PQS. Personnel qualification standards

R

RAS. Replenishment at sea

S

Sta/Sta. Station-to-station

STAR. SURF traveling actuated remotely

STREAM. Standard tensioned replenishment along-side method

SURF. Standard underway replenishment fixture

T

TFLC. Task force logistic coordinator

TGLC. Task group logistic coordinator

U

UNREP. Underway replenishment

URC. Underway replenishment coordinator

USNS. United States Naval Ship

V

VERTREP. Vertical replenishment

VFR. Visual flight rules

VMC. Visual meteorological conditions

VOD. Vertical onboard delivery

PREFACE

The information contained in NWP 4-01.4, Underway Replenishment, is directed toward preparing both the replenishment and customer ship for a replenishment evolution. Detailed rig make-up, requisite equipment, and standardized procedures are established to serve as specific guidelines for all aspects of replenishment at sea.

NWP 4-01.4 has evolved over the years as a direct result of continuing fleet requirements to standardize procedures, furnish rig make-up guidance, and provide continuity in application and use. The highest degree of professional competence in UNREP evolutions is required for their safe and efficient conduct. Each ship shall ensure wide dissemination to all personnel involved in the planning of, supervision of, and participation in UNREP evolutions.

NWP 4-01.41, MSC Handbook for Refueling at Sea, provides MSC and industry-owned tankers with operating procedures for underway refueling.

Throughout this publication, references to other publications imply the effective edition.

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URGENT CHANGE RECOMMENDATIONS

When items for changes are considered to be urgent (as defined in NWP 1-01, and including matters of safety), this information shall be sent by message (see accompanying sample message format) to COMLOG-GRU TWO, with information copies to Naval Doctrine Command, Navy Tactical Support Activity, and all other commands concerned, clearly explaining the proposed change. Information addressees should comment as appropriate. See NWP 1-01.

CHANGE SYMBOLS

Revised text in changes is indicated by a black vertical line in either margin of the page, like the one printed next to this paragraph. The change symbol shows where there has been a change. The change might be material added or information restated. A change symbol in the margin by the chapter number and title indicates a new or completely revised chapter.

FM ORIGINATOR
TO COMLOGGRUTWO NORFOLK VA//JJJ//
INFO COMNAVDOCOM NORFOLK VA//N3/N34//
NAVTACSUPPACT WASHINGTON DC//TT40//

CLASSIFICATION//N03510//

MSGID/GENADMIN/(*Organization ID*)//

SUBJ/URGENT CHANGE RECOMMENDATION FOR NWP 4-01.4//

REF/A/DOC/NWP 1-01//

POC/(*Command Representative*)//

RMKS/

1. IAW REF A URGENT CHANGE IS RECOMMENDED FOR NWP 4-01.4
2. PAGE _____ PARA NO _____ LINE NO _____ FIG NO _____
3. PROPOSED NEW TEXT (*Include Classification*)

4. JUSTIFICATION

WARNINGS, CAUTIONS, AND NOTES

The following definitions apply to “WARNINGS,” “CAUTIONS,” and “NOTES” found throughout the manual.


WARNING

An operating procedure, practice, or condition that may result in injury or death if not carefully observed or followed.


CAUTION

An operating procedure, practice, or condition that may result in damage to equipment if not carefully observed or followed.

Note

An operating procedure, practice, or condition that is essential to emphasize.

WORDING

The concept of word usage and intended meaning which has been adhered to in preparing this publication is as follows:

“Shall” has been used only when application of a procedure is mandatory.

“Should” has been used only when application of a procedure is recommended.

“May” and “need not” have been used only when application of a procedure is optional.

“Will” has been used only to indicate futurity, never to indicate any degree of requirement for application of a procedure.

CHAPTER 1

Concepts of Replenishment

1.1 OBJECTIVES OF REPLENISHMENT

In order to carry out the Navy's mission, fleet units must be capable of remaining at sea for prolonged periods, fully ready to carry out any assigned tasks. CLF ships are equipped to replenish combatants underway with fuel, ammunition, provisions, stores, and spare parts.

The Navy transports products loaded on resupply ships forward to safe areas in the theater, and shuttles commodities loaded on single product ships from forward sources to multiproduct ships stationed in the task force. The latter are the interface between the task force and the Navy's replenishment system. They operate as integral units of the task force and so provide the task force with its endurance. (See Figure 1-1.)

In order to operate at sea for prolonged periods, a fleet unit receives logistic support by means of an UNREP — a transfer of liquid and/or solid cargo between two ships while underway. Two methods of transfer are employed: horizontal transfer via CONREP rigs and vertical transfer via helicopter (VERTREP).

The goal of an UNREP is the safe delivery of the maximum amount of cargo in the minimum of time. An UNREP must be accomplished in such a manner that it does not interfere with the primary mission of the supported force.

Note

For conduct of Allied replenishment operations, refer to ATP 16.

1.2 ORGANIZATION AND COMMAND

1.2.1 Logistics Coordinator. Consistent with force makeup, an FLC, TFLC, or TGLC will be assigned and have the authority to coordinate logistic evolutions consistent with the CWC concept of operations. He/she is responsible for the following items, some of which may be delegated to the URC or OTC of the UNREP evolution:

1. Selecting and promulgating rendezvous time and place. This should be done as far in advance as scheduling permits.
2. Ensuring submission of requirements. Collect requirements or requisitions of force units for transfer to the replenishment OTC; however, he/she may direct each ship to submit its requirements directly to the appropriate replenishment ship. Requirements for ammunition, missiles, and personnel transfers should be submitted as far in advance of the UNREP as possible.

1.2.2 Local Air Logistics Coordinator. The LALC will coordinate logistics helicopter overhauls on CVs, LHDs, LHAs, and LPHs with airwing operations and COD/VOD overhauls for timely delivery or pickup of task group passengers, mail, and cargo. The LALC will promulgate the daily LOG HELO air plan.

1.2.3 Underway Replenishment Coordinator. The URC will:

1. Issue standing UNREP guidance (OPTASK RAS).
2. Monitor inventories/quantities of commodities on board assigned CLF ships in company with or enroute to the task force/group.
3. Monitor inventory status of commodities on TF/TG ships, identify problem areas to the LC, and recommend solutions.
4. Recommend UNREP and resupply/consol schedules to the LC.
5. Ensure that UNREP ships pass through the designated rendezvous point on time.
6. Coordinate with the FLSR/LHC to prioritize and direct the loading of fleet freight, FFV, and dairy products.

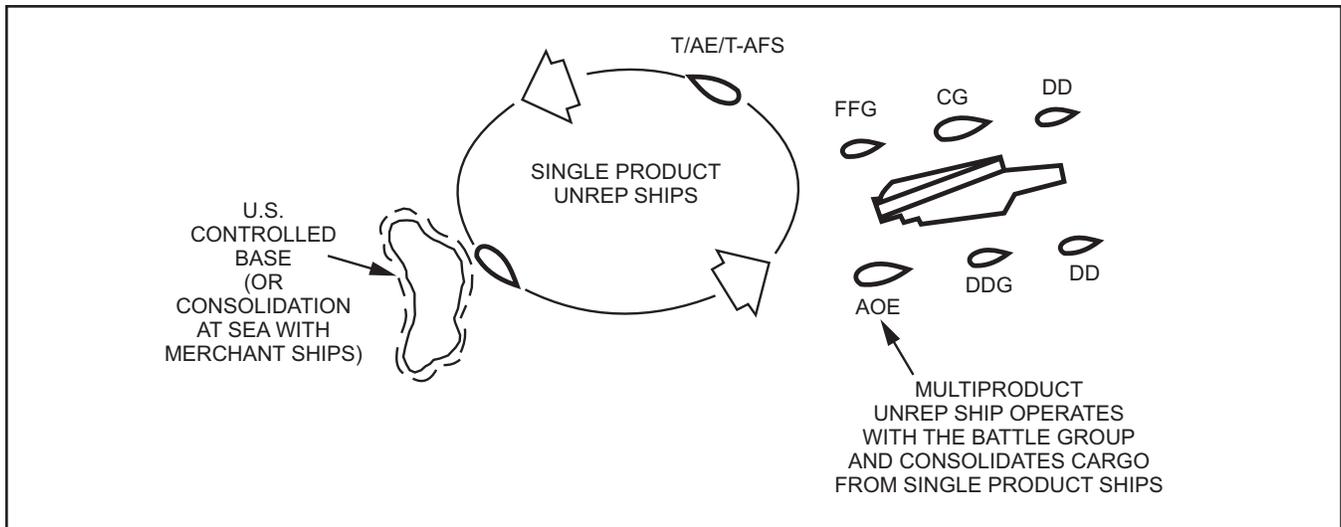


Figure 1-1. U.S. Navy Underway Replenishment Concept

7. In the event of an anticipated commodity shortage, ensure equitable distribution of available inventories to TF/TG ships.
8. During extended at-sea operations, when ships are not afforded opportunities for periodic pier-side offload of dry plastics trash and/or HAZMAT, arrange routine transfer of these materials from on-station forces to disposal facilities ashore via shuttle ship.

1.2.4 Order Alongside. The screen commander will designate the order alongside. The order alongside must be promulgated to reach all replenishment ships as early as practicable. Early notification will result in timely and efficient deck spotting. Once the order alongside has been promulgated, changes should be made only if absolutely necessary. Loss of valuable provisions and considerable labor are only two of the results of a change made after breakout. UNREP efficiency may be reduced by as much as 50 percent by a change in the order alongside.

1.2.5 Command Responsibilities. The CO of the CLF ship will normally be OCE for all UNREP operations. When two or more replenishment ships are involved, the senior CO may be designated as the URG commander. The CO of the CLF ship or URG commander will:

1. Consolidate cargoes prior to the UNREP operation. When the order alongside has been received, he/she shall ensure that fleet freight and passengers are aboard the correct replenishment ship for delivery.

2. Coordinate with the screen commander a replenishment course and speed for optimum replenishment conditions, taking into account any unusual limitations or characteristics of the ships involved that might affect the replenishment or influence the order alongside.
3. Ensure that replenishment ships transfer all passengers, mail, and fleet freight to consignees. Cargo may be consolidated on one or more UNREP ships for further transfer or distribution to other UNREP ships. For personnel transfers, one CLF ship is customarily used as the intermediate transfer point.

1.3 ORDER ALONGSIDE

The commander who is conducting the UNREP should order first alongside those units that have preferred STREAM rigs or routine stores requirements (carriers are excepted). Preferred STREAM rigs are STREAM with single- or double-probe fueling couplings and STREAM with SURF and STAR for solid cargo transfer. When fueling with single or double probe has been completed, ships that have Robb couplings should be ordered next alongside.

The order alongside for ships that have other than routine requirements should be based on the commodity required and the CLF ship's rig configuration. A CLF ship may require assignment of ships that require potable water to a specific side and transfer station.

The replenishment capabilities of small escorts should be considered before assigning them to the port side of oilers, since CLF ships are normally rigged to port for fueling by double-hose rig. Insufficient space or manpower aboard the escort may preclude receiving the double-hose rig. An unnecessary delay in the UNREP occurs whenever a change of rig is required.

1.4 GROSS REQUIREMENTS

The supported force commander must have available the gross requirements in tons and barrels (gallons) for each type of cargo from all units to be replenished. When metric units are used, requirements must be given in metric tons and cubic meters. This data should be collected or estimated early in the planning phase.

1.5 PREREPLENISHMENT CONFERENCE

A prereplenishment conference is an excellent means of improving the performance of units participating in an UNREP. When a conference can be held, it may be possible to develop a custom-made plan for a particular UNREP. Items that are particularly suited for discussion at a conference are order alongside; types and numbers of rigs to be used; requirements and submission of requirements; and use of experimental rigs, equipment, and techniques.

1.6 PLANNING

The overall efficiency of an UNREP is directly proportional to the thoroughness of planning. Even in the case of a small or one-product UNREP, thorough planning is required. Paragraphs 1.6.1 through 1.6.5 detail factors that must be considered when planning an UNREP. To minimize time alongside, plan combinations of CONREPs and VERTREPs. Place emphasis on the most efficient method or combinations of methods of transfer.

1.6.1 Transfer Rate. Planners should review the performance of units involved in the UNREP. Figure 1-2 provides average transfer rates for liquid and solid cargo to various ship types, as derived from past fleet experience. When transfer rates for individual units are not available, use average rates for planning daytime UNREPs under average weather conditions. For greater accuracy, use current monthly summaries of UNREP times.

Replenishment at night does not appreciably affect pumping rates of AOs, AOE's and T-AOs, but does affect transfer rates for solid cargo (T-AEs and T-AFSs).

Heavy weather normally increases the time required to rig and unrig. Pumping rates of AOs, AOE's, and

T-AOs are not appreciably affected, unless the number of rigs normally passed is reduced. A one-hose UNREP will increase the time alongside by as much as 50 percent for small escorts and more for heavy combatants. Heavy weather greatly reduces solid cargo transfer rates for all CLF ships, but the percentage of reduction in such circumstances is not predictable.

1.6.2 Breakout Problems. Crew limitations and space requirements aboard replenishment ships require an early and fixed order alongside. A change in the order alongside or nonreceipt of requirements will greatly reduce the efficiency of these ships. T-AFSs are particularly affected by a change in the order alongside, because fresh or frozen cargo may be on deck ready for transfer. Most ships break out cargo just before the UNREP and spot it on deck so as to provide efficient transfer in proper sequence. Deck-stowed cargo is more susceptible to damage. Injury to personnel or damage to the ship may result from shifting of cargo.

1.6.3 Rigs. To achieve a high transfer rate, ships must be prepared to use the maximum number of rigs during each UNREP.

Supported ships will indicate as early as possible the transfer stations at which, and the types of rigs by which, they desire to receive their requirements; they will also indicate any limitations at transfer stations and on the types of rigs which they are capable of receiving at a station. Replenishment ships, using this information, shall select and recommend the transfer stations and types of rigs to be used in the UNREP.

In the absence of information to the contrary, replenishment ships will assume that supported ships are prepared to receive any of the STREAM or nontensioned rigs (see Chapters 3 through 9), except in the case of helicopter-capable ships, when rigging at transfer station(s) will preclude conduct of flight operations concurrently with the UNREP. Accordingly, replenishment ships will use rigs which provide the highest transfer rates commensurate with safety and weather conditions.

The UNREP Station Capabilities Handbook, NAV-SEA S9571-A1-HBK-010, is a valuable planning aid in determining compatibility of transfer station, rig, and alignment between receiving and delivery ships.

1.6.4 Passengers, Mail, Deck Cargo, and Fleet Freight. Transfer of mail, fleet freight, deck cargo, and personnel may well be the controlling time factor for ships alongside oilers. Cargo may be consolidated on one ship for further transfer during the UNREP. Use of the planning aid described in paragraph 1.7.3 will greatly aid the planner in solving problems of multiple

PRODUCT	SHIP SEPARATION IN YARDS (m)	UNIT OF MEASURE	UNIT OF TRANSFER	CV/CVN LHA/LHD	LSD 41/49	CG	DD/DDG	FFG
F76	ALONGSIDE	BARRELS (CUBIC METERS)	1 — HOSE	2,600 (413.3)	2,238 (355.8)	2,238 (355.8)	2,070 (329.1)	2,200 (349.7)
F44	ALONGSIDE	BARRELS (CUBIC METERS)	1 — HOSE	2,970 (472.2)				
ORDNANCE PALLETIZED	ALONGSIDE	SHORT TONS (METRIC TONS)	1 — RIG	35 (31.7)	24 (21.7)	24 (21.7)	20 (18.1)	20 (18.1)
	- 2,000 (1,828.8)	SHORT TONS (METRIC TONS)	1 — HELO/ 20 TRIPS	30 (27.2)	30 (27.2)	30 (27.2)	30 (27.2)	30 (27.2)
	+ 2,000 (1,828.8)	SHORT TONS (METRIC TONS)	1 — HELO/ 8 TRIPS	12 (10.8)	12 (10.8)	12 (10.8)	12 (10.8)	12 (10.8)
MISSILE OR BOOSTER IN DOLLY	ALONGSIDE	LOADS SLIDING PADEYE FIXED PADEYE	1 — RIG			(Note 1) 10	(Note 1) 10	
			1 — RIG			5	5	5
STORES AND PROVISIONS	ALONGSIDE	SHORT TONS (METRIC TONS)	1 — RIG	21 (19.0)	13 (11.7)	17 (15.4)	13 (11.7)	13 (11.7)
	- 2,000 (1,828.8)	SHORT TONS (METRIC TONS)	1 — HELO/ 20 TRIPS	20 (18.1)	20 (18.1)	20 (18.1)	20 (18.1)	20 (18.1)
	+ 2,000 (1,828.8)	SHORT TONS (METRIC TONS)	1 — HELO/ 8 TRIPS	8 (7.2)	8 (7.2)	8 (7.2)	8 (7.2)	8 (7.2)

NOTE 1: HIGHER TRANSFER RATE TO SLIDING PADEYE, LOWER RATE TO FIXED PADEYE

Figure 1-2. Average Transfer Rates (Per Hour)

transfers. If transfer by CONREP will delay completion of the UNREP, transfer by helicopter (if available) should be considered. CONREP of personnel shall be by the STREAM method or synthetic highline method of personnel transfer.

WARNING

The station transferring personnel shall be the only station rigged while personnel are being transferred.

1.6.5 Emission Control Conditions. Under certain circumstances, replenishments are conducted under EMCON conditions. In such cases, it may be necessary to pass certain coordinating information, such as special cargo requirements, after rendezvous.

Transmitting at certain frequencies is not permitted when HERO SUSCEPTIBLE or HERO UNSAFE ordnance is present on the hangar deck or any weather deck. To ensure safe ordnance operations during CONREP, both ships shall operate under a common HERO EMCON bill. See NAVSEA OP 3565/NAVAIR 16-1-529/NAVELEX 0967-LP-624-6010.

1.7 FORMULATING THE PLAN

1.7.1 Replenishment Formation. An appropriate replenishment formation from ATP 1, Vol. I, is recommended. Use an offset axis to prevent ships astern from passing through the same water in the event of an oil spill or casualty and to facilitate visual signaling.

It is permissible to assign replenishment ships to any station within the replenishment formation that may be dictated by the tactical situation. When a number of replenishment ships are involved and when possible, the TF/TG commander should advise the URG commander of the replenishment course and speed, 4 to 8 hours prior to replenishment, in order to permit orderly reorientation of the replenishment group.

1.7.2 Movement of Ships. In maneuvering ships within the replenishment formation, supported ships (especially heavy combatants) should be scheduled to move straight up a column of replenishment ships. However, a carrier should go alongside the T-AF and T-AFS before going alongside the oiler. Alternation of heavy combatants and small units alongside and movement of supported ships from one side to the other side of successive replenishment ships should be avoided. In heavy weather, consideration should be given to scheduling

small units to the lee side of replenishment ships. Normally, once heavy combatants have completed replenishing, replenishment ships are clear to port and remaining small units can be scheduled to both sides.

1.7.2.1 Maritime Preposition Ships (MPS), Fast Sealift Ships (FSS), and Other Merchant Tankers.

When conducting UNREP to or from these vessels, they should be designated as the guide and the fleet units should make the approach.

1.7.3 UNREP Planning Aid. Average transfer rates in Figure 1-2 served as the guide for developing the sample UNREP operations shown in Figures 1-3 through 1-5.

Figure 1-3 is an example of how the information in Figure 1-2 can be used to develop estimated transfer times for fuel, ordnance, stores, and provisions from an AOE and a T-AFS to one CV, one CG, two DDs, two DDGs, and two FFGs. The cargo requirements, number of hoses, number of helicopters, and the fact that DD No. 1 does not receive probes have been entered to set up this sample only. Actual requirements and receiving ship capabilities must be used to plan an actual UNREP. Note that the transfer of fuel and ordnance occurs simultaneously from the AOE. In this example, the time alongside was developed from the transfer time for fuel; therefore, any ordnance that could not be transferred by CONREP during the time allotted for the consolidated replenishment was identified for transfer by VERTREP. Figure 10-18 provides an example of the staging on the AOE for VERTREP by two H-46 helicopters to the units in Figure 1-3.

Using the information developed in Figure 1-3, a graphic planning aid (Figures 1-4 and 1-5) was developed to show the order alongside and the VERTREP delivery schedule. For this sample, an approach/rig time of 12 minutes and an unrig/departure time of 6 minutes were used. Note that the CG remains alongside the AOE after completion of fuel transfer, while the AOE shifts from probes to Robb couplings for fueling DD No. 1. Approximately 30 minutes should be allowed for a shift

of FAS couplings by a delivery ship. In this example, the dead time is used to advantage to transfer additional ordnance to the CG. Because the CG is kept alongside an additional 30 minutes to transfer the remaining ordnance, DD No. 1 completes its time alongside to port during approximately the same time that DD No. 2 is alongside to starboard.

To preclude saturating the receiving areas of small units with VERTREP cargo, every effort should be made to conduct multiship VERTREPs as shown in this sample.

Receiving ships scheduled for VERTREP only should be stationed as close to the delivery ship as the tactical situation and safety permit. A significant reduction in VERTREP duration can be achieved when flight distances are minimized.

1.7.4 Air-Dropped Cargo. For procedures for delivery by paratroop from long-range aircraft, refer to OPNAVINST 3180.2.

1.8 REFERENCES

- ATP 1, Vol. I, Allied Maritime Tactical Instructions and Procedures
- ATP 1, Vol. II, Allied Maritime Tactical Signal and Maneuvering Book
- ATP 16, Replenishment at Sea
- COMNAVSURFPACINST 3180.2 or COMNAVSURFLANTINST C9010.1 series, Fleet Underway Replenishment Guide
- NAVSEA S9571-A1-HBK-010, UNREP Station Capabilities Handbook
- NAVSEA OP 3565/NAVAIR 16-1-529/ NAVELEX 0967-LP-624-6010, Electromagnetic Radiation Hazards (Hazards to Ordnance)

FUEL AND ORDNANCE FROM AOE (TWO HELICOPTERS)

SHIP	FUEL			ORDNANCE						
	REQUIREMENTS		NUMBER OF HOSES AVAILABLE	ESTIMATED TRANSFER TIME IN MINUTES	REQUIREMENT IN SHORT (METRIC) TONS	NUMBER OF RIGS AVAILABLE	TRANSFERRED DURING FUELING IN SHORT (METRIC) TONS	LEFT FOR VERTREP IN SHORT (METRIC) TONS	ESTIMATED VERTREP TIME FOR TWO HELICOPTERS IN MINUTES	
	F76 IN BARRELS (m ³)	F44 IN BARRELS (m ³)							LESS THAN 2,000 YARDS (1,828.8 m)	SCREEN
CV	12,000 (1,907.8)	17,000 (2,702.8)	7 7*	91 114	350*** (317.4)	4	264 (239.4)	86 (78.0)	86	—
CG	2,100 (333.8)		2	29	36*** (32.6)	1	11 (9.9)	25 (22.7)	25	70
DD #1	1,500 (238.4)		2**	22	28 (25.3)	1	7 (6.3)	21 (19.0)	21	53
DD #2	1,700 (270.2)		2	25	55 (49.8)	1	8 (7.2)	47 (42.6)	47	110
DDG #1	2,200 (349.7)		2	32	50 (45.3)	1	10 (9.0)	40 (36.2)	40	100
DDG #2	1,600 (254.3)		1	44	12 (10.8)	1	12 (10.8)	0 (0)	—	—
FFG #1	1,200 (190.7)		1	33	20*** (18.1)	1	10 (9.0)	10 (9.0)	10	25
FFG #2	1,000 (158.9)		1	28	26 (23.5)	1	9 (8.1)	17 (15.4)	17	43
TOTAL	23,300 (3,704.4)	17,000 (2,702.8)			577 (523.5)		331 (300.2)	246 (223.1)		
Notes: * 3 DOUBLE HOSE RIGS (1 F76 HOSE and 1 F44 HOSE PER RIG) PLUS 1 SINGLE HOSE RIG (F76) ** SHIP NOT EQUIPPED WITH PROBE RECEIVERS *** WHEN TRANSFERRING MISSILES OR BOOSTERS IN DOLLY, MAXIMUM TRANSFER RATES ARE SHOWN IN FIGURE 1-2										

Figure 1-3. Developing Information for an UNREP Operation (Sheet 1 of 2)

STORES/PROVISIONS FROM T-AFS (TWO HELICOPTERS)					
SHIP	REQUIREMENTS IN SHORT (METRIC) TONS	CONREP		VERTREP	
		NUMBER OF RIGS AVAILABLE	ESTIMATED TRANSFER TIME IN MINUTES	LESS THAN 2,000 YARDS (1.828.8 m) IN MINUTES	SCREEN IN MINUTES
CV	80 (72.5)	4	57	122	—
CG	10 (9.0)	2	18	16	39
DD #1	8 (7.2)	1	22	13	31
DD #2	10 (9.0)	1	48	18	39
DDG #1	10 (9.0)	1	48	16	39
DDG #2	8 (7.2)	1	38	13	31
FFG #1	6 (5.4)	1	29	10	24
FFG #2	8 (7.2)	1	38	13	31
TOTAL	140 (126.9)				

Figure 1-3. Developing Information for an UNREP Operation (Sheet 2 of 2)

Figure 1-4. Sample UNREP Planning Aid (Nonmetric)

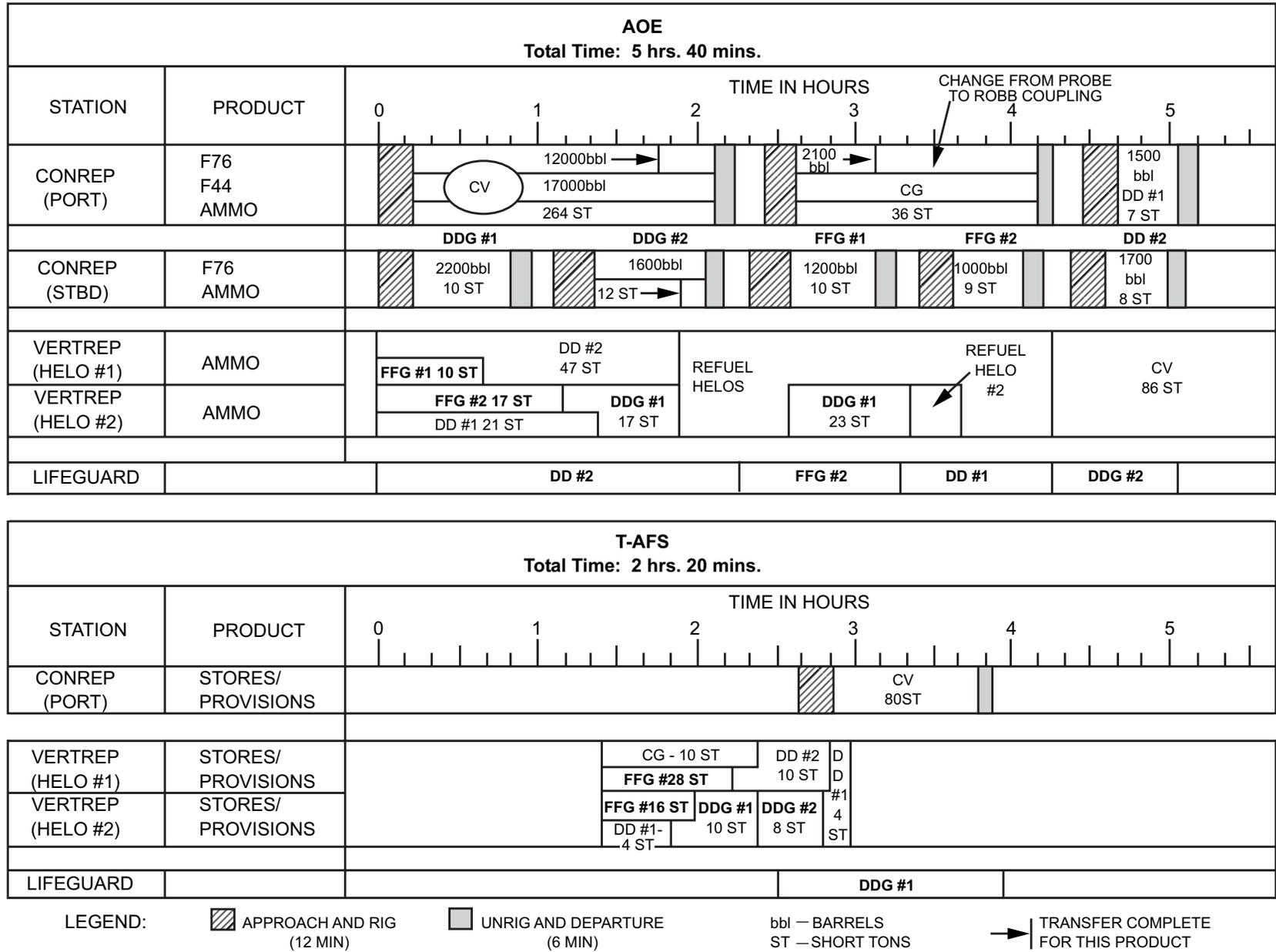
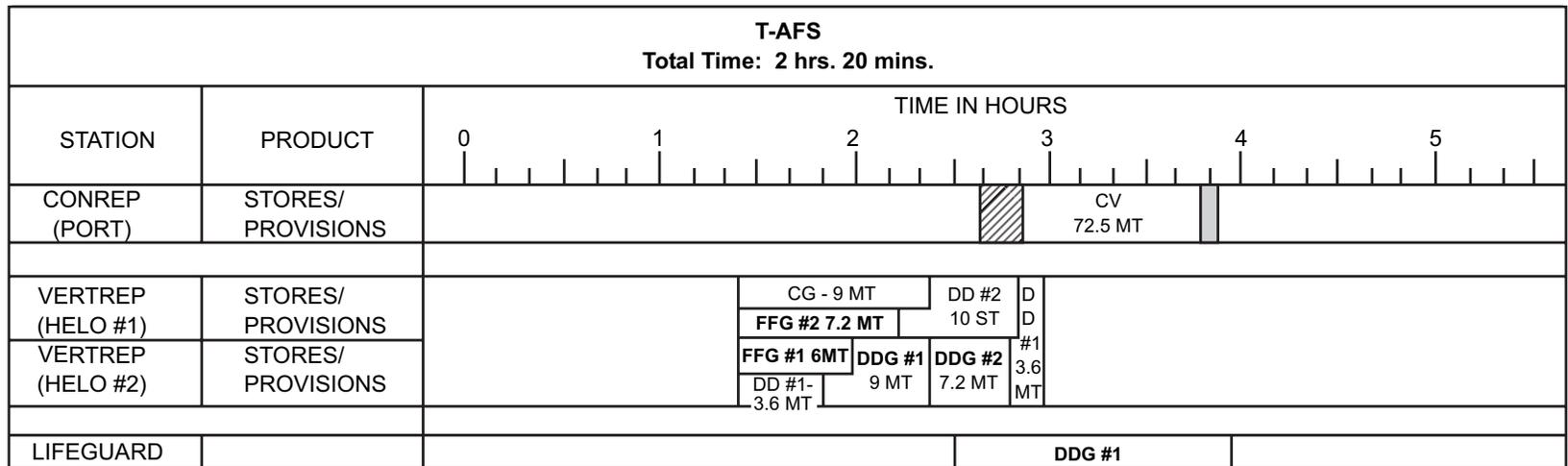
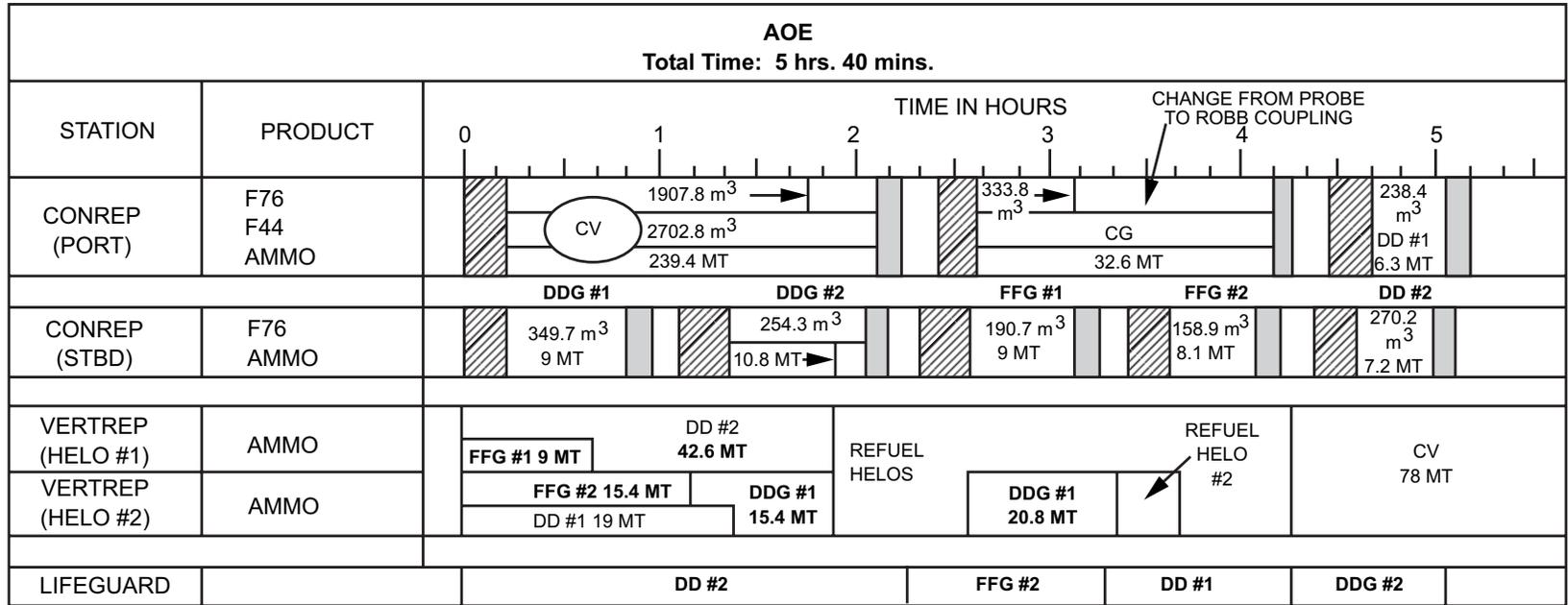


Figure 1-5. Sample UNREP Planning Aid (Metric)



LEGEND: APPROACH AND RIG (12 MIN) UNRIG AND DEPARTURE (6 MIN) m³ - CUBIC METERS MT - METRIC TONS TRANSFER COMPLETE FOR THIS PRODUCT

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 unit guide; the approach ship keeps station alongside. The responsibilities relating to the rigs that 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 unit guide 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° (10° 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 2.4.6.)

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 2.4.6.)
7. Furnishing and hand-tending the bridge-to-bridge phone/distance line. (See paragraphs 2.3.6 through 2.3.6.3.)
8. Hand-tending the station-to-station phone lines.

9. 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’s 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, LHA, LHD, or LPH 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.



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 hand-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's procedures prescribed elsewhere in this publication for the rig to be used or for the situation encountered.
2. Hand-tending 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, LHA, LHD, LPH, 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 hand-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 that 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 break-away 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 in-tratype 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.



If a course with the sea is chosen, the helmsmen should be cautioned that more rudder may be required to hold the ship on course than might otherwise be expected. Rudder effectiveness can be altered by the pressure/suction effect as the approach ship's bow passes the control ship's stern on a close approach.

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.

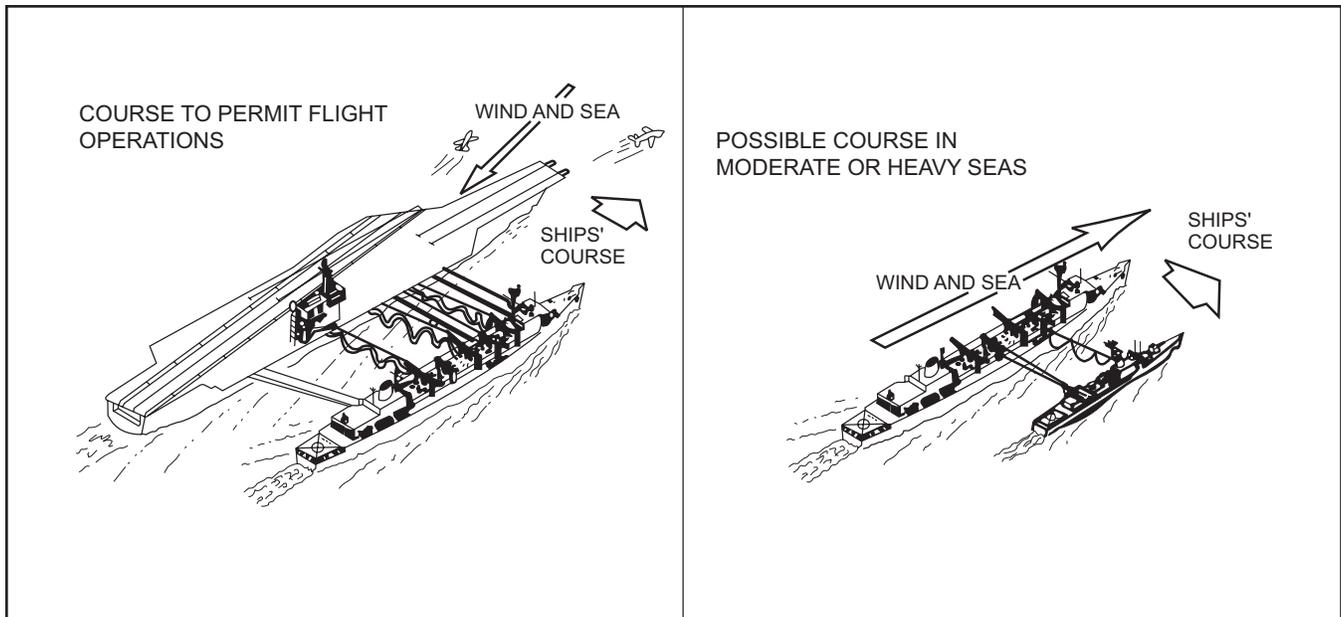


Figure 2-1. Replenishment Course

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.

Note

CG 47, DDG 993, DD 963, FFG 7, and LSD 41/49 Class ships are equipped with controllable pitch systems, which control speed in the modulate transmission mode (MTM) (speed varied by pitch changes) before achieving 100-percent pitch and in the modulate engine mode (MEM) (speed varied by RPM changes) after achieving 100-percent pitch. CG 47s, DDG 993s, and DD 963s reach 100-percent pitch in the 11.0 to 11.6 knot range; LSD 41s/49s in the 8.5 to 9.5 knot range; and FFG 7s at 10 knots. While this does not present any ship-handling restrictions while alongside, it should be noted that speed response is faster in MEM than in MTM; generally, a replenishment speed above the 100-percent pitch point is preferred.

Note

AOE-6 Class ships use a unique RCC drive with fixed pitch propellers instead of controllable pitch propellers to achieve speeds less than about 12 knots. Ships should be in direct drive, which bypasses the RCC, for maximum maneuverability during underway replenishments.

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. The conning officer on the bridge of the approach ship attains proper fore-and-aft position alongside by observing the appropriate ship structure or the station-keeping aid on the control ship. Appendix K provides additional information and illustrations of the station-keeping aid.
5. 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 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.

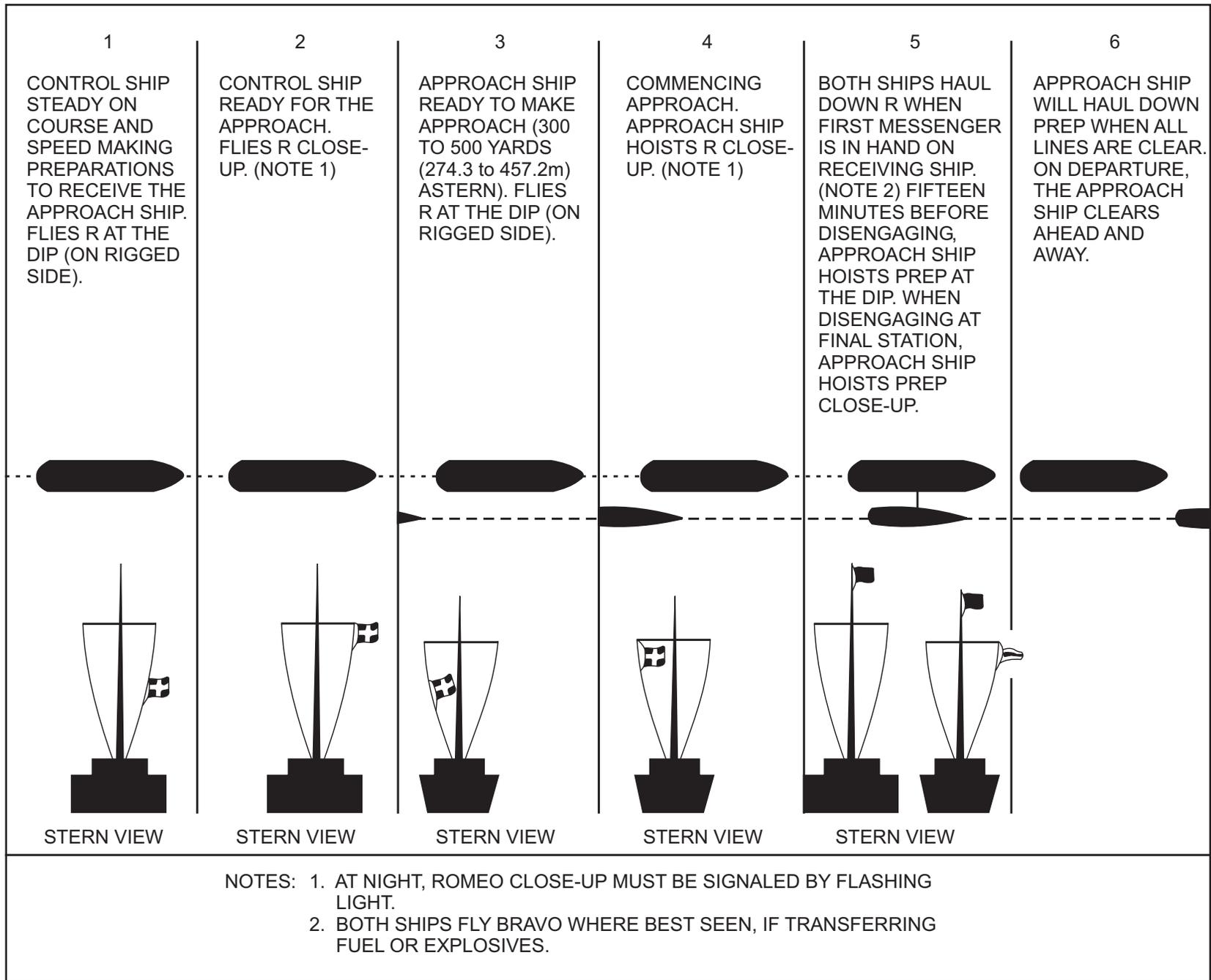


Ships that have protrusions that extend outward from the hull must measure the distance between ships from the outermost protrusion, perpendicular to the centerline.

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.

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



TYPE OF RIG	INTERVAL	SHIP TYPE		
		Smaller Ships	Larger Ships	CV/LHA/LHD
STREAM for Transfer of Solid Cargo and Missiles (Note 1)	Normal	80 to 200 ft 24.3 to 60.9 m	80 to 200 ft 24.3 to 60.9 m	100 to 200 ft 30.4 to 60.9 m
	Maximum	300 ft 91.4 m	300 ft 91.4 m	300 ft 91.4 m
Burton Synthetic Highline	Normal	80 to 100 ft 24.3 to 30.4 m	80 to 120 ft 24.3 to 36.5 m	100 to 140 ft 30.4 to 42.6 m
	Maximum	180 ft 54.8 m	200 ft 60.9 m	200 ft 60.9 m
STREAM for Transfer of Fuel (Notes 1, 2, and 3)	Normal	80 to 180 ft 24.3 to 54.8 m	80 to 180 ft 24.3 to 54.8 m	80 to 180 ft 24.3 to 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 to 100 ft 24.3 to 30.4 m	80 to 120 ft 24.3 to 36.5 m	100 to 140 ft 30.4 to 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 to 80 ft 18.2 to 24.3 m	60 to 100 ft 18.2 to 30.4 m	
	Maximum	100 ft 30.4 m	100 ft 30.4 m	
Spanline Fuel Rig	Normal	60 to 80 ft 18.2 to 24.3 m		
	Maximum	100 ft 30.4 m		
<p>Notes: 1. Minimum separation of 140 ft (42.7 m) required during intial tensioning. 2. 300 ft (91.4 m) heavy weather rig. 3. Separation distances between delivery ship and CV/CVN greater than 180 feet (54.8 m) may result in unseating the lower probe of double probe rig. 4. For oiler consolidation, see paragraph 3.14.1, Special Procedures.</p>				

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

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 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 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

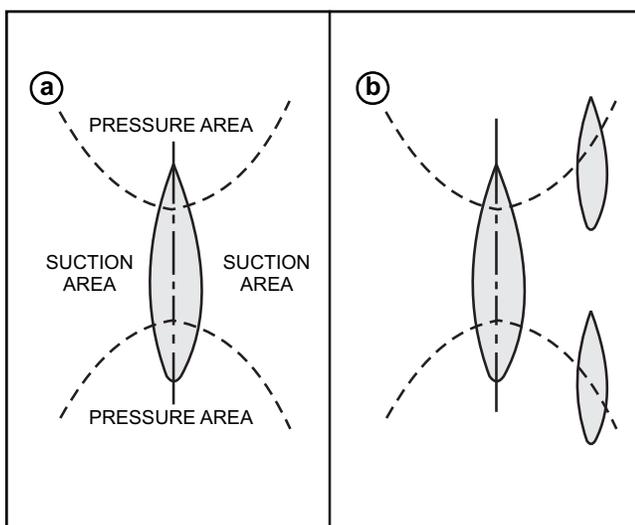


Figure 2-4. Dangers of Hull Wash

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.

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.



Except in wartime or in an emergency, ships will not operate underway alongside unless the depth of the water is at least three times the draft of the ship with the greatest draft.

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. Whenever feasible, assign a commissioned line officer as ship control safety officer on the bridge. Whether or not a regularly assigned OOD/JOOD, the ship control safety officer must have completed PQS and 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. Whenever feasible, a commissioned line officer should be assigned. 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.

Note

This requirement does not apply to ship classes that do not have a secondary control station 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 STREAM rig 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.



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 rig operations upon their ships:

1. Conning officers of ships receiving a STREAM rig 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.
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 a STREAM rig 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/she (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 method, which applies 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 rigs are 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 suction, the pull of tensioned lines, and excessive use of rudder will increase the probability of collision.



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/she can observe his/her 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/her 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°.



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/her 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 pre-arranged 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 UNREP 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/her and report immediately any malfunction by blowing on a whistle loudly until acknowledged by the rig captain. Appendix I provides winch malfunctions. Winch watchers should be observant for any of these malfunctions.

WARNING

Do not stand in the direct line of a winch wire under tension.

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.

Note

Seizing wire shall be removed from the bitter end of a wire rope, prior to securing the wire rope to a winch drum using a wire rope clip, to prevent the fouling of the wire rope in 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. (See Figure 2-5.)

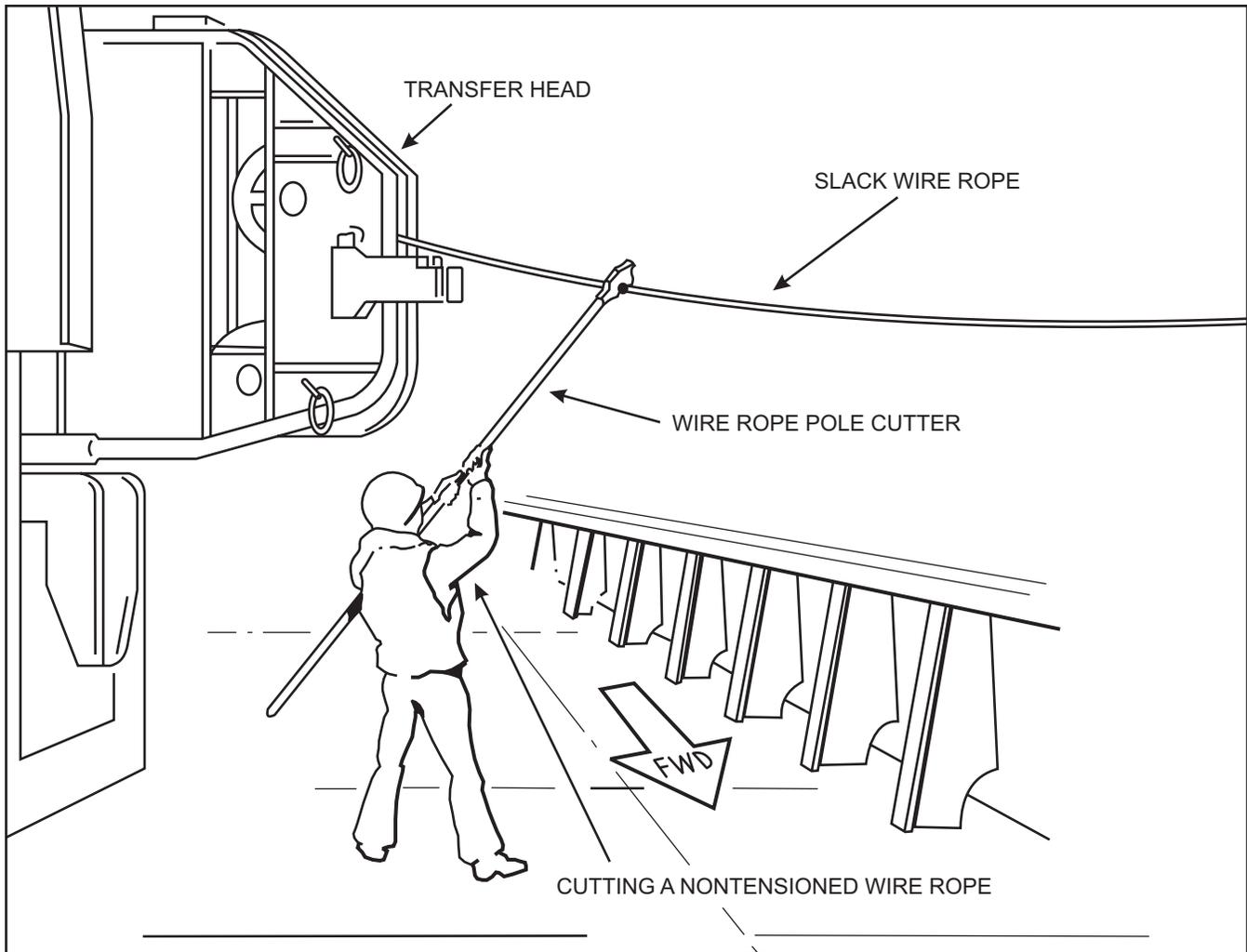


Figure 2-5. Cutting a Nontensioned Wire Rope

WARNING

Never use wire rope cutters to cut a tensioned wire rope.

Explosive-charged, velocity, pole-type, wire rope cutters are required at transfer stations as follows: two cutters at each STREAM solid cargo 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, 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. Messenger lines, riding lines, and easing-out lines shall be belayed to cleats (similar to the cleats shown in Figure 3-15) 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 spanwire end fitting or long link of 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 length to ease the wire clear of the ship's side. Easing-out lines are required for highlines and spanwires of all RAS and FAS rigs.

2.2.11.6 Conditions Warranting Emergency Breakaway. Examples of conditions that 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, IMC, 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 pre-arranged, 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.

- Retrieve rigs in accordance with the procedures in Chapters 3 through 8.

WARNING

Never trip a spanwire or highline under tension.

- 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 hand-tend the phone line until the rig is disconnected.
- 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.

CAUTION

Releasing the hydraulic brake under tension may cause damage to the hydraulic transmission.

The wire can be readily controlled with the hydraulic 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. On ships with winches equipped with slip or air clutches, the wire should be allowed to pay out on its own. The hydraulic brake release should only be used as a last resort.

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, IMC, 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 using 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.

- If the receiving ship experiences a casualty affecting her speed, the delivery ship should attempt to match her speed until breakaway is complete, 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.
- 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.
- 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.
- 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 a normal UNREP, all ships should simulate an emergency breakaway (when the situation permits) to train their crews in the procedures to be followed.

2.2.11.12 Display of Emergency Breakaway Markers. Markers for emergency breakaway procedures shall be displayed on underway replenishment ships where they can be readily observed by receiving ships. The marker should contain the following information:

EMERGENCY BREAKAWAY

- WE STOP PUMPING/RETRIEVE ALL LOADS
- YOU DISCONNECT HOSES/SURF/STAR
- WE RETRIEVE HOSES/SURF/STAR

4. WE SLACK SPAN WIRE/HIGHLINE
5. ON MY SIGNAL YOU TRIP PELICAN HOOK
6. YOU RETURN ALL HAND-TENDED LINES

DO NOT CUT/DISCONNECT TENSIONED LINES

The words “EMERGENCY BREAKAWAY” and “DO NOT CUT OR DISCONNECT TENSIONED LINES” shall be in red letters on a white background. Portable type of attachment is recommended for ease of locating. Where one marker each side would not be visible from all receiving ship locations, markers shall be displayed forward and aft each side on the underway replenishment ship (e.g., AOE).

2.2.12 Collision Procedures. During an along-side 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 fore-and-aft directions and decrease the impact angle to minimize damage. 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. When additional details and dimensions are required, refer to NAVSEA S9570-AD-CAT-010, UNREP Hardware and Equipment Manual.

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), IWRC, extra-improved plow steel (or improved plow steel until replaced), preformed, regular right-hand lay, in accordance with Federal Specification RR-W-410. As ship’s stocks of improved plow steel wire rope are depleted, only extra-improved plow steel wire rope shall be reordered for use in FAS and RAS rigs.

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

Note

See NTSM 0901-LP-613-0010 for natural and synthetic rope use precautions, instructions, and inspections.

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 IVA, Class 2 and 3; and chain shackles, Type IVB, Class 2 and 3 (see Figure 2-6). 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. High strength (Grade B) shackles shall be used on all UNREP rigging.

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, LHAs, LHDs, LPHs, 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.



Care must be taken when firing shot lines/ bolos to Aegis ships to avoid SPY arrays.

2.3.4.1 Bolo. The bolo is hand heaved. It can be used for passing the shot line in daylight and can be used when practicable. The bolo is attached to the end of the

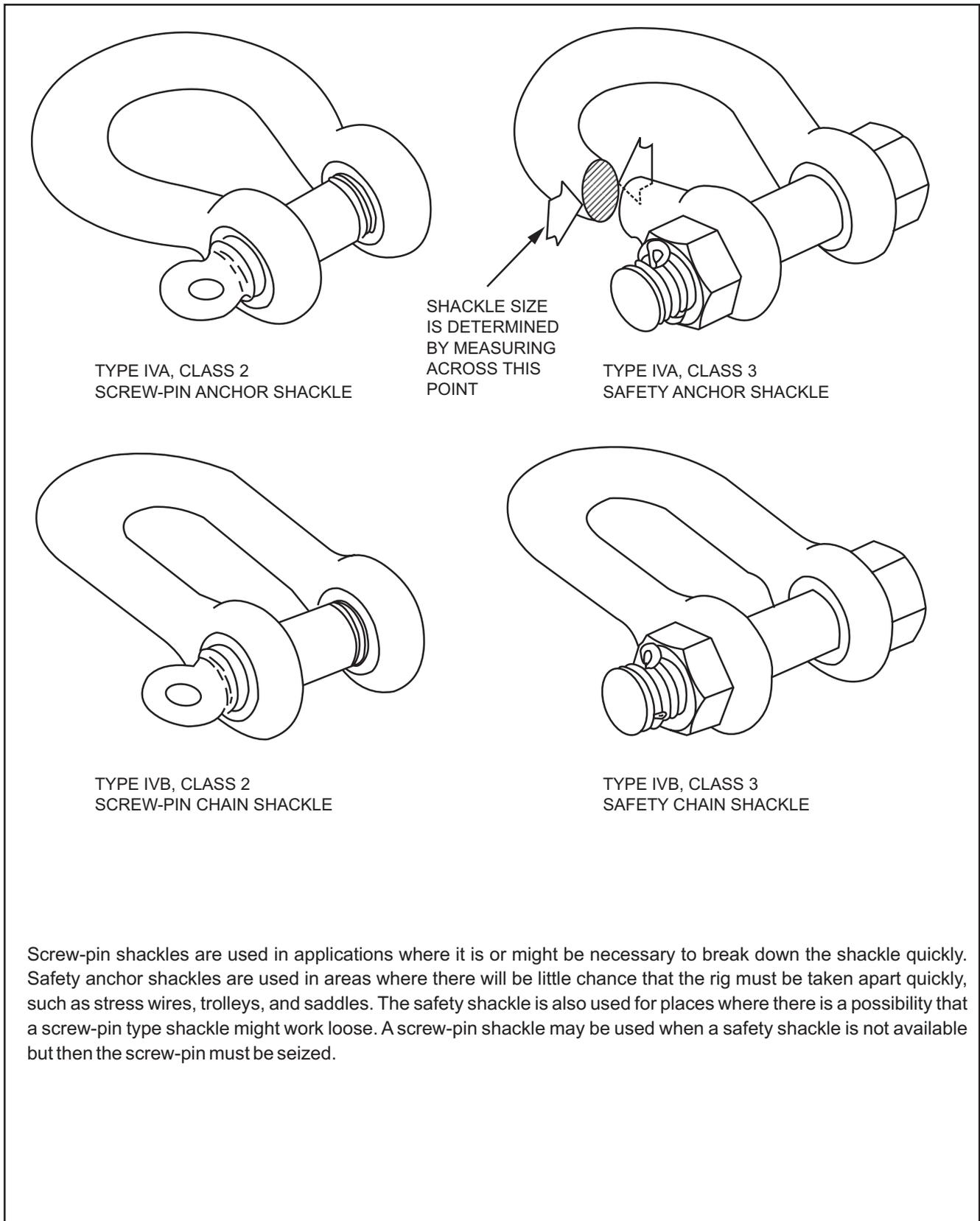


Figure 2-6. Anchor and Chain Shackles

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, M16, and M16A1 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. An orange chemical light shall be used to illuminate the projectile at night.

2.3.4.3 Shot Line Bag. The shot line bag is used to return the shot line (see Figure 2-7). 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.



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 STAR Messenger. The STAR messenger is the main line used to assist in hauling any basic rig across between the ships (see Figure 2-8). It is made up as shown in Figure 2-9.

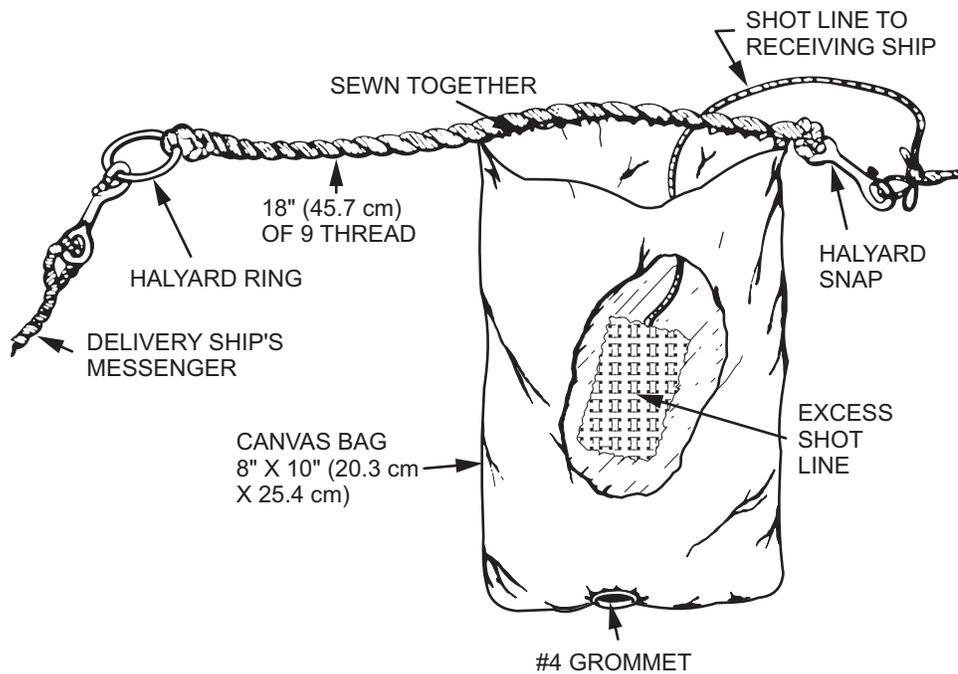
The preferred location for handling the STAR messenger and other lines is forward and inboard of the rig. If space is limited forward, aft and inboard of the rig is acceptable on a station-to-station basis. Other lines, such as the station-to-station (Sta/Sta) phone line and the lead line messenger for the bridge-to-bridge (B/B) 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 5-inch (12.7 cm) soft eye splice forms the bitter end of the 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.

2.3.6 Bridge-to-Bridge Phone/Distance Line. The B/B 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. The lead line messenger and the B/B phone/distance line are made up as shown in Figure 2-10. B/B phone/distance lines shall be tested prior to sending to the receiving station.

METHOD OF SENDING SHOTLINE BAG TO RECEIVING SHIP



METHOD OF RETURNING SHOTLINE BAG TO DELIVERY SHIP

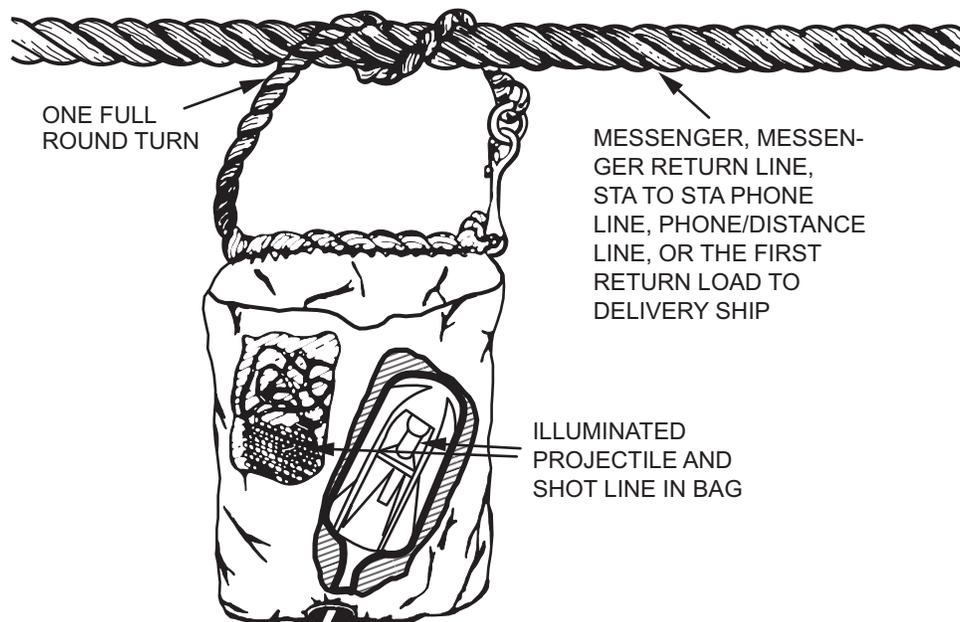


Figure 2-7. Shot Line Bag

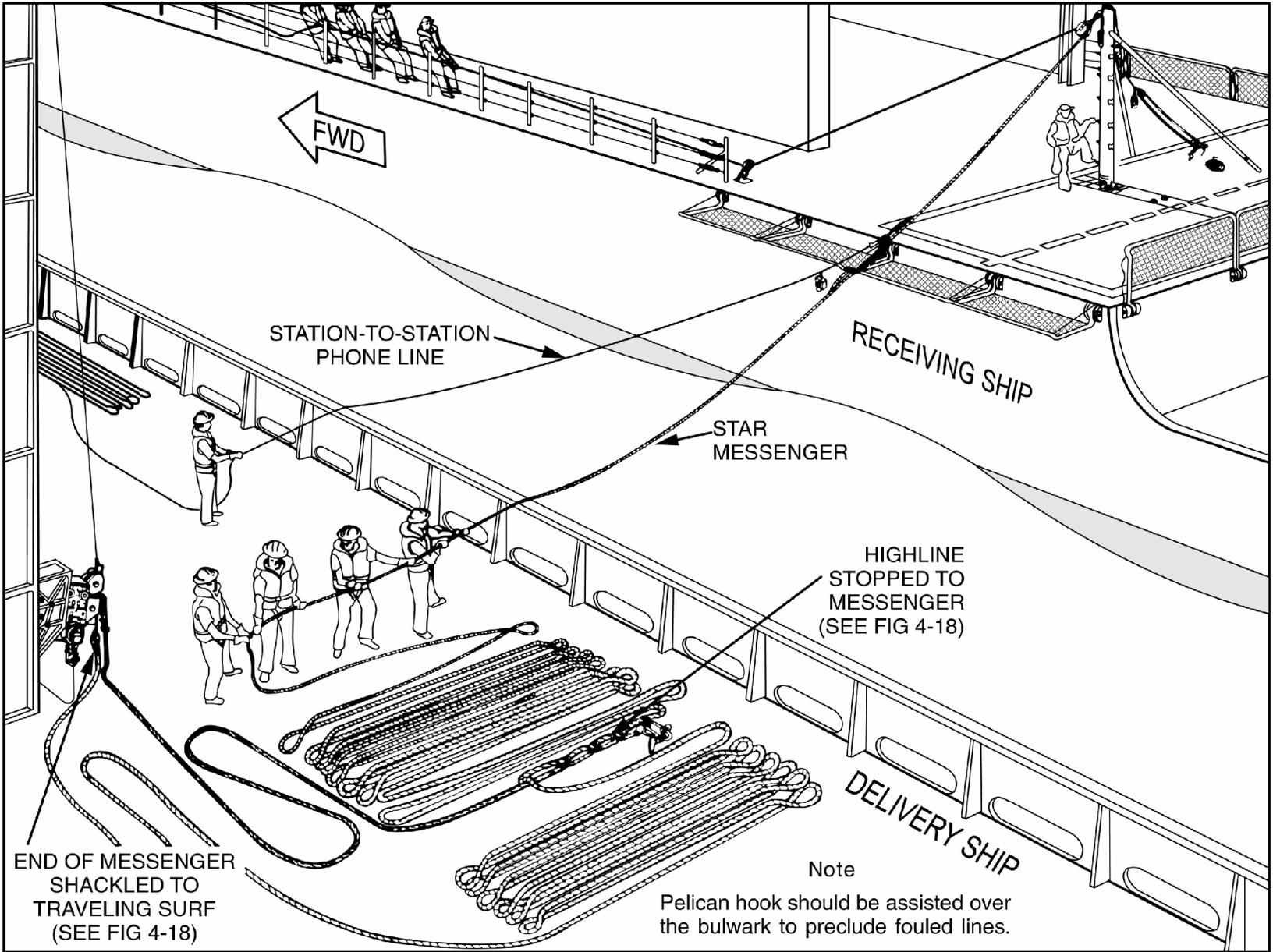
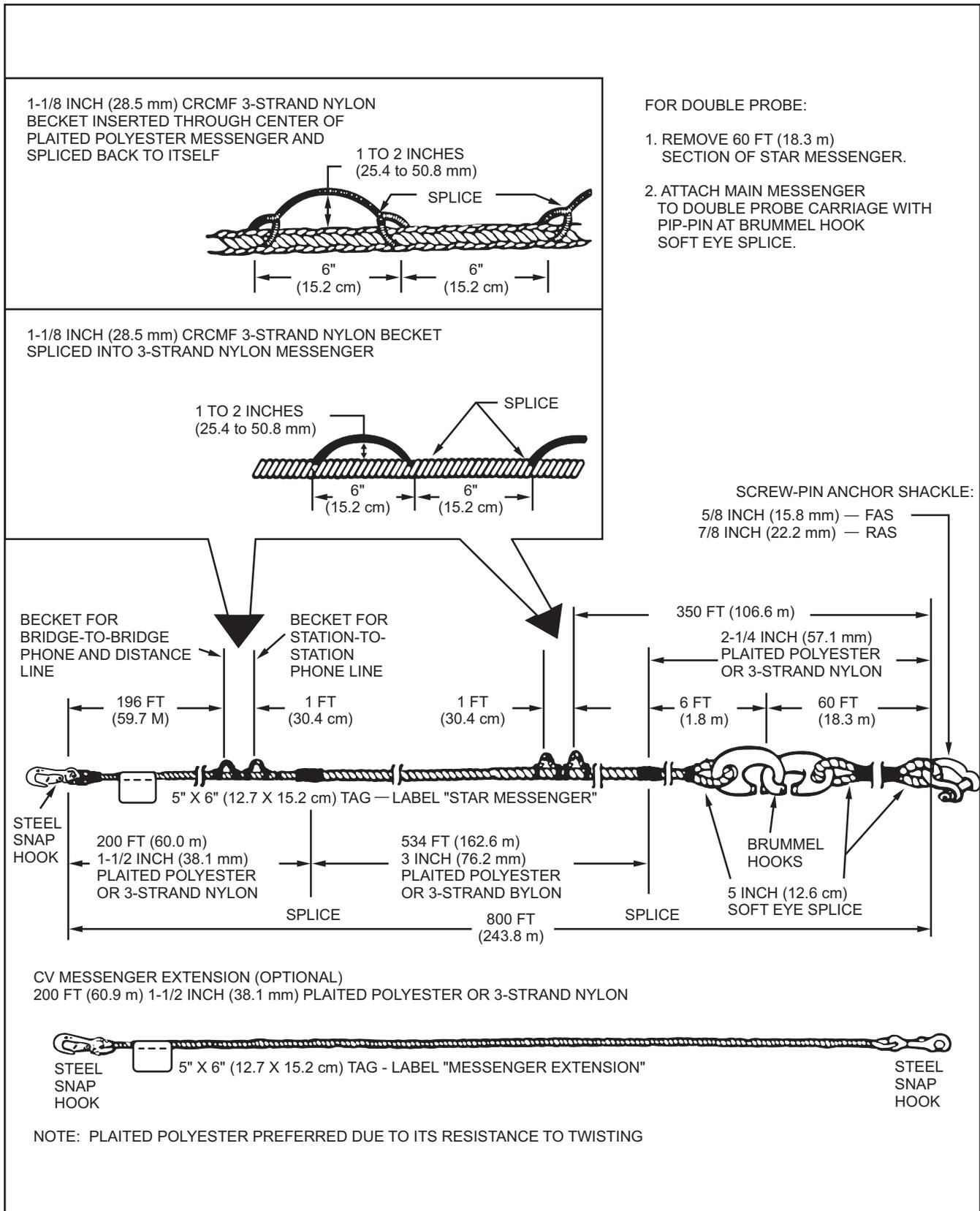


Figure 2-8. Replenishment-at-Sea Messenger



NOTE: PLAITED POLYESTER PREFERRED DUE TO ITS RESISTANCE TO TWISTING

Figure 2-9. STAR Messenger

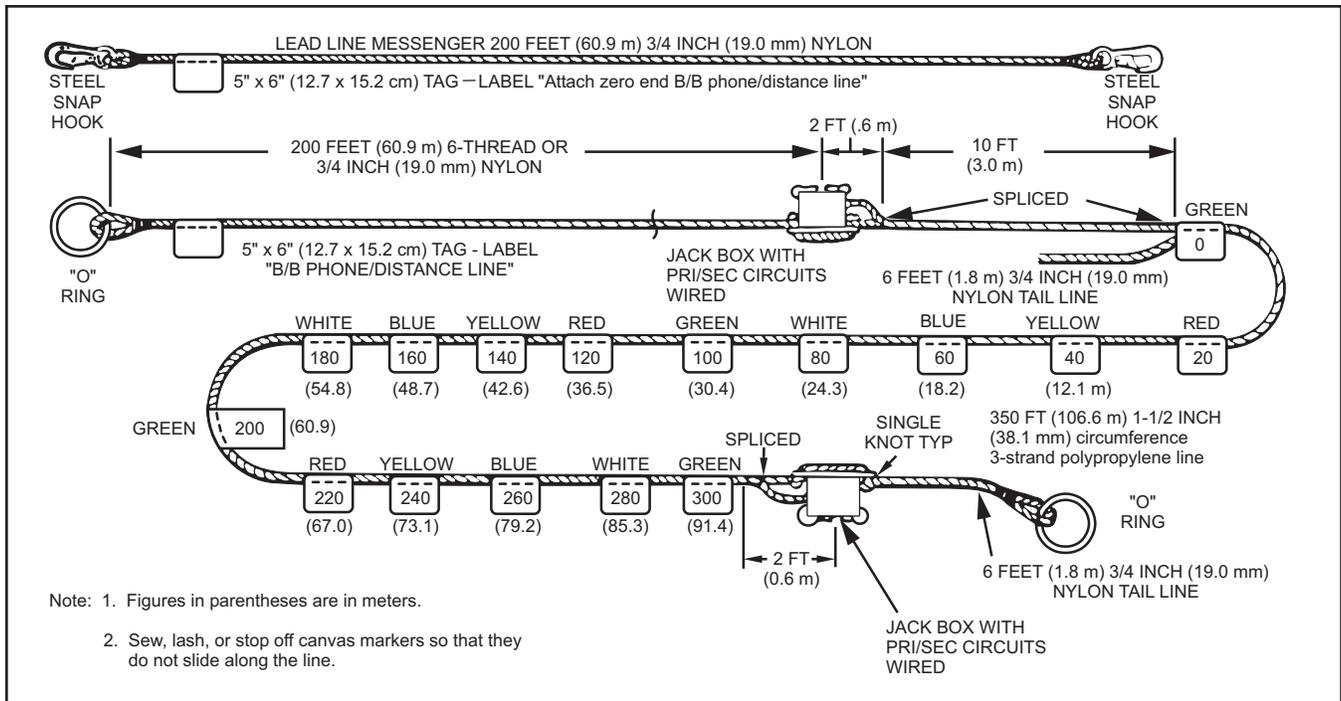


Figure 2-10. Bridge-to-Bridge (B/B) Phone/Distance Line

2.3.6.1 Distance Markers. Distance markers on the B/B phone/distance line are arranged as shown in Figure 2-11. They are made up as follows:

1. In daylight, use 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. Numerals shall be white on red or blue markers, yellow on green markers, green on yellow markers, and blue on white markers. Markers must be sewn, lashed, or otherwise stopped off in such manner that they will not slide along the line. Pouches are provided on each side of canvas markers for lashing chemical lights at night to provide an unobstructed view during flapping and twisting of the distance line.
2. At night, use chemical lights as indicated: 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 54.8 m) markers; one red chemical light on the approach ship's side of the other markers. (One-cell, pin-on-type, red flashlights may be used in lieu of red chemical lights.)

2.3.6.2 Passing the Line. Pass the B/B phone/distance line from the approach ship to the control ship using the lead line messenger (Figure 2-12):

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, LHD, 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 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. She then signals the control ship, "Heave around."
3. The control ship hauls in the B/B phone/distance line and secures it with the zero flag at the outermost rail.

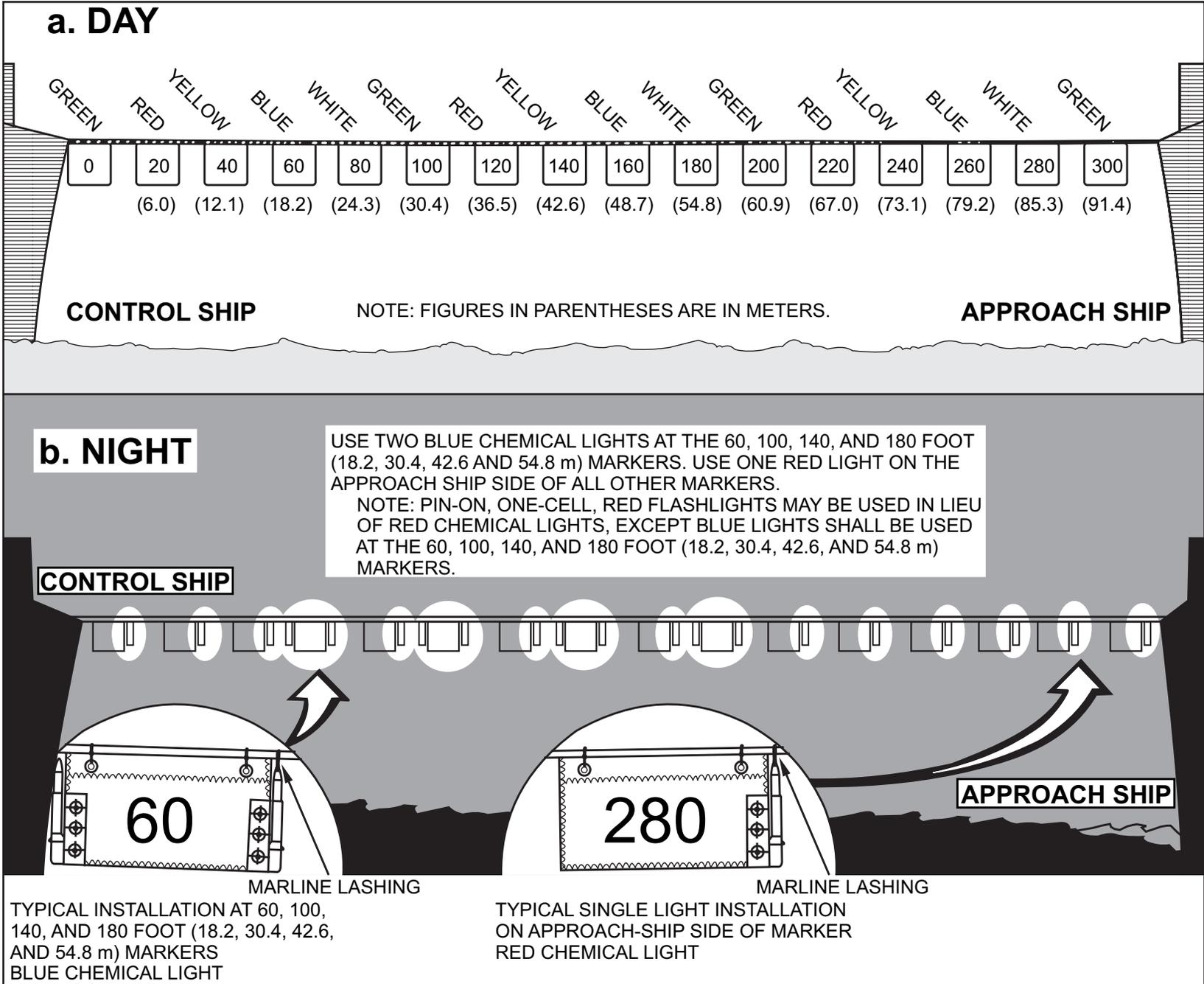


Figure 2-11. B/B Phone/Distance Line Markings

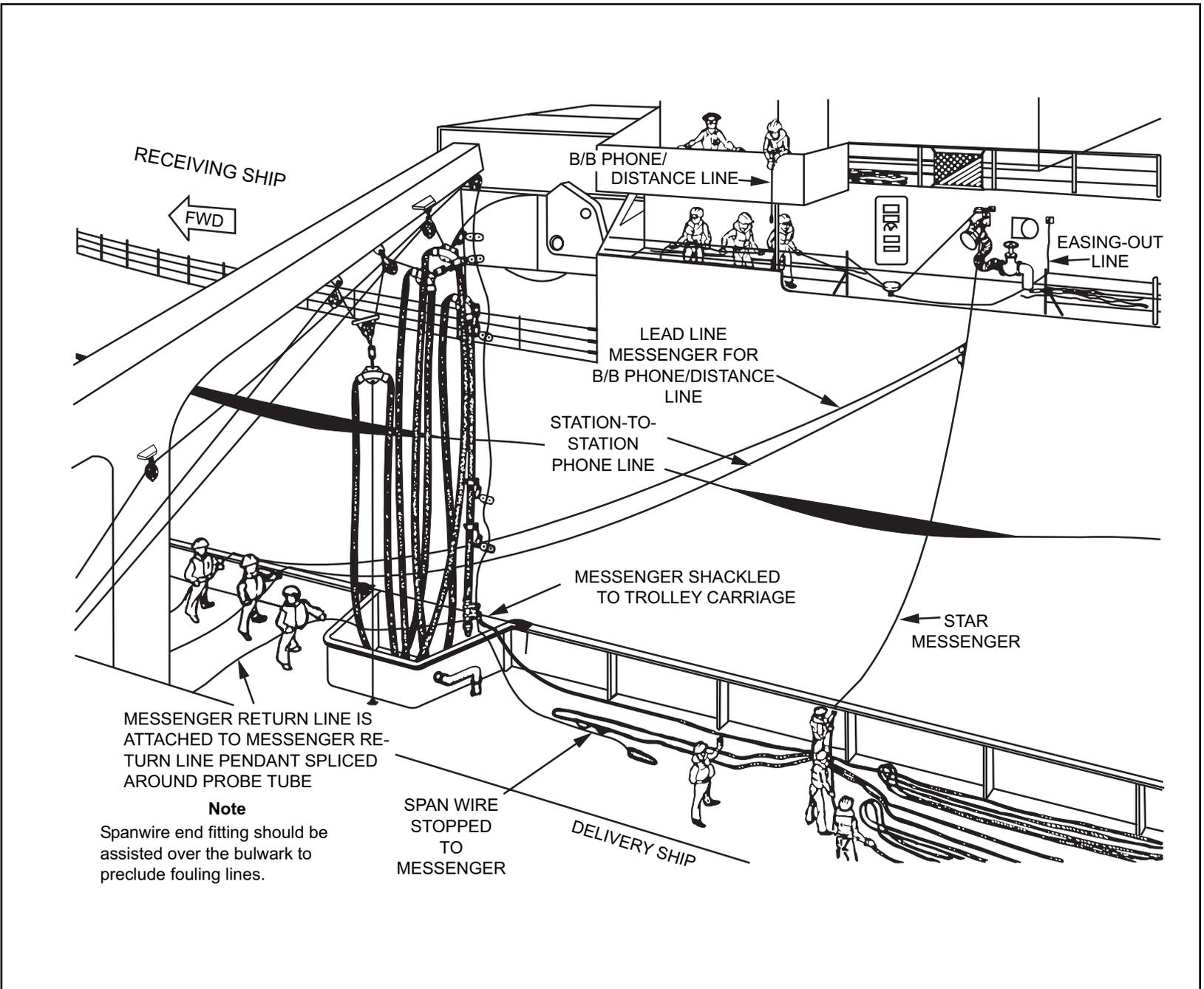


Figure 2-12. Passing the Lines

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 personnel 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 flag at the outermost rail and the delivery ship sends and hand-tends all phone lines.
6. When the approach ship has the messenger/highline aboard, the control ship should — prior to hookup — separate the messenger 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. CV, LHA, LHD, and LPH class ships will normally send an individual shot line for the B/B phone/distance line.

2.3.6.3 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 petty officer shall keep the conning officer informed of the distance between the delivery and receiving ships.
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.
4. The B/B phone/distance line shall be supervised by a PQS-qualified (line handler, underway replenishment) petty officer. The petty officer shall be experienced in line handling procedures.

WARNING

The approach ship shall hand-tend the B/B phone/distance line. The B/B phone/distance line shall be maintained free for running (coiled or faked) and shall never be secured to the approach ship's structure. Personnel must keep inboard of all lines and exercise extreme caution and alertness to potential danger.

2.3.7 Station-to-Station Phone Line. The Sta/Sta 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. Each Sta/Sta phone line shall be tested prior to sending it to the receiving station. The Sta/Sta phone line is made up as shown in Figure 2-13.

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 tools, spare parts, and spare components needed for repairs to transfer stations must be kept ready to make major or minor repairs and for use during an emergency break-away. While the individual ship's configuration will dictate stowage of spare components, a complete set of working and repair tools and 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) that 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 span wire 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

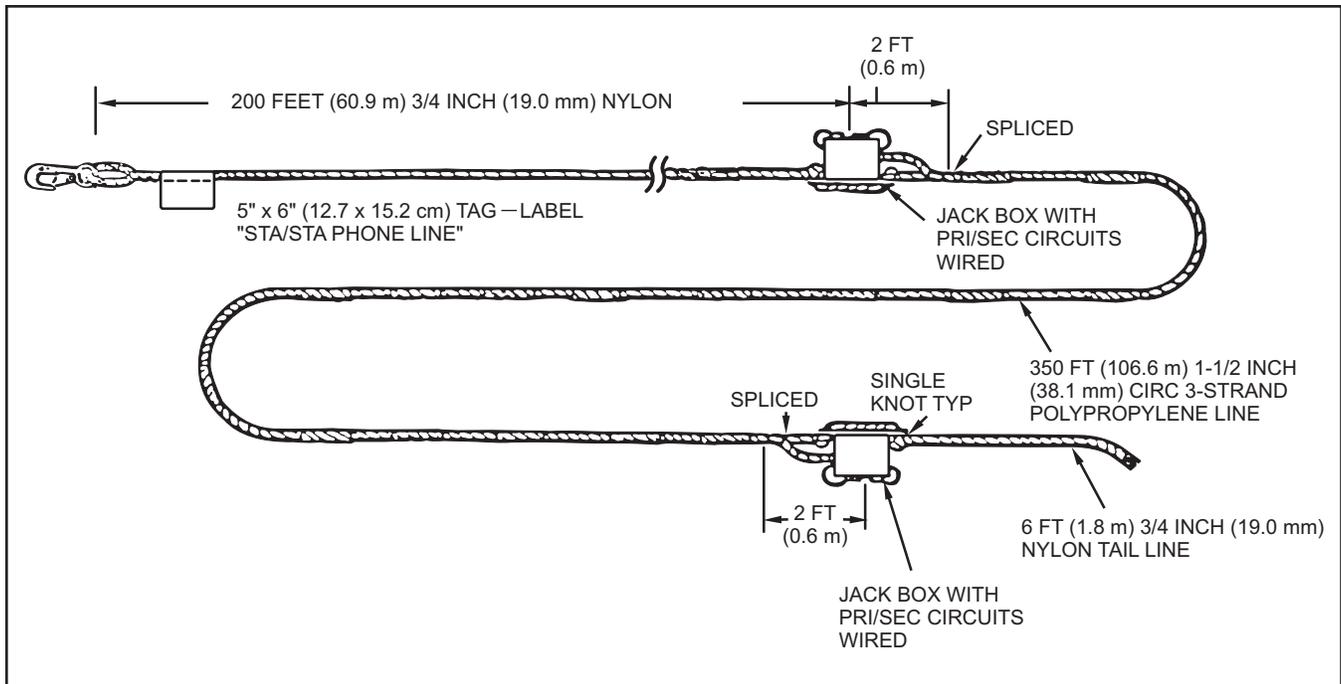


Figure 2-13. Station-to-Station (Sta/Sta) Phone Line

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, circuit 70MC UNREP announcing system, flags, paddles, wands, radios, signal searchlights, and electric megaphones.

2.4.1 Sound-Powered Phones. 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 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.

ITEM	KEY	QUANTITY
ALLEN WRENCHES (for end fittings and hose split clamps)	B	2 each size
AXE	B	1
CHAIN STOPPER, 1/4 inch (6.3 mm) X 6 feet (1.8 m) long	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 (0.9 to 2.2 kg)	B	1
HAMMER, SLEDGE, 10 or 12 lb (4.5 or 5.4 kg)	B	1
HOSE COUPLING CLAMPING TOOLS	A	2 each size
MARLINE SPIKE, 16 inch (40.6 cm)	B	2
PLIERS, SIDE-CUTTING, 8 inch (20.3 cm)	B	1
PLIERS, SLIP-JOINT, appropriate size	B	1
SCREW DRIVER (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 (25.4 cm)	B	1 Minimum
WRENCH, ADJUSTABLE, 12 inch (30.5 cm)	B	1 Minimum
WRENCH, ADJUSTABLE, 15 inch (38.1 cm)	B	1 Minimum
KEY: A — PER SHIP WITH WIRE ROPE DELIVERY CAPABILITY (NOT CARRIED IN STATION TOOL BOX) B — ALL DELIVERY AND RECEIVING STATIONS		

Figure 2-14. UNREP Working and Repair Tools

6. Phone boxes must be kept dry by sealing them in plastic bags or similar material before passing.
7. Whenever possible, station-to-station sound-powered phone lines should be passed and hand-tended forward of the rig.

2.4.2 Circuit 70MC UNREP Announcing System. This system provides a means of two-way communication for control of starboard UNREP stations (circuit 70MC1) and port UNREP stations (circuit 70MC2) on some CLF ships.

2.4.3 Electric Megaphones. 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.

2.4.4 Radios. 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.

2.4.5 Flag and Light Signals. Signals discussed below are in addition to the lights and shapes required by the Rules of the Road. See paragraph 2.4.6.

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

2.4.5.2 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.)

2.4.5.3 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/her collateral assignment to any other duties (such as phone talker). Position the signalman in an area where he/she can readily see and be seen by the signalman with whom he/she 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.

2.4.5.3.1 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.

2.4.6 Task Shapes and Lights. 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.

2.4.6.1 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

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

Figure 2-15. Signal Flag Hoists

clearing the control ship. These shapes shall not be displayed, unless one or more of the above situations exist.

2.4.6.2 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 2.4.6.1.

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, obstruction, attachment point, 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; ensure life jackets are equipped with dye markers, whistles, personnel marker lights, and a primary green chemical light; and checking operation of all life ring distress marker lights.

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	YELLOW & BLUE TRIANGLES	 
LUBE OIL	BLACK, YELLOW QUARTERS	 
FEEDWATER	WHITE	 
POTABLE WATER	WHITE WITH BLUE LETTER "P" CENTERED	 
STORES	GREEN WITH WHITE VERTICAL STRIPES	 
PERSONNEL AND/OR LIGHT FREIGHT	GREEN WITH WHITE LETTER "P" CENTERED	 
FUEL OIL AND F44	RED/YELLOW & BLUE TRIANGLES	 
F76 AND F44	RED/BLUE & YELLOW/BLUE TRIANGLES	 
BRIDGE-TO-BRIDGE PHONE/DISTANCE LINE	GREEN WITH WHITE LETTER "B" CENTERED	 

Figure 2-16. Transfer Station Markers

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. Messenger
 - b. Attach zero end B/B phone/distance line
 - c. Bri/Bri phone/distance line
 - d. Sta/Sta phone
 - e. Messenger return
 - f. Highline messenger
 - g. Burton messenger.

Note

The canvas tags shall be marked as indicated and sewn by hand to 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 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.

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
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.

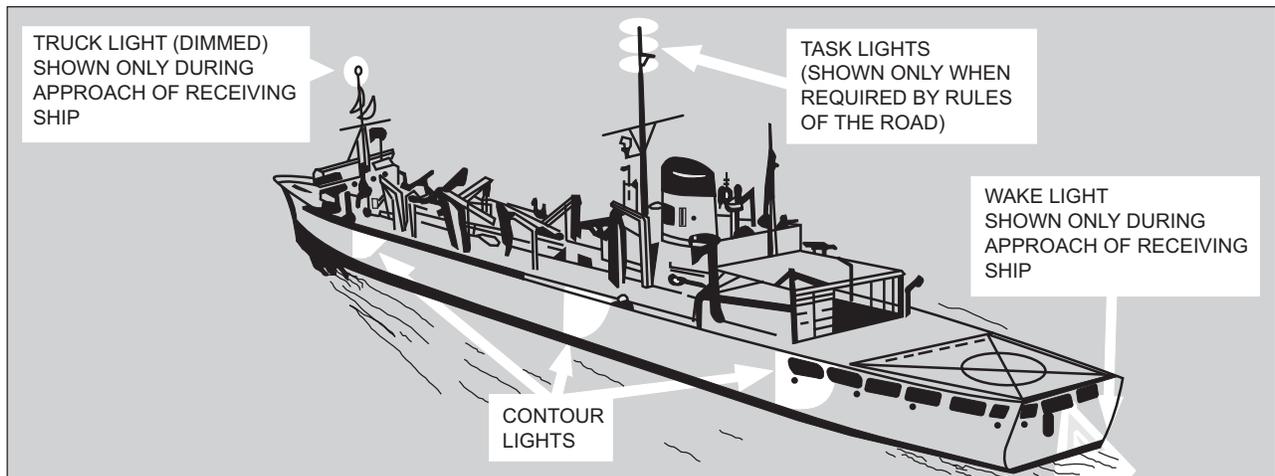


Figure 2-17. Approach and Station-Keeping Lights

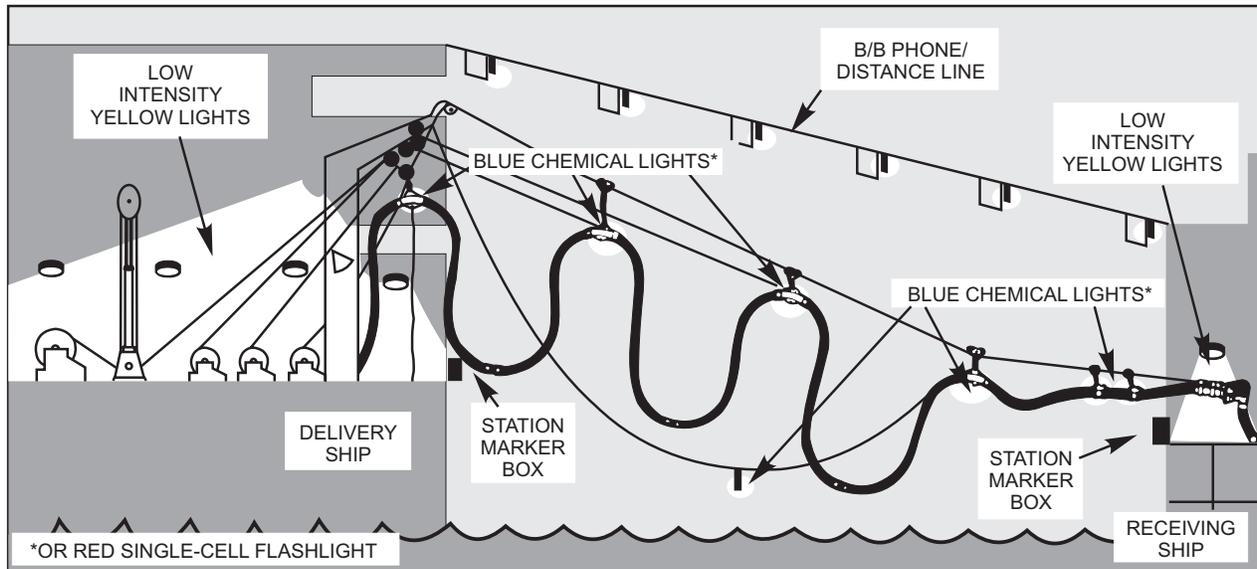


Figure 2-18. Lighting for Night Replenishment

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 Bridge-to-Bridge Phone/Distance Line Lights. These lights were described in paragraph 2.3.6.1 and shown in Figure 2-11.

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 red chemical lights.

1. Mark with at least one red-lens flashlight or one red chemical light: deck-edge elevator corners, stanchion base sockets, davit sockets, torpedo and gun mounts, and similar obstructions.
2. Mark with three red-lens flashlights or three red chemical lights, 6 inches (15.2 cm) apart in a vertical line: vertical stanchions, boom guys, preventer wires, elevator cables, and other vertical obstructions that form the limits of open area available for working at the receiving station.
3. Mark with six red-lens flashlights or six red 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 red 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

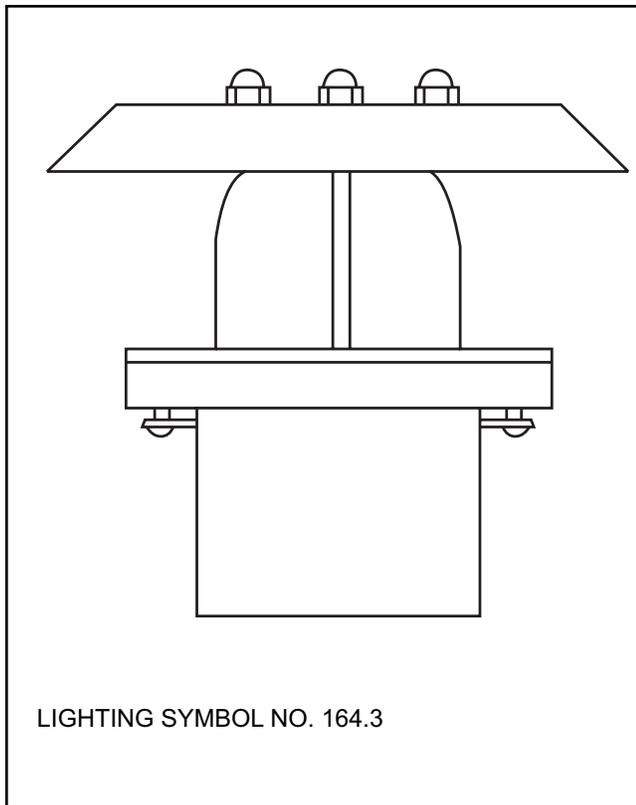


Figure 2-19. Hull Contour Lights

or at the height of the highest obstruction outboard of the receiving station's landing area.

4. When a CV, LHA, LHD, or LPH is the control ship, two blue 25-watt lights will also be shown along the forward, starboard edge of the flight deck 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. Install a 3/4-inch (19.0 mm) safety anchor shackle between the shackle with the chemical light and the retriever attachment at the flow-through saddle to prevent the shackle with the chemical light from lodging at the retriever saddle.

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

2. Messengers and lines:

- a. Messenger: 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. 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: 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. Burton whip end: One, attached to the messenger, near the whip wire end.
- d. Burton tie-plate: Three on each side, secured to the side of the plate.
- e. 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.

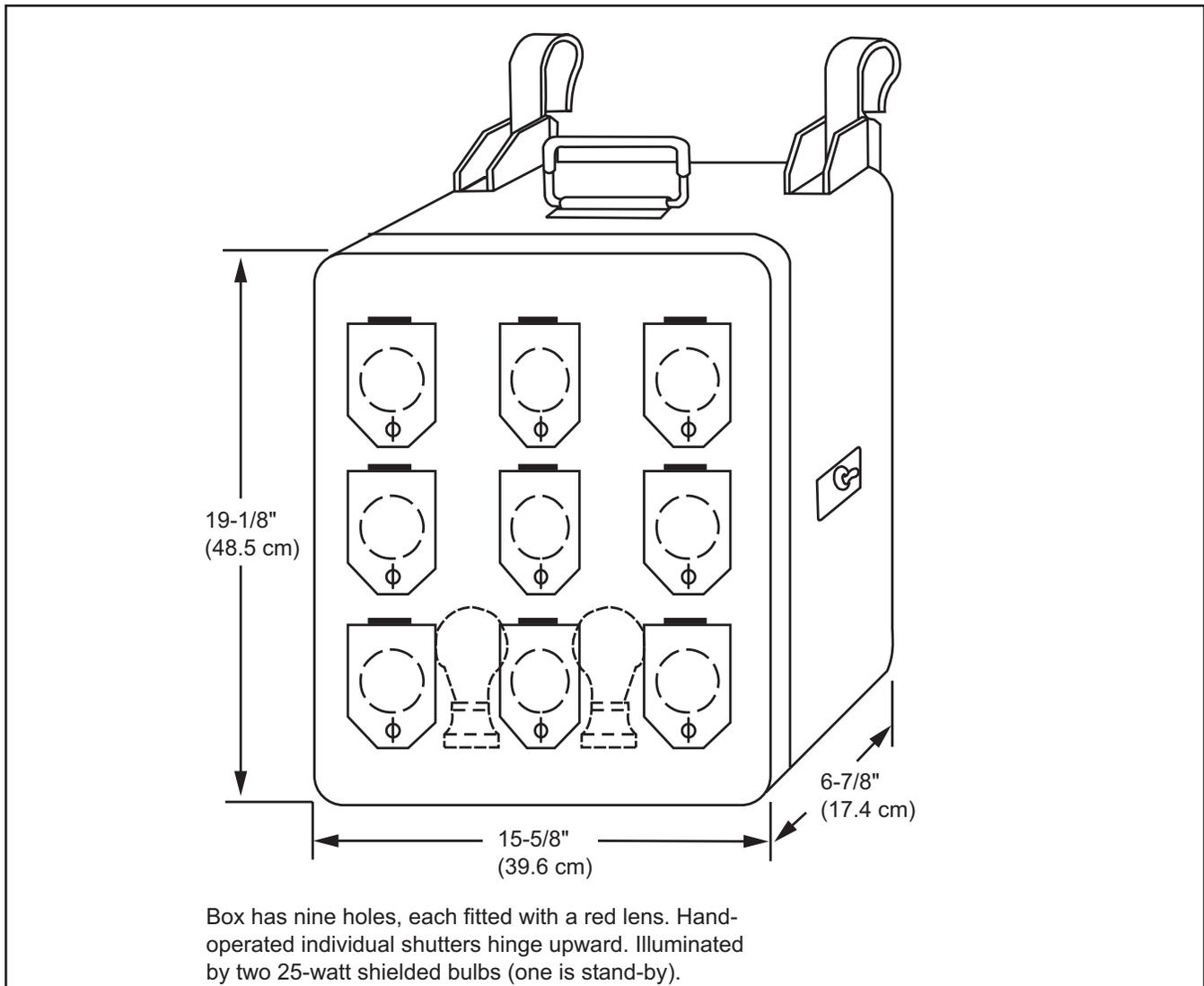


Figure 2-20. Station Marker Light Box

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. FAS spanwire pelican hook
 - c. 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 10.11.1.4.

2.6 INSPECTION AND TEST FREQUENCY

1. FAS and RAS equipment and fittings shall be tested upon initial installation using the guidance of NAVSEA S9086-TK-STM-010 (NSTM 571) and 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. Repaired, moved, or modified FAS and RAS equipment and fittings shall be tested using the guidance of NAVSEA S9086-TK-STM-010 (NSTM 571) to determine what tests are needed. Test loads and arrangements shall be per the ship's overhaul specification and the general specifications for overhaul (GSO) of surface ships, NAVSEA S9AAO-GO5-010/GSO.
3. 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.
4. 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 weight test memos or label plates of the last static and dynamic tests are maintained on board.
5. 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) 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 that 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 for winches without a slip clutch (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 that will produce maximum stress.

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 span wire or the Burton 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 Ship’s Structure Protective Devices. Shipboard damage caused by tightlining of wire ropes is prevented by weak links or winch drum slip clutches.

2.6.6.1 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. Weak links are not required where winch drums have built-in slip clutches.

WARNING

Weak links give no absolute assurance 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 Slip Clutch. A slip clutch is a device built into a wire rope winch drum designed to slip at a preset load. When the load on the wire rope exceeds this preset load, the clutch allows the drum to rotate and the wire rope begins to strip off the drum. This continues

until (1) the wire rope load is decreased below the preset load and the clutch resets or (2) the bitter end of the wire rope comes off the drum.

2.6.6.3 Guidance. When the static-tested load for the attachment point, as shown on the latest weight test memo, is less than the breaking strength of the transfer rig to be used, a weak link or slip clutch must be employed.

WARNING

Personnel Transfer Rig Exceptions: Weak links will not be used with any wire rope or synthetic line, except when needed to attach the hand-tended outhaul to a trolley in STREAM mode (see Chapter 8). Only inhaul winches outfitted with a slip clutch shall be used for STREAM personnel transfer (see Chapter 8).

2.6.6.4 Types of FAS Weak Link

1. 7/8-inch (22.2 mm) spanwire weak-link end fitting with a breaking strength of 35,000 lb (15,875 kg) — NAVSHIPS Dwg 803-2252856
2. 3/4-inch (19.0 mm) spanwire weak-link end fitting with a breaking strength of 30,000 lb (13,608 kg) — NAVSHIPS Dwg 803-2252855.

2.6.6.5 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. 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
5. 50,000-lb (22,675 kg) STAR rig (highline STAR probe) shear pin — NAVSHIPS Dwg 805-4629266.

2.6.7 Rig Loads. Loads on a transfer rig are affected 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 7.1.5 and Figure 7-3.

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 ice-breaker 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/her units to the replenishment force, or he/she 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. For detailed listings, refer to NAVSUP 4998 (Hull/Fill) and Atlantic and Pacific Fleet Underway Replenishment Guides.

1. AO and T-AO — Petroleum products — F76, F44, selected lube oils (drums), and bottled gases
2. AE and T-AE — Ammunition, bombs, rockets, and missiles; F76; and a mini/multicapability that includes fresh-frozen, chilled, and dry provisions
3. T-AF — Fresh-frozen, chilled, and dry provisions; and selected high-volume general stores

items, such as rags, paints, paper, and cleaning materials

4. T-AFS — T-AF load; plus general stores items, technical supplies (ordnance, electronic, and ship's), repair parts, medical and dental material, ships stores stock, clothing and small stores, and forms and publications; and F76 and packaged lubricants and grease
5. AOE — AO and AE combined plus T-AFS load; range of provisions at lesser depth; selected high-volume general stores items.

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 (T-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 VERTREP. Ammunition and missiles are considered transferred when they safely reach the receiving ship's deck (see paragraph 6.3.5.3).

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/her 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 Personnel and 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 an 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.

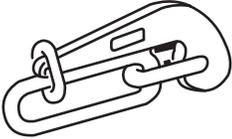
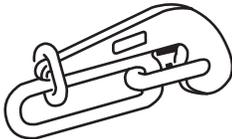
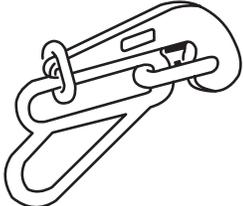
1. Only essential personnel shall be allowed at a transfer station during replenishment.
2. Life lines should not be lowered unless absolutely necessary; if lowered, temporary life lines must be rigged. Temporary life lines shall be 2-1/4-inch (57.2 mm), 3-strand polyester line, Specification MIL-R-30500, or 2-1/4-inch (57.2 mm), 3-strand, nylon line, Specification MIL-R-17343.
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 that 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 if practical, to remain at least 6 feet (1.8 m) from the blocks, cleats, gypsy heads, capstans, etc., through which the lines pass. All personnel on rig teams, station-to-station phone lines, and bridge-to-bridge phone/distance lines should be forward and inboard of all lines and wire ropes. If required to work aft, personnel must keep well inboard of all lines and wire ropes, exercising extreme caution and alertness to potential danger.
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 spread 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 highlines to prevent the transfer head from swinging sharply into the stops and causing the wire to pinch inside the trolley (see Figure 2-22).
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.

Note

Due to limited manpower on MSC T-AOs, only one lifebuoy watch may be posted. In case of multiple station UNREP or simultaneous CONREP/VERTREP, manpower requirements on deck may preclude stationing a lifebuoy watch. When posted, the lifebuoy watch will not be equipped with smoke floats.

15. All hands shall be instructed on the hazards of emergency breakaway (see paragraphs 2.2.1.1 through 2.2.11.12).
 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 3-04.1M (formerly NWP 42) and safety devices as indicated in paragraph 10.12 and NWP 3-04.1M (formerly NWP 42).
 20. Personnel involved in an UNREP shall wear the safety equipment required by paragraph 2.10.2 and Figure 2-23.
 21. Personnel rigging aloft or working outboard of bulwarks or safety chains shall 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.

RIG APPLICATION	PELICAN HOOK	COTTER PIN
<p>FUEL SPAN WIRE WITH ROBB OR NATO COUPLING</p> <p>Note Do not use with probe fueling system.</p>	<p>FAS, LIGHTWEIGHT, 1 INCH (25.4 mm)</p>  <p>NAVSHIPS 805-2556852 or NAVSEA 571-6937107</p>	<p>STEEL, 3/16 INCH (4.7 mm) X 3 INCH (76.2 mm)</p>
<p>STREAM WITH STAR</p>	<p>STANDARD 1-3/8 INCH (34.9 mm)</p>  <p>NAVSHIPS 805-2556852</p>	<p>STEEL, 1/4 INCH (6.3 mm) X 3 INCH (76.2 mm)</p>
<p>STREAM WITH TRAVELING SURF</p> <p>Note Do not use with STREAM with STAR.</p>	<p>STREAM 1-3/8 INCH (34.9 mm)</p>  <p>NAVSHIPS 805-2580284</p>	<p>STEEL, 1/4 INCH (6.3 mm) X 3 INCH (76.2 mm)</p>
<p>SINGLE- AND DOUBLE-PROBE FUELING RECEIVERS</p>	<p>(INTEGRAL WITH RECEIVER)</p>	<p>STEEL, 3/16 INCH (4.7 mm) X 3 INCH (76.2 mm)</p>

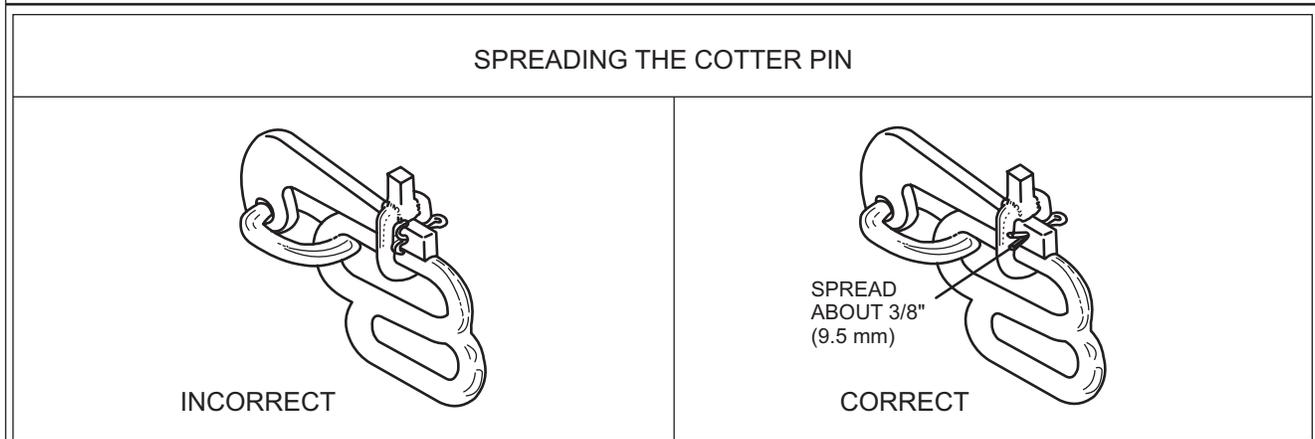


Figure 2-21. Pelican Hooks and Cotter Pins

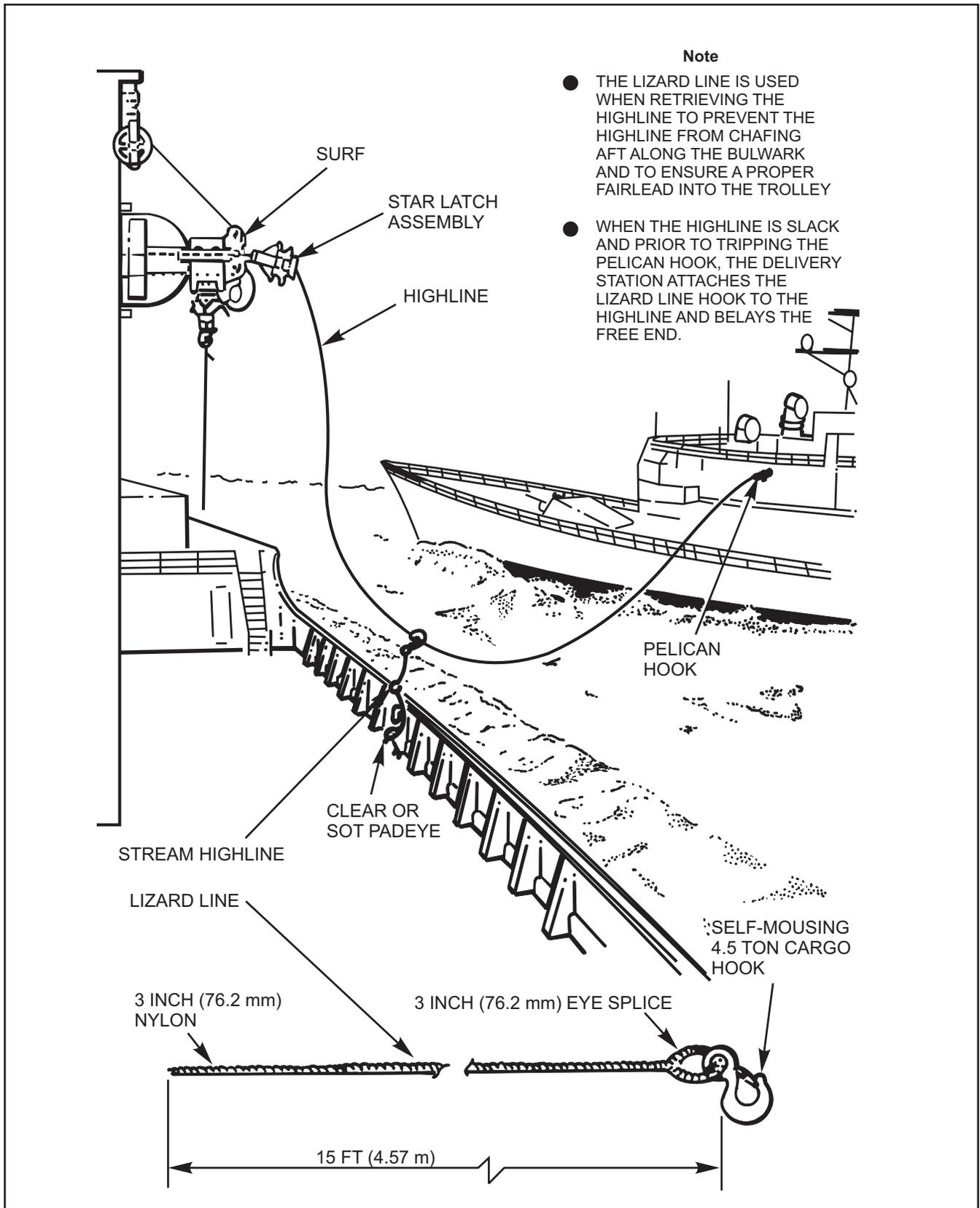


Figure 2-22. STREAM Highline Lizard Line

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 span wire and saddle whips to the winch drums
 - b. Check the spanwire weak link 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 2-23 and shall be worn as prescribed below:

1. Personnel in the immediate area of the transfer station, with the exception of phone talkers, shall wear construction-type safety helmets, equipped with quick-acting breakaway devices. Chin straps shall be fastened and worn under the chin. Phone talkers shall wear the Mk 4 Mod 0 Kevlar helmet designed for use with sound-powered phones. Phone talkers shall wear their helmets with chin straps unfastened. Safety helmets will be color-coded as listed in Figure 2-23.

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 or properly donned, green-colored, auto inflatable utility life preservers (AIULPs) Mk 5 Type. Forklift truck operators and winch repair personnel will wear properly donned, green-colored AIULPs. Colored jerseys may not be worn over AIULPs, but are optional with inherently buoyant life jackets.

Note

MSC ships shall follow the standards for life-jackets as set forth in COMSCINST 5100.17 Series.

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 or AIULP 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), whistle, and dye marker on the outside of their life jacket. Flashlights need not be lighted except at the discretion of the commanding officer. Chemical lights must be lighted. Chemical lights are never to be discarded over the side, as the ship on lifeguard station may mistake a discarded chemical light for a man overboard. Dispose of chemical lights in accordance with OPNAV 5090.1B.
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. Personnel 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 Hazardous Materials. Prior to transfer of hazardous 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 hazardous 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.

EQUIPMENT	REFERENCE																						
Gloves	Para. 2.10.2, items 6 and 7																						
Knife	Para. 2.10.2, item 8																						
Life Jacket — Inflatable Type; Vest Type With Collar, Inherently Bouyant, Orange-colored; or Auto Inflatable Utility Life Preserver (AIULP) Mk 5 Mod 0	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 and Safety and Working Lines	Para. 2.10.1, item 21 and Para. 2.10.2, item 3																						
<p>Safety Helmet — Color-coded as follows:</p> <table border="0" data-bbox="331 779 1094 1155"> <tr> <td>WHITE</td> <td>Officer/CPO</td> </tr> <tr> <td>WHITE with GREEN CROSS</td> <td>Safety Officer</td> </tr> <tr> <td>WHITE with RED CROSS</td> <td>Corpsman</td> </tr> <tr> <td>YELLOW</td> <td>Rig Captain</td> </tr> <tr> <td>GREEN</td> <td>Signalman</td> </tr> <tr> <td>RED</td> <td>Line-throwing Gunner/Bolo Heaver</td> </tr> <tr> <td>BROWN</td> <td>Winch Operator</td> </tr> <tr> <td>PURPLE</td> <td>Winch Watcher/Repairman</td> </tr> <tr> <td>BLUE</td> <td>Line Handler/Deck Rigger</td> </tr> <tr> <td>ORANGE</td> <td>Checker/Supply Personnel</td> </tr> <tr> <td>GREY</td> <td>All Others</td> </tr> </table>	WHITE	Officer/CPO	WHITE with GREEN CROSS	Safety Officer	WHITE with RED CROSS	Corpsman	YELLOW	Rig Captain	GREEN	Signalman	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
WHITE	Officer/CPO																						
WHITE with GREEN CROSS	Safety Officer																						
WHITE with RED CROSS	Corpsman																						
YELLOW	Rig Captain																						
GREEN	Signalman																						
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																						
Phone-talker Helmet, Green, Mk 4 Mod 0, Kevlar	Para. 2.10.2, item 1																						
Safety Shoes	Para. 2.10.2, item 5																						
Whistle	Para. 2.10.2, item 4																						
Dye Marker	Para. 2.10.2, item 4																						

Figure 2-23. Personnel Safety Equipment

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 Mishap/Incident Reporting. Appendix A provides the guidance for reporting replenishment mishaps/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 2-24. 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, except on CIVMAR-manned replenishment ships.

2.12 REFERENCES

ATP 16, Replenishment at Sea

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

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 S9086-TK-STM-010/CH-571, Naval Ship's Technical Manual, Chapter 571, Underway Replenishment

NAVSEA S9AA0-AB-GOS-010/GSO, General Specifications for Overhaul of Navy Ships

NAVSEA 0964-000-2000, Lighting for Naval Ships

NAVSEA 0920-LP-106-3010, Cutter, Wire Rope, Velocity Pole-Type

NAVSHIPS Technical Manual 0901-LP-613-0010

NAVSUP 4998-P, Cargo Manual

NAVSUP Publication 485

OPNAVINST 5100.19C, Navy Safety Precautions for Forces Afloat

Station Personnel	Number per Station	Remarks
Safety Officer	1	
Rig Captain	1	
Signalman	1	
Phone Talkers	As required	Station-to-Station and Station-to-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) lan- yard, and conduct breakaway
Line Handlers	As required	Tend messengers, lizard lines, synthetic outhauls, and phone and distance lines Note When manually hauling in a wire, a minimum of 15 line handlers are required.
Other Personnel		
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
POIC Bridge-to-Bridge Phone/Distance Line	1	One per engaged side

Figure 2-24. Personnel Requirements

CHAPTER 3

Liquid Cargo Transfer — STREAM Rigging and Operation

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 and Chapter 4 detail the procedures for transferring fuel between ships of the U.S. Navy — by STREAM and non-STREAM methods respectively; while Chapter 5 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 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, CLF ships (AE/T-AFS), and amphibious ships frequently refuel other ships, especially their screening ships.

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 Tables. 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 3-1 gives the hose sizes and pumping rates of various types of ships when transferring F76 and F44.

3.3 TRANSFER STATIONS

3.3.1 Oiler Stations. Fleet oilers can rig up to seven separate transfer stations to deliver petroleum products. Figure 3-2 shows the location of typical stations on various classes of oilers and the products available at each station. The UNREP Station Capabilities Handbook, NAVSEA S9571-A1-HBK-010, shows station locations on all delivery and various receiving ship classes and a listing of products for each station.

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

3.3.2 Non-Oiler Stations. Carriers 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. Amphibious and auxiliary ships — One or more stations, port or starboard.
3. Selected Maritime Preposition Ships (MPS) — One astern fueling rig.

3.4 STANDARD HOSE RIGS

3.4.1 Choice of Rigs. U.S. ships normally transfer fuel by STREAM rig, by spanwire rig, by the close-in method on some non-oiler types, or by the spanline rig. The STREAM rig is preferred because it permits greater ship separation. The choice of rig is governed by:

FUEL	DELIVERY SHIP	RECEIVING SHIP	AVAILABLE HOSE SIZE IN INCHES (mm)	DESIGN PUMPING CAPABILITY GAL (m ³)/HR/HOSE
F76	All AOs, T-AOs, and AOE's	All Types	7 (177.8)	180,000* (681.3)
	Carriers	Destroyers and Frigates	7 (177.8)	180,000* (681.3)
	AE-21 Class AE-26 Class T-AFS-1, 2, 3, 5 T-AFS-4, 6, 7	All Types Except Carriers	7 (177.8) 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 LHD-1 Class LPH-2 Class LPD-4 Class LSD-36 Class LSD-41/49 Class	Destroyers, Frigates, and Small Auxiliaries	7 (177.8) 7 (177.8) 6 (152.4) 4 (101.6) 6 (152.4) 2-1/2 (63.5)	135,000 (511.0) 135,000 (511.0) 120,000 (454.2) 60,000 (227.1) 60,000 (227.1) 15,000 (56.8)
F44	All AOs, T-AOs, and AOE's	Carriers	7 (177.8)	180,000* (681.3)
		Destroyers, Frigates, and Auxiliaries Capable of Refueling Helicopters	2-1/2 (63.5)	15,000 (56.8)
	Carriers	Frigates	7 (177.8)	180,000* (681.3)
*Rate shown is with fueling probe. For Robb coupling or pigtail, the rate will be less.				

Figure 3-1. Hose Sizes and Pumping Rates

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



A ram-tensioned spanwire shall not be used when fueling a small, shallow-draft ship (i.e., PC, WMEC, MCM, MHC, 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

Typical static-tested loads for attachment points located at FAS receiving stations (as rigged) are listed below.

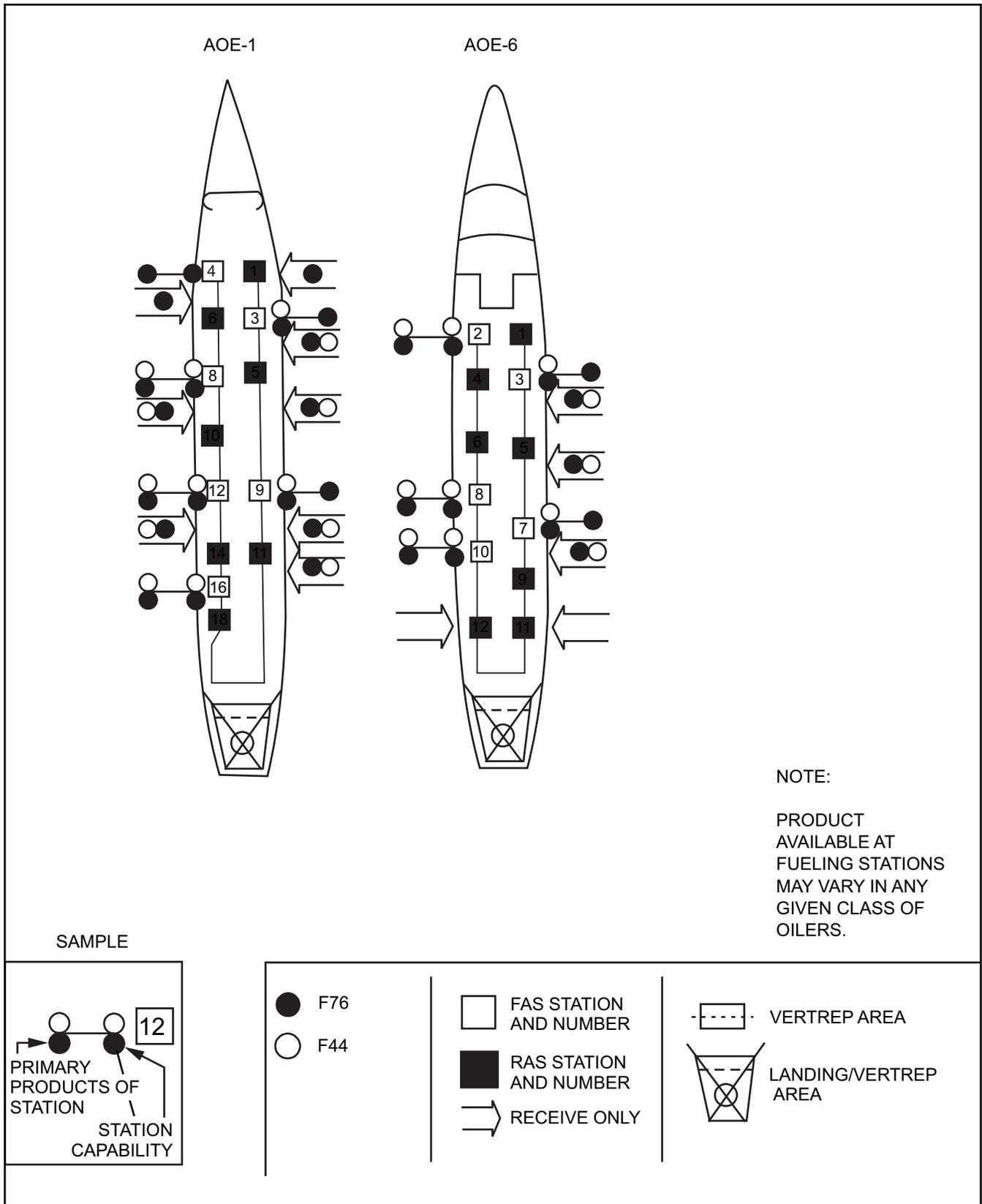


Figure 3-2. Typical Transfer Stations on Oilers (Sheet 1 of 2)

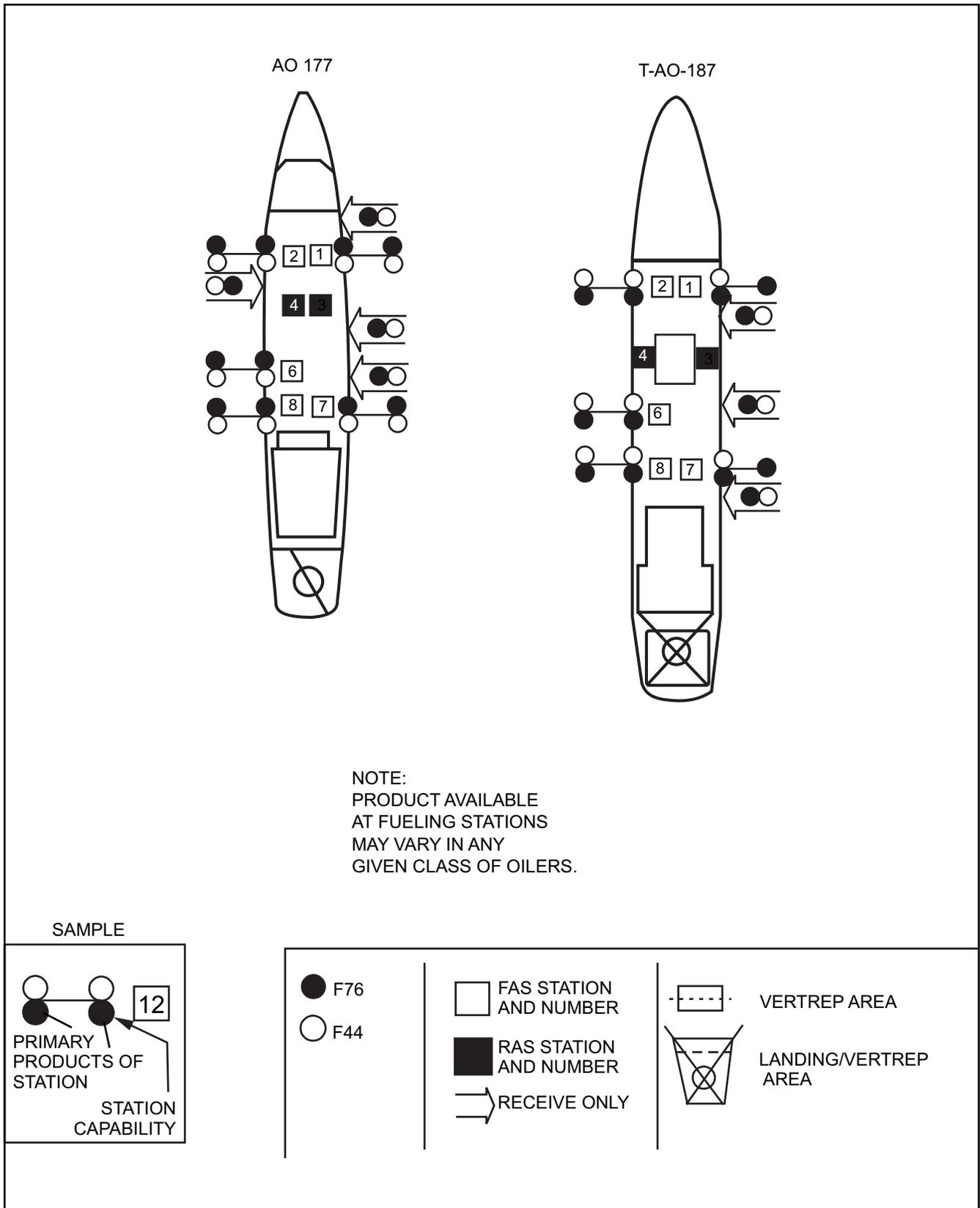


Figure 3-2. Typical Transfer Stations on Oilers (Sheet 2 of 2)

1. Spanwire attachment point — 36,000 lb (16,326 kg)
2. Messenger padeye — 8,000 lb (3,628 kg)
3. Riding line padeye/cleat — 15,000 lb (6,802 kg)
4. Jigger tackle padeye — 12,000 lb (5,436 kg)
5. Jigger tackle cleat — 3,000 lb (1,360 kg)
6. Easing-out line padeye, staple, and cleat — 2,700 lb (1,225 kg)
7. Probe stowage tiedown padeye, staple, and cleat — 600 lb (272 kg).

Note

Detailed weight-testing information can be found in NAVSEA 59080-TK-STM-010/ Chapter 571.

3.6 FUELING PREPARATIONS

3.6.1 Receiving Ships. As fuel is consumed, ships may ballast with seawater 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.

WIRE ROPE	SIZE IN INCHES (mm)	MINIMUM LENGTH IN FEET (m)
SPAN WIRE (Tensioned) (See Note)	3/4 (19.0) 7/8 (22.2)	800 (243.8)
SPAN WIRE (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/T-AFS units using a tensioned FAS delivery rig shall use the highline winch wire rigged through the ram tensioner as the span wire instead of the inhaul and outhaul wires.		

Figure 3-3. Wire Rope Requirement for Fueling-at-Sea Rigs

3.6.3 Checklists. Comprehensive checklists 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, checklists must suit the individual ship’s installation.

3.7 BASIC ALONGSIDE FUELING-AT-SEA RIG EQUIPMENT

Paragraphs 3.7.1 through 3.7.6 describe major equipment used in alongside fueling operations.

3.7.1 Wire Rope. Wire rope used in FAS rigs is in accordance with paragraph 2.3.1. End fittings shall be in accordance with paragraph 3.12. Sizes and lengths for various applications are listed in Figure 3-3.

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

3.7.2.1 STAR Messenger. The STAR messenger (see Figure 2-9 and paragraph 2.3.5) is the main line used to assist in hauling the span wire and fuel rig across between the ships. When sending a single- or double-probe rig to a single-probe receiver, 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 3.7.2.3 is not required. When

passing a single- or double-probe rig to double-probe receivers, remove the 60-foot (18.2 m) releasing line section and attach the messenger to the pip-pin on the special inhaul clamp. Double-probe receiving stations will provide the remating line described in paragraph 3.7.2.3 and the short strap described in paragraph 3.7.2.8.

3.7.2.2 Messenger Return Line. The messenger return line is a minimum of 300-feet (91.4 m) of 2-1/4-inch (57.1 mm) nylon line, and is fitted on one end with a 3-inch (76.2 mm) soft eye with a brummel hook. It is used with the messenger return line pendant described in paragraph 3.7.2.9.

3.7.2.3 Remating Line. The remating line is required at double-probe receiving stations. It is a 3-inch (76.2 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 pip-pin on the special inhaul clamp after the probes are seated and the messenger has been removed. For single-probe rigs, the 60-foot (18.2 m) releasing line section of the STAR messenger serves as the remating line.

3.7.2.4 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 3/4-inch (19.0 mm) pear-shaped link is inserted in one end of the riding line.

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.

3.7.2.5 Two-Fold Purchase. The two-fold purchase is used with the riding line, as shown in Figure 4-2. 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).

3.7.2.6 Easing-Out Line. The easing-out line is 12- to 21-thread manila with whipped ends. See paragraph 2.2.11.5.

3.7.2.7 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 4-3 and 4-4.

3.7.2.8 Span Line. The span line is used with the 2-1/2-inch (63.5 mm) hose rig. It is 4-inch (101.6 mm) double-braided spun polyester, 450 feet (137.1 m) in length.

3.7.2.9 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.

3.7.2.10 Strap Assembly. The strap assembly is a 1-1/8-inch (28.5 mm) nylon line with steel safety snap hooks at each end. There are two strap sizes: (1) an 18-inch (0.46 m) short strap and (2) a 42-inch (1.07 m) long strap. The short strap is used on the double-probe rig when disconnecting the messenger and hooking up the remating line. The long strap is used if the messenger has round turns around the span wire.

3.7.2.11 Messenger Return Line Pendant. The messenger return line pendant is made up of 2-1/4-inch (57.1 mm) nylon or braided polyester line of sufficient length to encircle the probe tube and provide a 1-foot (304 cm) pigtail. One end shall have a 3-inch (76.2 mm) soft eye spliced in it, the other end is fitted with a brummel hook in a 3-inch soft eye. The pigtail with brummel hook shall be passed through the soft eye and choked around the tube. (The soft eye of the choker may be seized by small stuff or a plastic tie-wrapper to ensure it does not slip.) The brummel hook is used to attach the messenger return line.

3.7.3 Hose and Fittings

3.7.3.1 Fuel Transfer Hose (MILSPEC MIL-H-22240). Fuel transfer hose is lightweight and nonrigid (collapsible). There are five different types.

3.7.3.1.1 7-Inch (177.8 mm) Alongside Fuel Delivery Hose. This is the standard hose used in fuel STREAM rigs. Standard issue length is 35 feet (10.6 m).

Note

- LPH-2 and LSD-36 Class amphibious ships use 6-inch (152.4 mm) alongside fuel delivery hose for fuel delivery. Standard issue length is 35 feet (10.6 m).
- LPD-4 Class amphibious ships use 4 inch (101.6 mm) alongside fuel delivery hose for fuel delivery. Standard issue length is 30 feet (9.1 m).

3.7.3.1.2 2-1/2 Inch (63.5 mm) Alongside Fuel Delivery Hose. This hose can be used in fuel STREAM rigs under the 7-inch (177.8 mm) single hose or by itself in a close-in or spanline rig. Standard issue length is 35 feet (10.6 m). Virgin, 2-1/2-inch-(63.5 mm), alongside fuel delivery hose, from stock, can be used for either F76, F44, or water transfer. After the first transfer of a product, the hose takes on the product's identity. The hose can only be used for that product for all following transfers. Ship's force must stencil on each hose at each end the product that can be transferred with the hose.



Once a hose has been used for a product (fuel or water), do *not* use it for any other product. Using a hose for a different product than that for which it was first used may contaminate fuel or water tanks.

3.7.3.2 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. Hose saddles used in the 2-1/2 inch (63.5 mm) hose rig are similar in design and are shown in NAVSHIPS Std Plan 803-2260818.

3.7.3.3 Hose Couplings (MILSPEC MIL-C-24356). The hose couplings for 2-1/2-inch (63.5 mm), 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.

3.7.3.4 Riding Line Fittings (Flow-Through). The riding line fittings for 2-1/2-inch (63.5 mm), 4-inch (101.6 mm), 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 803-3360819 (for the 2-1/2-inch (63.5 mm) fitting), 805-4472630 (for the 4-inch (101.6 mm) fitting), 810-1385968 (for the 6-inch (152.4 mm) fitting), and 810-1385969 (for the 7-inch (177.8 mm) fitting).

3.7.4 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.

3.7.4.1 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 fuel.

3.7.4.1.1 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.

3.7.4.1.2 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 3-26). 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 3-27). When the probe is engaged, the flags are in the raised position; when the probe is disengaged, the flags are in the stowed position.

FLOW-THRU SADDLES	SAFETY ANCHOR SADDLES
2-1/2" (63.5 mm)	3/4" (19.0 mm)
6" (152.4 mm)	
7" (177.8 mm)	7/8" (22.2 mm)

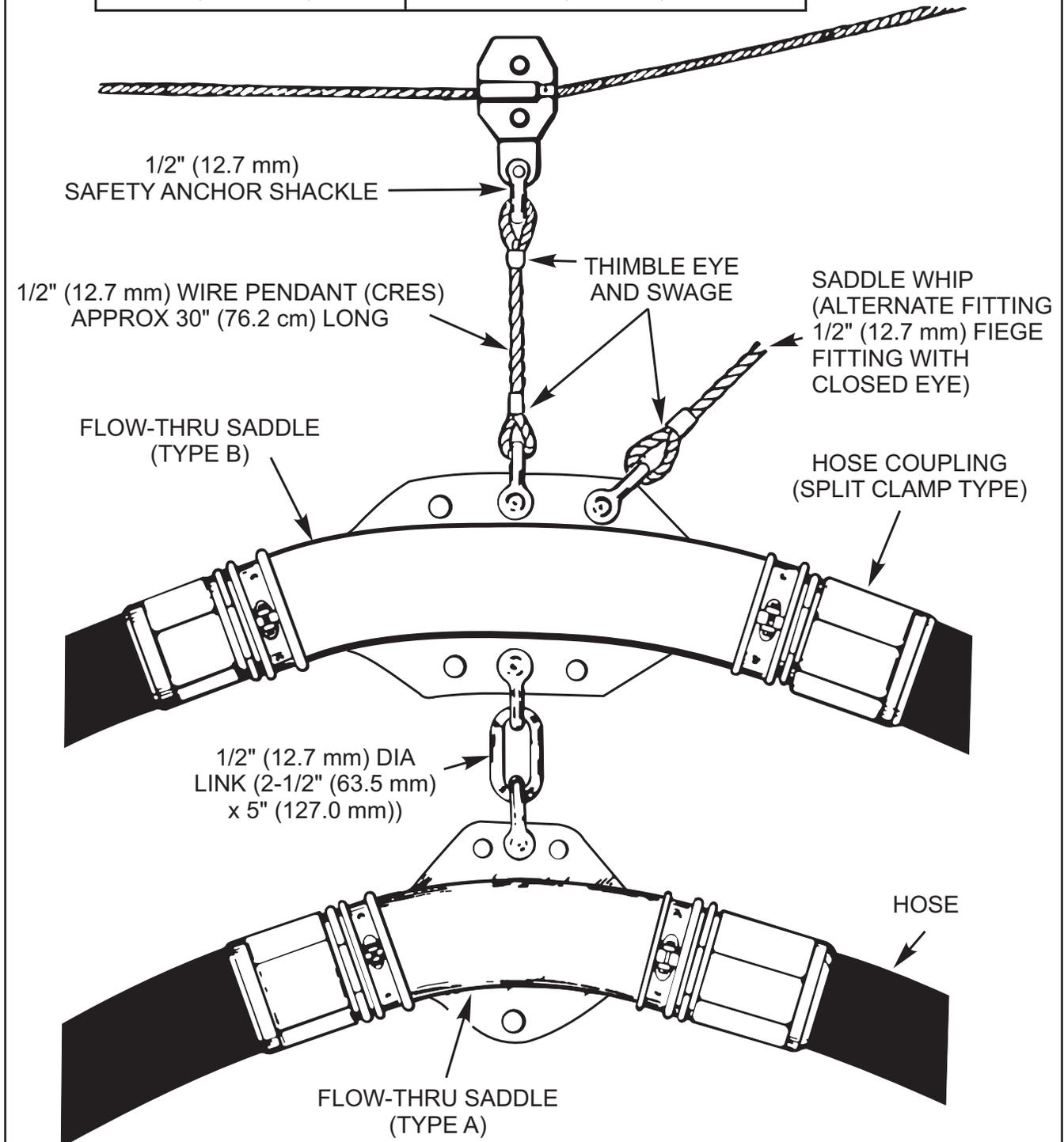


Figure 3-4. Hose Saddles

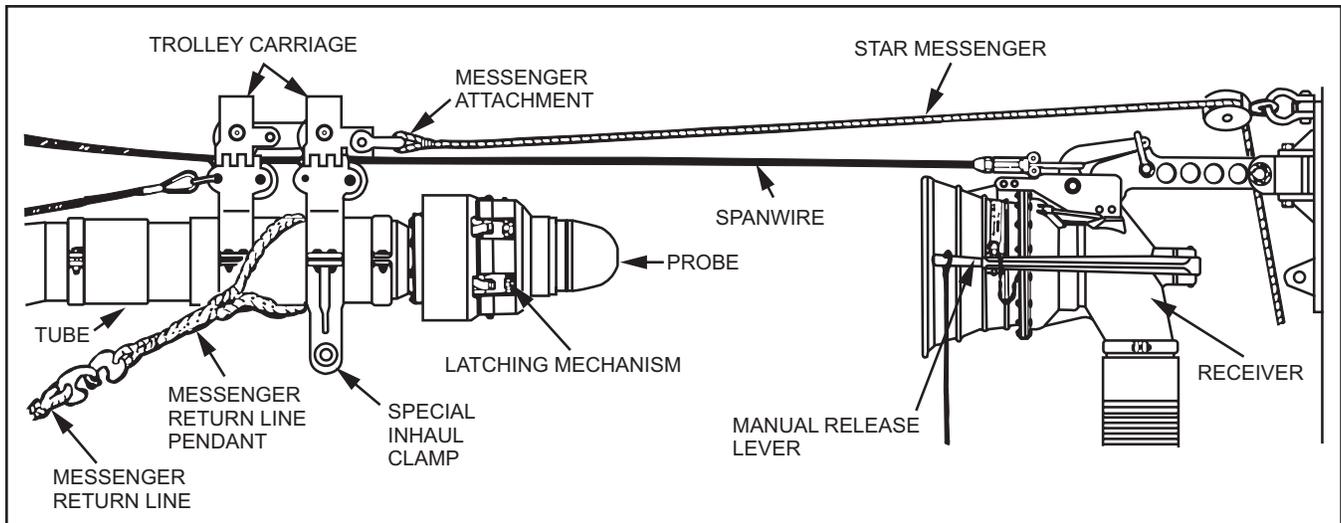


Figure 3-5. Single Probe and Receiver

3.7.4.1.3 Receiver Hose Assembly. The receiver hose assembly is a steel-reinforced, 7-inch (177.8 mm) diameter hose with a male hose coupling and adapter to 8-inch (203.2 mm) flange connector at one end and a female hose coupling at the other end. It is 8-feet (2.4 m) long and connects the receiver to the fuel riser.

3.7.4.2 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.

3.7.4.2.1 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), the 19-inch (48.3 cm) centerline dimension (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.

3.7.4.2.2 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 receiver hose assembly (described in paragraph 3.11.1.3) connects each receiver to its fuel riser. 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 3-27).

CAUTION

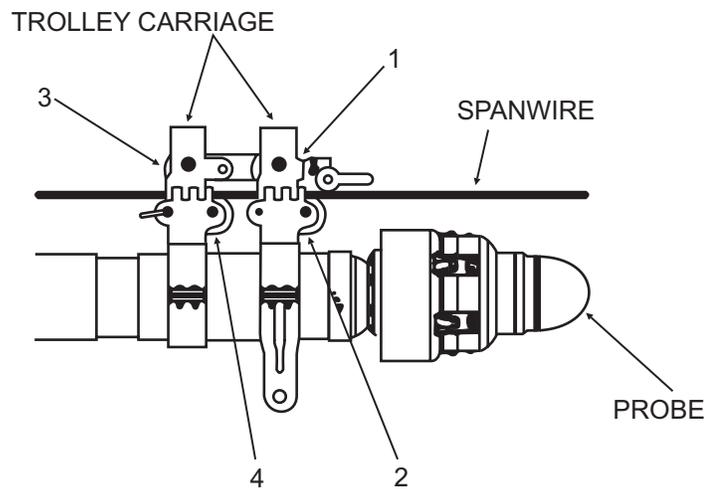
Use only the remating line for seating and remating the probes. Do not use hogging-in lines to assist in seating the probes due to the danger of damage to the probe frame or fuel spills.

3.7.4.2.3 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. See 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.

3.7.4.3 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 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

SHEAVE IDENTIFICATION	SHEAVE O.D.	NAVSHIPS PART NO.	STOCK NO.
1 UPPER FORWARD	5-1/2" (139.7 MM)	2255760-5	NSN 2040-00-895-7102
2 LOWER FORWARD	3-1/2" (88.9 MM)	2255760-6	NSN 2040-00-895-7105
3 UPPER REAR	4-3/4" (120.6 MM)	2255760-7	NSN 2040-00-895-7110
4 LOWER REAR	4-1/4" (107.9 MM)	2255760-8	NSN 2040-00-895-7116



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. Delivering Double Probe to Double-Probe Receivers

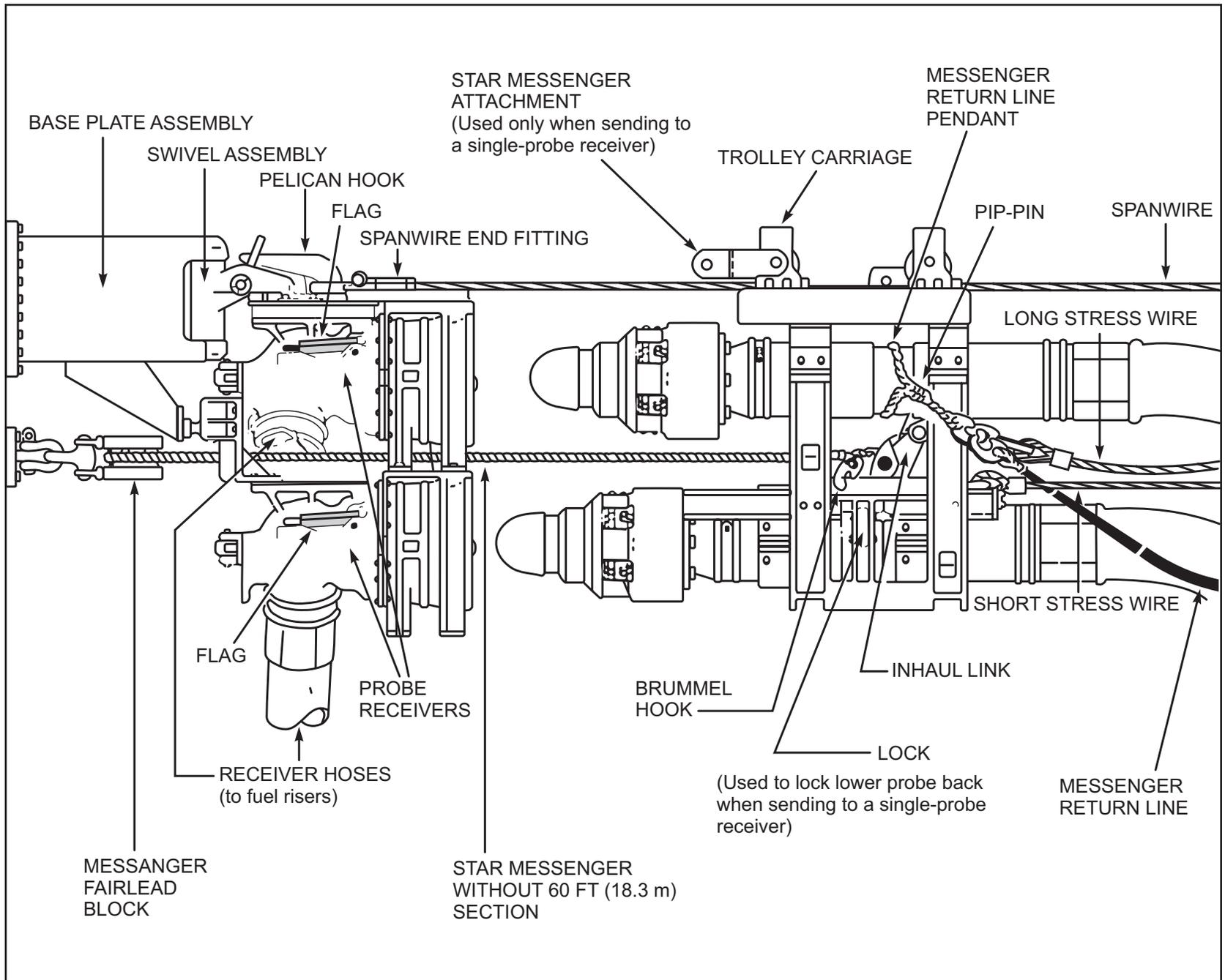


Figure 3-8. Double-Probe Hose Assembly

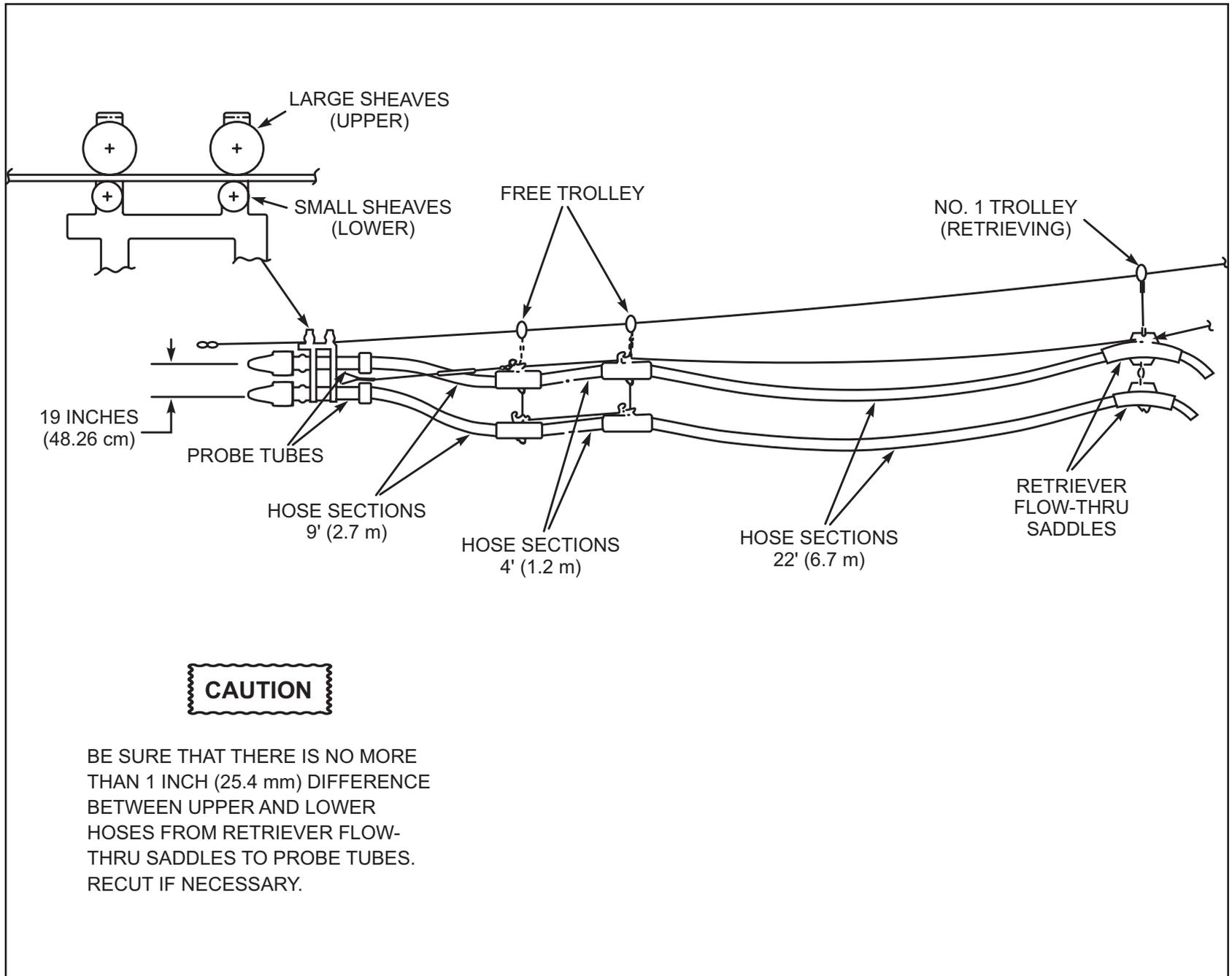
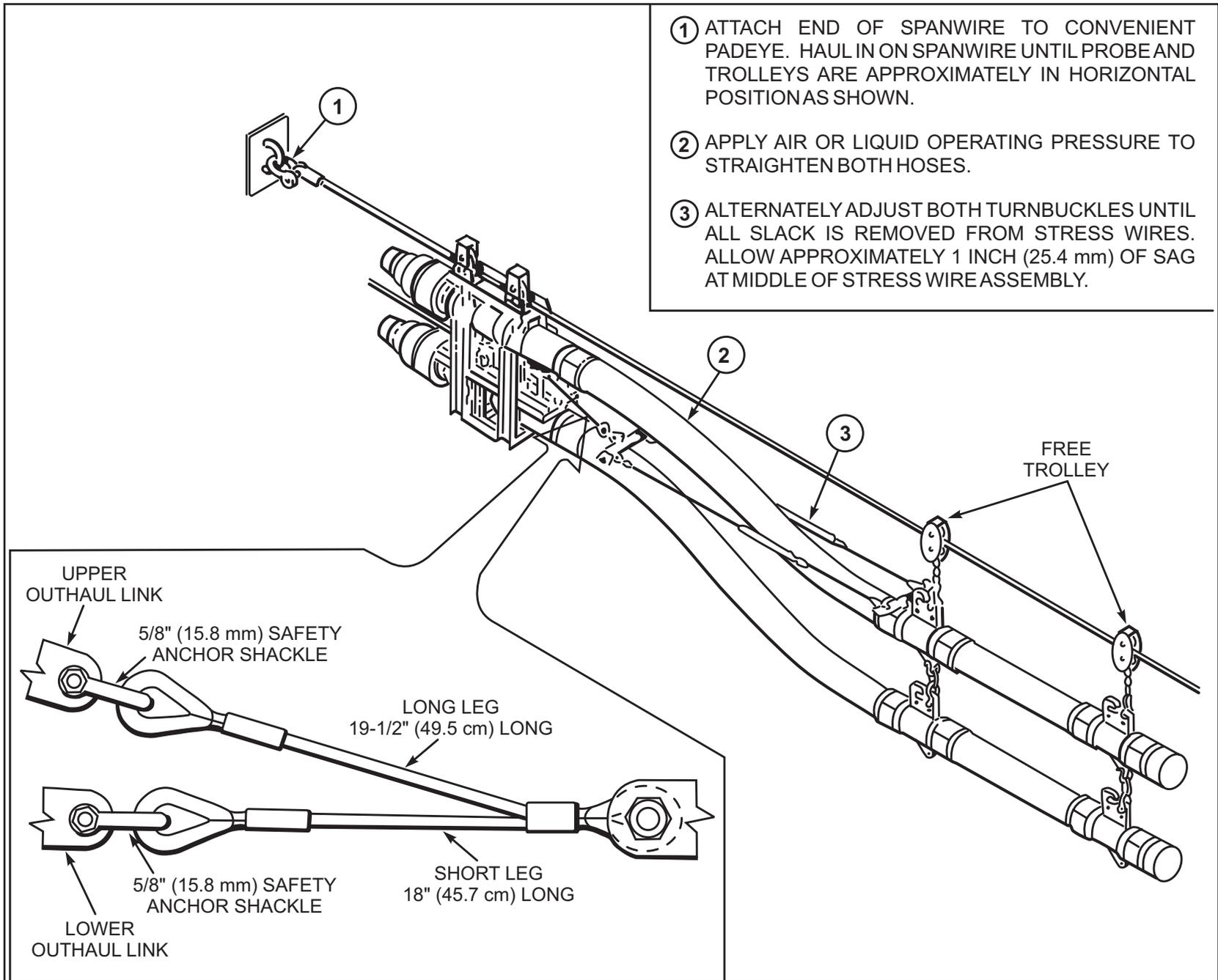


Figure 3-9. Adjustment of Double-Probe Bridle Assembly



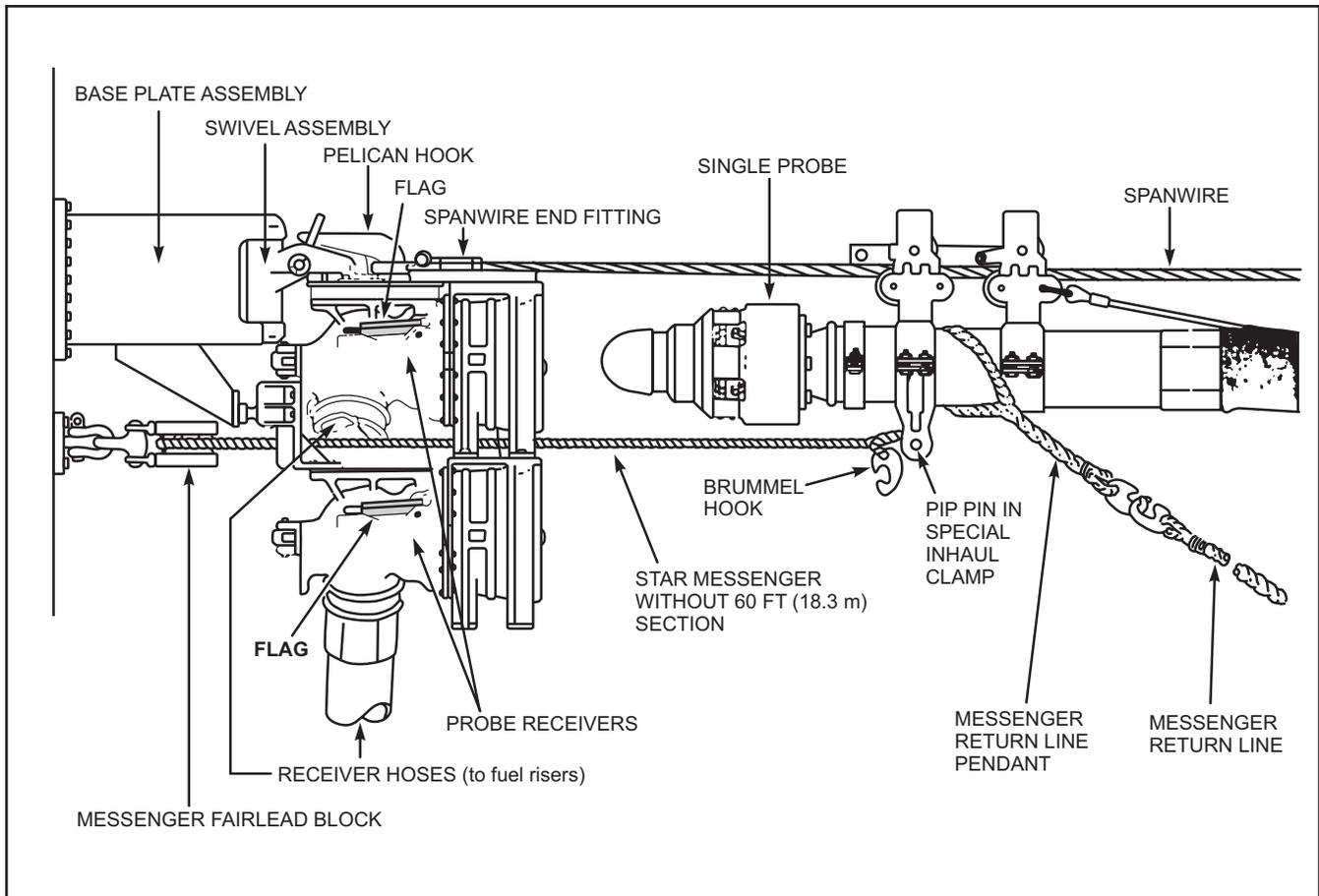


Figure 3-10. Delivering Single Probe to Double-Probe Receivers

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.

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.

3.7.4.4 Breakable-Spool, NATO Quick-Release Coupling. This coupling, shown in Figure 3-12, is used when fueling NATO ships 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 pipe 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.

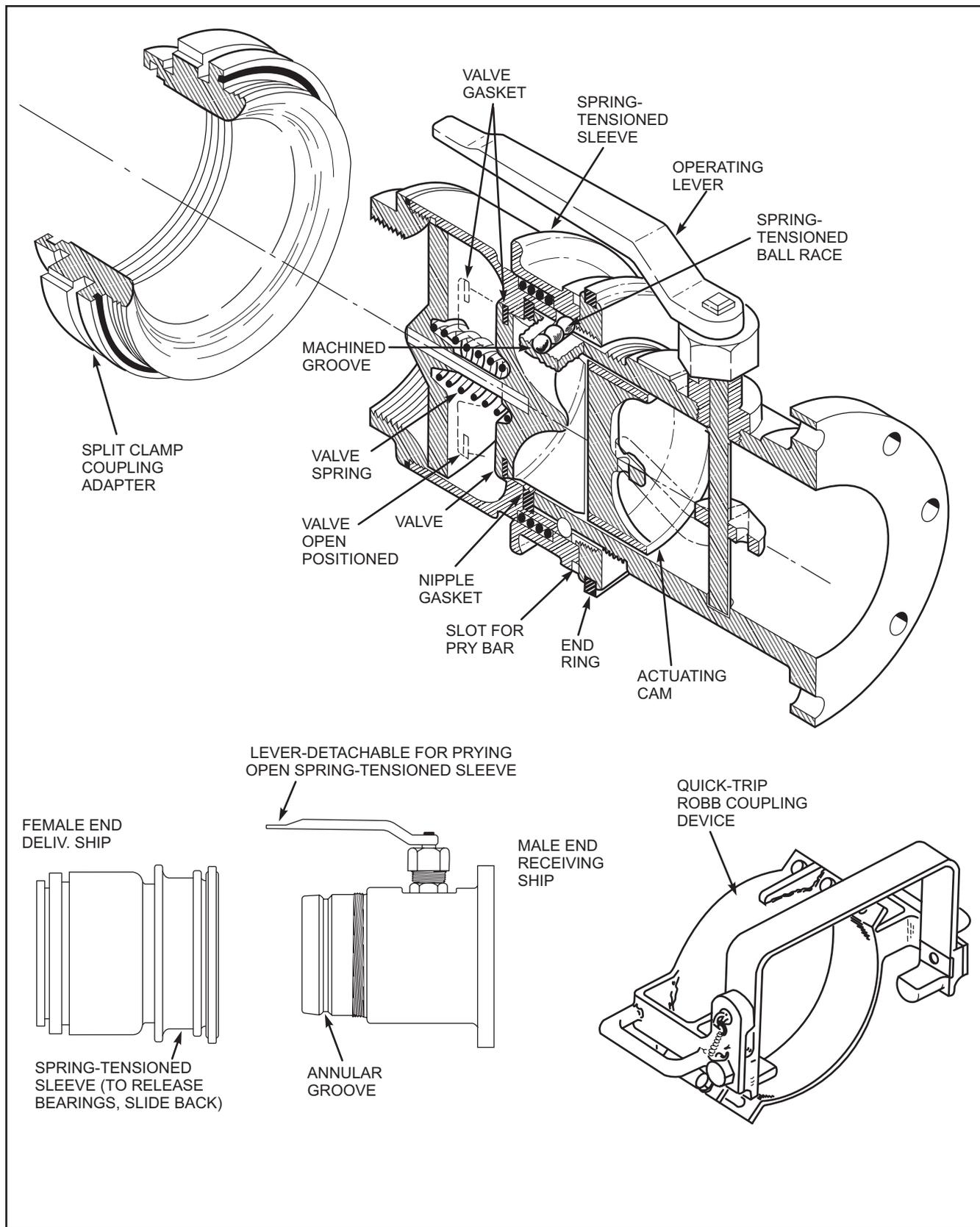


Figure 3-11. Combined Quick-Release Coupling and Valve (Robb Coupling)

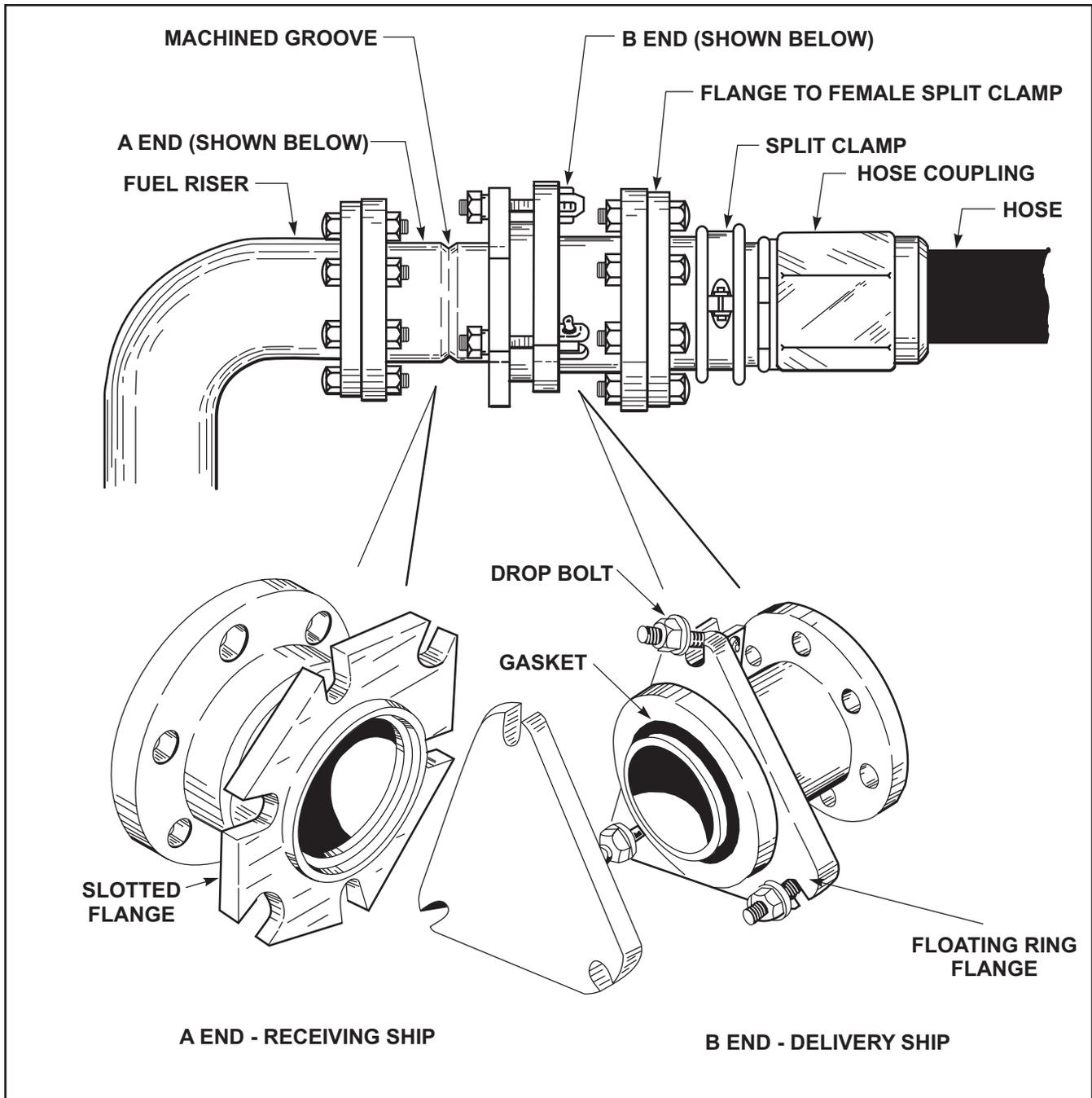


Figure 3-12. Breakable-Spool, NATO Quick-Release Coupling

3.7.4.5 Quick-Release Coupling, 2-1/2 Inch (63.5 mm). This coupling is used only when ships are unable to use the D-2 nozzle system.

3.7.4.6 Type D-2 Nozzle and Receiver. The D-2 nozzle (NAVSEA Drawing 571-6821693) shown in Figure 3-13 is the standard fuel coupling for all 2-1/2-inch (63.5 mm) alongside delivery rigs. The coupling is a quick-operating, dry-break device. Connection

requires a 30° turn while pushing the two halves together. Once connected, the internal flow valve on the nozzle end is rotated to full open, which depresses the poppet type of check valve in the receiving half. When the valve is open, the nozzle cannot be disconnected from the receiver (NAVSEA Drawing 571-6821656). To disconnect, the valve must first be closed; then the nozzle is rotated back 30° until free of the receiver.

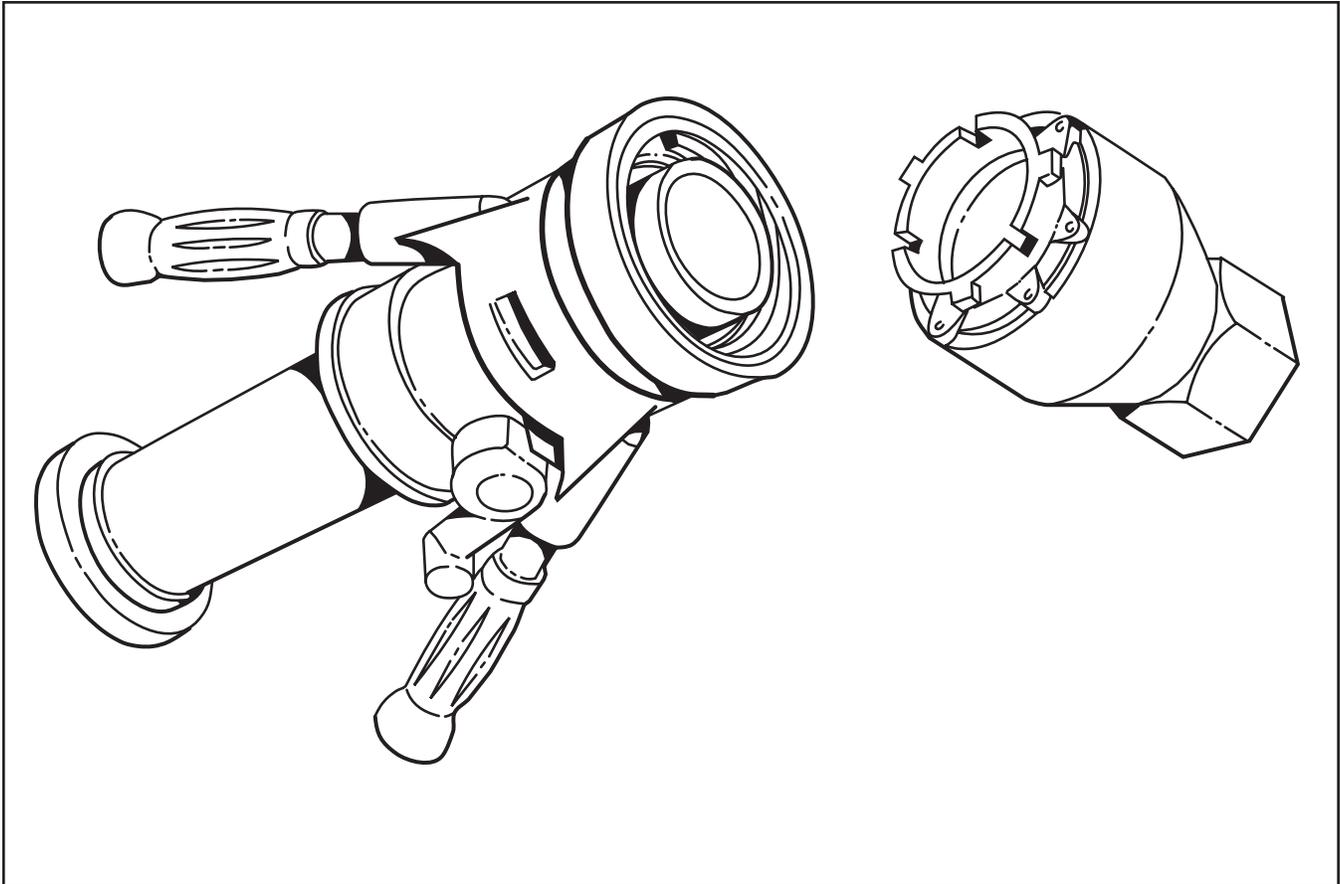


Figure 3-13. Type D-2 Nozzle for 2-1/2-Inch (65.3 mm) Hose Rig

3.7.4.7 Auto Disconnect Coupling, 2-1/2 inch (63.5 mm). The auto disconnect coupling protects the hose from overtension failure, thereby preventing inadvertent fuel spillage. If the rigging or rig control should fail and the hose tensions, the coupling will dry-break between 500 and 700 lb (227 and 318 kg). The coupling may be vented and re-attached once the rig is stabilized.

3.7.4.8 Elbow, 90 Degree, 2-1/2 inch (63.5 mm). The elbow adapter provides a connection point to secure the hose rig to the receiving ship and smoothly lead the hose forward to the riser connection.

3.7.5 Spanwire Weak-Link End Fitting. The weak-link end fitting (Figure 3-14a) is the preferred FAS spanwire end fitting. There are two sizes: (1) the 3/4-inch (19.0 mm) spanwire end fitting (designed to fail at 30,000 lb (13,608 kg)), and (2) the 7/8-inch (22.2 mm) spanwire end fitting (designed to fail at 35,000 lb (15,876 kg)). For fueling methods other than probe, or when sending the span wire to a receiving station padeye that has a long link for Robb or NATO fueling

operations, install a shackle and pelican hook as shown in Figure 3-14c.

WARNING

The weak link end fitting *must* be used on any spanwire that does not have a slip clutch.

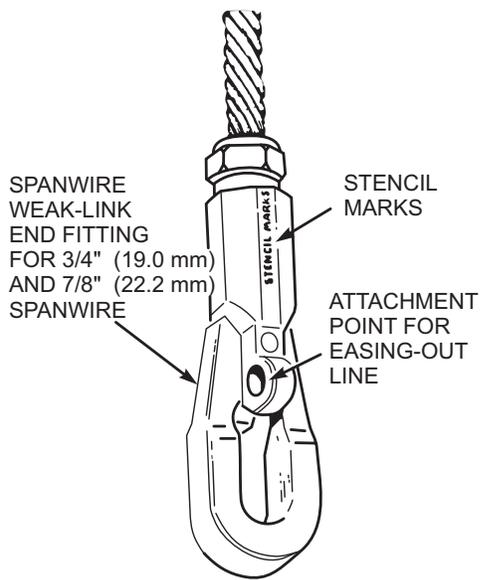
The non-weak-link end fitting (Figure 3-14b) may be used instead of the weak-link end fitting on any span wire that has a slip clutch. (This applies to all Navy standard spanwire winches and some carrier automatic tension span wires.)

WARNING

The non-weak-link end fitting *must not* be used on any spanwire that does not have a slip clutch.

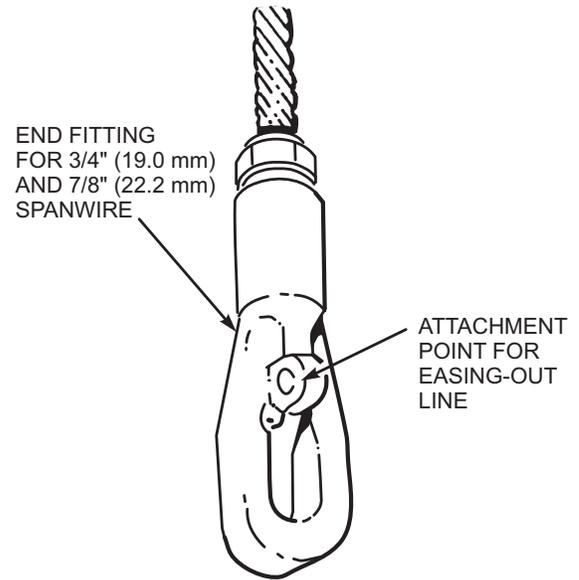
**PREFERRED SPANWIRE END FITTINGS
(MANDATORY FOR DOUBLE-PROBE RECEIVERS)**

a. WEAK-LINK END FITTING



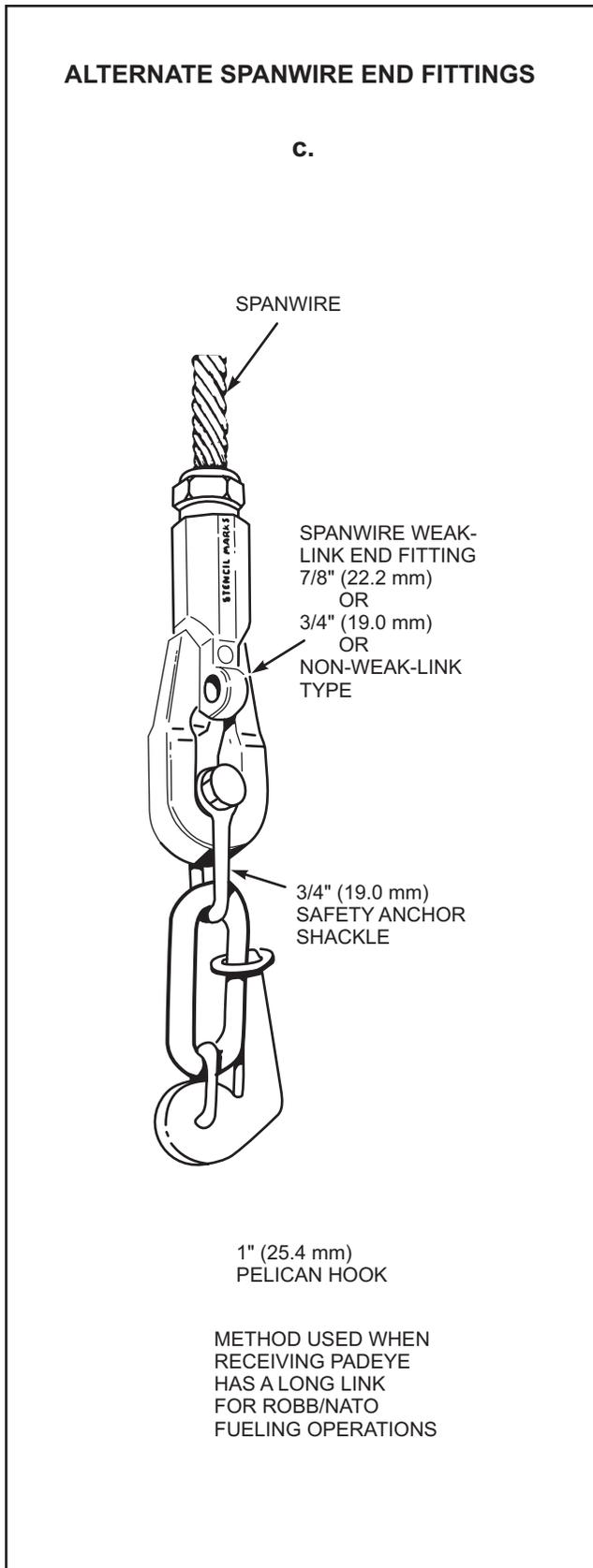
- NOTE:
1. STENCIL MARKS INDICATE APPROPRIATE SIZE (DIAMETER) OF WIRE ROPE
 2. OPTIONAL FOR USE WHERE WINCH DRUMS HAVE BUILT-IN SLIP CLUTCHES

b. NON-WEAK-LINK END FITTING



- NOTE:
- FOR USE WHERE WINCH DRUMS HAVE BUILT-IN SLIP CLUTCHES

Figure 3-14. Spanwire End Fittings for Fueling Rigs (Sheet 1 of 2)



3.7.6 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 3-15) 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 3-16) 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 3-17.
10. Spanline trolley (NAVSEA 803-2260816).
11. Free trolley (NAVSEA Drawing 803-2557585).

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

Figure 3-14. Spanwire End Fittings for Fueling Rigs (Sheet 2 of 2)

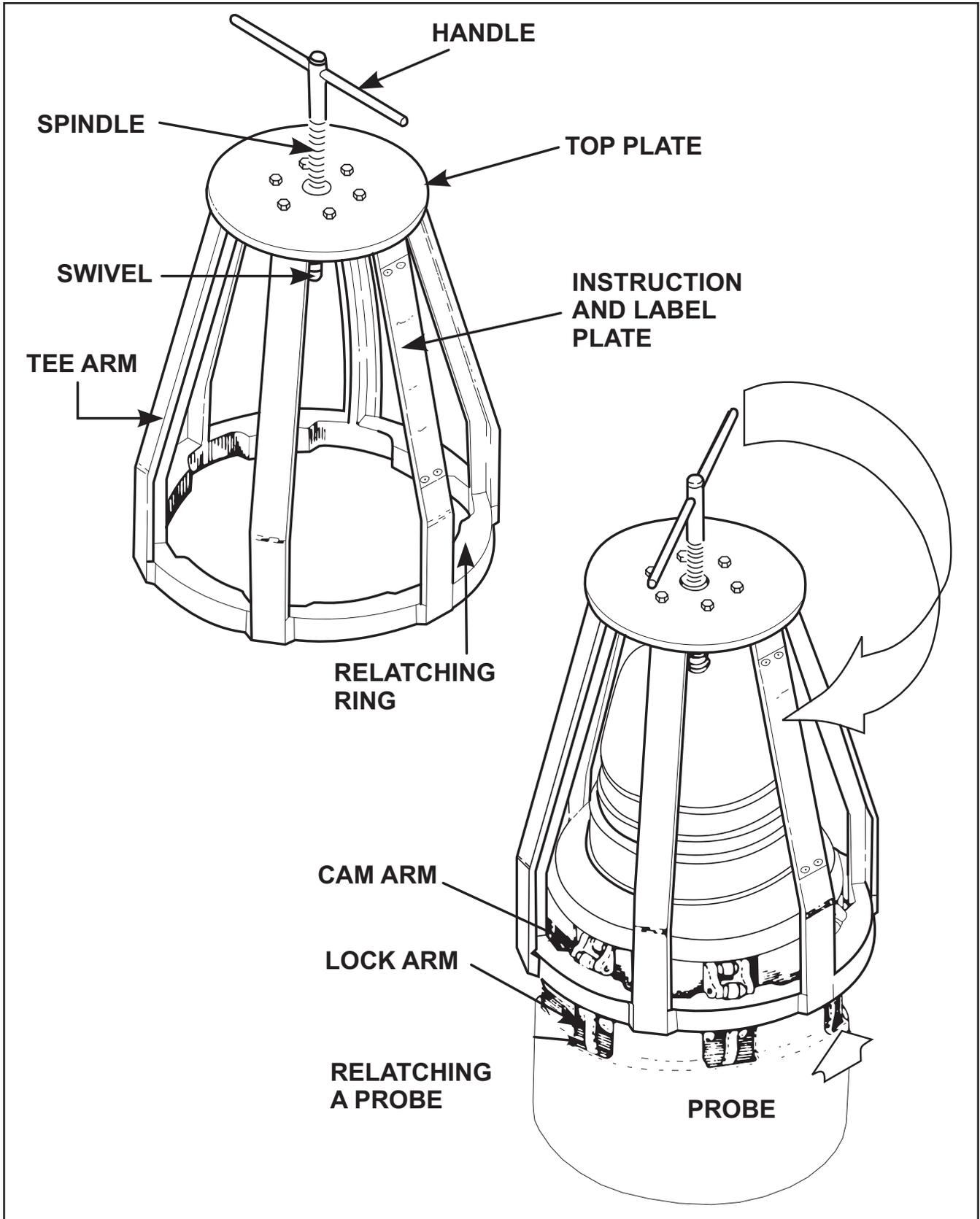


Figure 3-15. Probe Relatching Tool

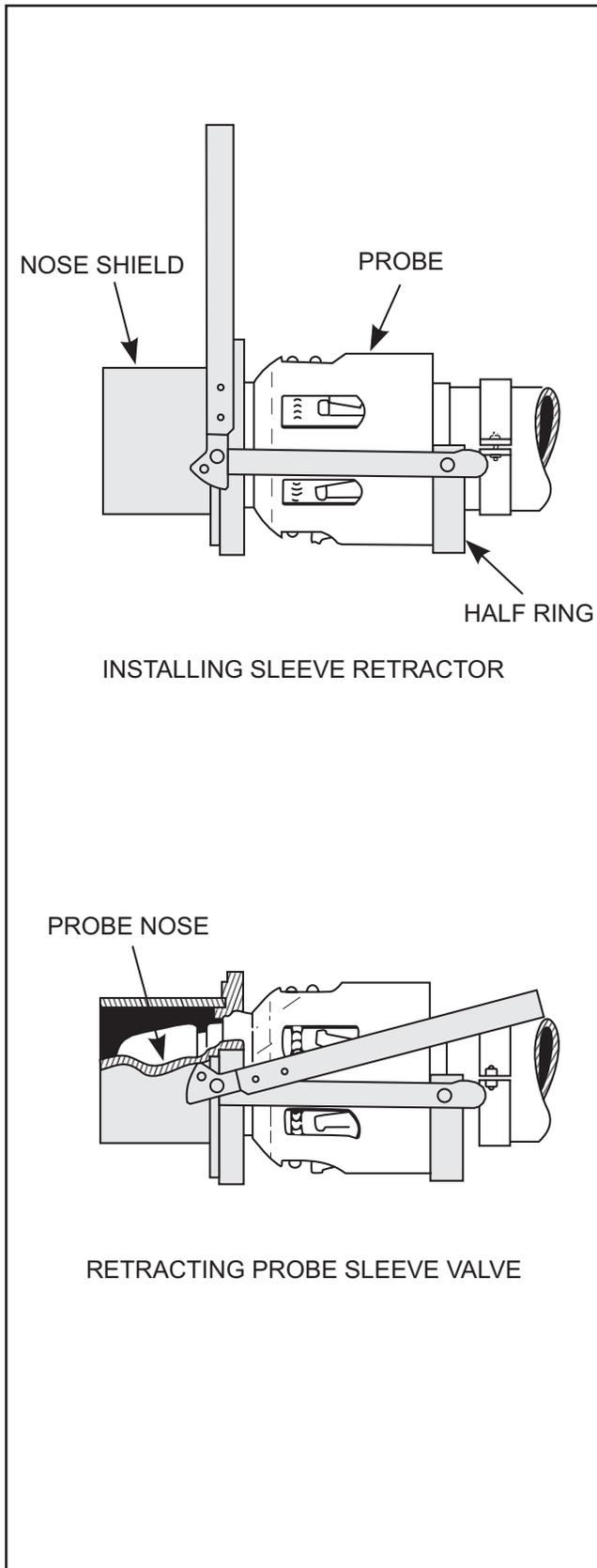


Figure 3-16. Probe Sleeve Retractor

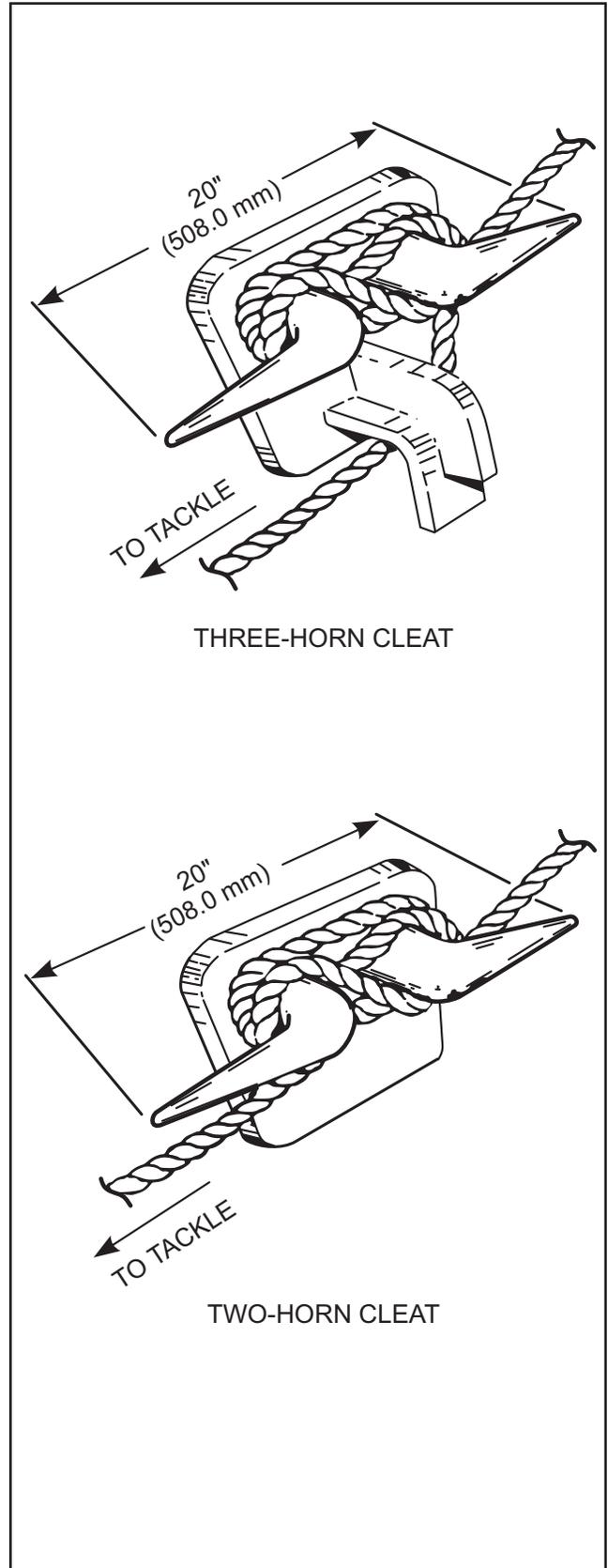


Figure 3-17. 20-Inch (508 mm) Cleats

3.8 ALONGSIDE FUELING-AT-SEA RIGS

Fleet Underway Replenishment Guide (COMNAV-SURFPACINST 3180.2 or COMNAVSURFLANT-INST C9010.1) and NAVSEA S9571-A1-NBK-010, 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 nontensioned spanwire rig, or as a backup, the close-in rig (see Chapter 4). Fuel can also be transferred by the astern method (see Chapter 5).

Fueling-at-sea hardware for delivery and receiving stations is listed in Figures 3-31 and 3-32 at the end of the chapter.

3.9 FUEL STREAM RIG

In the STREAM rig for FAS (referred to as fuel STREAM for brevity), the hose is supported between two ships on the ram-tensioned spanwire (see Figure 3-18). The fuel STREAM rig allows 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 span wire, and provides for improved personnel safety by maintaining constant tension in the span wire.

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 3-19 for fuel STREAM ram tensioner air flask 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 or electronic controls with a tension tower 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 rig.

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.

3.9.1 Rigging the Delivery Station for Fuel STREAM

3.9.1.1 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. Before joining hose lengths, inspect each length per PMS procedures and replace damaged lengths. If usable portions of damaged hose sections are salvaged and reused, hose sections must be hydrostatically tested prior to placing them back in service.

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

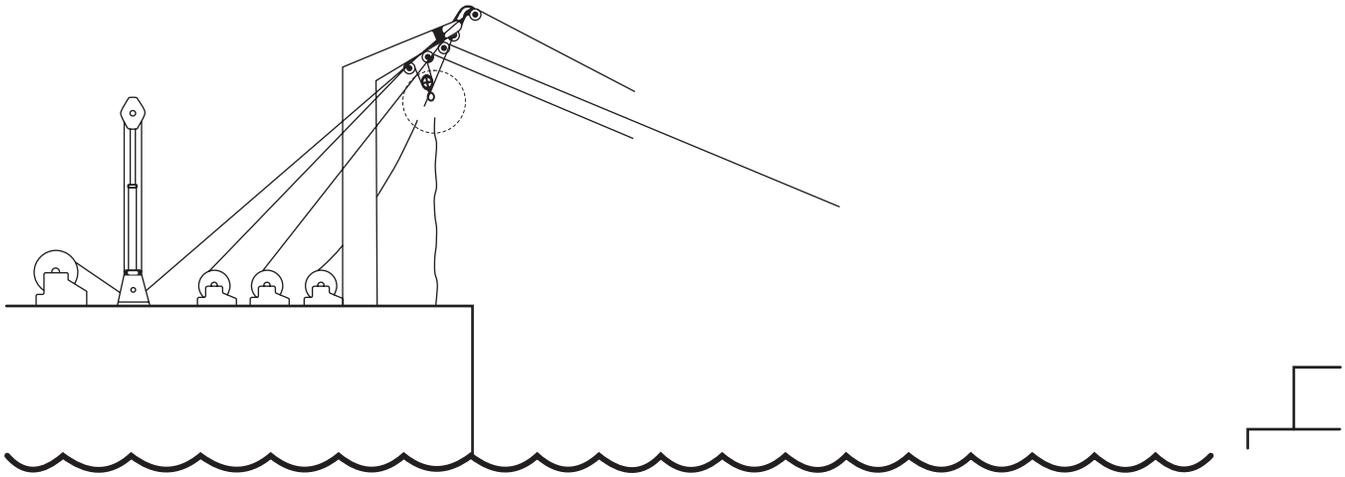


Figure 3-18. Fuel STREAM Rig — Single Hose with Probe

- 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.

4-foot (1.2 m) FAS hose sections are added on each side of the flow-through saddles to extend the life of the 35-foot (10.6 m) sections (see Figure 3-20).

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

3.9.1.3 Rigging the Hose Assembly. The hose is suspended from the span wire 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 span wire.

For passing the rig, the span wire is stopped to two becketts, 350 feet (106.5 m) from the shackle end of the messenger, as shown in Figure 3-21. Grease in the way of the stops should be removed from the span wire.

3.9.1.4 Saddle Whips. Wire rope saddle whips are used to control the positions of the flow-through saddles on the span wire (see Figure 3-18).

3.9.1.4.1 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 block equipped with an antitoppling device (Figure 3-22). One end of a 3/4 inch (19.0 mm) wire preventer is shackled to the bottom of the No. 4 saddle and the other end of the preventer is shackled to a designated preventer padeye. The preventer is sized to suit the individual ship's installation to prevent two-blocking the No. 4 saddle.

3.9.1.4.2 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.

SHIP	STATION	RAM FLASK PRESSURE (PSI) (2) (3) (4)	NORMAL RAM PRESSURE SETTING (PSI)	
			DOUBLE HOSE (1) (3)	SINGLE HOSE (1) (3)
T-AE-26/32 Class	3	900 (6,205)	—	800 (5,516)
T-AFS-1 Class	3	900 (6,205)	—	800 (5,516)
T-AO-187 thru 204	1, 7	900 (6,205)	—	800 (5,516)
	2, 6, 8	1,600 (11,032)	1,550 (10,686)	—
AOE-1 thru 4	3, 9	900 (6,205)	—	800 (5,516)
	4, 8, 12, 16	1,600 (11,032)	1,550 (10,686)	—
AOE-6 thru 8 and 10	3, 7	900 (6,205)	—	800 (5,516)
	2, 8, 10	1,600 (11,032)	1,550 (10,686)	—

NOTES: (1) Maximum ram pressure based on the winch's maximum line pull.
(2) Ram flask air pressure is read with the ram in the down position (secured). Normal ram pressure setting is read at the ram when the ram is mid stroke. This pressure will vary with the location of flasks on board the ship.
(3) Data provided in parentheses reflects units in kiloPascal (kPa).
(4) Ram flask pressures in this table represent optimum operating conditions.

Figure 3-19. Ram Tension Air Pressure Settings for Fuel STREAM Rig

3.9.1.4.3 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.

3.9.1.5 Fuel Transfer. Ensure during fuel delivery that quick-closing valves and fuel line valves on both

ships are open and remain open until pumping stops. Closing or throttling of receiving ship's valves can result in destructive pressure surges within piping systems. The receiving ship must keep the delivery ship advised of fueling time remaining at each station to prevent overfilling of fuel tanks.

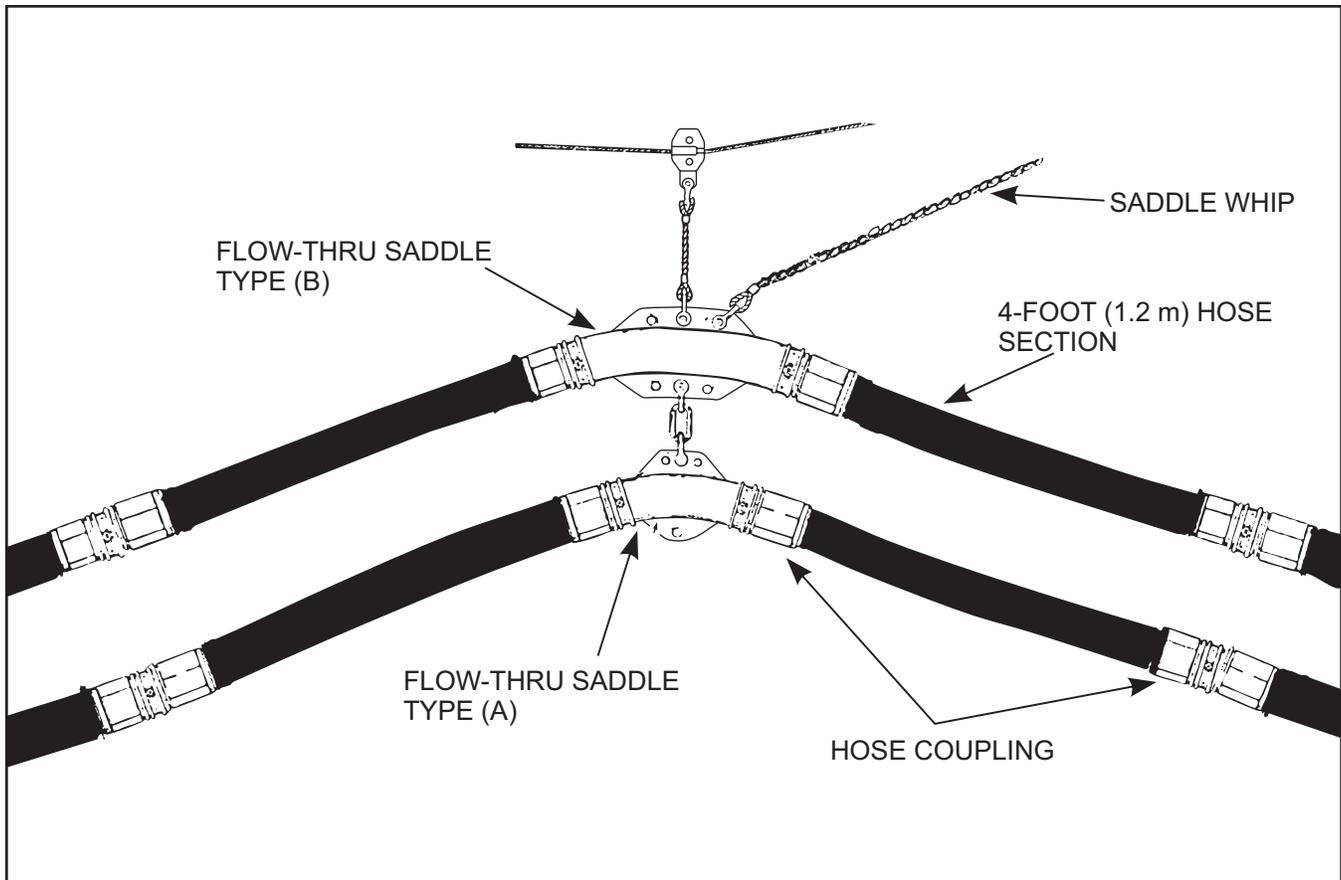


Figure 3-20. 4-Foot (1.2 m) Hose Sections

CAUTION

Actuating valves too rapidly may disengage probes or other couplings. This can cause fuel spills or damage to fuel piping, valves, and fuel hoses.

3.9.1.6 Blowdown and Back Suction. Once fueling is completed, the delivery ship will determine the need to remove fuel from the delivery hoses. Removing fuel can be done through blowdown, back suction, or a combination of the two. Blowdown is the fastest method of removing fuel from a delivery hose; a combination of blowdown with back suction is the most thorough. The combination method should be conducted, as a minimum, after the last fueling evolution (when hoses will not be used for several days), when switching fuel products a hose will deliver, and at other times the delivery ship considers necessary.

3.9.1.6.1 Blowdown. Blowdown uses air to force excess fuel out of the delivery hose and into the receiving ship's tanks. To accomplish blowdown, the delivery ship stops pumping and closes the fuel delivery riser valve. The delivery ship then injects low pressure air (approximately 80 psi (552 kPa)) into the fuel delivery hose. Blowdown takes about 3 minutes to clear fuel from the delivery hose.

CAUTION

- The receiving ship must not disconnect the FAS coupling until blowdown is completed. Attempting to disconnect the FAS coupling may cause fuel spills or damage to fuel piping or fuel hoses.
- The receiving ship must leave valves and tank vents open during blowdown so that fuel and air may move through the fuel hose. Failure to do so may cause fuel spills or damage to fuel piping or fuel hoses.

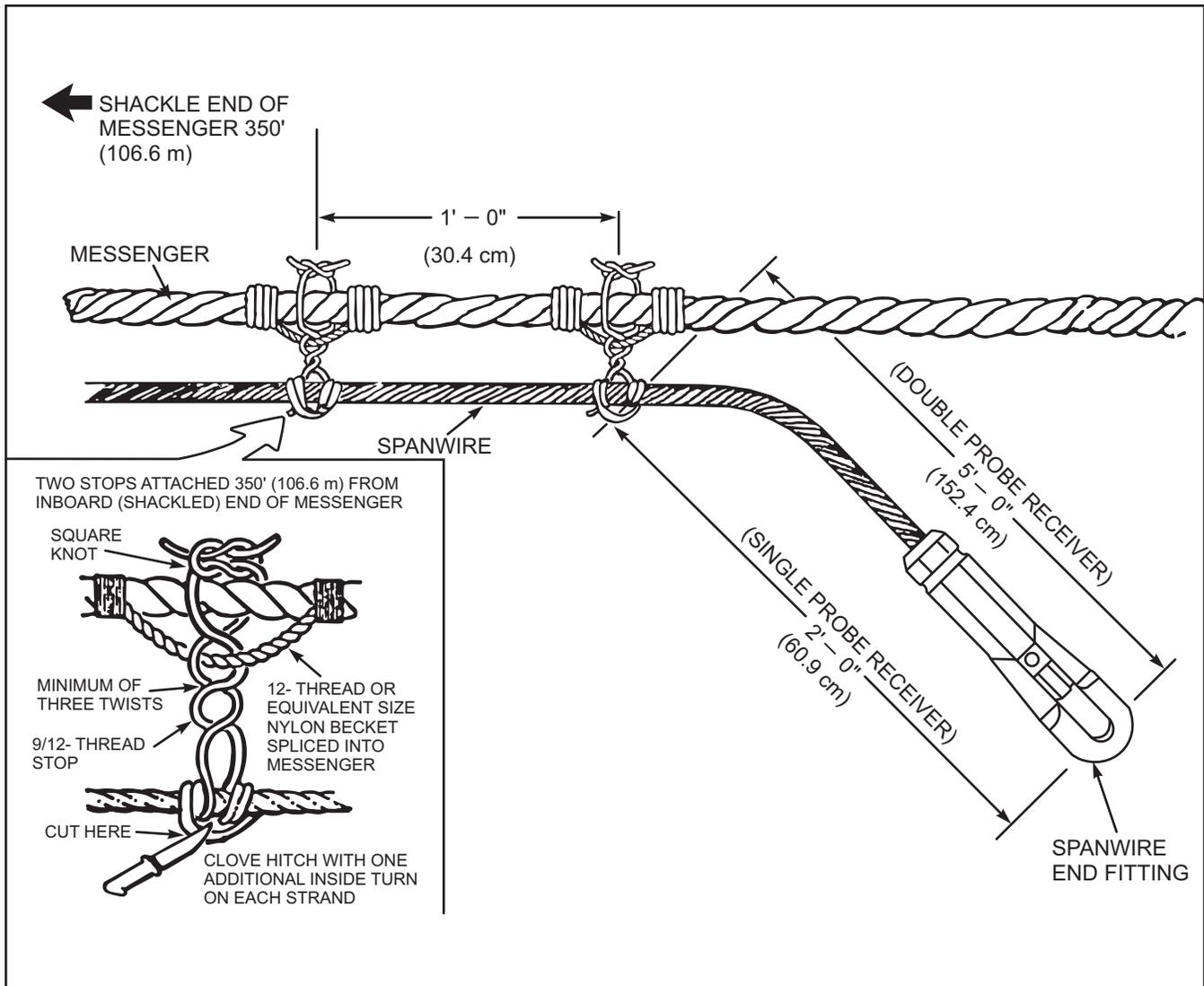


Figure 3-21. Method of Stopping the Span Wire to the Messenger

3.9.1.6.2 Back Suction. The term, “back suction,” for FAS purposes, means gravity drain combined with a slight venturi effect at the fuel manifold.

assists the natural flow of gravity in drawing fuel from the fuel delivery hose. Back suction takes much more time than blowdown to clear fuel from the delivery hose.

Note

The delivery ship *cannot* reverse its fuel system’s centrifugal pumps and take suction on the fuel in the hose (and by extension the receiving ship’s fuel tanks). Back suction will not remove fuel from the receiving ship’s tanks.

To create a “back suction,” the delivery ship cycles fuel through a line to a cargo fuel tank, bypassing the piping manifold. This flow to the tank causes a slight suction (venturi effect) at the piping manifold, which

CAUTION

- The receiving ship must not disconnect the FAS coupling until the back suction is completed. Attempting to disconnect the FAS coupling may cause fuel spills.
- The receiving ship must leave valves and tank vents open during the back suction so that fuel may move through the hose. Failure to do so may cause fuel spills.

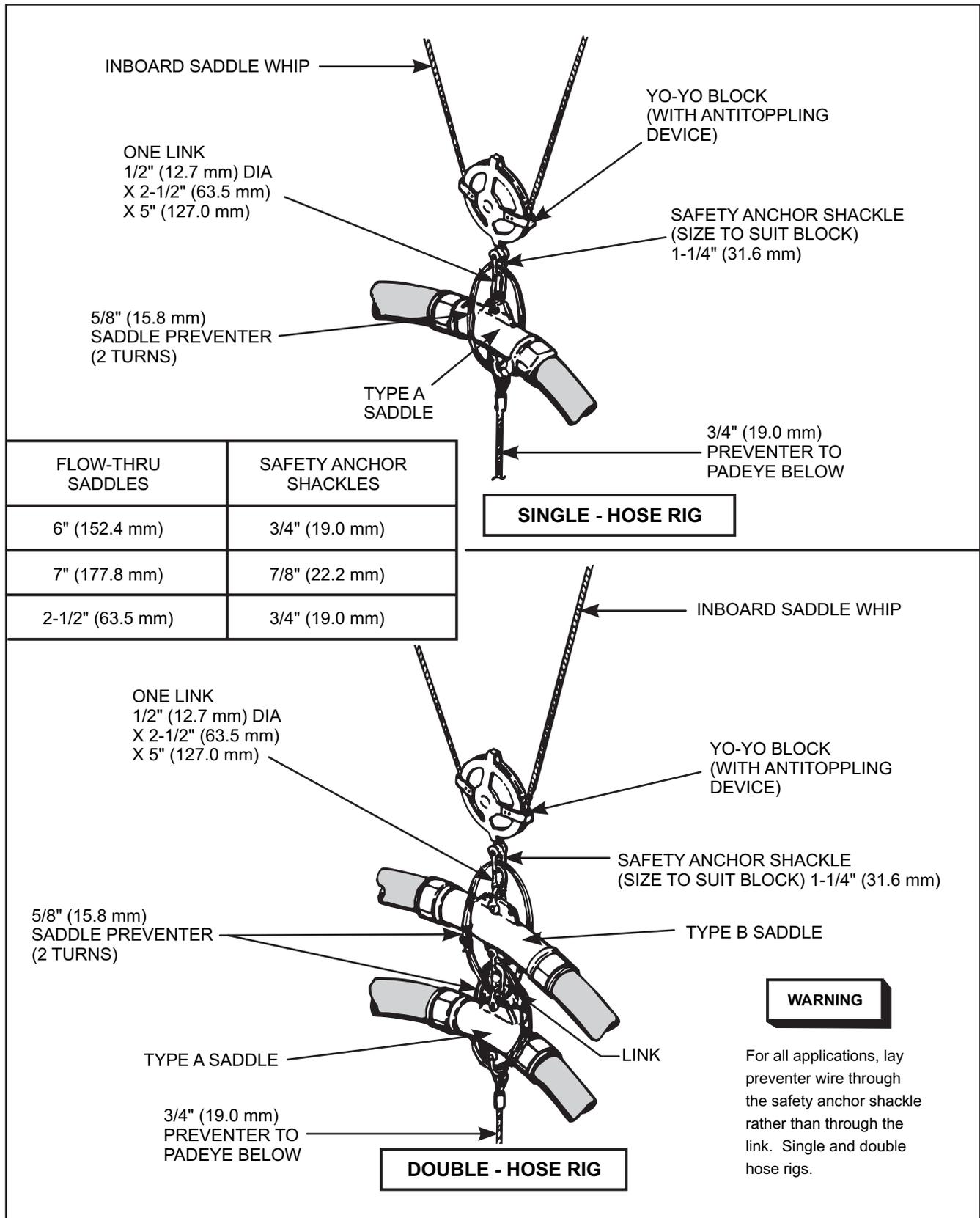


Figure 3-22. Inboard Saddle Arrangement

3.9.1.6.3 Combination Method. The combination method consists of a back suction, followed by a blowdown, followed by a second back suction. The combination method leaves the least amount of fuel in the hose. The most effective procedure for performing the combination of blowdown with back suction is:

1. Delivery ship secures pumping.
2. Both delivery ship and receiving ship close riser valves.



When fueling two stations to a ship with a pressure-compensated fuel system, exercise caution in valve alignment to ensure fueling or blowdown at one station does not force fuel out of the other station.

3. Delivery ship aligns lowest tank with excess capacity to risers.
4. Delivery ship aligns tank recirculation system and opens riser valves to drain hose and piping.
5. Delivery ship closes riser valves once hose goes flat.
6. Delivery ship connects low pressure air hose to risers, pressurizes hose to 80 psi (552 kPa), and removes low pressure air hose from risers.

Note

Gravity drain (with venturi effect) removes enough fuel from the hose that pressurizing the hose will force the fuel remaining in the hose to the probe end.

7. Upon delivery ship's signal, the receiving ship opens riser valves.
8. Delivery ship signals the receiving ship to close riser valves after approximately 3 minutes.
9. Delivery ship aligns lowest tank with excess capacity to risers.
10. Delivery ship opens riser valves to drain hose and piping a second time (approximately 2 minutes).
11. Delivery ship closes riser valves.

12. Both ships commence breaking rigs.

3.10 SINGLE-HOSE FUEL STREAM RIG

The single-hose fuel STREAM rig (Figure 3-23) is a tensioned spanwire rig with the span wire 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. An adapter for stepping down to a 2-1/2-inch (63.5 mm) hose
4. A NATO breakable-spool hose coupling to a NATO breakable spool.

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

Hardware for delivery and receiving stations is listed in Figures 3-31 and 3-32 at the end of the chapter.

3.10.1 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 3-23 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 3-24.

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.

3.10.2 Preparing Fuel STREAM With Single Probe

(1) DELIVERY SHIP

1. Fake out the STAR messenger and attach the in-board end to the trolley carriage, as shown in Figure 3-25.

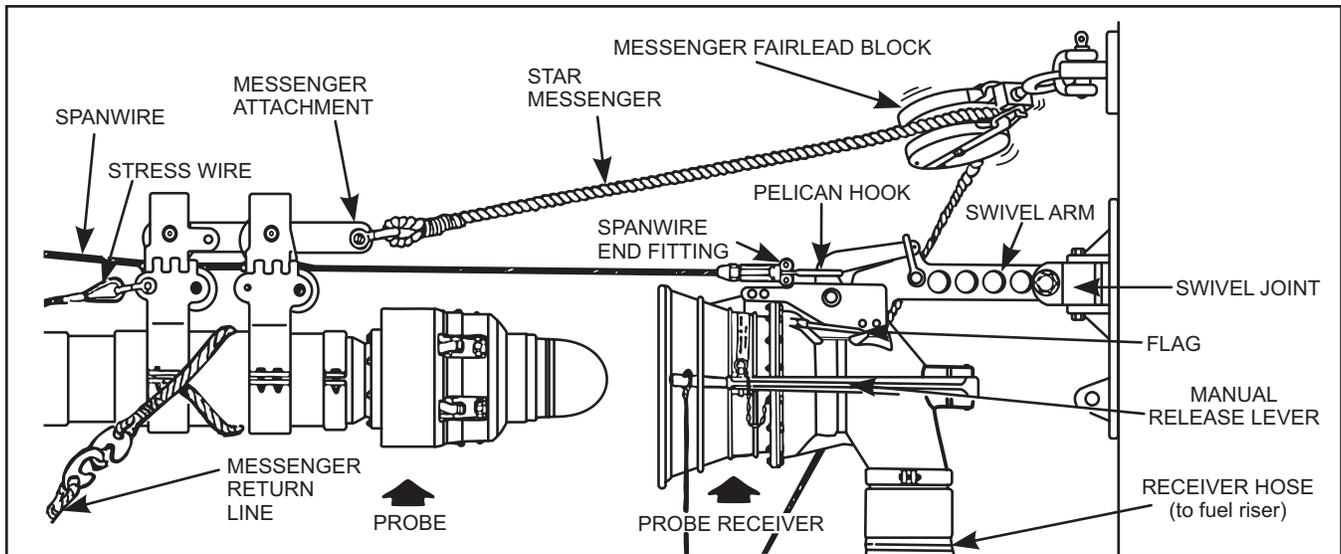


Figure 3-23. Single-Hose Fuel STREAM Rig With Probe

Note

- When sending single probe to a single-probe receiver, the 60 foot (18.2 m) releasing line section of the STAR messenger (Figure 2-9) will be used by the receiving station as the remating line.
 - When sending single probe to double-probe receivers, use the STAR messenger without the 60-foot (18.2 m) releasing line section and attach it to the special inhaul clamp using a 5/8-inch (15.8 mm) screw pin anchor shackle or the pip-pin (if provided) on the trolley carriage (Figure 3-10).
2. Stop off the span wire to the messenger 350 feet (106.5 m) from the inboard (shackled) end of the messenger, as shown in Figure 3-21.
 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 end with the brummel hook to the messenger return line pendant around the probe tube at the trolley carriage, as shown in Figure 3-23.

6. Ensure that all probe latches are latched.

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 (30.5 cm) wood or metal messenger fairlead block (see Figure 3-26 for correct installation).
2. Install deck fairlead snatch blocks (as called out in ship's underway replenishment rigging drawings) 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 span wire. See paragraph 2.2.11.5.
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.
6. A probe breakaway tool may be provided as an alternate means of tripping the pelican hook.

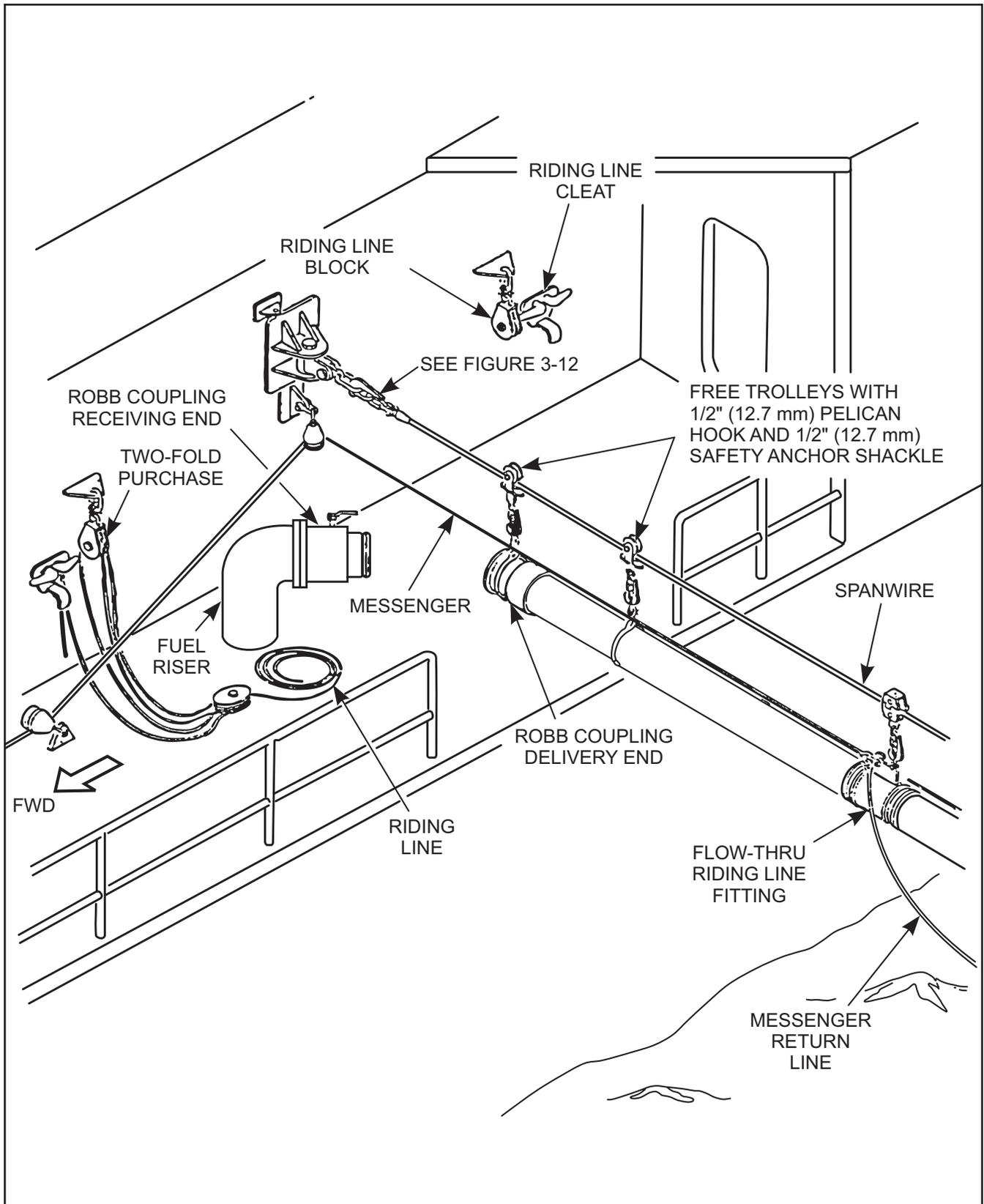


Figure 3-24. Single-Hose Fuel STREAM Rig With Robb Coupling

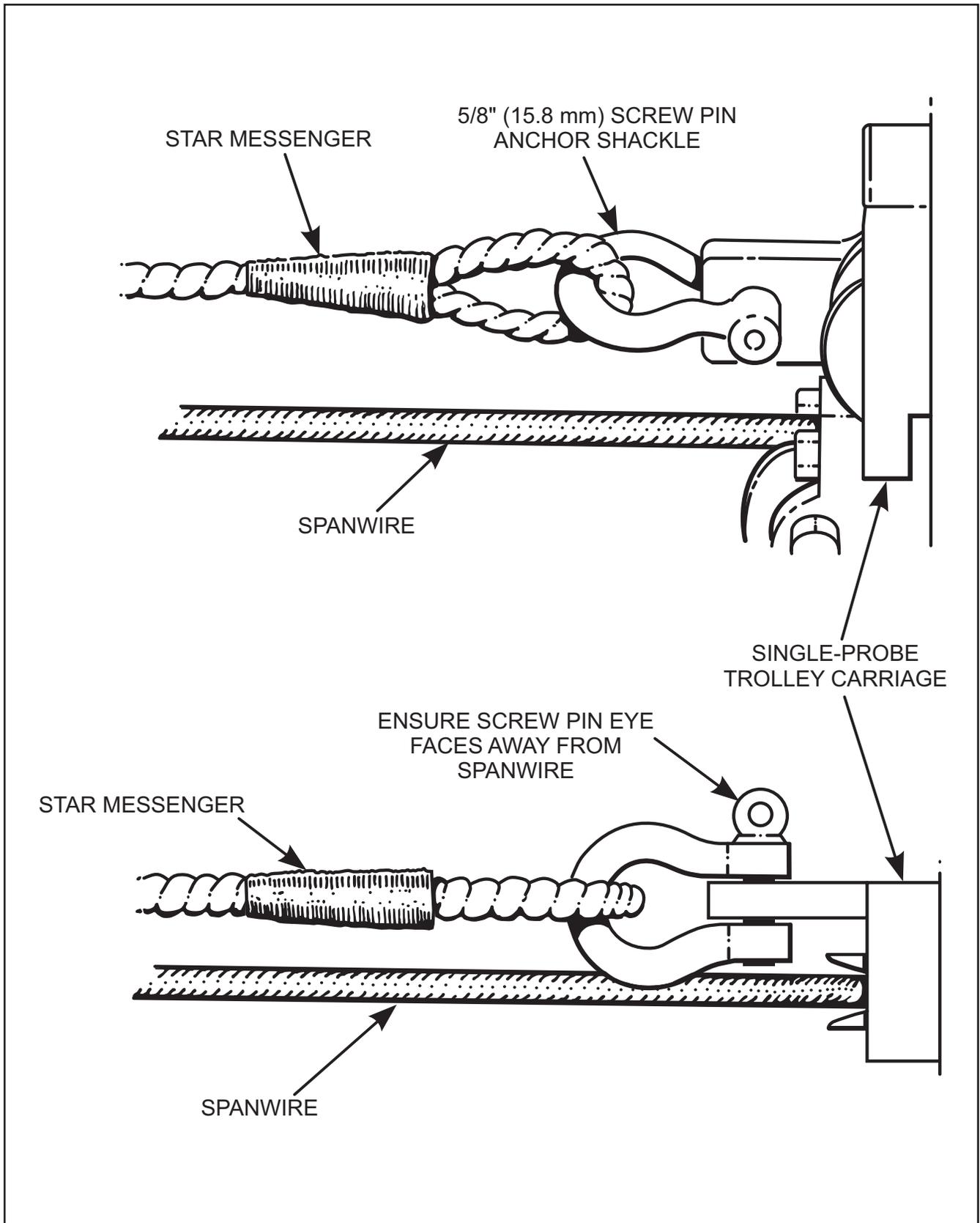


Figure 3-25. Attachment of STAR Messenger Shackle to Trolley Carriage

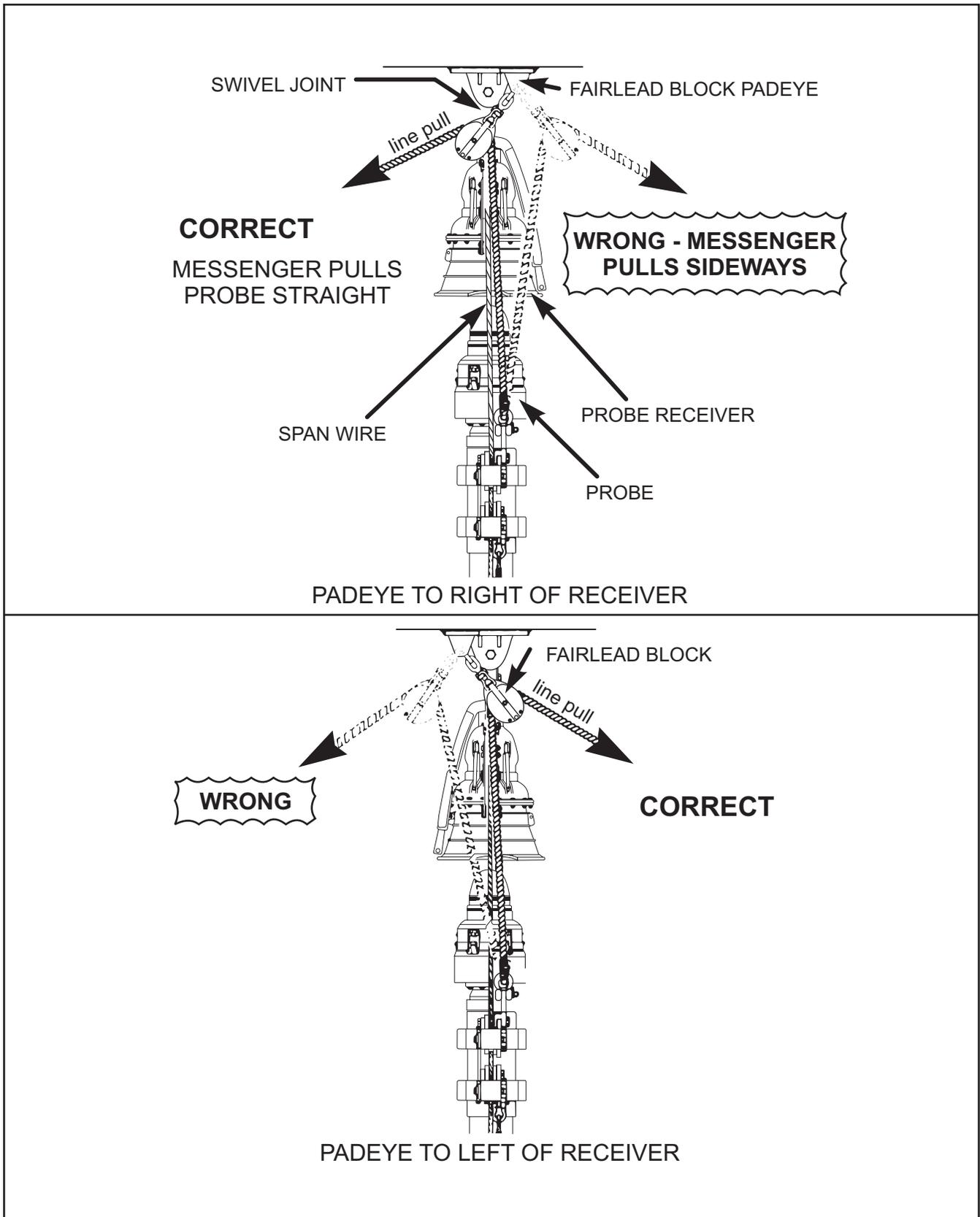


Figure 3-26. Messenger Fairlead at Receiving Station (Top View)

Note

A remating line must be provided on station when receiving at double-probe receivers. Provide a short strap and a long strap. (See paragraph 3.7.2.10.)

3.10.3 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 span wire.
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

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.

WARNING

The approach ship shall hand-tend the B/B phone/distance line. The B/B phone/distance line shall be maintained free for running (coiled or faked) and shall never be secured to the approach ship's structure. Personnel must keep inboard of all lines and exercise extreme caution and alertness to potential danger.

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 (ASD) is turned ON, or that slack is pulled from the span wire 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 span wire to the pelican hook, make sure that the messenger is not twisted with the span wire. If twisted, the probe will not seat in the receiver.

2. Remove any twists of the messenger around the span wire 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 3-14b) 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 span wire, then cut the stops that hold the span wire 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 span wire at station ____." This alerts his bridge that tension will be applied shortly. Bridge will grant permission to tension span wire.
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 tension the span wire. When the span wire is tensioned, the ASD, if installed, should be turned off until the rig is to be detensioned. 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 span wire at my station ____."
4. If either ship's bridge determines that it wants to delay tensioning the span wire 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 span wire.

(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 3-27) 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) releasing line attached to the

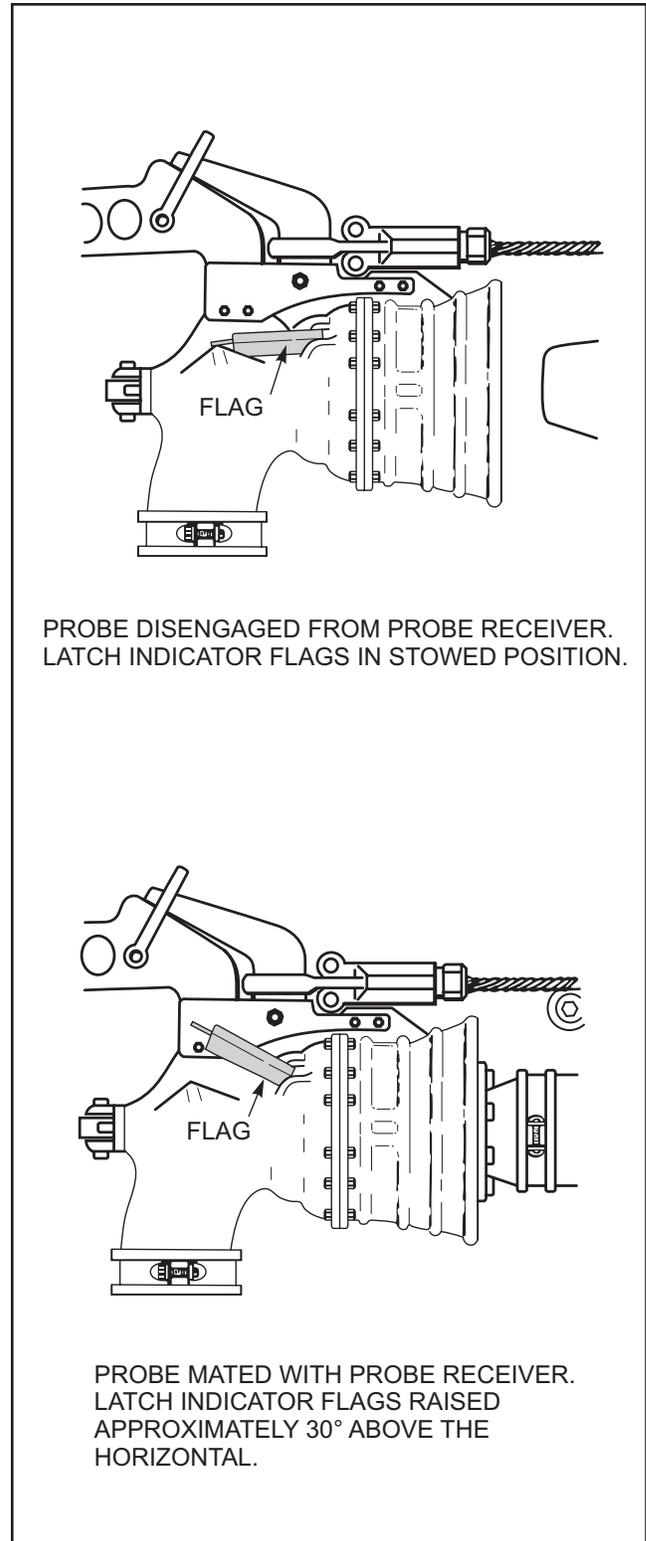


Figure 3-27. Latch Indicator Flags

trolley carriage for use as the remating line, secure the brummel hook end of this section to a cleat, and coil down the remaining length. Do not take a strain on the remating line. The remating line is used to reseal 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.

WARNING

All excess remating line must be coiled down between the probe fairlead block and the cleat.

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 messenger return line pendant (Figure 3-23) and connect it to the brummel hook on the long section of the STAR messenger.
2. Signal the delivery station to haul in the messenger return line.

3.10.4 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.

3.10.5 Retrieving Fuel STREAM With Single Probe

(1) DELIVERY SHIP

1. Stop pumping.
2. Complete the blowdown or back suction and secure all valves. (See paragraph 3.9.16.)

(2) BOTH SHIPS

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

(3) RECEIVING SHIP

1. Remove the 60 foot (18.2 m) releasing line from cleats, fairlead blocks, and all obstructions; after coiling the releasing line, make it up and attach it to the return line pendant on the probe tube using the brummel hook on the bitter end. Leave the other end of the releasing line attached to the trolley carriage.

Note

At a double-probe receiver, disconnect the remating line.

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.

(4) DELIVERY SHIP

Haul in on the saddle whips to retrieve the hose.

(5) BOTH SHIPS

Procedures for detensioning the span wire are as follows:

1. The receiving station's phone talker will notify both his bridge and the delivery station: "Ready to detension span wire at station ___." This alerts his bridge that the span wire will be detensioned shortly. Bridge will grant permission to detension span wire.

2. When the message is received at the delivery station, the phone talker there informs his bridge: "We are detensioning the span wire at station ____." At the same time, the rig captain instructs the winch operator to turn on the ASD, if installed, and pay out on the span wire, allowing the ram tensioner to extend and slacken the span wire. 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 span wire at my station ____."
4. If the receiving ship's bridge determines that it does not want to detension the span wire 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 span wire at station ____." The rig captain shall *immediately* instruct the winch operator to stop detensioning the span wire.

(6) DELIVERY SHIP

Slack the span wire and tend slack, but clear of the water.

WARNING

The receiving station must not trip the pelican hook until the span wire 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 span wire clear of the deck edge, and release the easing-out line.

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

(8) DELIVERY SHIP

1. Haul in the span wire and station phone line.
2. Disconnect the phone/distance line.

(9) RECEIVING SHIP

Haul in the phone/distance line.

3.10.6 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 span wire and, when the span wire is slack, trip the pelican hook.
7. If unable to disconnect the span wire, 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.

3.10.7 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 3-28, for transfer of small quantities of F76, F44, bulk POL, 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 be sent as a close-in rig (see paragraph 4.10) or supported on a synthetic line, called a span line (see paragraph 4.11).

3.11 DOUBLE-HOSE FUEL STREAM RIG

The double-hose fuel STREAM rig (Figure 3-29) is a tensioned spanwire rig with the span wire and saddle whips tended by winches at the delivery station. The two hoses are suspended from the span wire, 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
2. A probe over a Robb coupling to a single-probe receiver and a Robb receiver (Figure 3-30)
3. Two Robb couplings for fueling two Robb receivers.

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

Hardware for delivery and receiving stations is listed in Figures 3-31 and 3-32 at the end of the chapter.

3.11.1 Fuel STREAM Station Rigging. Fuel STREAM station rigging varies slightly, depending on the type of connection required at the fuel riser. Follow the rig hose construction guideline of paragraph 3.9.1.1. Rig double probe to double-probe receivers as shown in Figure 3-7. Hose lengths (Figure 3-8), the 19 inch (48.3 cm) centerline dimension (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 3-30; 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 permissible 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 3-30, 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 couplings must be manually connected and disconnected and require a riding line to retain the hose at the receiving station.

3.11.2 Preparing Fuel STREAM With Double Probe

(1) DELIVERY SHIP

1. Fake out the STAR 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 double-probe receivers, use the STAR messenger without the 60-foot (18.2 m) releasing line section (Figure 2-9). The remating line must be provided by the receiving station. Do not use the alternate spanwire end fitting (Figure 3-14b).
 - When sending double probe to a single receiver, use the STAR messenger and attach the 5 inch (127.0 mm) soft eye to the upper pip-pin on the trolley carriage (Figure 3-30). Attach the messenger return line to the messenger return line pendant around the probe tube (Figure 3-30). 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 span wire to the messenger 350 feet from the inboard (shackled) end of the messenger, as shown in Figure 3-21.
 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.

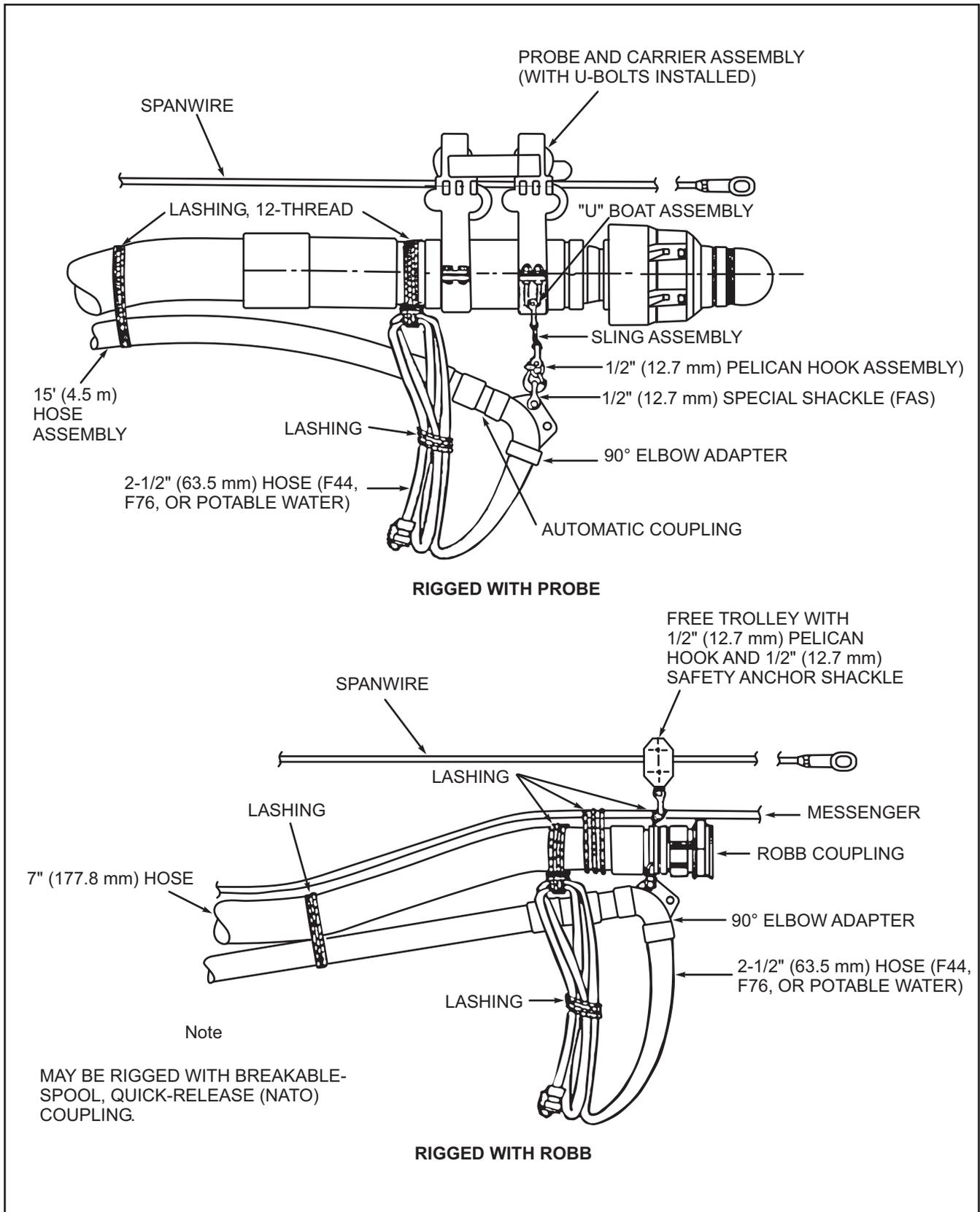


Figure 3-28. 2-1/2-Inch (63.5 mm) Hose Rigging

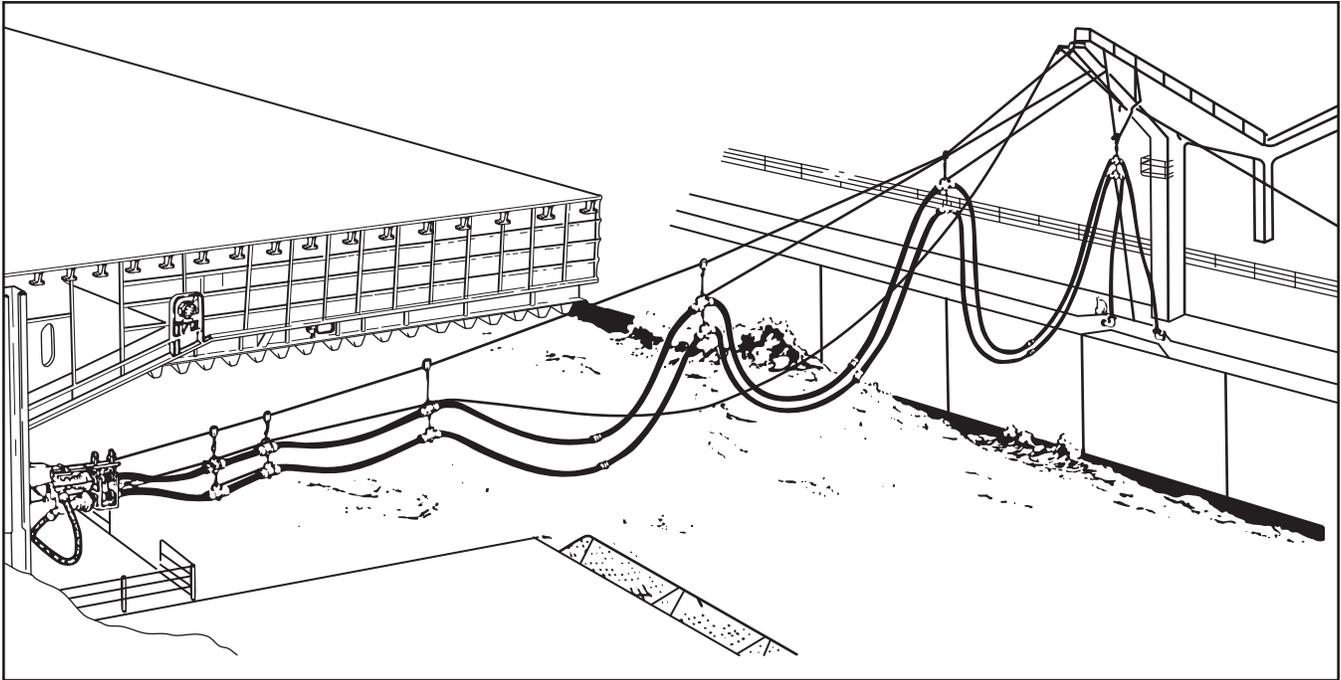


Figure 3-29. Double-Hose Fuel STREAM Rig (With Double Probe)

5. Fake out the messenger return line and attach the end with the brummel hook to the messenger return line pendant around the upper probe tube, as shown in Figure 3-6.
6. Ensure that all probe latches are latched.
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 3-6).
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 span wire (see paragraph 2.2.11.5) and a short strap and a long strap (see paragraph 3.7.2.10). For double-probe receivers, a remating line is also needed (see paragraph 3.7.2.3).

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.
6. A probe breakaway tool may be provided as an alternate means of tripping the pelican hook.

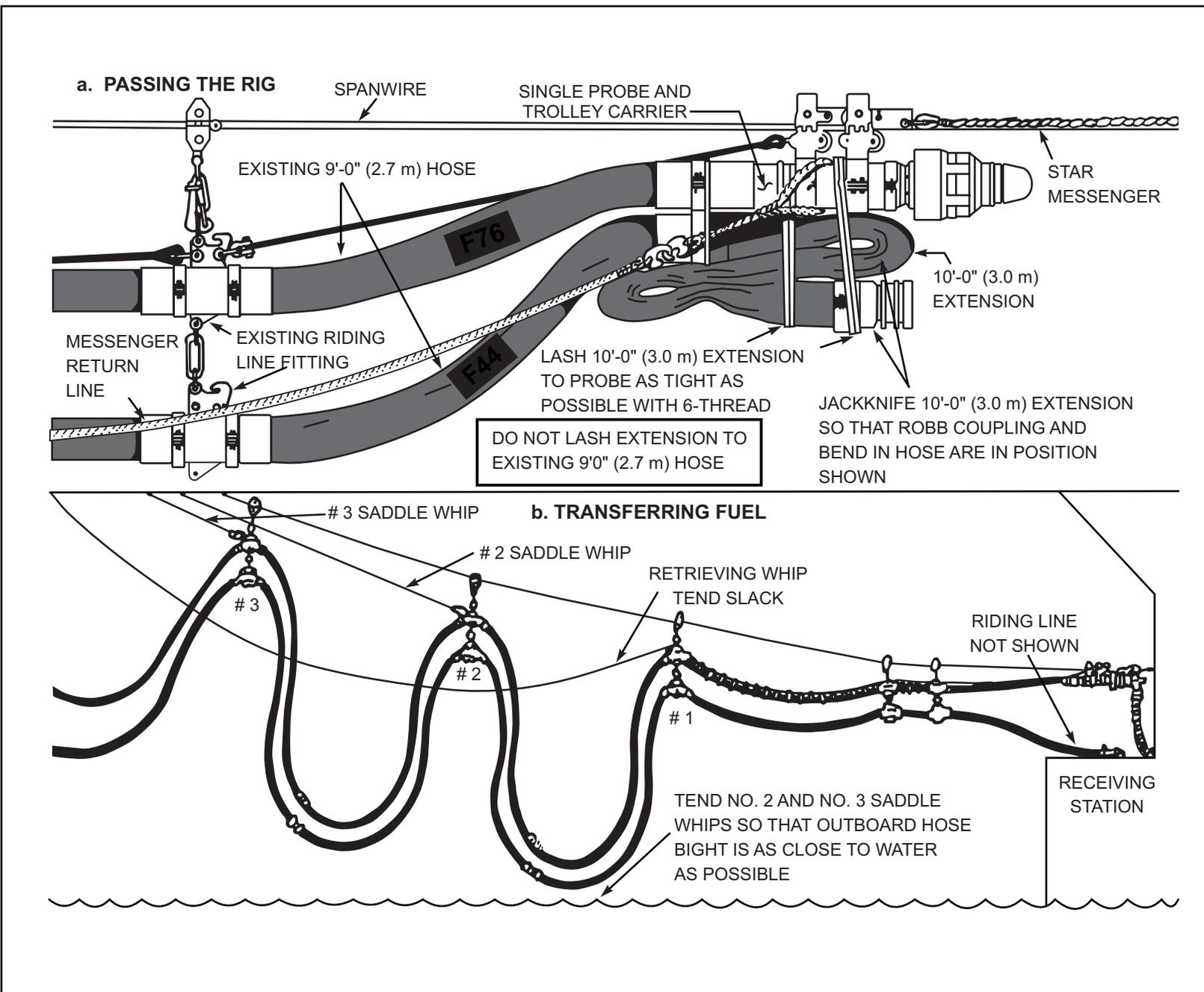
Note

A remating line, a long strap, and a short strap must be provided on station when receiving at double-probe receivers.

3.11.3 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.

Figure 3-30. Double-Hose Fuel STREAM Rig (With Single Probe and Robb Coupling)



(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

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.

WARNING

The approach ship shall hand-tend the B/B phone/distance line. The B/B phone/distance line shall be maintained free for running (coiled or faked) and shall never be secured to the approach ship's structure. Personnel must keep inboard of all lines and exercise extreme caution and alertness to potential danger.

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 (ASD) is turned ON, or that slack is pulled from

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

2. Remove any twists of the messenger around the span wire 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 span wire end fitting and secure.
4. Slack the messenger to allow the pelican hook to take the strain of the span wire, then cut the stops that hold the span wire 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 span wire at station ____." This alerts his bridge that tension will be applied shortly. Bridge will grant permission to tension the span wire.
2. The delivery station's phone talker will inform his bridge: "We are tensioning the span wire at station ____." At the same time, the rig captain instructs the winch operator to tension the span wire. When the span wire is tensioned, the ASD, if installed, should be turned off until the rig is to be detensioned. 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 span wire at my station ____."
4. If either ship's bridge determines that it wants to delay tensioning the span wire 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 span wire.

(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 3-27) will raise. This indicates that the probes are engaged in the receivers.
2. Once the probes are properly engaged, install the short strap, and then slack the messenger and disconnect it at the inhaul link pip-pin (Figure 3-7). Connect the remating line to the inhaul link pip-pin. Secure and fake out the remating line and remove the short strap. 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.



Failure to use short strap while connecting remating line may result in injury to personnel as a result of inadvertent disconnect of probes.

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 messenger return line pendant and connect it to the brummel hook on the long section of the STAR messenger.

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

3.11.4 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.

3.11.5 Retrieving Fuel STREAM With Double Probe

(1) DELIVERY SHIP

1. Stop pumping.
2. Complete the blowdown or back suction and secure all valves. (See paragraph 3.9.1.6.)

(2) BOTH SHIPS

Signalmen signal: “Replenishment completed at this station. Commence unrigging.”

(3) RECEIVING SHIP

1. Disconnect the remating line from the trolley carriage.

Note

At a single-probe receiver, leave the releasing line attached to the trolley carriage and with small line (6-thread or marline), tie it off to the probe, prior to signaling the delivery ship to heave around. Tend the releasing line clear of the ship’s side.

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

Haul in on the saddle whips to retrieve the hoses.

(5) BOTH SHIPS

Procedures for detensioning the span wire 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 span wire will be detensioned shortly. Bridge will grant permission to detension span wire.
2. When the message is received at the delivery station, the phone talker there informs his bridge: "We are detensioning the span wire at station ____." At the same time, the rig captain instructs the winch operator to turn on the ASD, if installed, and pay out on the span wire, allowing the ram tensioner to extend and slacken the span wire. 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 span wire at my station ____."
4. If the receiving ship's bridge determines that it does not want to detension the span wire 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 span wire at station ____." The rig captain shall *immediately* instruct the winch operator to stop detensioning the span wire.

(6) DELIVERY SHIP

Slack the span wire and tend slack, but clear of the water.

WARNING

The receiving station must *not* trip the pelican hook until the span wire 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 span wire clear of the deck edge, and release the easing-out line.
4. Signal the delivery station to haul in the span wire and station phone line.

(8) DELIVERY SHIP

1. Haul in the span wire and station phone line.
2. Disconnect the phone/distance line.

(9) RECEIVING SHIP

Haul in the phone/distance line.

3.11.6 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 probes, and start retrieving all hoses.
6. Detension the span wire and, when the span wire is slack, trip the pelican hook.
7. If unable to disconnect the span wire, continue to pay out until all wire is free of the drum.

WARNING

Never cut a tensioned wire.



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.

3.11.7 Double-Hose Fuel STREAM Rig With Robb Coupling. For preparation of the double-hose, probe-over-Robb rig, see Figure 3-30. 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 STAR messenger to haul over the span wire and hoses to all receivers (without the 60-foot (18.2 m) releasing line section when sending to double-probe receivers).
2. The 60-foot (18.2 m) releasing line of the STAR messenger is used in sending the double-hose STREAM rig with Robb coupling to a single receiver. When the hoses are aboard, the receiving station disconnects the 60-foot (18.2 m) releasing line section of the STAR messenger at the brummel hooks, secures the brummel hook end of this section to a cleat, and coils down the remaining length for use as the remating line. Rig the riding line to the lower hose riding line fitting.
3. After fuel transfer has started, the receiving station disconnects the messenger return line from the messenger return line pendant around the probe tube (Figure 3-30), 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.

3.12 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 span wire is tensioned) or a spanwire rig (if the span wire is not tensioned).

3.12.1 Hose Assembly. Hose assembly for the 240-foot (73.1 m) rig is the same as specified in paragraph 3.9.1 with the exceptions noted herein. The rig is approximately 240 feet (73.1 m) long with the following fittings and hose lengths coupled in succes-

sion, starting with the inboard end of the hose rig. (See Figure 3-18.)

- 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 out-board 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.

3.12.2 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 3.10.
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 4.9.

3.13 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 span wire, 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 span wire to recover the remainder of the hose.

3.14 SPECIAL PROCEDURES

Procedures to be followed during special fueling operations are presented in the following paragraphs.

3.14.1 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 fuel 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.

3.15 REFERENCES

ATP 16, Replenishment at Sea

Damage Control/Casualty Control Book

NAVSEA S9086-TK-STM-010/571, Naval Ships Technical Manual, Chapter 571, Underway Replenishment

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

NAVSEA 0955-LP-020-8010, Double-Probe Fueling System

NAVSEA S9571-A1-HBK-010, UNREP Station Capabilities Handbook

EQUIPMENT*	FUEL STREAM RIG			REMARKS
	WITH PROBE	WITH ROBB COUPLING	WITH 2-1/2" (63.5 mm) AUX	
Adapter, Hose	(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 3.7.5)
Block, Fiber Rope	(Note 1)	(Note 1)	(Note 1)	Size and type to suit station and rig
Block, Wire Rope	(Note 1)	(Note 1)	(Note 1)	Size and type to suit station and rig
Block, Wire Rope (Yo-Yo) With Antitoppling Straps	1	1	1	To support inboard saddle
Bolo w/Shot line	2	2	2	(Note 2)
Cap, Hose; 4" (101.6 mm) or 2-1/2" (63.5 mm)	—	—	2 per ship	
Cap, Hose, Female Split Clamp 2-1/2" (63.5 mm)	—	—	(Note 3)	
Clamp, Hose, Riding Line; 4" (101.6 mm)	—	—	2 per ship	
Clamp, Hose With Handles; 4" (101.6 mm)	—	—	2 per ship	
Clamp, Split, Hose 2-1/2" (63.5 mm)	—	—	(Note 1)	
Clamp, Split, Hose Coupling Assembly, 7" (177.8 mm)	—	—	(Note 1)	
Coupling, Hose, NATO Breakable-Spool — B End	—	—	—	To send to NATO ship or MSC ship with A-end of coupling
Coupling, Assembly Quick-Release 2-1/2" (63.5 mm)	—	—	1	
Coupling, Auto Disconnect, 2-1/2" (63.5 mm)	—	—	1	
Coupling, Hose Robb — Female End	[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), 4" (101.6 mm)	(Note 1)	(Note 1)	(Note 1)	
Crimper, Hose	1	1	1	

Figure 3-31. Fueling-at-Sea Hardware for Delivery Ship — One Station (Sheet 1 of 4)

EQUIPMENT*	FUEL STREAM RIG			REMARKS
	WITH PROBE	WITH ROBB COUPLING	WITH 2-1/2" (63.5 mm) AUX	
Crook, Hose	1	1	1	NAVSHIPS Std Plan 805-2554182
Elbow, 90-Degree, 2-1/2" (63.5 mm)	—	—	1	
End Fitting, Spanwire Non-Weak-Link; 3/4" (19.0 mm)	1	1	1	Preferred end fitting. Used when spanwire winch drum has a slip clutch (see paragraph 3.7.5)
End Fitting, Spanwire Non-Weak-Link; 7/8" (22.2 mm)	[1]	[1]	[1]	Preferred end fitting. Used when spanwire winch drum has a slip clutch (see paragraph 3.7.5)
End Fitting, Spanwire Weak-Link; 3/4" (19.0 mm)	1	1	1	Preferred end fitting (see paragraph 3.7.5)
End Fitting, Spanwire Weak-Link; 7/8" (22.2 mm)	[1]	[1]	[1]	Preferred end fitting (see paragraph 3.7.5)
Fitting, Riding Line, Flow-Thru 2-1/2" (63.5 mm)	—	—	2	
Gun, Line-Throwing NAVSEA SW-350-AL-MMO-010	1	1	1	(Note 2)
Hook, Pelican, 1/2" (12.7 mm)	2	3	(Note 1)	
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)	Size and length to suit rig
Line, Messenger Return	1	1	1	
Line, Saddle 3" (76.2 mm)	—	—	3	Nylon 300' (91.3 m)
Line, Station-to-Station Phone	1	1	1	
Link, End	(Note 1)	(Note 1)	(Note 1)	Size to suit application
Link, Special (Probe Fueling)	(Note 1)	—	(Note 1)	Used with eye socket spanwire and fitting (see paragraph 3.7.5)
Link 1/2" dia (12.7 mm)	—	—	(Note 1)	2-1/2" x 5" (63.5 mm x 127 mm)
Marker or Light Box	1	1	1	Transfer station
Messenger, STAR	1	1	1	

Figure 3-31. Fueling-at-Sea Hardware for Delivery Ship — One Station (Sheet 2 of 4)

EQUIPMENT*	FUEL STREAM RIG			REMARKS
	WITH PROBE	WITH ROBB COUPLING	WITH 2-1/2" (63.5 mm) AUX	
Messenger, Phone and Distance Line	1	1	1	Only for station nearest bridge when more than one station is rigged
Nozzle, Type D-2, 2-1/2" (63.5 mm)	—	—	1	Send to receiving ship with 2-1/2" (63.5 mm) hose rig
O-Ring, Coupling, Hose	(Note 1)	(Note 1)	(Note 1)	
Paddles, Signal (Set) or Wands (Set)	1	1	1	
Pendant, Messenger Return Line	1	1	1	See paragraph 3.7.2.11
Phone, Sound-Powered	2	2	2	
Pins, Cotter, Steel	(Note 1)	(Note 1)	(Note 1)	Size and type to suit shackle
Plug, Hose, Male Split Clamp 2-1/2" (63.5 mm)	—	—	(Note 3)	
Plug, Threaded 2-1/2" (63.5 mm)	—	—	1	
Preventer, Wire 3/4" (19.0 mm)	1	1	1	Rigged from yo-yo block to deck (length to suit application)
Probe, Double	[1]	—	—	Send to receiving ship with double- or single-probe receiver(s)
Probe, Single	1	[1]	—	Send to receiving ship with double- or single-probe receiver(s)
Projectile, Gun Line With Shot Line	2	2	2	(Note 2)
Riding Line Fitting, Flow-Thru	2[4]	2[4]	2	Size to suit hose
Saddle, Hose, Flow-Thru — Type A	4[4]	4[4]	4	Size to suit hose
Saddle, Hose, Flow-Thru — Type B	[4]	[4]	—	Used as upper saddle on double-hose rig; size to suit hose
Seal, O-Ring	(Note 1)	(Note 1)	(Note 1)	Size to fit hose
Shackle, Safety or Screw Pin	(Note 1)	(Note 1)	(Note 1)	Size and type to suit application
Shackle, Special FAS	2	2	2	Used on riding line fittings
Tools, UNREP Working and Repair	1	1	1	See paragraph 2.3.9
Trolley, Free	—	3	4	

Figure 3-31. Fueling-at-Sea Hardware for Delivery Ship — One Station (Sheet 3 of 4)

EQUIPMENT*	FUEL STREAM RIG			REMARKS
	WITH PROBE	WITH ROBB COUPLING	WITH 2-1/2" (63.5 mm) AUX	
Trolley, Spanwire	5	3	3	
U-Bolt, Assembly	—	—	1	
Wrench, Spanner 2" to 4-3/4" (50.8 to 120.6 mm)	1	1	1	
*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, or ship with aircraft on deck. 3. Ten required. Used to secure hose when hose is stowed.				

Figure 3-31. Fueling-at-Sea Hardware for Delivery Ship — One Station (Sheet 4 of 4)

EQUIPMENT*	FUEL STREAM RIG			REMARKS
	WITH PROBE	WITH ROBB COUPLING	WITH 2-1/2" (63.5 mm) AUX	
Block, Snatch: 10" (254.0 mm) or 12" (304.8 mm)	(Note 1)	(Note 1)	(Note 1)	
Block, Snatch: 12" (304.8 mm) Rig 25 with Upset Shackle	1	—	—	
Bolo w/Shot Line	2	2	2	(Note 2)
Coupling, Hose, NATO Breakable-Spool — A-End	—	1	—	NATO nation ship or MSC ship without probe receiver or Robb coupling
Coupling, Hose, Robb — Male End	[1]	1[2]	—	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	(Note 2)
Hose, Reinforced Wire; 7" (177.8 mm)	1[2]	—	—	For probe receiver to fuel piping
Line, B/B Phone/Distance Line	1	1	1	Only for station nearest bridge when more than one station is rigged
Line, Easing-Out	1	1	1	
Line, Remating	[1]	—	[1]	See paragraph 3.7.2.3
Line, Riding	—	1	1	
Marker or Light Box, Transfer Station	1	1	1	
Paddles, Signal (Set) or Wands (Set)	1	1	1	
Phone, Sound-Powered	2	2	2	
Pins, Cotter, Steel	(Note 1)	(Note 1)	(Note 1)	Size and type to suit shackle and pelican hook (see Fig. 2-21).
Projectile, Gun - Line With Shot Line	2	2	2	(Note 2)
Receiver for Type D-2 Nozzle	—	—	1	
Receiver for Single Probe	1	—	—	Receives single probe or upper probe of double probe
Receiver for Double Probe	1	—	—	Receives single or double probe
Shackles, Screw Pin or Safety	(Note 1)	(Note 1)	(Note 1)	Size and type to suit application

Figure 3-32. Fueling-at-Sea Hardware for Receiving Ship — One Station (Sheet 1 of 2)

EQUIPMENT*	FUEL STREAM RIG			REMARKS
	WITH PROBE	WITH ROBB COUPLING	WITH 2-1/2" (63.5 mm) AUX	
Short Strap Assembly	2	—	—	(Note 3)
Tackle, Two-Fold	—	1	1	
Tools, UNREP Working and Repair (Set)	1	1	1	See paragraph 2.3.9
*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. Double-probe rig only; see NAVSEA Dwg. 803-2252873, Detail A.				

Figure 3-32. Fueling-at-Sea Hardware for Receiving Ship — One Station (Sheet 2 of 2)

CHAPTER 4

Liquid Cargo Transfer — Non-STREAM Rigging and Operation

4.1 SCOPE

Although STREAM is the preferred method, a nontensioned method may be used for the transfer of fuel products between ships. During fuel transfer, lubricating oil (in drums), industrial gases (in cylinders), water, personnel, and cargo may also be transferred.

This chapter details the methods for transferring fuel between ships using the nontensioned spanwire, close-in, and spanline fuel rigs. Chapter 5 covers procedures employed when MSC tankers are used for replenishment of Navy ships. ATP 16 covers procedures employed when conducting FAS operations with ships of NATO nations.

4.2 DELIVERY SHIP CHARACTERISTICS

Refer to paragraph 3.2.

4.3 TRANSFER STATIONS

Refer to paragraph 3.3.

4.4 STANDARD HOSE RIGS

Refer to paragraph 3.4.

4.5 STATIC-TESTED LOADS

Refer to paragraph 3.5.

4.6 FUELING PREPARATIONS

Refer to paragraph 3.6.

4.7 BASIC ALONGSIDE FUELING-AT-SEA RIG EQUIPMENT

Refer to paragraph 3.7.

4.8 ALONGSIDE FUELING-AT-SEA RIGS

Refer to paragraph 3.8.

4.9 NONTENSIONED SPANWIRE FUEL RIG

In the nontensioned spanwire fuel rig (Figures 4-1 and 4-2), the hose is supported between two ships on a nontensioned span wire. 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.

Hardware for delivery and receiving stations is listed in Figures 4-11 and 4-12 at the end of the chapter.

4.9.1 Rigging the Delivery Station for Nontensioned Spanwire Fuel Rig

4.9.1.1 Hose Assembly. Hose assembly procedures for the nontensioned spanwire fuel rig are the same as the fuel STREAM rig, as specified in paragraph 3.9.1.1, with the exceptions noted herein.

The nontensioned spanwire fuel rig is approximately 245 feet (74.6 m) long with the following fittings and hose lengths coupled in succession, starting with the in-board end.

- Two 35-foot (10.6 m) lengths of hose (in-board length cut to suit)
- Flow-through saddle (No. 3)
- Two 35-foot (10.6 m) lengths of hose

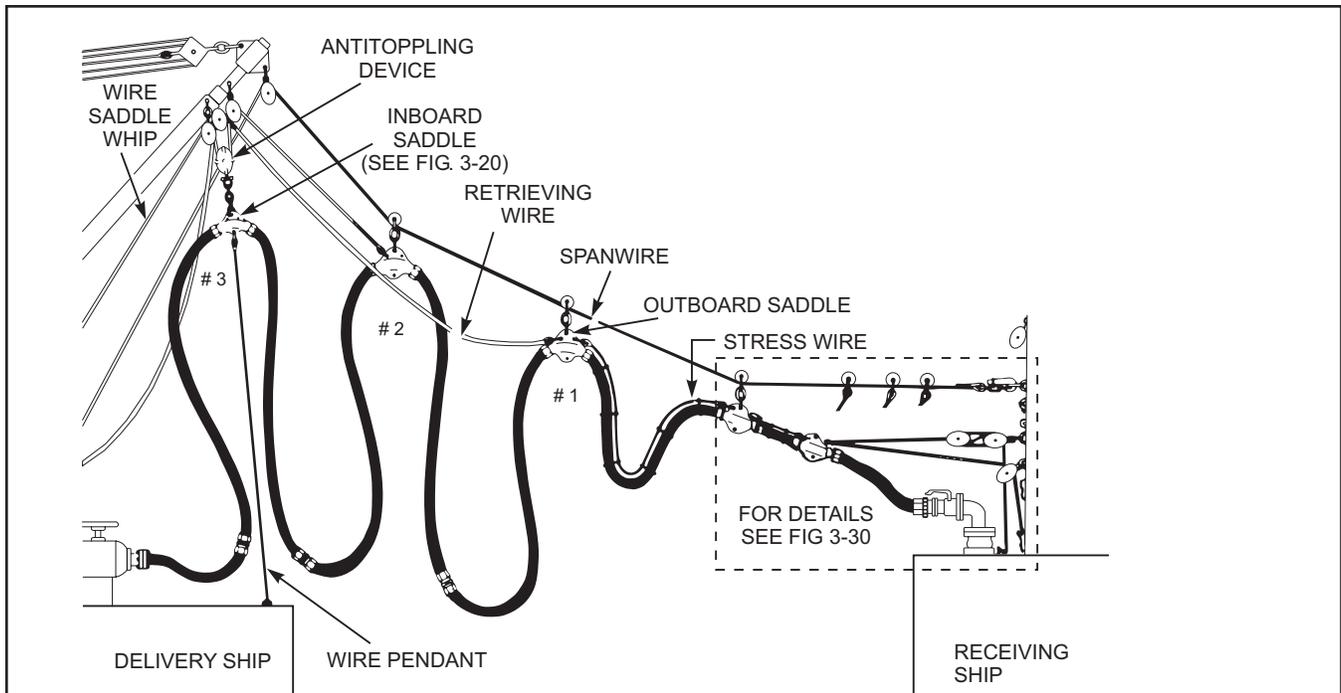


Figure 4-1. Nontensioned Spanwire Fuel Rig (Single Hose With Robb Coupling)

- 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
- An end connection consisting of either a single probe and carrier assembly, a Robb coupling (see Figure 3-11), a NATO coupling (see Figure 3-12), or any adapters needed to go from the hose size to the end connection.

4.9.1.2 Rigging the Hose Assembly. Rigging the hose for the nontensioned spanwire fuel rig is the same as specified in paragraph 3.9.1.3, except that the nontensioned spanwire fuel rig has three flow-through saddles instead of four flow-through saddles. The inboard saddle whip controls the No. 2 and No. 3 saddles.

4.9.2 Preparing the Nontensioned Spanwire Fuel Rig. The fitting on the outboard end of the hose can be a probe, a Robb coupling, or a breakable-spool coupling. If a probe is used, the trolley carriage (Figure 3-5) supports the outboard section of the hose and no additional trolleys are required. If a Robb coupling (Figure 3-11) or a breakable-spool coupling (Figure 3-12) is used, free trolleys (Figure 3-24) 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 3-24).
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 3-24).
3. Stop off the span wire to the messenger 350 feet (106.5 m) from the inboard (shackled) end of the messenger, as shown in Figure 3-21.
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).

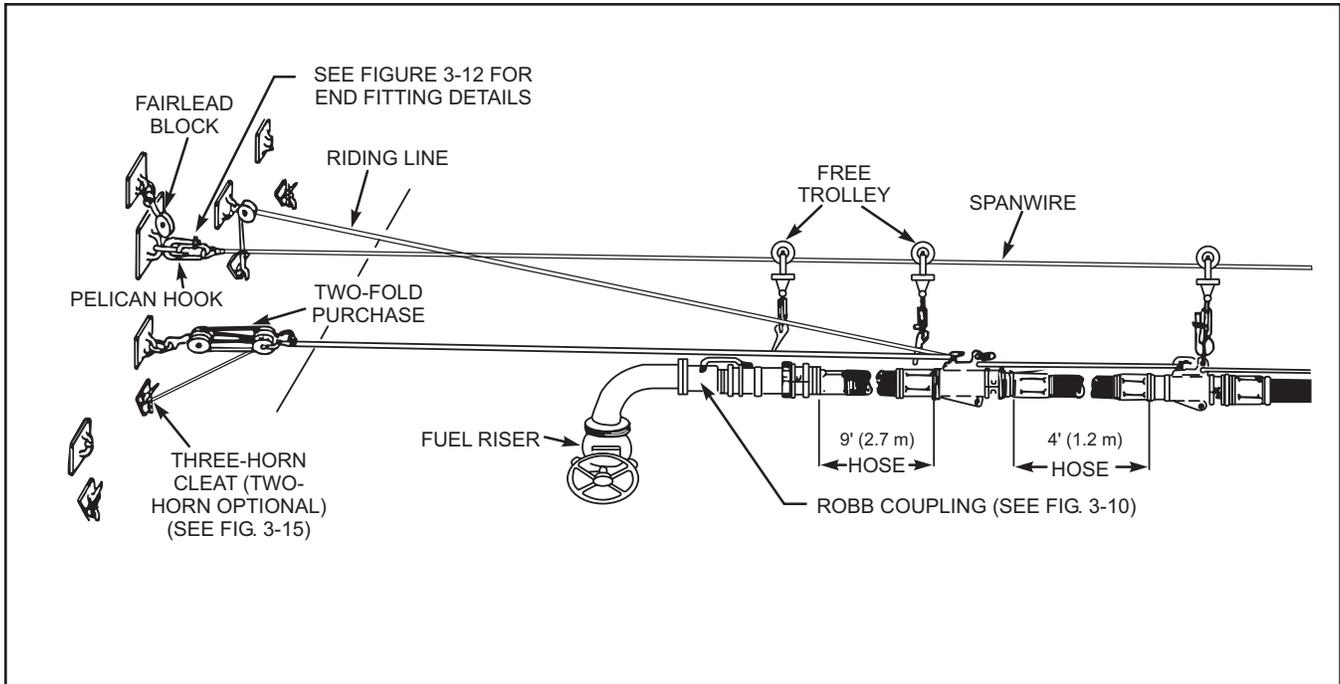


Figure 4-2. Securing the Single Hose With Robb Coupling

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 it to the messenger return line pendant around the probe tube at the trolley carriage, as shown in Figure 3-23.
7. Ensure that all probe latches are latched.
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 (30.5 cm) wood or steel messenger fairlead block (see Figure 3-26).
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 span wire. See paragraph 2.2.11.5.

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.

4.9.3 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 span wire.
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 fair-lead 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

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.

WARNING

The approach ship shall hand-tend the B/B phone/distance line. The B/B phone/distance line shall be maintained free for running (coiled or faked) and shall never be secured to the approach ship's structure. Personnel must keep inboard of all lines and exercise extreme caution and alertness to potential danger.

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

2. Cut the first stop, remove any twists of the messenger around the span wire, 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 span wire, then cut the remaining stop that holds the span wire to the messenger.

(6) DELIVERY SHIP

Haul in on the span wire and tend slack. Do not allow the span wire 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 3-26) will raise. This indicates that the probe is engaged in the receiver.
 - b. Disconnect the 60-foot (18.2 m) releasing line at the brummel hooks, secure the brummel hook end of this section to a cleat, and coil down the remaining length 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 messenger return line pendant around the probe tube (Figure 3-23) 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 3-11) to the open position.



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 and connect it to the messenger return line.
- 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.

4.9.4 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.

4.9.5 Retrieving the Nontensioned Spanwire Fuel Rig

(1) DELIVERY SHIP

1. Stop pumping.
2. Complete the blowdown or back suction and secure all valves. (See paragraph 3.9.1.6.)

(2) BOTH SHIPS

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

(3) RECEIVING SHIP

1. For probe:
 - a. Remove the 60-foot (18.2 m) releasing line from cleats, fairlead blocks, and all obstructions. Leave the releasing line attached to the trolley carriage and with small line (6-thread or marline), stop it off to the probe.
 - b. When advised by the delivery station's phone talker, operate the manual release lever on the receiver (Figure 3-23) to release the probe.

2. For Robb or breakable-spool coupling:

- a. For Robb coupling, move the operating lever (Figure 3-11) to the closed position.



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 3-24).

e. Prepare the riding line for use in easing out the hose.

(4) DELIVERY SHIP

Haul in on the saddle whips to retrieve the hose.

(5) RECEIVING SHIP

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

When the hose has been secured, tend slack in the span wire 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 span wire clear of the deck edge, and release the easing-out line.
4. Signal the delivery station to haul in the span wire and station phone line.

(8) DELIVERY SHIP

1. Haul in the span wire and station phone line.
2. Disconnect the phone/distance line.

(9) RECEIVING SHIP

Haul in the phone/distance line.

4.9.6 Emergency Breakaway for Nontensioned 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 probe or close/disconnect coupling and riding line. Start retrieving all hoses.

5. Trip the spanwire pelican hook.

6. If unable to disconnect the span wire, 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.

4.10 CLOSE-IN FUEL RIG

In the close-in fuel rig (Figure 4-3), 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.

Hardware for delivery and receiving stations is listed in Figures 4-11 and 4-12 at the end of the chapter.

4.10.1 Rigging the Close-In Fuel Rig. Figure 4-4 contains information about the saddle whips, retrieving line, and outer bight line (optional). The outer bight line is used only when fueling large ships.

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 as follows:

1. Two-block the inboard saddle.
2. Hoist the No. 1 and No. 2 saddles to a point just below the inboard saddle.
3. Using the retrieving line saddle whip, hoist the bight of hose, which is supported by the inboard riding line fitting, to a point just below the outboard No. 1 saddle.

4.10.2 Preparing the Close-In Fuel Rig. The fitting on the outboard end of the hose can be a Robb coupling (Figure 3-11) or a breakable-spool coupling (Figure 3-12).

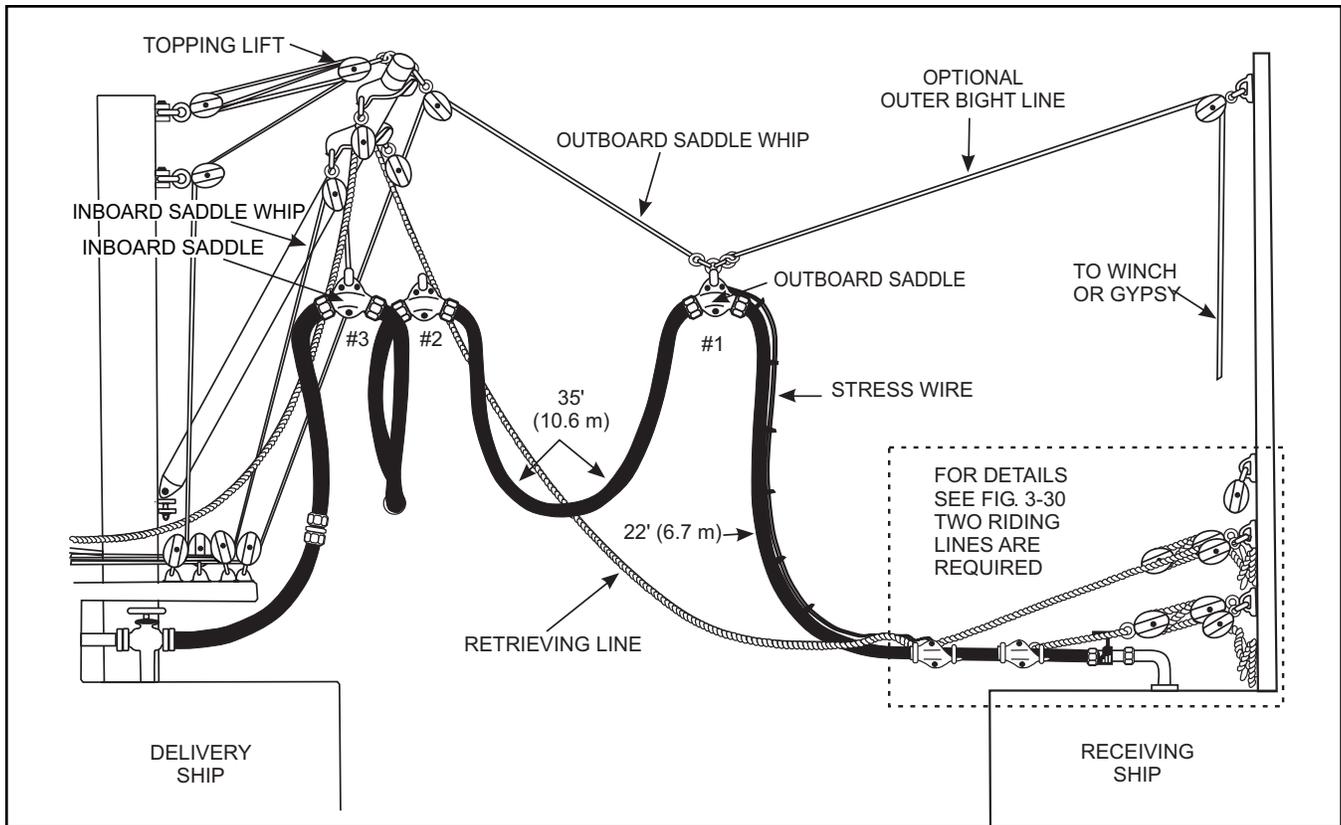


Figure 4-3. Close-In Fuel Rig

(1) DELIVERY SHIP

1. Fake out the STAR 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.
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 4-3). 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.

(2) RECEIVING SHIP

1. Install a 12-inch (30.5 cm) 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 3-24). 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

EQUIPMENT	MATERIAL	LENGTH IN FEET (m)	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)	This whip, fitted with a thimble eye and 7/8" (22.2 mm) shackle at one end.
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)	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 king-post or boom, then through fairleads to winches.
Retrieving Line	3-1/2" (88.9 mm) CIRC braided nylon line	450 (137.1)	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. This line is rove through a 12" (30.5 cm) or 14" (35.6 cm) snatch block on the after side of the boom head, then through a fairlead to a gypsy 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)	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) 3-strand nylon, 90 feet (27.4 m) of 1-1/2" (38.1 mm) 3-strand nylon, and 180 feet (54.8 m) of 3/4" (19.0 mm) 3-strand nylon taper-spliced in succession to the other end. The thimble eye is shackled to the outboard side of the outboard saddle.

Figure 4-4. Lines for Close-In Fuel Rig at Delivery Station

bight line to a high point on the ship's structure (see Figure 4-3).

5. Rig the Robb coupling's male end or breakable-spool coupling's 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.

4.10.3 Passing the Close-In Fuel Rig

(1) DELIVERY SHIP

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

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.

WARNING

The approach ship shall hand-tend the B/B phone/distance line. The B/B phone/distance line shall be maintained free for running (coiled or faked) and shall never be secured to the approach ship's structure. Personnel must keep inboard of all lines and exercise extreme caution and alertness to potential danger.

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

(5) RECEIVING SHIP

Continue to haul in the messenger to haul in the hose.

(6) DELIVERY SHIP

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 first riding line until the outboard riding line fitting is in reach and rig the second riding line. Adjust riding lines until the coupling is in position for attachment.
5. Attach the coupling. For the Robb coupling, move the operating lever (Figure 3-11) to the open position.



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.

6. Signal the delivery station: "Start pumping."
7. After fuel transfer has started, disconnect the messenger at the flow-through riding line fitting.
8. 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.

4.10.4 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

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.

4.10.5 Retrieving the Close-In Fuel Rig

(1) DELIVERY SHIP

1. Stop pumping.
2. Complete the blowdown or back suction and secure all valves. (See paragraph 3.9.1.6.)

(2) BOTH SHIPS

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

(3) RECEIVING SHIP

1. For a Robb coupling, move the operating lever (Figure 3-11) to the closed position.



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

Haul in on the saddle whips to retrieve the hose.

(5) RECEIVING SHIP

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

Haul in the phone/distance line.

4.10.6 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.

4.10.7 Close-in Fuel Rig — Blowdown and Back Suction. Perform the following steps in order to most effectively remove fuel from the close-in rig's fuel delivery hose during blowdown or back suction:

1. Pay out the No. 2 saddle whip to minimize the inboard hose catenary between the No. 2 and No. 3 flow-through saddles.
2. With the 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. Haul in the No. 1 saddle slightly to clear fuel from the hose's outer length.

4.11 NONTENSIONED SPANLINE FUEL RIG

The 2-1/2-inch (63.5 mm) fuel hose, supported on a nontensioned synthetic line, as shown in Figure 4-5, may be employed whenever conditions on either the delivery or receiving ship preclude transfer of F76, F44, or water using the 2-1/2-inch (63.5 mm) hose rig with the probe fueling system.

The spanline fuel rig is 188 feet (57.3 m) long and consists of four 35-foot (10.6 m) hose assemblies and one 23-foot (7.0 m), one 15-foot (4.6 m), and one 10-foot (3.0 m) hose assembly. Additional lengths of hose may be used as jumpers and added to the rig to reach some riser locations on either ship; however, no other change is authorized for this rig. The hose is suspended from four spanline trolleys. Most of the components in the spanline fuel rig are identical to like components in the other 2-1/2-inch (63.5 mm) fuel rigs.

Hardware for delivery and receiving stations is listed in Figures 4-11 and 4-12 at the end of the chapter.

4.11.1 Rigging the Nontensioned Spanline Fuel Rig. At every assembly step of the following step-by-step procedures for rigging the spanline fuel rig, ensure that components that contact F76 or F44 are not used in a potable water rig.



Once a hose rig has been used for one product, hose rig components that contact the product must be dedicated to that product only. See Appendix L for transfer of potable water.

The following procedure defines the necessary steps for rigging the 2-1/2-inch (63.5 mm) hose for use with a span line.

1. At the delivery station, lay out enough 35-foot (10.7 m) hose assemblies of 2-1/2-inch (63.5 mm) hose to suit station arrangement and riser location.
2. Couple the two hose assemblies together with a split clamp.
3. Using a reducer, an adapter, and split clamps as required, attach the female end of the 2-1/2-inch (63.5 mm) hose to the ship's riser.

4. Couple the male end of the outboard 35-foot (10.7 m) hose section to the 2-1/2-inch (63.5 mm) flow-through saddle fitting.
5. Couple the female end of another 35-foot (10.7 m) hose assembly to the other end of the saddle.
6. Using the shackles and link, attach the flow-through saddle to spanline trolley No. 4, as shown in Figure 4-6. Fake down hose sections and lay the trolley on the deck.
7. Couple a flow-through saddle to the 35-foot (10.7 m) hose assembly running from the saddle attached to trolley No. 4. Attach this saddle to trolley No. 3 in the same manner that the saddle was attached to trolley No. 4. The rigging is shown in Figure 4-7.
8. Couple a flow-through saddle to the 35-foot (10.7 m) hose assembly running from the saddle attached to trolley No. 3. Attach this saddle to trolley No. 2 in the same manner that the saddle was attached to trolley No. 3. See Figure 4-7.
9. Couple a 23-foot (7.0 m) hose assembly to the flow-through saddle attached to trolley No. 2.
10. Couple a flow-through saddle to the 23-foot (7.0 m) hose assembly and attach this saddle to trolley No. 1. See Figure 4-8.
11. Couple a 15-foot (4.6 m) hose assembly to the flow-through saddle attached to trolley No. 1.
12. On the male end of the hose, install in sequence an automatic coupling and a 90-degree elbow adapter.
13. Couple a 10-foot (3.0 m) assembly of 2-1/2-inch (63.5 mm) jumper hose to the 90-degree elbow adapter. Attach the D-2 nozzle onto the male end of the jumper hose.
14. Cover the D-2 nozzle with the attached cap and install a shackle on the 90-degree elbow adapter as shown in Figure 4-8.
15. Fold the jumper hose and secure it to the 23-foot (7.0 m) hose assembly aft of the saddle. See Figure 4-8.
16. Shackle the 800-foot (243.8 m) STAR messenger and the messenger return line to trolley No. 1.

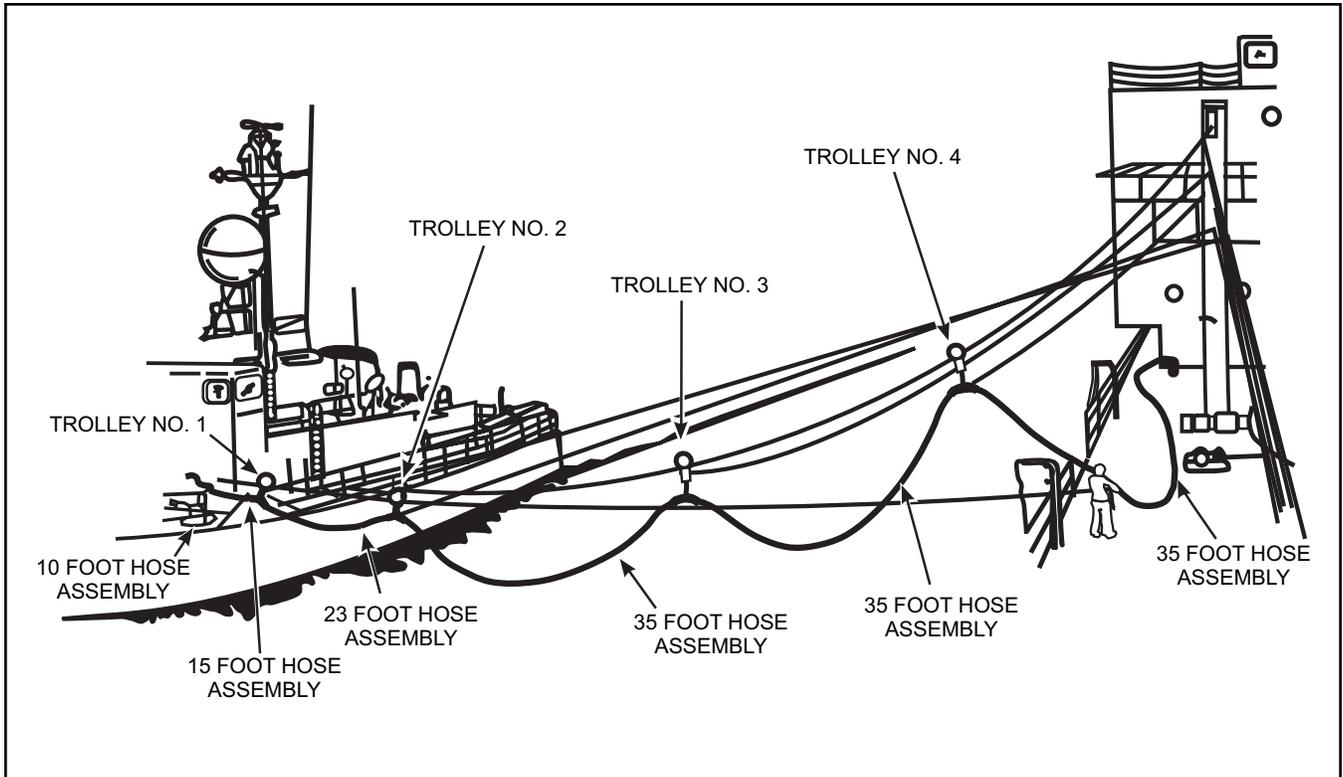


Figure 4-5. Nontensioned Spanline Fuel Rig (188 Feet)

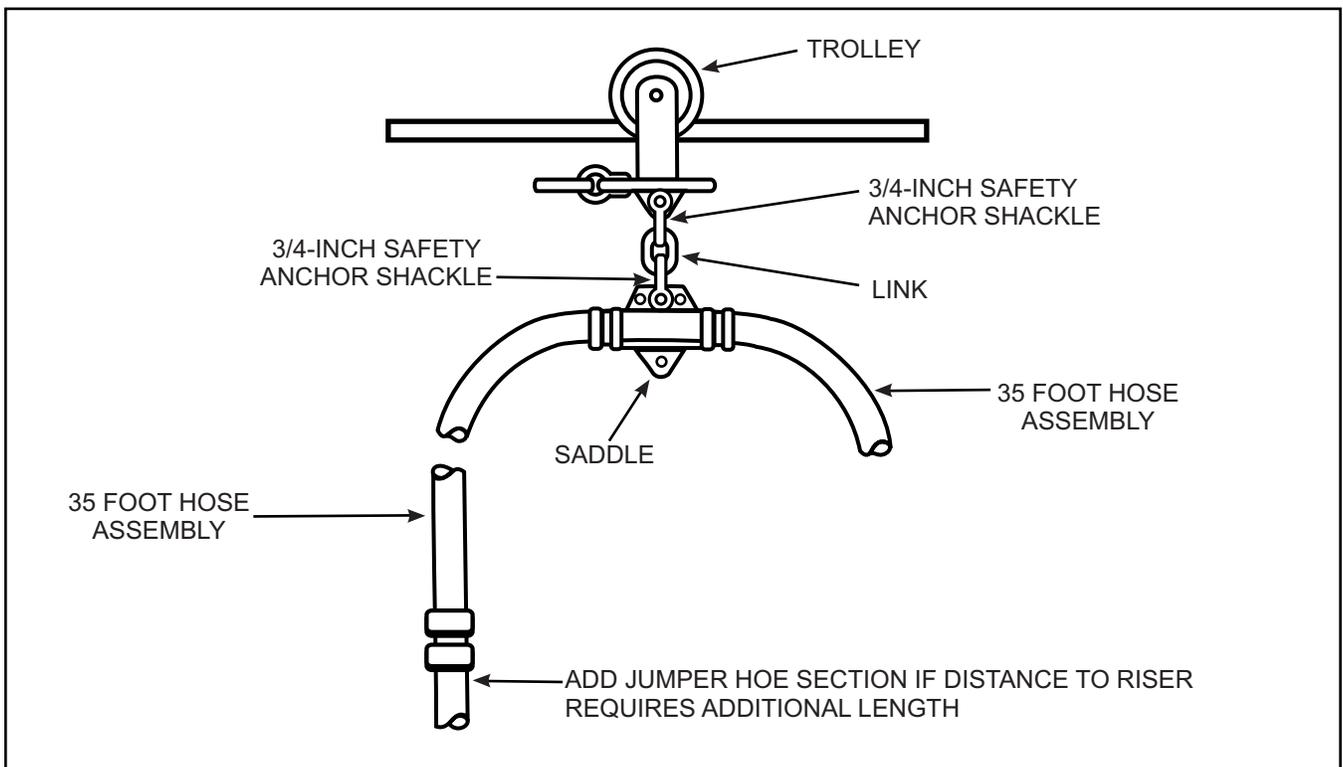


Figure 4-6. Nontensioned Spanline Fuel Rig at Trolley No. 4

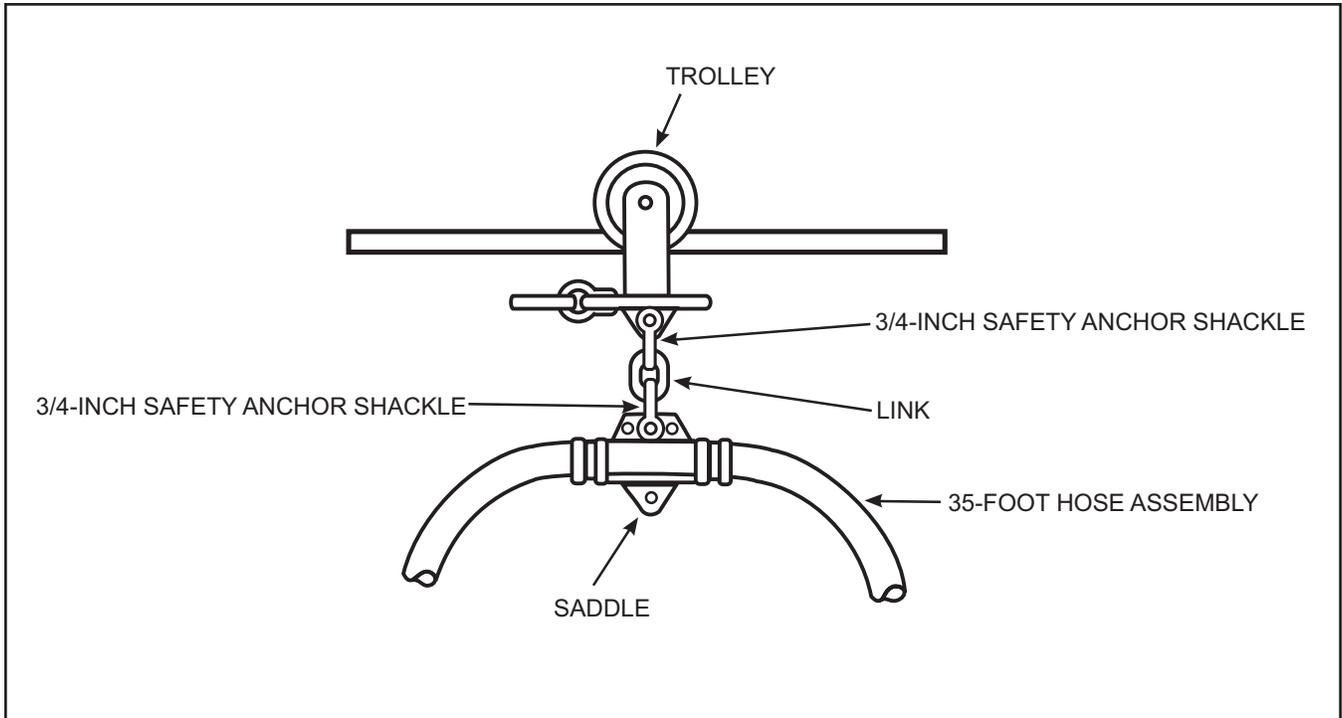


Figure 4-7. Nontensioned Spanline Fuel Rig at Trolley Nos. 2 and 3

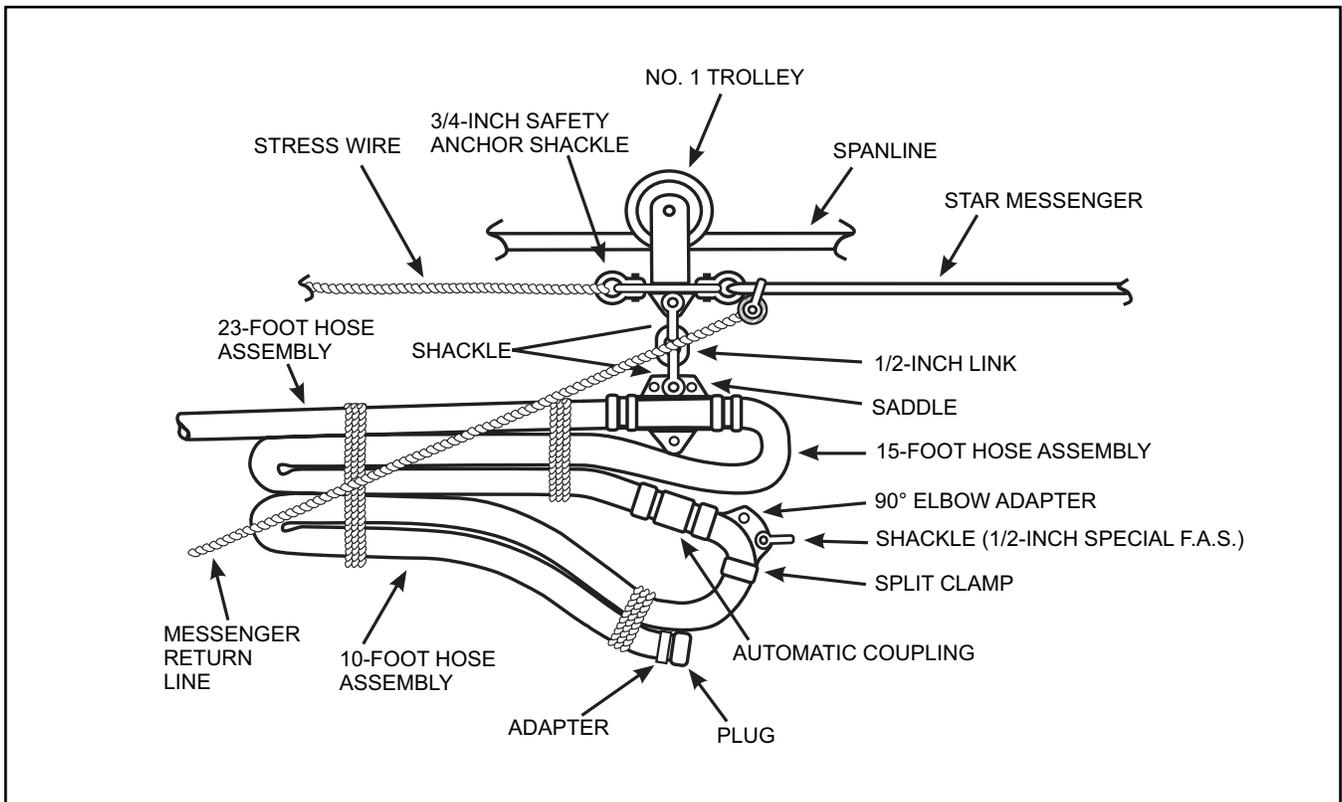


Figure 4-8. Nontensioned Spanline Fuel Rig at Trolley No. 1

17. Shackle saddle whip assembly lines to trolley Nos. 2, 3, and 4 and fake down lines.
18. Reeve the span line through trolley Nos. 4 (inboard), 3, 2, and 1 (outboard) in turn. Haul the span line through the trolleys and fake down enough to reach to the receiving ship.

4.11.2 Operating the Nontensioned Spanline Fuel Rig. The following procedures emphasize actions related directly to the 2-1/2-inch (63.5 mm) hose rig. At every assembly step of the following procedures, ensure that components that contact F76 or F44 are not used in a potable water rig.

4.11.2.1 Delivery Ship Procedure. To prepare a spanline delivery station for replenishing fuel or water using 2-1/2-inch (63.5 mm) hose, perform the following steps.

1. Rig appropriate station markers.
2. Prepare sound-powered phones.
3. Provide safety equipment and ensure that all personnel assigned to refueling stations are dressed as prescribed.
4. Lay out and check UNREP repair and working tools at each station.
5. Perform preoperational preparation of the winches.

WARNING

Inspect all lines for worn places and frayed condition. *Do not use such lines.*

6. Attach sound-powered phone line messenger to messenger beackets. Attach bridge-to-bridge phone/distance line if required.
7. Stop the span line (with attached pelican hook) about 350 feet (107 m) from the shackled end of the STAR messenger.
8. Ensure that the span line has been hauled through the spanline trolley.
9. Ensure that the messenger, messenger return line, span line, synthetic saddle whips for trolleys, and hose are faked down for free running.

10. Verify that the proper hose end and adapter to be sent to the receiving ship are on the hose rig.



Once a hose rig has been used for one product, hose rig components that contact the product must be dedicated to that product only.

11. Inspect the hose for cuts, abrasions, and excessive wear.
12. Provide safety equipment and ensure that all personnel assigned to refueling stations are dressed as prescribed.

4.11.2.1.1 Passing the Rig

1. Send over messenger with messenger return line, station-to-station phone line, and span line attached.
2. Upon receipt of a signal from the receiving ship that the spanline end has been attached, take a strain on the span line.
3. As the span line reaches its proper catenary, ease the hose over the side and signal the receiving ship to take in the messenger.
4. Ease out saddles and hand tend.

4.11.2.1.2 Tending the Rig

1. Start pumping upon signal from the receiving ship.



Once a hose rig has been used for one product, hose rig components that contact the product must be dedicated to that product only.

2. Tend span line and trolleys to keep the bight of the hose out of the water.
3. Stop pumping upon signal from the receiving ship.
4. Conduct blowdown if desired.

4.11.2.1.3 Recovering the Rig

1. Wait until correct signal to retrieve the rig has been received from the receiving ship.
2. Retrieve synthetic saddle whips on all saddles until entire rig is aboard.
3. When the rig is back aboard, slack off the span line and give the receiving ship the signal to disconnect the span line.
4. Retrieve span line upon release by receiving ship.

4.11.2.2 Receiving Ship Procedures. To prepare the receiving station for replenishing fuel or water using a 2-1/2-inch (63.5 mm) hose rig, perform the following steps.

1. Rig appropriate station markers.
2. Prepare sound-powered phones and phone/distance line.
3. Install a snatch block and fairlead blocks as required for the messenger.
4. Provide safety equipment and ensure that all personnel assigned to the replenishment are dressed as prescribed.
5. Lay out and check UNREP repair and working tools at the station.
6. Remove life lines and install a hand-tended safety line at the station.

4.11.2.2.1 Receiving the Rig

1. Pass the phone/distance line. Receive the messenger, place it in the snatch block, and haul in until the span line is over the station area.

WARNING

The approach ship shall hand-tend the B/B phone/distance line. The B/B phone/distance line shall be maintained free for running (coiled or faked) and shall never be secured to the approach ship's structure. Personnel

must keep inboard of all lines and exercise extreme caution and alertness to potential danger.

2. Cut the first stop holding the spanline pelican hook.
3. Connect the pelican hook on the spanline end to the receiving station link. Install the easing-out line through the pelican hook's long link.
4. Slack the messenger to allow the pelican hook to take the strain of the span line, then cut the remaining stops.
5. Upon signal, take in the messenger and pull trolley No. 1 into position over the receiving station working area. See Figure 4-9.
6. Take the 60-foot (18.3 m) section to a cleat to hold trolley No. 1's position at the work area and hand tend.

WARNING

Hand tend 60-foot (18.3 m) section at all times to facilitate emergency breakaway.

7. Unshackle the messenger return line and disconnect the STAR messenger from the last 60 foot (18.3 m) section. Connect messenger to messenger return line at brummel hooks and send back to delivery ship.
8. Cut stops supporting the 90-degree elbow adapter and jumper hose, and shackle the 90-degree elbow adapter to the link vacated by the snatch block.
9. Remove the plug and connect the end of the jumper hose to the ship's riser.
10. Adjust the bight of hose with the 60-foot (18.3 m) section of STAR messenger controlling trolley No. 1 so that strain will be taken on the quick-disconnect or automatic coupling with minimum slack in hose.
11. Open riser valve.
12. Stand clear of coupling and jumper hose.
13. Signal the delivery ship to start pumping.

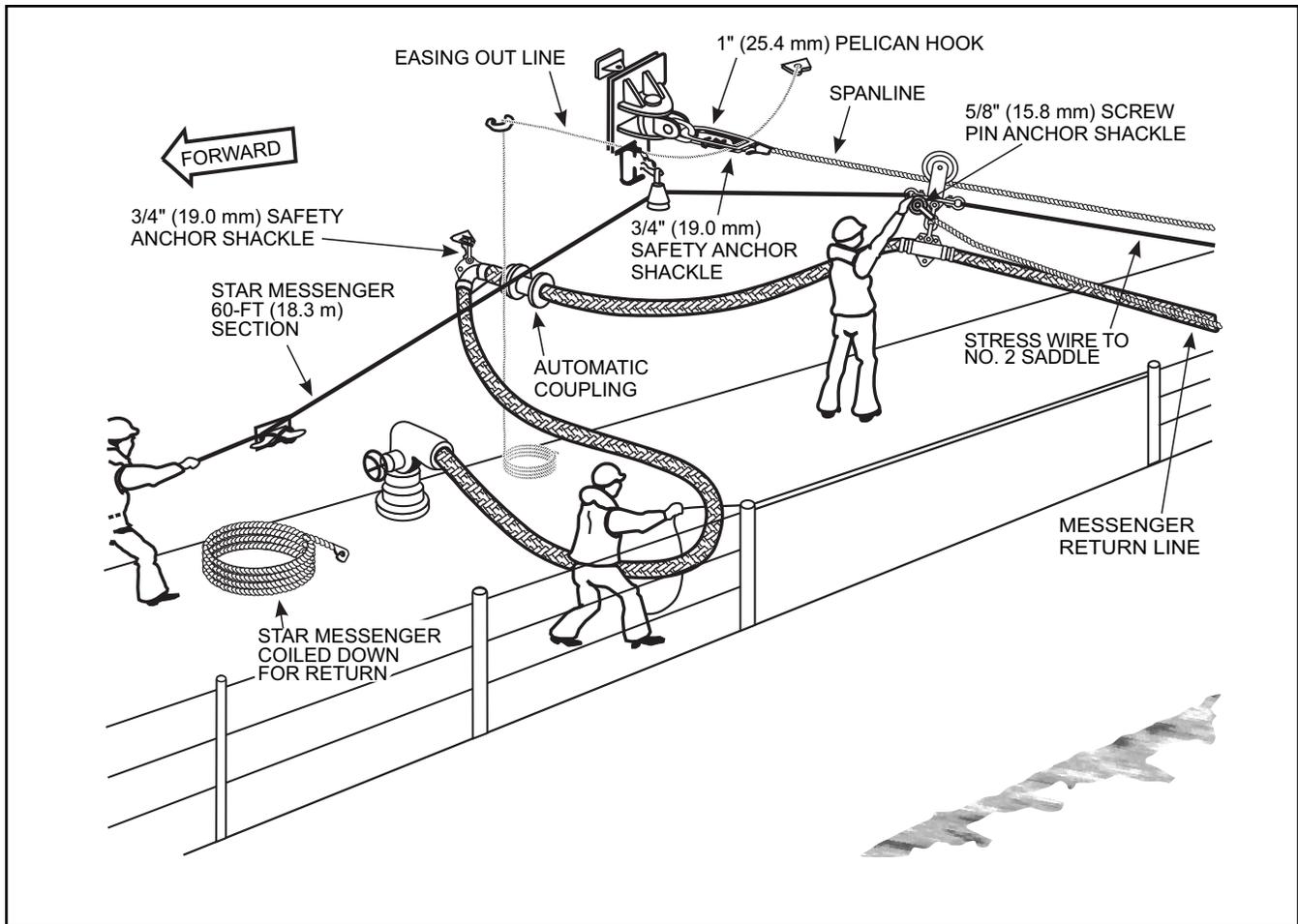


Figure 4-9. Receiving the Nontensioned Spanline Fuel Rig

4.11.2.2.2 Returning the Rig

1. When sufficient fuel or water has been transferred, signal the delivery ship to cease pumping.
2. Inquire if a blowdown is desired.
3. Close the valve, remove the jumper hose from the riser, and insert the plug.
4. Haul in trolley No. 1 to allow slack in the hose and hand-tend the 60-foot (18.3 m) section to a cleat.
5. Unshackle the 90-degree elbow coupling. Stop the jumper hose and 90-degree elbow coupling under trolley No. 1 similar to the received configuration.
6. Slack off the 60-foot (18.3 m) section holding trolley No. 1.

7. Signal the delivery ship to retrieve the hose.

8. Upon signal, disconnect the span line, ease it over the side, and release the span line.

4.11.2.3 Accidental Uncoupling. By design the nontensioned spanline fuel rig will break at its automatic coupling when subjected to a tensile force of 500 lb (227 kg). Although the incidence of an accidental uncoupling is very low, a standard procedure to follow when it occurs can safely expedite resumption of the operation. In the event of an accidental uncoupling, proceed as follows:

1. If the uncoupling occurs while fuel or water is being transferred, signal the delivery ship to cease pumping.

WARNING

- The deck may be wet as a result of the uncoupling.
 - Wait until the force that caused the uncoupling is no longer acting on the hose rig. Vent the residual pressure in the delivery hose.
2. Signal the delivery ship to ease out on saddle whip No. 1. This allows access to the trolley, permitting receiving of the 60-foot (18.3 m) section of messenger and recoupling of the automatic or quick-disconnect coupling.

WARNING

The halves of the automatic coupling cannot be recoupled when the hose is under pressure. Without pressure in the hose, a force of approximately 25 lb (11 kg) is required to recouple.

3. When the coupling has been rejoined, have all hands stand clear and signal the delivery ship to resume pumping.

4.11.2.4 Emergency Breakaway for Nontensioned Spanline Fuel Rig. Emergency breakaway is an accelerated breakaway using the procedures described in the preceding paragraphs. The following procedures also apply.

Note

Such tools as sledge hammers, axes, and knives should always be available.

4.11.2.4.1 Delivery Ship's Emergency Breakaway Procedure. When the signal "Emergency breakaway" is received from the bridge or from the receiving station:

1. Pass the signal "Emergency breakaway" to the receiving ship or your ship's bridge.

WARNING

The determination to order all personnel to clear the area must be based on the particular circumstances existing when the word is received to execute an emergency breakaway and a judgment of the officer in charge.

2. Clear all unnecessary personnel from the area immediately.
3. Stop pumping.
4. Slack off on span line to remove all tension.
5. Commence hauling in hand-tended phone/distance lines.

WARNING

If recovery of the phone/distance lines interferes with the breakaway operation, cut the lines.

6. As soon as the receiving ship releases the 60-foot (18.3 m) section of the STAR messenger restraining trolley No. 1, heave in on the saddle whip to separate the hose rig at its automatic coupling and haul in the hose rig as rapidly as possible. The quick-disconnect coupling must be manually released prior to signaling the delivery ship to haul in the hose.

WARNING

If the span line cannot be slacked off to release the pelican hook, receiving ship personnel will clear the area and the delivery ship must allow the span line to run free. Delivery ship personnel should stand clear of all rigging.

7. When the span line is slack, signal the receiving ship to release the pelican hook.
8. Haul in the spanline.
9. Notify the bridge when all lines are clear.

4.11.2.4.2 Receiving Ship's Emergency Breakaway Procedure. When the signal "Emergency breakaway" is received from the bridge or from the delivery ship station:

1. Pass the signal "Emergency breakaway" to the delivery ship or to your ship's bridge.

WARNING

The determination to order all personnel to clear the area must be based on the particular circumstances existing when the word is received to execute an emergency breakaway and a judgment of the officer in charge.

2. Clear all unnecessary personnel from the area immediately.
3. If the span line does not slacken, clear all personnel from the area.

WARNING

Never cut a line that is under tension.

4. If the span line is slack, release the easing-out line restraining trolley No. 1.
5. Stand clear and allow the hose rig to part at its automatic coupling.
6. If the pelican hook cannot be released, clear the area of all personnel, and allow the span line to run free.
7. Notify the bridge when all lines are clear.

4.11.2.5 Saddle Whip Casualty. If the saddle whip parts, proceed as follows to recover the rig:

1. Maintain span line tension.
2. Receiving ship must disconnect the hose rig from the riser and install the plug at the terminal fitting.
3. Receiving ship must unshackle 90-degree elbow adapter from receiving station's padeye.
4. Retrieve the inboard saddles.
5. Bring hose alongside. The delivery ship hauls in on the retrieving line to place hose bights in the

vicinity of the delivery ship's side. No attempt should be made to two-block the outrigger.

WARNING

Unsupported saddles and hoses may fall when the spanline is detensioned.

6. Clear all unnecessary personnel.
7. The span line is kept tensioned throughout the previous steps, then detensioned and disconnected carefully using standard procedures.
8. Recover the hose rigs. After bights of hose have been stopped to the ship's side and the hose has been dropped on deck, the saddle whip or span line can be used to recover any hose not on board.

4.11.2.6 Stowing the Spanline Rig. To stow the spanline rig when it is not in use, proceed as follows:

1. Open riser valve.
2. Starting at the automatic coupling end, elevate the hose so that it drains back through its riser.
3. Close riser valve and uncouple hose from riser.
4. Flush clean the exterior of the hose rig with fresh water and allow to dry.
5. Disassemble hose rig into sections and assemblies of a size convenient to handle and stow.
6. Secure hose sections and assemblies in the designated stowage location.

4.12 AUXILIARY FUEL RIG (UNDER STREAM RIG)

The 2-1/2-inch (63.5 mm) hose can be rigged under the single or double STREAM rig. The rig is designed to transfer up to 300 GPM (1.14 m³/min) of F76, F44, bulk POL, or water. Once a hose has been used for one product, it must be dedicated to that product.

4.12.1 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 that 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. Before joining hose lengths, inspect each length per PMS procedures and replace damaged lengths.

The auxiliary hose rig is templated to fit under the supporting 7-inch (177.8 mm) hose rig and must therefore be constructed in accordance with paragraphs 3.9.1 or 4.9.1 up to the outboard riding line fitting. To the outboard end of the outboard riding line fitting connect the pigtail assembly as follows:

- One 15-foot (4.6 m) length of hose.
- Autotension disconnect.
- Adapter elbow, 90 degree.
- One 10-foot (3 m) length of hose.
- D-2 nozzle for fuel transfer.

Hose sections, each 4 feet (1.2 m) in length, shall be added to appropriate saddles to match the configuration of the supporting 7-inch (177.8 mm) hose rig as applicable.

4.12.2 Rigging the Hose Assembly. The auxiliary hose rig is suspended from the supporting 7-inch (177.8 mm) hose rig at the hose saddle points using two 3/4-inch (19.0 mm) safety anchor shackles and a 1/2-inch (13.0 mm) link. The hose pigtail shall be dressed per Figure 3-28.

4.12.3 Preparing the Auxiliary Hose Rig

1. The delivery and receiving ship preparations are in accordance with paragraphs 3.10.2, 3.11.2, or 4.9.2.
2. Also, on the receiving ship, connect a pendant assembly to a bulkhead padeye as close as possible to station centerline. The pendant is fabricated using 1-1/8-inch (28.5 mm) circumference nylon (MIL-R-17343) with 3/8-inch (9.5 mm) diameter oval thimbles (FF-T-276, Type II) on each end, length to suit the station. Shackle one end to the bulkhead padeye with a 3/4-inch (19.0 mm) safety anchor shackle. The other end is connected to the 1/2-inch (13.0 mm) special shackle on the 90-degree elbow adapter with a 3/4-inch (19.0 mm) screw pin shackle.

4.12.4 Passing the Auxiliary Hose Rig

1. Passing procedure is the same as for probe (see paragraph 3.10.3), double probe (see paragraph 3.11.3), or nontensioned (see paragraph 4.9.3) for delivery and receiving ships.
2. Also, on the receiving ship, cut the hose pigtail stops after the 7-inch (177.8 mm) hose is connected.
3. Disconnect the 90-degree elbow adapter from the probe carriage and connect it to the pendant assembly (see Figure 4-10). Dress the outboard hose from the auto disconnect coupling clear of any obstruction on the deck or bulwark.
4. Remove receiver adapter cover, if applicable, and connect the hose pigtail.
5. Open the valve on the D-2 nozzle.

4.12.5 Operating the Auxiliary Hose Rig. Operation of the rig is the same as in paragraph 3.10.4, 3.11.4, or 4.9.4 for delivery and receiving ships.

4.12.6 Retrieving the Auxiliary Hose Rig

(1) DELIVERY SHIP

1. Stop pumping.
2. Complete the blowdown/back suction and secure all valves. (See paragraph 3.9.1.6.)

(2) BOTH SHIPS

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

(3) RECEIVING SHIP

1. Close the fuel valve on the D-2 nozzle. Disconnect the hose from the riser and cap connection halves as appropriate.
2. Disconnect the 90-degree elbow adapter from the pendant and secure it onto the delivery carriage.
3. Secure the hose pigtail to the 7-inch (177.8 mm) hose rig as shown in Figure 3-28.
4. Follow the procedure outlined in paragraph 3.10.5, 3.11.5, or 4.9.5 as applicable.

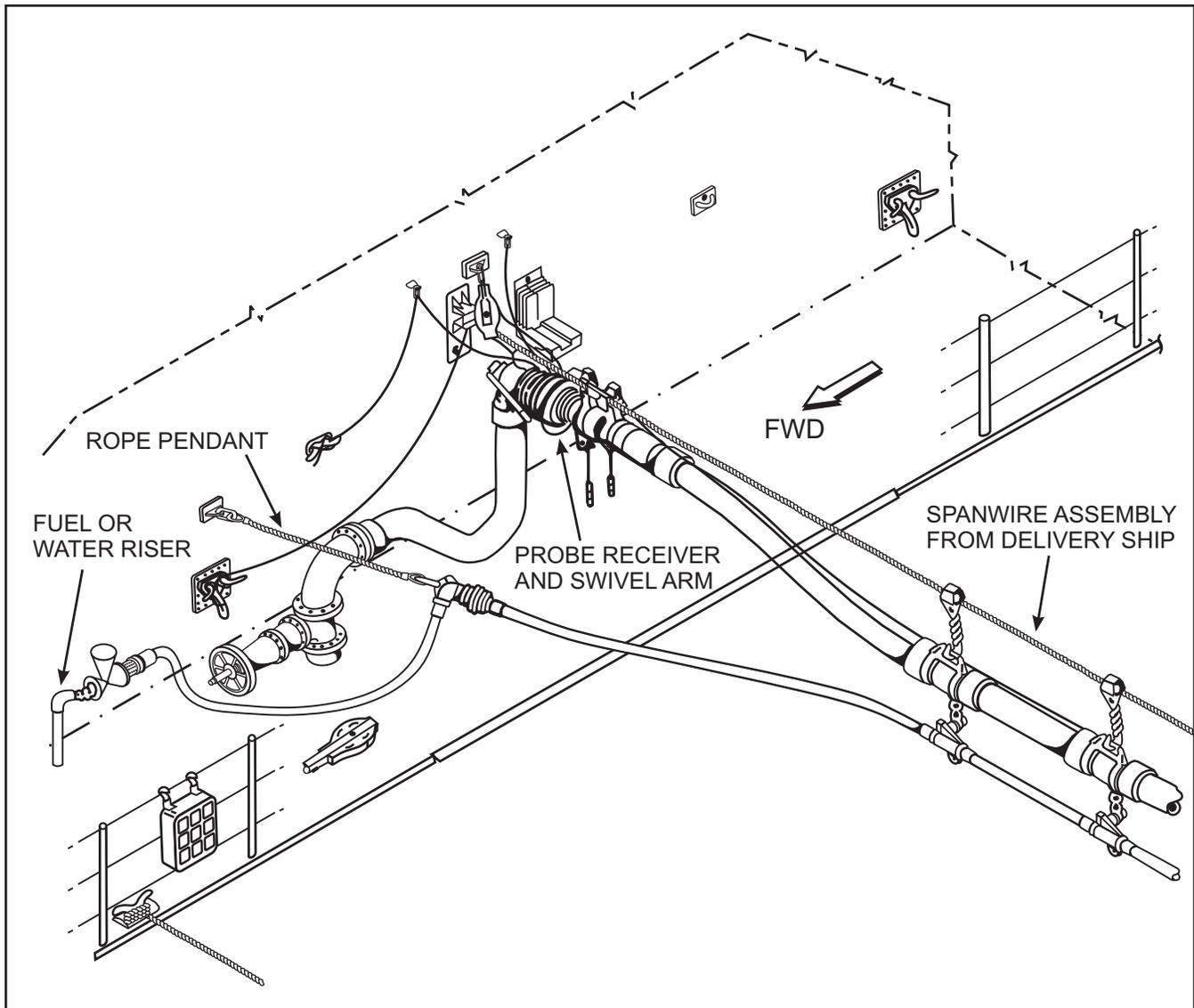


Figure 4-10. Auxiliary Fuel Rig (Under STREAM Rig) at Receiving Station

4.12.7 Accidental Disengagement

1. By design the probe rig and auxiliary hose rig will disengage if 2,500 lb (1,134 kg) or 500 lb (227 kg) respectively is induced to the hose at the receiver.
2. Cease pumping.

WARNING

- The deck may be wet as a result of the uncoupling.
- Wait until the force that caused the separation is no longer present.

3. Signal the delivery ship to ease out on the retriever whip.
4. Haul in on the remating line until the probe(s) engage.
5. Gaff the auxiliary hose if outboard and bring it aboard.
6. Vent the delivery hose at the automatic coupling by draining trapped fluid into a drip pan.
7. Connect the autotension coupling.
8. Stand clear and signal to resume pumping.

4.12.8 Emergency Breakaway for Auxiliary Hose Rig. Follow the procedures of paragraph 3.10.6, 3.11.6, or 4.9.6 as appropriate.

4.13 AIRCRAFT CARRIER-TO-ESCORT MODIFIED 240-FOOT (73.1 M) FUEL RIG

Refer to paragraph 3.12.

4.14 SPANWIRE CASUALTY FOR NONTENSIONED RIGS

Should the span wire 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.)

4.15 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 span wire, 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 span wire to recover the remainder of the hose.

4.16 SPECIAL PROCEDURES

Procedures to be followed during special fueling operations are presented in the following paragraphs.

4.16.1 Consolidation Between Oilers. Refer to paragraph 3.14.1.

4.16.2 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.

4.16.3 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.

4.16.4 Fueling Boats. Boats to be fueled must come alongside the delivery ship and tie 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.

4.16.5 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 that is not an oiler.

4.17 REFERENCES

ATP 16, Replenishment at Sea

Damage Control/Casualty Control Book

NAVSEA S9086-TK-STM-010/571, Naval Ships Technical Manual, Chapter 571, Underway Replenishment

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

NAVSEA 0955-LP-020-8010, Double-Probe Fueling System

NAVSEA S9571-A1-HBK-010, UNREP Station Capabilities Handbook

EQUIPMENT*	NONTENSIONED SPANWIRE RIG			CLOSE-IN RIG	SPAN-LINE RIG	REMARKS
	WITH PROBE	WITH ROBB COUPLING	WITH 2-1/2" (63.5 mm) AUX	WITH ROBB COUPLING	2-1/2" (63.5 mm)	
Adapter, Hose	(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 3.7.5)
Block, Fiber Rope	(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)	Size and type to suit station and rig
Block, Wire Rope (Yo-Yo) With Antitoppling Straps	1	1	1	—	—	To support inboard saddle
Bolo With Shot Line	2	2	2	2	2	(Note 2)
Cap, Hose; 4" (101.6 mm) or 2-1/2" (63.5 mm)	—	—	1	—	1	
Cap, Hose, Female Split Clamp 2-1/2" (63.5 mm)	—	—	(Note 3)	—	(Note 3)	
Clamp, Hose, Riding Line; 4" (101.6 mm)	—	—	1	—	1	
Clamp, Hose With Handles; 4" (101.6 mm)	—	—	1	—	1	
Clamp, Split, Hose 2-1/2" (63.5 mm)	—	—	(Note 1)	—	(Note 1)	
Clamp, Split, Hose Coupling Assembly, 7" (177.8 mm)	—	—	(Note 1)	—	(Note 1)	
Coupling, Hose, NATO Breakable-Spool — B End	—	—	—	—	—	To send to NATO ship or MSC ship with A-end of coupling
Coupling, Assembly Quick-Release 2-1/2" (63.5 mm)	—	—	1	—	1	

Figure 4-11. Fueling-at-Sea Hardware for Delivery Ship — One Station (Sheet 1 of 4)

EQUIPMENT*	NONTENSIONED SPANWIRE RIG			CLOSE-IN RIG	SPAN-LINE RIG	REMARKS
	WITH PROBE	WITH ROBB COUPLING	WITH 2-1/2" (63.5 mm) AUX	WITH ROBB COUPLING	2-1/2" (63.5 mm)	
Coupling, Hose, Split Clamp and Band; 7" (177.8 mm) 6" (152.4 mm) 4" (101.6 mm)	(Note 1)	(Note 1)	(Note 1)	(Note 1)	(Note 1)	
Crimper, Hose	1	1	1	1	1	
Crook, Hose	1	1	1	1	1	NAVSHIPS Std Plan 805-2554182
Elbow, 90° 2-1/2" (63.5 mm)	—	—	1	—	1	
End Fitting, Spanwire Non-Weak-Link; 3/4" (19.0 mm)	1	1	1	—	—	Preferred end fitting. Used when spanwire winch drum has a slip clutch (see paragraph 3.7.5)
End Fitting, Spanwire Non-Weak-Link; 7/8" (22.2 mm)	[1]	[1]	[1]	—	—	Preferred end fitting. Used when spanwire winch drum has a slip clutch (see paragraph 3.7.5)
End Fitting, Spanwire Weak-Link; 3/4" (19.0 mm)	1	1	1	—	—	Preferred end fitting (see paragraph 3.7.5)
End Fitting, Spanwire Weak-Link; 7/8" (22.2 mm)	[1]	[1]	[1]	—	—	Preferred end fitting (see paragraph 3.7.5)
Fitting, Riding Line, Flow-Thru 2-1/2" (63.5 mm)	—	—	2	—	2	
Gun, Line-Throwing NAVSEA SW-350-AL-MMO-010	1	1	1	1	1	(Note 2)
Hook, Pelican, 1/2" (12.7 mm)	2	3	(Note 1)	—	(Note 1)	
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)	Size and length to suit rig
Line, Messenger Return	1	1	1	1	1	

Figure 4-11. Fueling-at-Sea Hardware for Delivery Ship — One Station (Sheet 2 of 4)

EQUIPMENT*	NONTENSIONED SPANWIRE RIG			CLOSE-IN RIG	SPAN-LINE RIG	REMARKS
	WITH PROBE	WITH ROBB COUPLING	WITH 2-1/2" (63.5 mm) AUX	WITH ROBB COUPLING	2-1/2" (63.5 mm)	
Line, Saddle 3" (76.2 mm)	—	—	3	—	3	Nylon 300' (91.3 m)
Line, Spanline 4" (101.6 mm)	—	—	—	—	1	Double-Braided, Polyester 450' (137 m)
Line, Station-to-Station Phone	1	1	1	1	1	
Link, End	(Note 1)	(Note 1)	(Note 1)	(Note 1)	(Note 1)	Size to suit application
Link, Special (Probe Fueling)	—	—	—	—	—	Used with eye socket spanwire and fitting (see paragraph 3.7.5)
Link 1/2" dia (12.7 mm)	—	—	(Note 1)	—	(Note 1)	2-1/2" x 5" (63.5 mm x 127 mm)
Marker or Light Box	1	1	1	1	1	Transfer station
Messenger, STAR	1	1	1	1	1	
Messenger, Phone and Distance Line	1	1	1	1	1	Only for station nearest bridge when more than one station is rigged
O-Ring, Coupling, Hose	(Note 1)	(Note 1)	(Note 1)	(Note 1)	(Note 1)	
Paddles, Signal (Set) or Wands (Set)	1	1	1	1	1	
Pendant, Messenger Return Line	1	1	1	1	1	See paragraph 3.7.2.11
Phone, Sound-Powered	2	2	2	2	2	
Pins, Cotter, Steel	(Note 1)	(Note 1)	(Note 1)	(Note 1)	(Note 1)	Size and type to suit shackle
Plug, Hose, Male Split Clamp 2-1/2" (63.5 mm)	—	—	(Note 3)	—	(Note 3)	
Plug, Threaded 2-1/2" (63.5 mm)	—	—	1	—	1	
Preventer, Wire 3/4" (19.0 mm)	1	1	1	—	—	Rigged from yo-yo block to deck (length to suit application)
Probe, Double	—	—	—	—	—	Send to receiving ship with double- or single-probe receiver(s)

Figure 4-11. Fueling-at-Sea Hardware for Delivery Ship — One Station (Sheet 3 of 4)

EQUIPMENT*	NONTENSIONED SPANWIRE RIG			CLOSE-IN RIG	SPAN-LINE RIG	REMARKS
	WITH PROBE	WITH ROBB COUPLING	WITH 2-1/2" (63.5 mm) AUX	WITH ROBB COUPLING	2-1/2" (63.5 mm)	
Probe, Single	1	[1]	—	—	—	Send to receiving ship with double- or single-probe receiver(s)
Projectile, Gun Line With Shot Line	2	2	2	2	2	(Note 2)
Riding Line Fitting, Flow-Thru	2[4]	2[4]	2	2	2	Size to suit hose
Saddle, Hose, Flow-Thru — Type A	3[3]	3[3]	3	3	3	Size to suit hose
Saddle, Hose, Flow-Thru — Type B	[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)	Size to fit hose
Shackle, Safety or Screw Pin	(Note 1)	(Note 1)	(Note 1)	(Note 1)	(Note 1)	Size and type to suit application
Shackle, Special FAS	2	2	2	—	—	Used on riding line fittings
Tools, UNREP Working and Repair	1	1	1	1	1	See paragraph 2.3.9
Trolley, Free	—	3	4	—	—	
Trolley, Spanline	—	—	—	—	6	
Trolley, Spanwire	5	2	2	—	—	
U-Bolt, Assembly	—	—	1	—	—	
Wrench, Spanner 2" to 4-3/4" (50.8 to 120.6 mm)	1	1	1	1	1	
*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, or ship with aircraft on deck. 3. Ten required. Used to secure hose when hose is stowed.						

Figure 4-11. Fueling-at-Sea Hardware for Delivery Ship — One Station (Sheet 4 of 4)

EQUIPMENT*	NONTENSIONED SPANWIRE RIG			CLOSE-IN RIG	SPAN-LINE RIG	REMARKS
	WITH PROBE	WITH ROBB COUPLING	WITH 2-1/2" (63.5 mm) AUX	WITH ROBB COUPLING	2-1/2" (63.5 mm)	
Block, Snatch: 10" (254.0 mm) or 12" (304.8 mm)	(Note 1)	(Note 1)	(Note 1)	(Note 1)	(Note 1)	
Block, Snatch: 12" (304.8 mm) Rig 25 w/Upset Shackle	1	—	—	—	—	
Bolo w/Shot Line	2	2	2	2	2	(Note 2)
Coupling, Hose, NATO Breakable-Spool — A-End	—	1	—	1	—	NATO nation ship or MSC ship without probe receiver or Robb coupling
Coupling, Hose, Robb — Male End	[1]	1[2]	—	1	—	For rig with probe: station has single-probe receiver and two fuel risers
Gun, Line-Throwing NAVSEA SW350-AL-MMO-010	1	1	1	1	1	(Note 2)
Hose, Reinforced Wire; 7" (177.8 mm)	1[2]	—	—	—	—	For probe receiver to fuel piping
Line, B/B Phone/Distance Line	1	1	1	1	1	Only for station nearest bridge when more than one station is rigged
Line, Easing-Out	1	1	1	—	—	
Line, Riding	—	1	1	2	—	
Marker or Light Box, Transfer Station	1	1	1	1	1	
Paddles, Signal (Set) or Wands (Set)	1	1	1	1	1	
Phone, Sound-Powered	2	2	2	2	2	
Pins, Cotter, Steel	(Note 1)	(Note 1)	(Note 1)	(Note 1)	(Note 1)	Size and type to suit shackle and pelican hook (see Fig. 2-21).
Projectile, Gun Line With Shot Line	2	2	2	2	2	(Note 2)
Receiver for Single Probe	1	—	—	—	—	Receives single probe or upper probe of double probe

Figure 4-12. Fueling-at-Sea Hardware for Receiving Ship — One Station (Sheet 1 of 2)

EQUIPMENT*	NONTENSIONED SPANWIRE RIG			CLOSE-IN RIG	SPAN-LINE RIG	REMARKS
	WITH PROBE	WITH ROBB COUPLING	WITH 2-1/2" (63.5 mm) AUX	WITH ROBB COUPLING	2-1/2" (63.5 mm)	
Receiver for Double Probe	1	—	—	—	—	Receives single or double probe
Shackles, Screw Pin or Safety	(Note 1)	(Note 1)	(Note 1)	(Note 1)	(Note 1)	Size and type to suit application
Short Strap Assembly						(Note 3)
Tackle, Two-Fold	—	1	1	2	—	
Tools, UNREP Working and Repair (Set)	1	1	1	1	1	See paragraph 2.3.9
*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. Double-probe rig only; see NAVSEA Dwg. 803-2252873, Detail A.						

Figure 4-12. Fueling-at-Sea Hardware for Receiving Ship — One Station (Sheet 2 of 2)

CHAPTER 5

Liquid Cargo Transfer — Astern Fueling Method and Operations With Tankers

5.1 SCOPE

While replenishment ships do not normally conduct astern fueling, selected oilers and merchant tankers may have this capability. The astern hose can be delivered using a 6-inch (152.4 mm) hose reel rig or a 2-1/2-inch (63.5 mm) lay-on-deck hose rig. Some merchant tankers still use a 6-inch (152.4 mm) lay-on-deck hose rig. Each delivery system uses the float method of passing the rig to the receiving ship.

This chapter details the methods for transferring fuel between ships of the U.S. Navy using the astern method. It also covers the procedures employed when merchant tankers are used for underway replenishment of Navy ships. ATP 16 covers procedures employed when conducting FAS operations with ships of NATO nations.

5.2 DELIVERY SHIP CHARACTERISTICS

Refer to paragraph 3.2.

5.3 STANDARD HOSE RIGS

Refer to paragraph 3.4.

5.4 STATIC-TESTED LOADS

Refer to paragraph 3.5.

5.5 FUELING PREPARATIONS

Refer to paragraph 3.6.

5.6 BASIC ASTERN FUEL RIG EQUIPMENT

Paragraphs 5.6.1 through 5.6.6 describe major equipment used in astern fueling operations.

5.6.1 Wire Rope. Refer to paragraph 3.7.1.

5.6.2 Fiber Rope. Refer to paragraph 3.7.2.

5.6.3 Hose and Fittings. The hose and fittings used in FAS rigs are in accordance with the paragraphs below.

5.6.3.1 Fuel Transfer Hose (MILSPEC MIL-H-22240). Fuel transfer hose is lightweight and nonrigid (collapsible). There are two different types.

1. 6-inch (152.4 mm) astern fuel delivery hose is used in either the lay-on-deck rig or astern reel rig. Standard issue length for lay-on-deck rigs is 50 feet (15.2 m); it is 750 feet (228.6 m) for astern reels.
2. 2-1/2-inch (63.5 mm) astern fuel delivery hose is used in the 2-1/2-inch (63.5 mm) lay-on-deck astern rig. Standard issue length is 50 feet (15.2 m). Virgin, 2-1/2-inch (63.5 mm), astern fuel delivery hose, from stock, can be used for either F76, F44, or water transfer. After the first transfer of a product, the hose takes on the product's identity. The hose can only be used for that product for all following transfers. Ship's force must stencil on each hose at each end the product that can be transferred with the hose.



Once a hose has been used for a product (fuel or water), do not use it for any other product. Using a hose for a different product than that for which it was first used may contaminate fuel or water tanks.

5.6.3.2 Hose Couplings (MILSPEC MIL-C-24356). Refer to paragraph 3.7.3.3.

5.6.3.3 Riding Line Fittings (Flow-Through). Refer to paragraph 3.7.3.4.

5.6.4 Fueling Couplings. A variety of fueling couplings are required to provide for compatibility of the delivery and receiving ships.

1. Combined quick-release coupling and valve (Robb coupling) — Refer to paragraph 3.7.4.3.
2. Breakable-spool, NATO quick-release coupling — Refer to paragraph 3.7.4.4.
3. Quick-release coupling, 2-1/2 inch (63.5 mm) — Refer to paragraph 3.7.4.5.
4. Type D-2 nozzle and receiver — Refer to paragraph 3.7.4.6.

5.6.5 Miscellaneous Fittings. Refer to paragraph 3.7.6.

5.7 ASTERN FUELING RIGS

In the astern method of fueling, the delivery ship streams a single-hose rig and the receiving ship maintains station astern and outboard of the delivery ship while receiving fuel. Because of an astern fuel rig's characteristics during streaming, no attempt should be made to receive the rig at an after station. 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.

Figure 5-1 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.

5.7.1 Communications. Basic communication and rendezvous procedures will be conducted as outlined in paragraph 5.8.2. (Sound-powered phones 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 5-2. Signal flags made of 3-foot (91.4 cm) squares of bunting of the designated color shall be used at both stations for day operations. Wands or appropriate colored-lens flashlights shall be used for night operations.

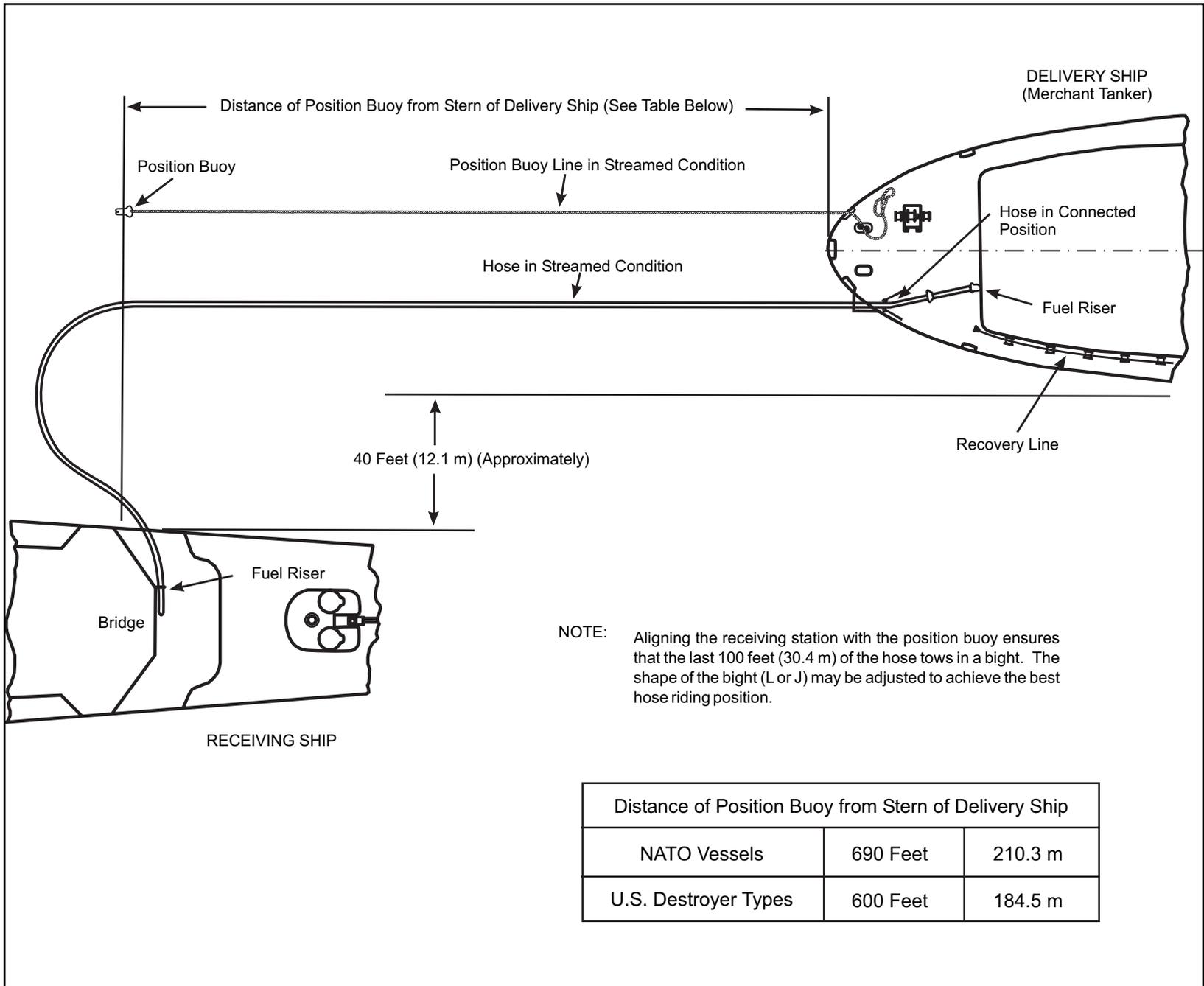
5.7.2 Maneuvering

1. The fueling course and speed will be determined by the OTC. Variations in speed assume more importance than steering a steady course when fueling astern. 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. Before sending the astern fueling rig, the delivery speed should be agreed to and the sending ship should maintain a constant speed. Any speed adjustments will be made by the receiving ship.

2. In all cases, it is the responsibility of the delivery ship to maintain a steady course and speed as prescribed by the OTC. The receiving ship being fueled is responsible for adjusting her course and speed to maintain correct station.
3. During the fuel transfer phase of astern fueling, the receiving ship maintains a safe distance astern of the delivery ship by station-keeping on a position buoy that is towed astern and outboard. At that time, the receiving ship's horizontal position is ideally about 40 feet (12.1 m) outboard of a line extended aft from the delivery ship's beam (see Figure 5-1). 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.
4. It is the responsibility of the delivery ship to keep the receiving ship informed of any alteration 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 accomplishing each step in 5° increments.
 - a. When the OTC signals to alter course 20°, the delivery ship will:
 - (1) Indicate commencement of each 5° increment by waving a signal flag/paddle (red for port turns, green for starboard turns) in a *circular* motion above the head.
 - (2) Hold the flag/paddle *steady* while the ship is swinging to the new course.
 - (3) Wave the flag/paddle *up and down* when steady on each new 5° increment.
 - (4) Hold the flag/paddle in a *horizontal* position, arm outstretched, on completion of the last 5° increment.
 - b. The commanding officer of the receiving ship will execute similar signals to indicate the movement of his ship. During the course change, the receiving ship will maintain her

Figure 5-1. Typical Astern Fueling Station Keeping (6-Inch (152.4 mm) Rig)



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 down hose.	Pumping or blowing down has stopped.
White Flag	Amber Light	Blow down the hose.	Blowing down started.

Figure 5-2. Control Signals for Astern Fueling

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.

- Alterations in speed by the delivery ship should be made in increments of 1 knot; before making speed changes, the delivery ship shall inform the receiving ship of the new speed. The receiving ship keeps accurate station by keeping her bridge abreast of a marker buoy towed by the delivery ship and by staying about 40 feet (12.1 m) clear of the wake.

5.7.3 Merchant Tanker Astern Refueling of Escort Ships. U.S. flag tankers are currently configured with an astern fueling capability. This capability will provide a more readily available means of refueling escort ships. Concepts common to both delivery and receiving ships, such as communications, emergency breakaway, safety, and maneuvering are described in Chapter 2. Equipment necessary for receiving ships to refuel by the astern method are detailed in Chapter 3. Details of delivery and receiving ship rigging, streaming the rig, and recovering the rig are described below.

The following is required on station (both ships) — in addition to the tools listed in paragraph 2.3.9:

- Signal flags (3-foot (91.4 cm) squares of bunting) for daytime use: 1 each — red, green, and white
- Signal wands (or flashlights with cone fixtures): 1 each — red, green, and amber
- Sledge hammer (for use on the breakable-spool coupling during emergency breakaway)

- Socket wrench and 1-1/2-inch (38.1 mm) socket (for the air valve in the conical cap on the hose end fitting)
- Oil drip pan to catch spillage
- Rags or fiber waste.

The master is responsible for ensuring that the tanker is ready in all respects for refueling operations. Use Figure 5-29 at the end of the chapter as a guide for items to be checked. Figure 5-30 at the end of the chapter is a list of minimum loose hardware requirements for each refueling station.

5.7.4 Delivery Ship System Description — Reelable Astern Rig. The reelable astern fueling rig, installed on the fantail (normally starboard side) in selected merchant tankers, allows naval escort ships to be refueled while underway using the tanker's astern fueling capability. The delivery ship passes a 6-inch (152. mm) hose rig to the receiving ship maintaining position 600 feet (184.5 m) astern. See Figure 5-1. Details of the streaming procedure are provided in the following paragraphs.

The fueling hose reel contains 750 feet (228.6 m) of 6-inch (152.4 mm) inside diameter hose. The rated hauling load of the hose reel is 12,000 lb (5,443 kg) and rated speeds in paying out and hauling in are 60 feet (18.3 m) per minute in slow speed and 120 feet (36.6 m) in fast speed. Maximum fuel delivery rate is 120,000 gallons per hour (454.2 m³ per hour).

FAS operations with the reelable astern fueling rig should be carried out at ship speeds up to 13 knots.

5.7.4.1 Astern Fueling Hose Reel Assembly. The reelable astern fueling rig consists of the fueling hose reel assembly, the fueling hose assembly, the pig

launcher assembly, piping and associated rigging, and accessories. The major components of the astern fueling hose reel assembly are shown in Figures 5-3 and 5-4.

5.7.4.2 Fueling Hose Assembly. The fueling hose assembly is 750 feet (228.6 m) of 6-inch (152.4 mm) inside diameter hose with a male or female coupling installed on each end. The female coupling connects the hose to the gooseneck on the drum and shaft assembly of the reel. The male coupling connects the hose to the female end of the securing adapter (see Figure 5-5).

5.7.4.3 Conical Cap, Hose Messenger Bridle, Securing Adapter, NATO Coupling, and Hose End Assembly. The 6-inch (152.4 mm) fuel hose 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 5-6). One end of the messenger bridle is attached to the conical cap's outboard end (Figure 5-7). The other end of the messenger bridle is attached to the securing adapter, using a securing adapter clamp (Figure 5-5). The inboard end is fitted with an inboard conical cap for attachment of the forward recovery wire (Figure 5-5).

5.7.4.4 Hose Messenger and Position Buoy Assemblies. The delivery ship provides a messenger that consists of 310 feet (94.4 m) of 1-inch (25.4 mm), double-braided, nylon rope (Figure 5-8). 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 inboard end of the hose is attached to the reelable astern hose on the reel.

The delivery ship also provides a position buoy line that consists of 800 feet (243.8 m) of 3/8-inch (9.5 mm) wire rope (Figure 5-8). 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.

The physical configuration of the buoys (floats) varies with the manufacturer. The most recent version is a cylinder with an inner core of polyethylene foam and an outer skin of orange-colored polyurethane elastomer. When rigged, the float pendant is connected to one of the rings of the float. Additional rings are provided on the outside of the float for attachment of blue chemical lights if required.

5.7.4.5 Refueling Station Preparation

1. Establish communications with the bridge and cargo control.

2. Ensure that station flags (or appropriate colored-lens flashlights for night operations) are ready for use at the station (see Appendix C and Figure 5-2).

5.7.4.6 Rigging the Delivery Ship

1. Remove the conical cap from the NATO coupling. Verify that the pig catcher (see Figure 5-6) is installed in the coupling and that the sealing flange gasket is in place. Re-install the conical cap and secure it with drop bolts.
2. Inspect the outboard hose assembly. Ensure the hose has no cracks or breaks and hose couplings are not damaged.
3. Ensure the securing adapter clamp is properly secured to the securing adapter and CRES cotter pins are installed in the drop bolt and hinge pin (see Figure 5-5).
4. Inspect and rig the hose messenger bridle assembly as follows:
 - a. Lay out the assembly on deck and inspect the wire ropes, chain, and fittings for any breaks or deformation.
 - b. Connect the bridle sling's wire rope sockets to the securing adapter clamp (see Figure 5-5).
 - c. Ensure CRES cotter pins are properly installed in the socket pins.
 - d. Connect the shackle or jaw-end swivel to the conical cap padeye.
 - e. Ensure the CRES cotter pin is properly installed in the swivel pin.
5. Inspect and rig the hose messenger as follows:
 - a. Inspect the nylon messenger assembly, grapnel, and fittings for any breaks, chafing, or deformation (see Figure 5-8).
 - b. Using a 5/8-inch (15.9 mm) safety anchor shackle, connect the messenger soft eye splice to the hose messenger bridle assembly at the pear-shaped link.
 - c. Ensure the CRES cotter pin is properly installed in the shackle bolt.

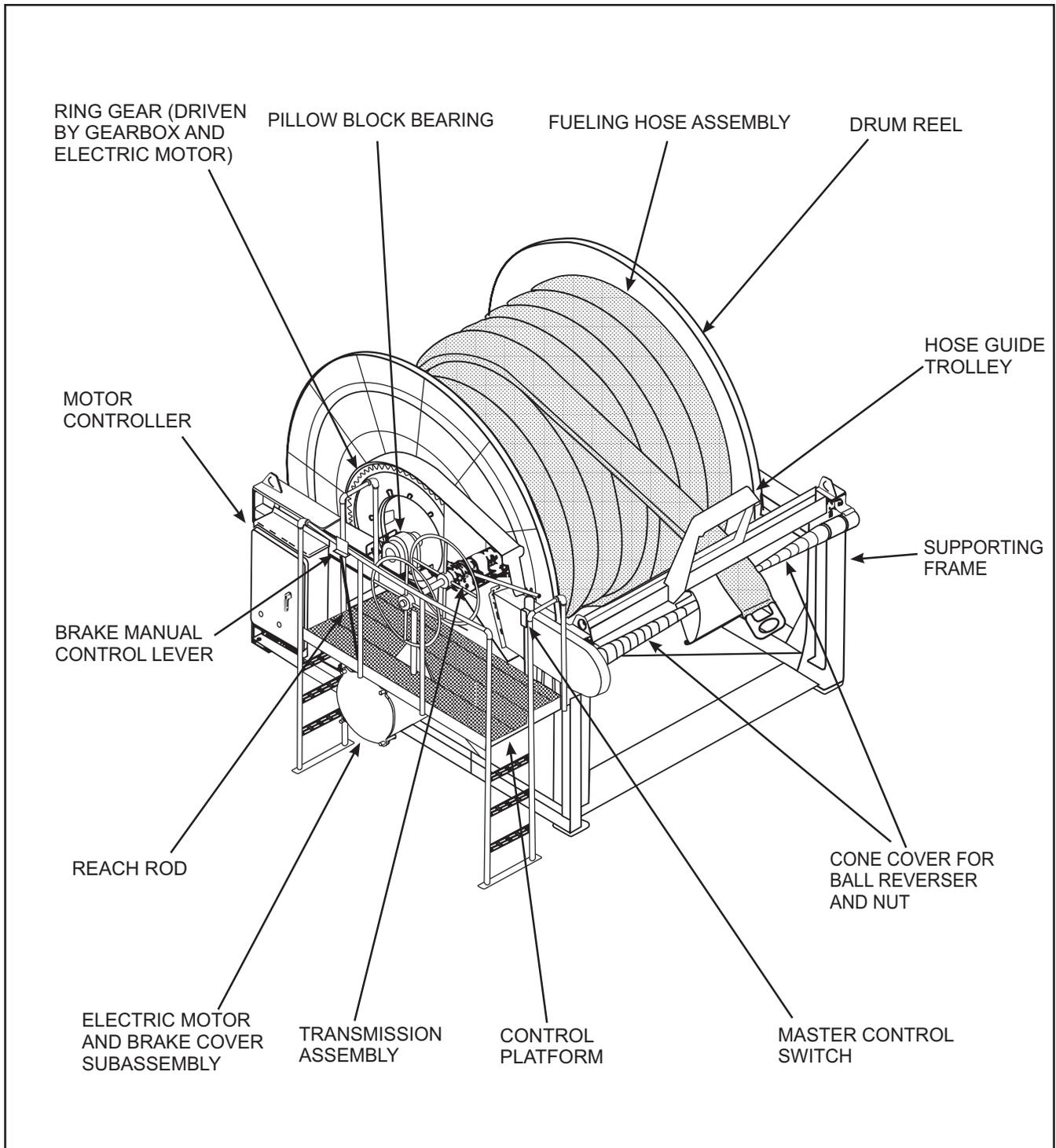


Figure 5-3. Astern Refueling Hose Reel Assembly (View A)

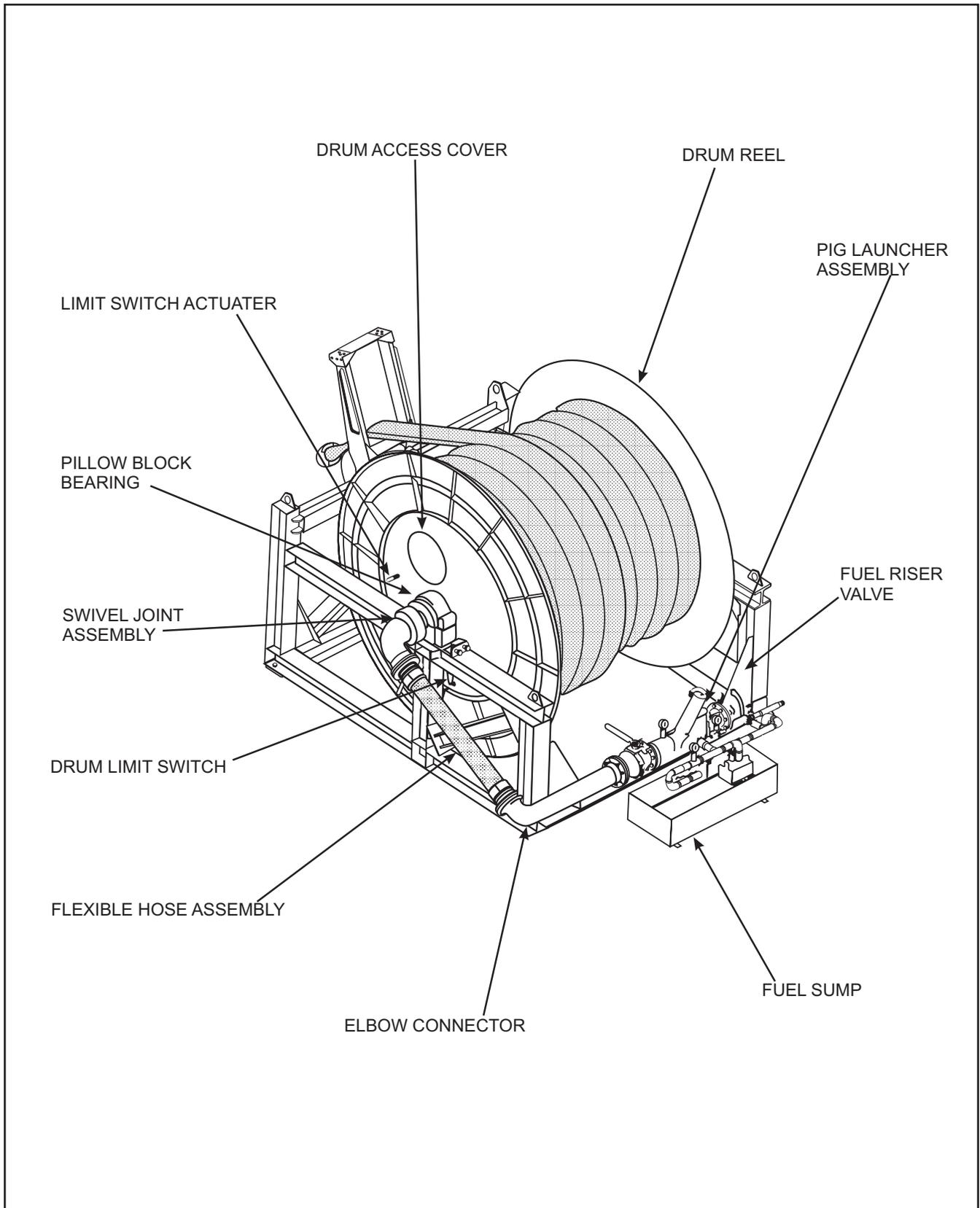


Figure 5-4. Astern Refueling Hose Reel Assembly (View B)

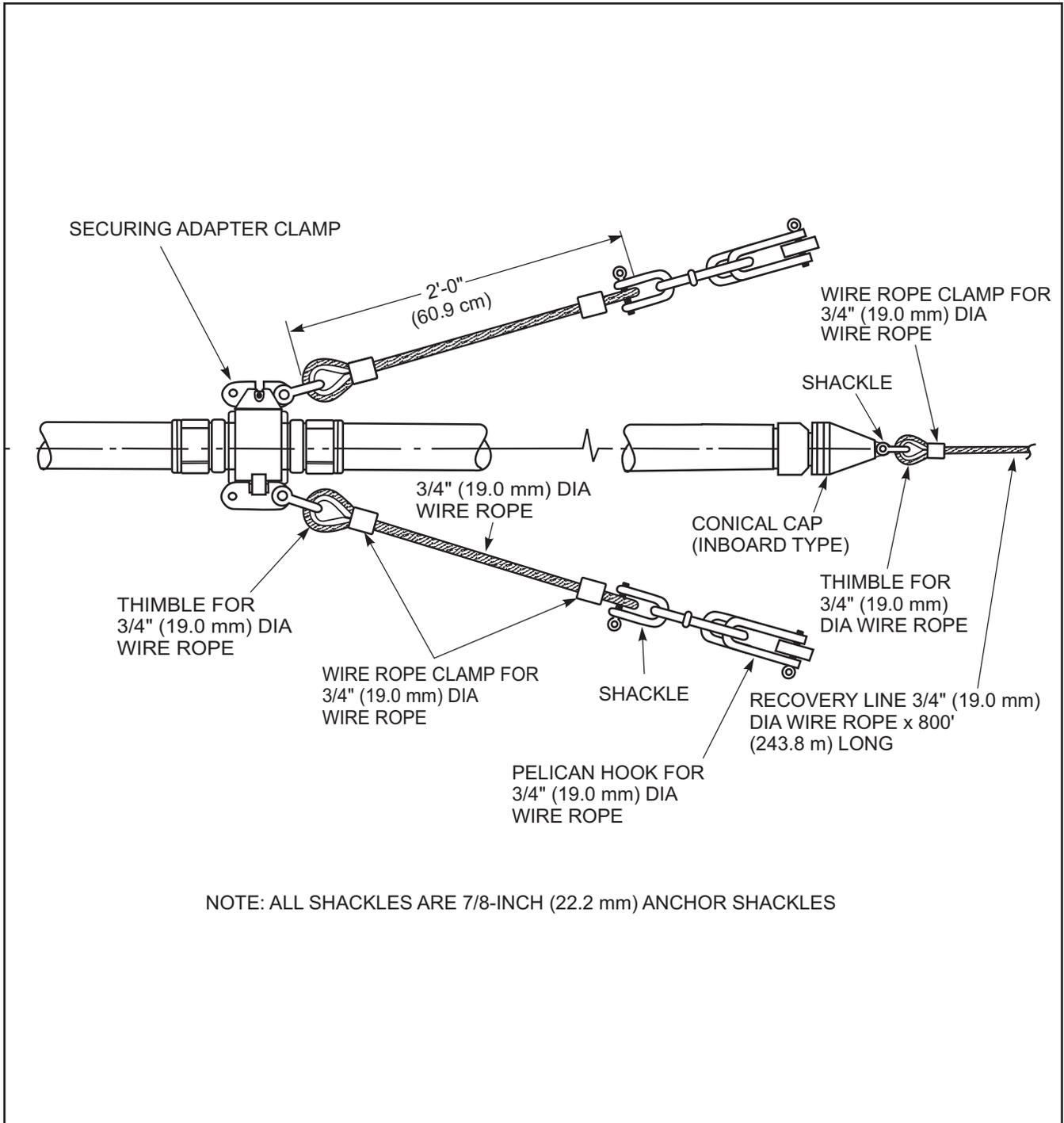


Figure 5-5. Hose Securing Pendant and Adapter

- d. Pass the outboard end of the hose messenger through the stern roller (see Figure 5-9) and back on deck over the life rail.
 - e. Connect the messenger swivel hook (see Figure 5-5) to the grapnel using a second 5/8-inch (15.9 mm) safety anchor shackle.
 - f. Connect the float pendant to the grapnel and hose messenger buoy.
 - g. During night operations, attach blue chemical lights to the buoy.
 - h. Fake down the remainder of the messenger for free running through the stern roller, or wind it on the hose reel in advance of paying it out.
6. Inspect and rig the position buoy as follows:
- a. Inspect the position buoy line wire rope for any breaks (see Figure 5-8).
 - b. Pass the outboard end of the position buoy line through the port side stern chock and fairleads and back on deck over the life rail.

- c. Attach the position buoy line to the buoy using a 1/2-inch (12.7 mm) safety anchor shackle.
- d. Fake down the inboard end near the gypsy.
- e. During night operations, attach blue chemical lights to the buoy.

5.7.4.7 Streaming the Rig

1. Ease the position buoy (see Figure 5-9) over the stern (port side) and pay out while tending the line on the gypsy winch. The final distance of buoy from stern of ship, unless varied for the configuration of the receiving ship, will be about 750 feet (228.6 m). If necessary, stop off the inboard end and take it to a cleat to free the gypsy.
2. Ease the hose messenger buoy over the stern (starboard side) and pay out while tending the line. If the messenger is not wound up on the reel, use the gypsy to ease it out.
3. Move the master control switch handle to the OUTHAUL SLOW position and pay out the hose rig. Switch to OUTHAUL FAST upon direction.

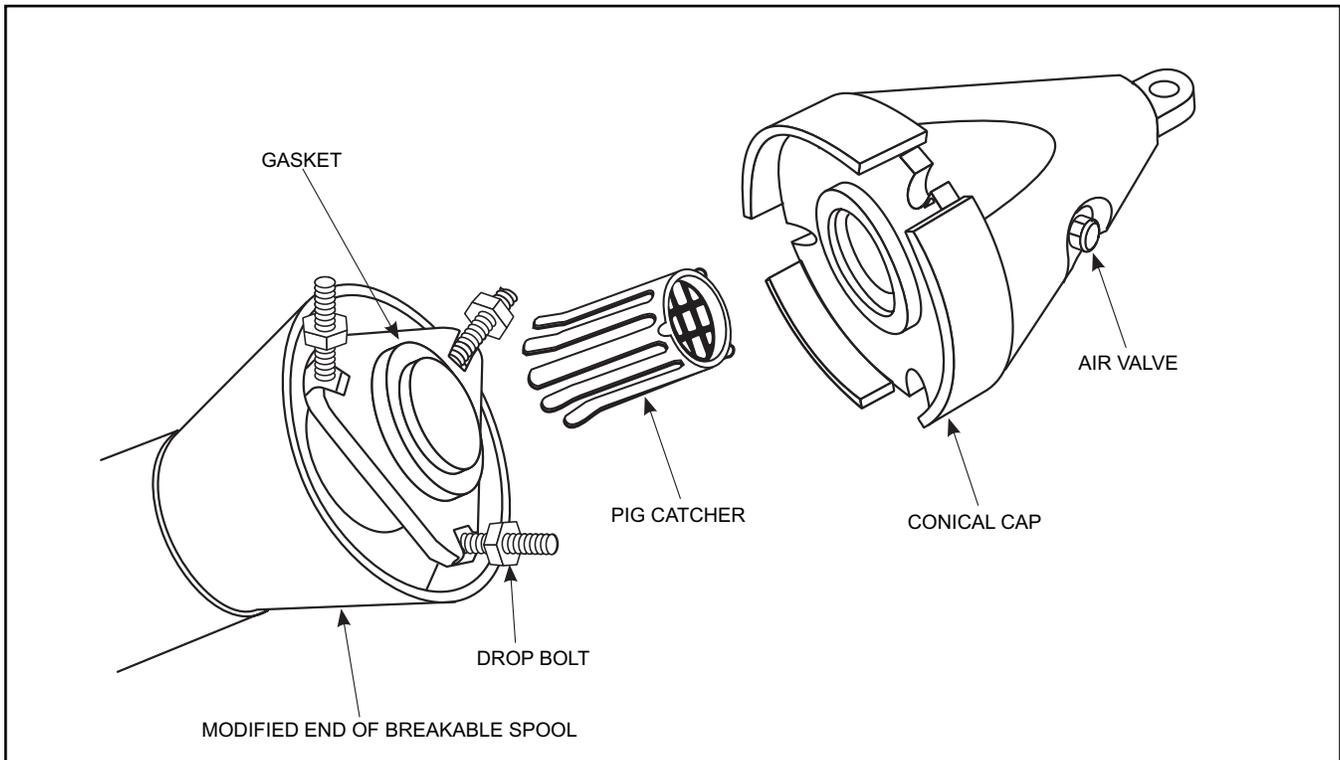


Figure 5-6. Hose End (Outboard) Conical Cap Assembly

Figure 5-7. Float Assembly, Hose Messenger, and Hose Bridle Assembly

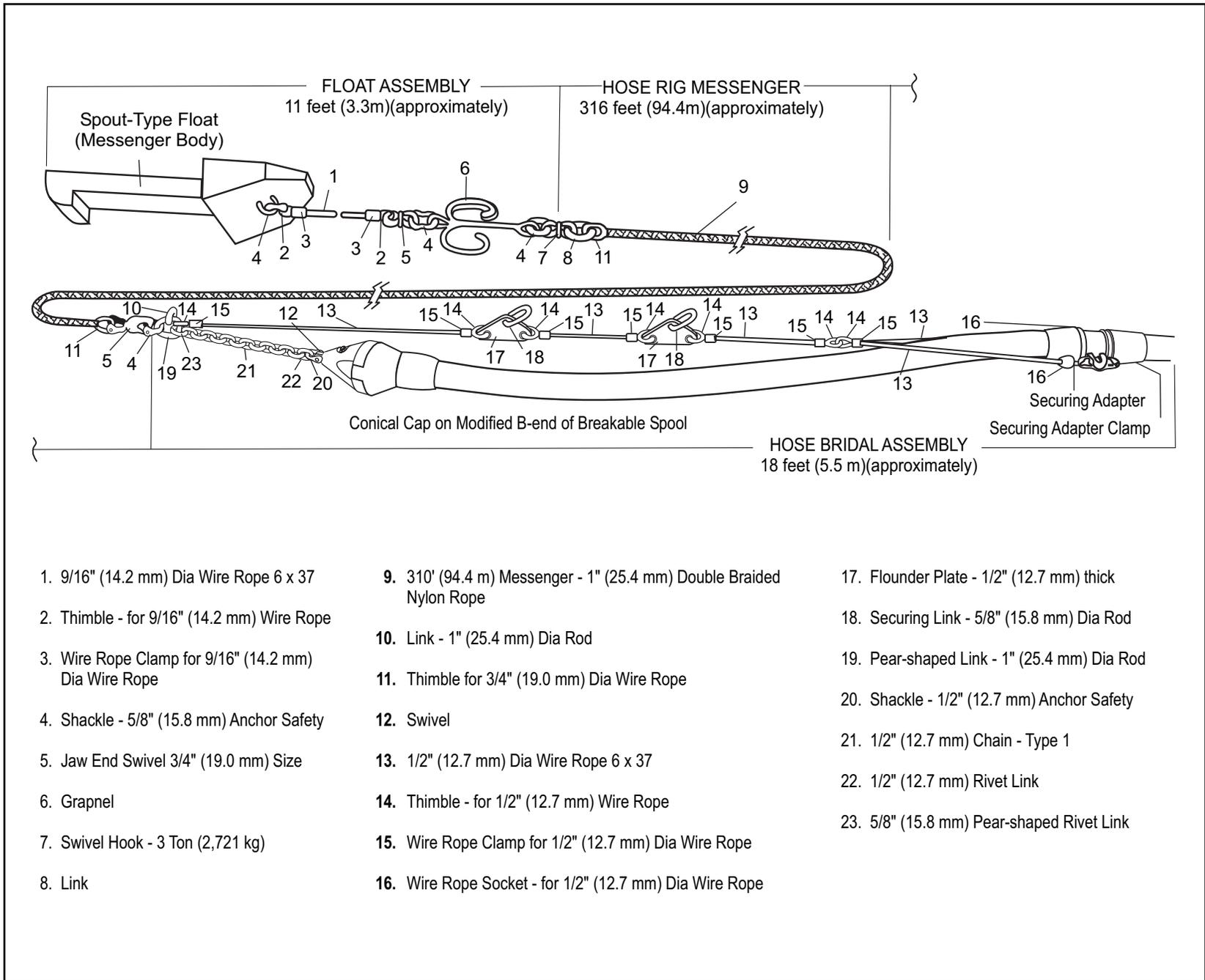
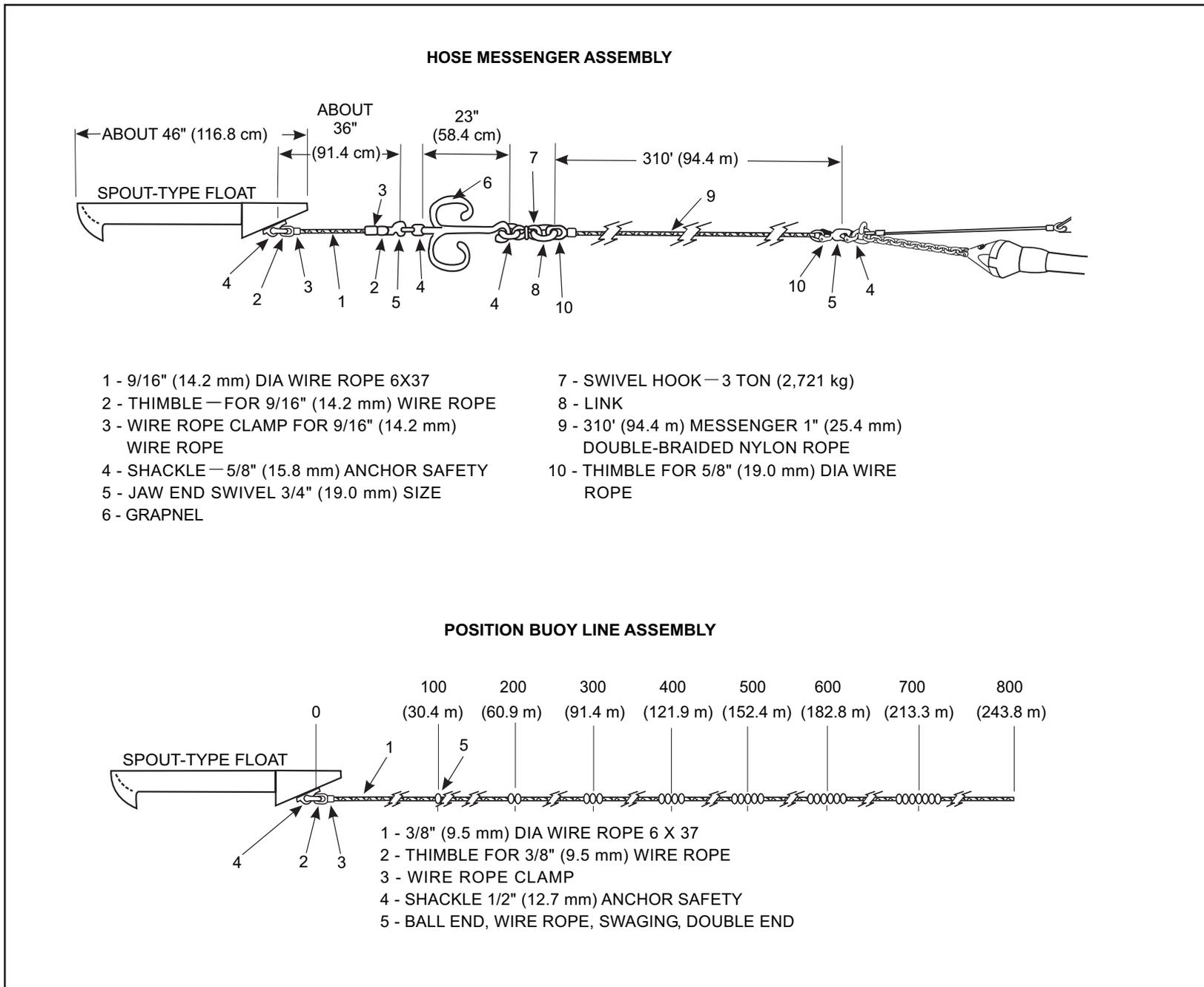


Figure 5-8. Hose Messenger and Position Buoy Assemblies



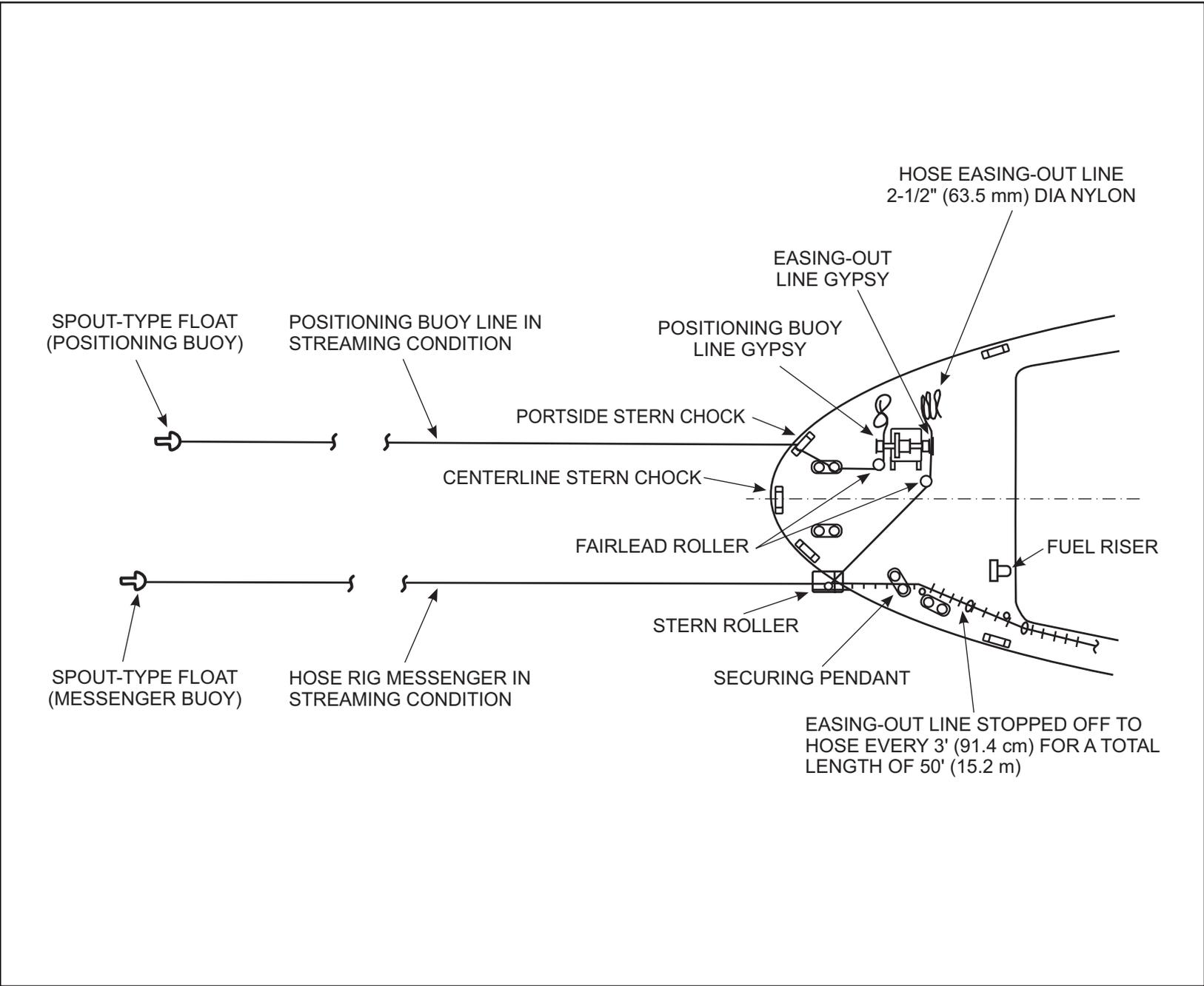


Figure 5-9. Easing Hose Through Stern Roller

4. Before the last few wraps of the hose come off the reel, switch to the OUTHAUL SLOW position.

Note

As the last wrap of the hose comes off the drum reel, the drum limit switch contacts open; the electric motor stops and the magnetic brake sets.

5. After the brake sets, move the operating mode handle to the INHAUL MANUAL position. The spring-loaded pawl will engage and relieve the load on the brake.

5.7.4.8 Transferring Fuel

1. Upon signal from the receiving ship to “Start pumping,” open the red fuel riser valve (9, Figure 5-10).
2. Commence pumping and signal the receiving ship: “Pumping started.”
3. Upon signal from the receiving ship to “Stop pumping,” stop pumping and close the red fuel riser valve.
4. Signal the receiving ship: “Pumping has stopped.”

5.7.4.9 Blowthrough. If more than one ship is to be fueled before retrieving the rig, blow through the fuel hose rig with air only (i.e., without the pig). A blowthrough with air normally takes only 5 to 10 minutes.

1. Upon signal from the receiving ship to start blowthrough, align the pig launcher valves for blowthrough with the pig as follows (see Figure 5-10):
 - a. Open the black valve (10) for about 15 seconds to clear fuel oil from the pig launcher; then close the black valve (10) and the green valve (8).
 - b. Slowly open the yellow valve (11) to relieve any pressure in the launcher.
 - c. Observe the white pressure gauge (5). When the gauge shows zero psi, close the yellow valve (11) and open the pig launcher cap (1).
 - d. Insert the pig; close and secure the cap.
 - e. Fully open the green valve (8) and the black valve (10).
2. Signal the receiving ship: “Blowthrough has started.”

3. Observe the white pressure gauge (5).

Note

The pressure on gauge (5) will remain fairly constant as the pig travels through the hose. Actual pressure indicated depends on ship’s service air pressure and the elevation of the fuel riser on the receiving ship. When the pig enters the pig catcher, the air in the hose will vent past the pig and the pressure on gauge (5) will start to drop.

4. When hose pressure drops and then holds steady, close the black valve (10).
5. Slowly open the yellow valve (11); allow pressure to drop to zero.
6. Signal the receiving ship: “Blowthrough has stopped.”

5.7.4.10 Retrieving the Rig. After the receiving ship has disconnected the rig and all lines are clear:

1. Align the pig launcher valves for rig retrieval as follows (Figure 5-10):
 - a. Close the yellow valve.
 - b. Open the blue valve.
 - c. Open the black valve until the relief valve starts dumping air (about 6 psi (41 kPa) on the pressure gauge), then close the black valve.
2. Signal the reel operator to haul in the hose rig. As the hose is reeled in, air will dump over the relief valve.
3. Move the operating mode handle to the POWER MODE position.
4. Move the master control switch handle to the INHAUL SLOW position and haul in the hose rig. Switch to INHAUL FAST upon direction of the rig captain.

Note

As the final 100 feet (30.48 m) of the hose is being retrieved, operate the reel at slow speed to prevent damage to equipment or injury of personnel while the outboard hose assembly and bridle messenger are hauled on board.

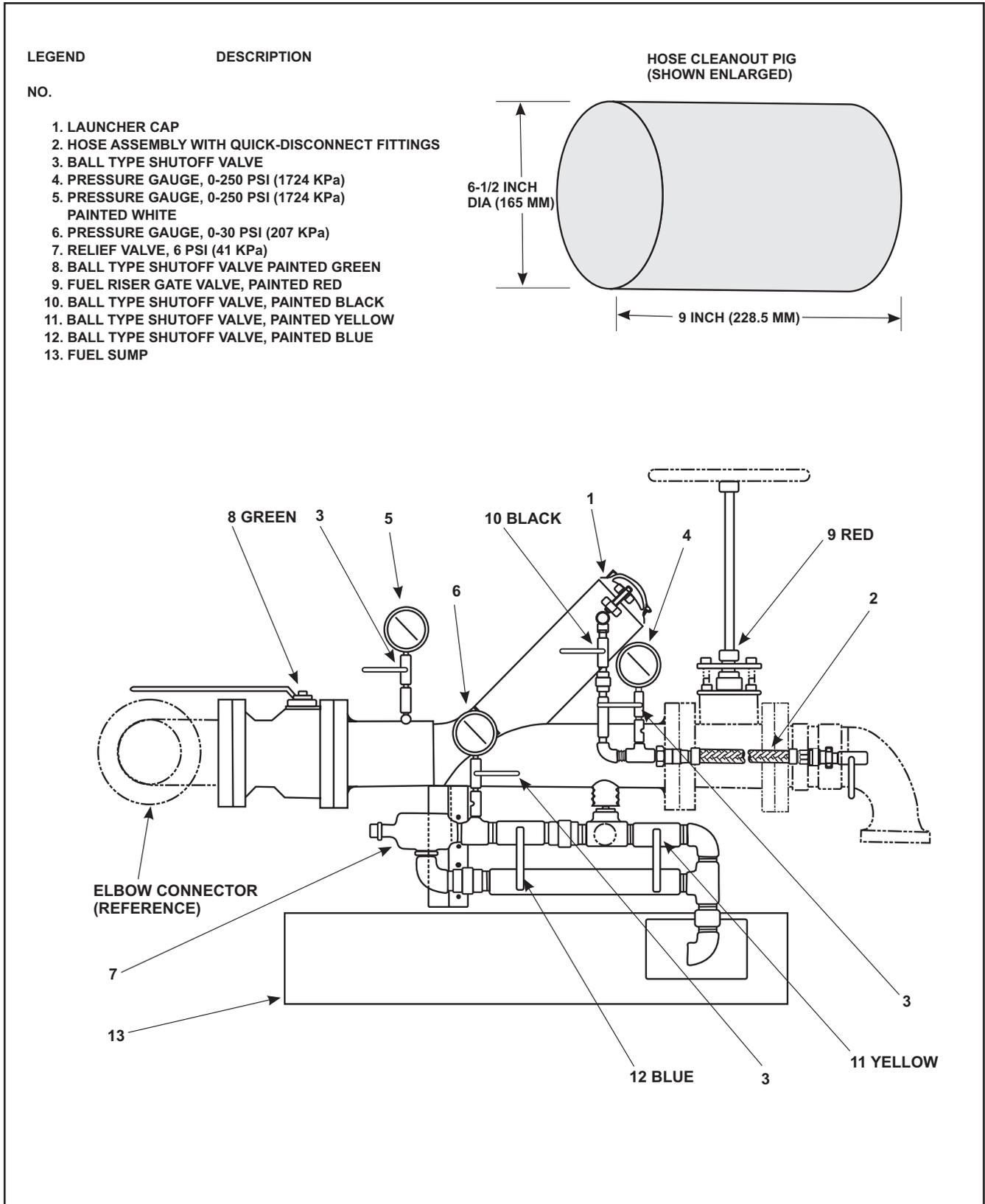


Figure 5-10. Pig Launcher Assembly and Hose Cleanout Pig

5. Move the master control switch handle to IN-HAUL SLOW position. Carefully haul the outboard hose assembly on board, then move the master control switch handle to the OFF position.
6. Retrieve the hose messenger and buoy on the reel or on deck.
7. Retrieve the position line and buoy using the gypsy winch.
8. See the maintenance manual for emergency operation of the hose rig and post-operational procedures.

5.7.4.11 Communications Required in Delivery Ship

1. Between stern and forward winch operator
2. Between stern and bridge
3. Between stern and pumphoom
4. Between bridge and pumphoom.

5.7.5 Delivery Ship System Description — Lay-On-Deck Rig. The delivery ship passes a 6-inch (152.4 mm) hose rig to the receiving ship maintaining position 600 feet (184.5 m) astern. See Figure 5-1. Details of the streaming procedure are provided in the paragraphs below.

5.7.5.1 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 5-11 shows the hose assembly. Total length of all three flights is 745 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.

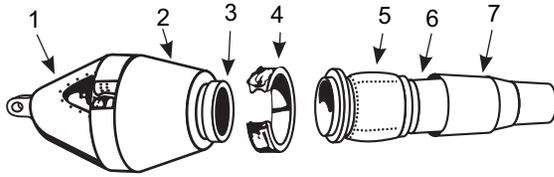
5.7.5.2 Conical Cap, Messenger Bridle, Securing Adapter, NATO Coupling, and Hose End Assembly. Refer to Figures 5-5, 5-6, and 5-7. Rigging is the same as described in paragraph 5.7.4.3, except that the modified B-end of the breakable-spool is fitted on the outboard end of Flight 1. Each end of Flights 2 and 3 is fitted with protective caps to prevent any contamination of the hose's interior from an exterior source.

5.7.5.3 Messenger and Position Buoy Assemblies. Refer to Figure 5-8. These assemblies are described in paragraph 5.7.4.4.

5.7.5.4 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 5-6). 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.

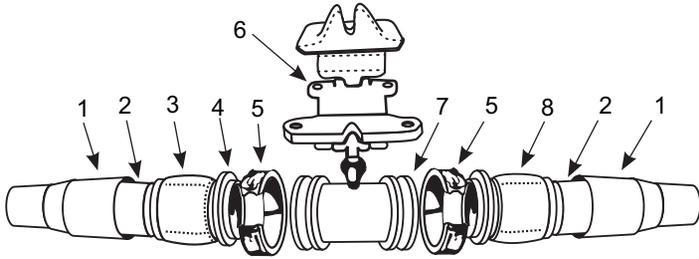
The stern of the delivery ship is fitted with a closed stern roller (Figure 5-12). A fairlead block, strapped to the top of the stern roller and in line with the hose, provides a fairlead for the easing-out messenger. The easing-out line is 2-1/2-inch (63.5 mm) nylon. Various blocks provide a fairlead for the easing-out messenger to the gypsy head of a stern winch (Figure 5-12).

DETAIL: MODIFIED BREAKABLE SPOOL ATTACHMENT



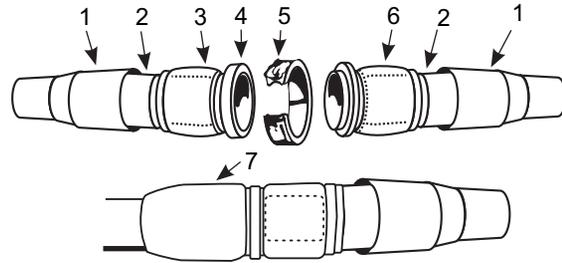
1. CONICAL CAP
2. MODIFIED B-END OF BREAKABLE SPOOL
3. "O" RING
4. SPLIT CLAMP
5. SEGMENTED MALE HOSE COUPLING
6. 6-INCH (152.4 mm) HOSE
7. PROTECTIVE JACKET

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

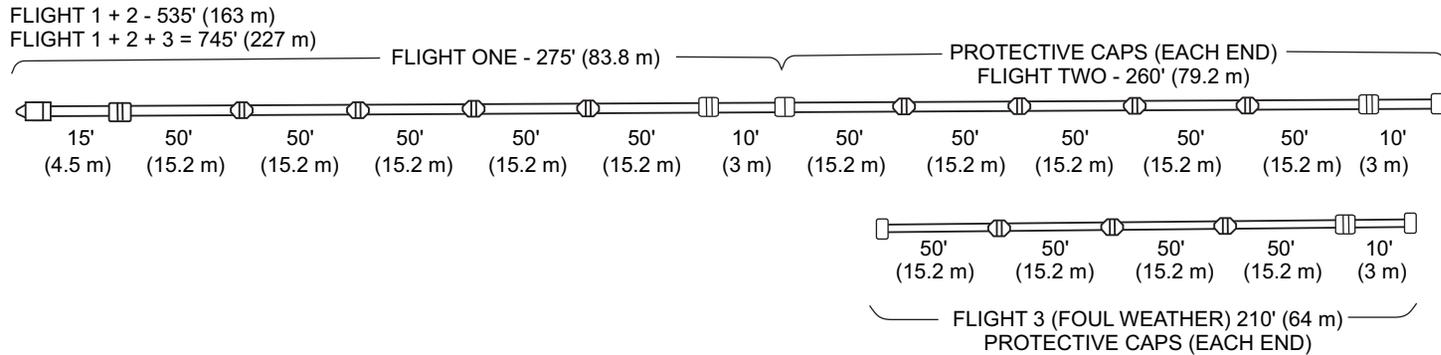


Figure 5-11. Astern Refueling Hose Assembly (Merchant Tanker)

A fuel oil riser, located on the stern, is fitted with a gate valve for controlling fuel flow and with 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.

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.

5.7.5.5 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 (9.1 to 15.2 m). Fake down the other end near the gypsy. (See Figure 5-12.)
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 5-9.)
3. Pass the outboard end of the 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 5-12.)
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.

5.7.5.6 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 5-9), 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 the 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.

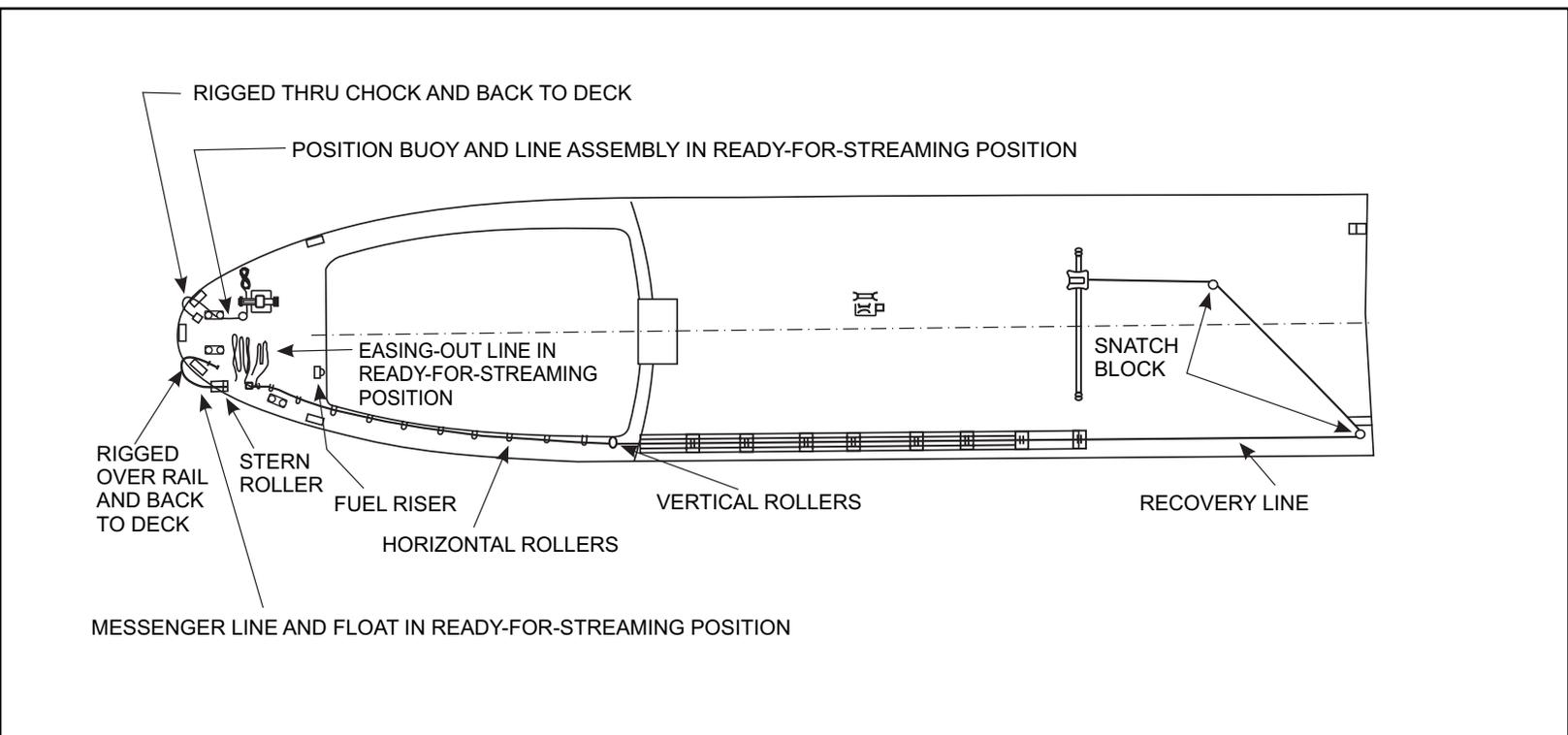


Figure 5-12. Delivery Ship Rigged for Streaming 6-Inch (152.4 mm) Astern Fuel Rig

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 to receive receiving ship's signal: "Commence pumping."
14. On signal, open fuel riser valve and commence pumping.

5.7.5.7 Retrieving the Rig

1. Stand by to receive receiving ship's signal: "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.

5.7.6 Receiving Ship Description — Float Method

5.7.6.1 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 5-13).
3. Install the A-end of the breakable-spool coupling on the adapter (Figure 5-13).
4. Shackle a 12-inch (30.5 cm) snatch block to the messenger fairlead padeye, using an upset safety shackle. This will be used as the *messenger fairlead block* (Figure 5-13). Fairlead the messenger to power when available.
5. Shackle a 12-inch (30.5 cm) 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 the *inhaul/retaining line fairlead block* (Figure 5-13).
6. The *inhaul/retaining line* is 4-inch (101.6 mm) manila line, 50 feet (15.2 m) long. One end of the line has a thimble eye spliced to the eye of a 7-ton safety hook. A bight of the line at the hook end is inserted in the inhaul block (Figure 5-13).
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

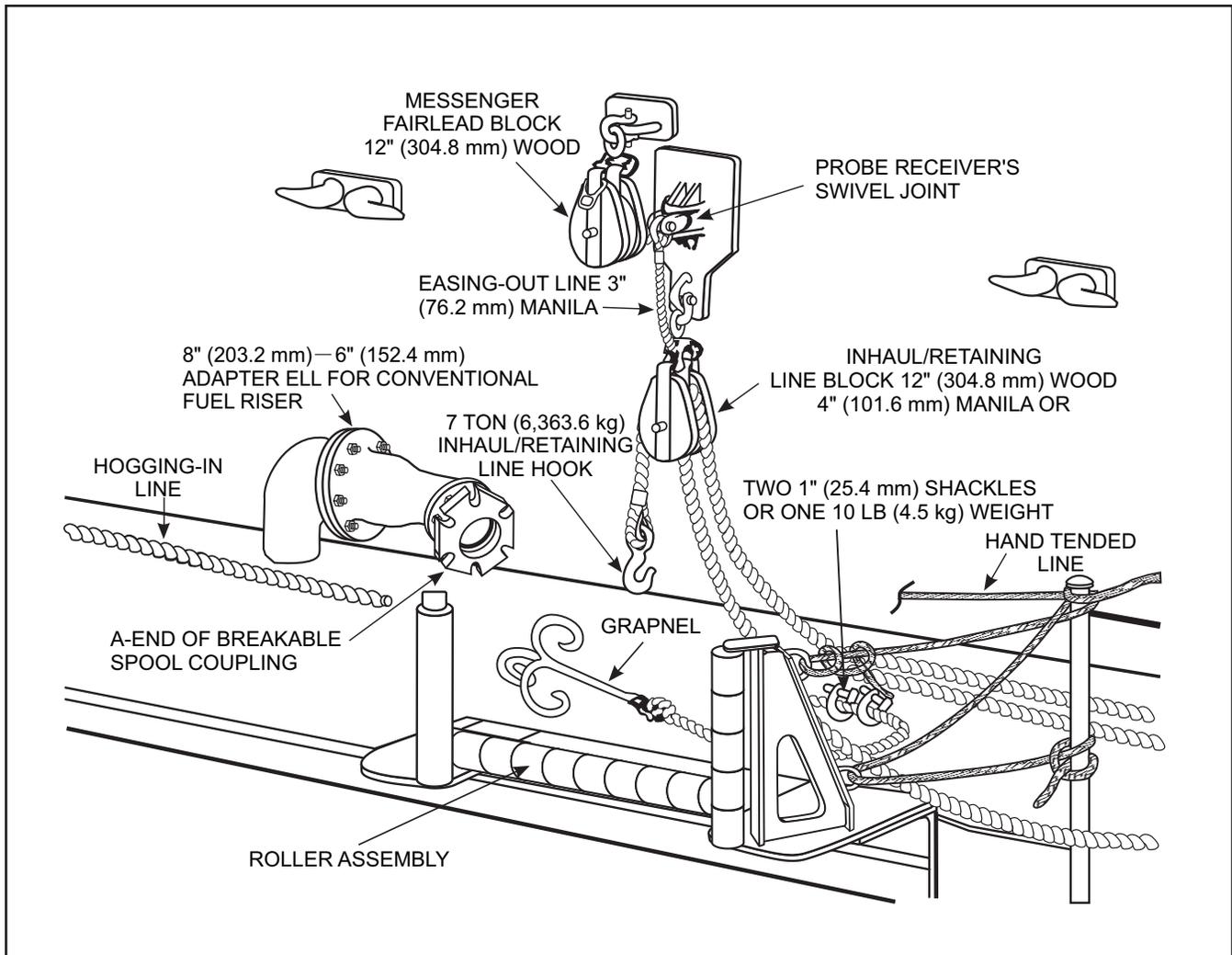


Figure 5-13. Receiving Station Ready to Receive 6-Inch (152.4 mm) Astern Fuel Rig

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.

5.7.6.2 Grappling and Securing the Rig

1. The receiving ship approaches the messenger buoy from astern and normally maneuvers at a speed 3 to 4 knots greater than base speed. 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.

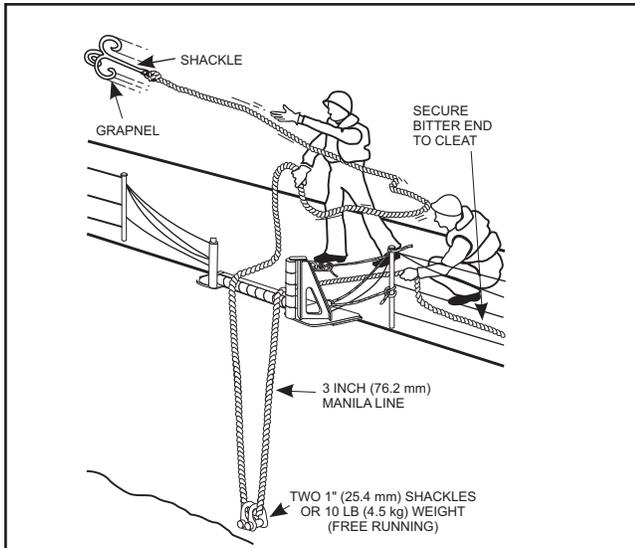


Figure 5-14. Heaving the Grapnel Line

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 5-14). Heave the grapnel across the messenger before the float enters the bow wash. The free running shackles should tend to sink between the ship and the messenger, and cause the ship's grapnel to contact the messenger's grapnel. Slack the grapnel line until the two grapnels make contact.
4. Haul the messenger and float assembly up to the deck until both can be taken in hand safely.



Do not bring the float assembly inboard of the rail.

5. With the 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 messenger connection (Figure 5-15). Do not attempt to disassemble any other component of the float assembly. Secure the reeving line messenger to the 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 messenger at the receiving station to bring the messenger aboard.

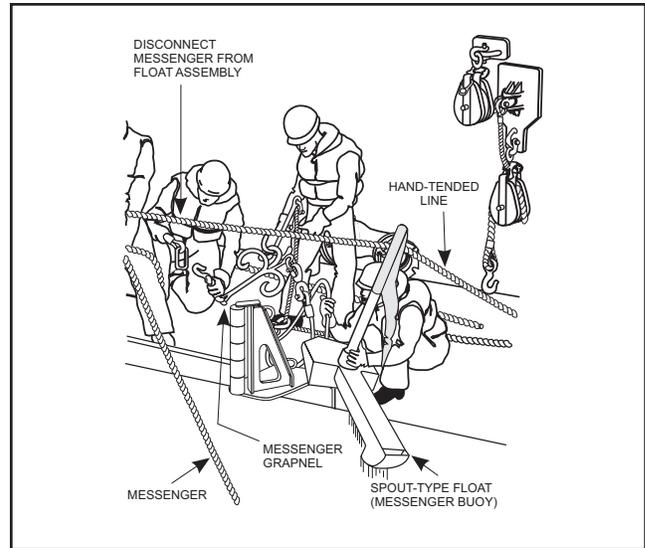


Figure 5-15. Disconnecting the Hose Messenger

7. Haul in on the messenger until a safe working bight of the manila can be reeved in the messenger fairlead block. Lock the snatch block when the messenger can be made free for running.
8. Disconnect the 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 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 messenger to the conical cap. Remove slack from the easing-out line and belay the line to a cleat (Figure 5-16).
11. Secure the hogging-in line around the hose (Figure 5-16), and use it to haul the hose in as the hose is brought aboard by the inhaul line (step 12).
12. Engage the hook on the inhaul line (Figure 5-16) 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.

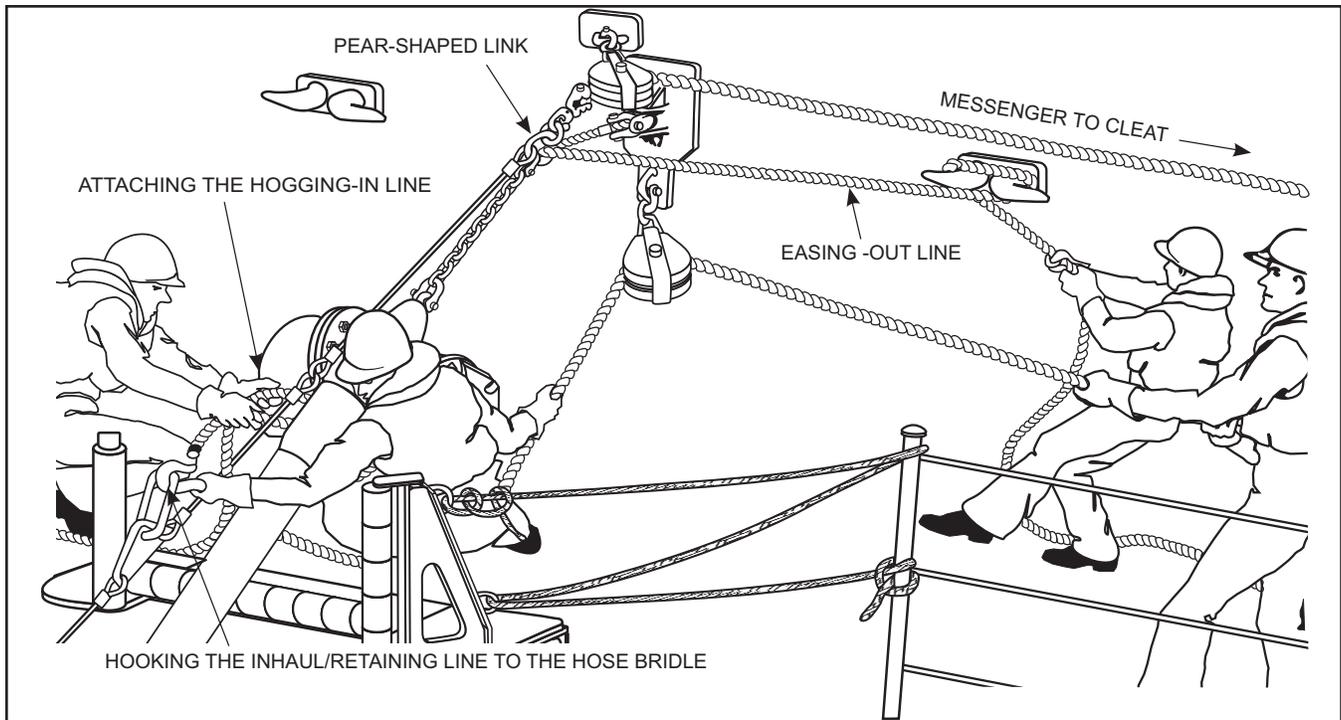


Figure 5-16. Securing the Hose Rig

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 5-17).
 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 5-18).
 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 5-19).
- 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 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 it off with small stuff in long bights with the link for the float connection leading aft (Figures 5-20 and 5-21).
 18. Walk the hose float assembly aft to a location suitable for rigging breakaway operations (Figure 5-21).
 19. Reconnect the 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 messenger from the fairlead block. Position the conical cap to permit rapid connection before breakaway operations.

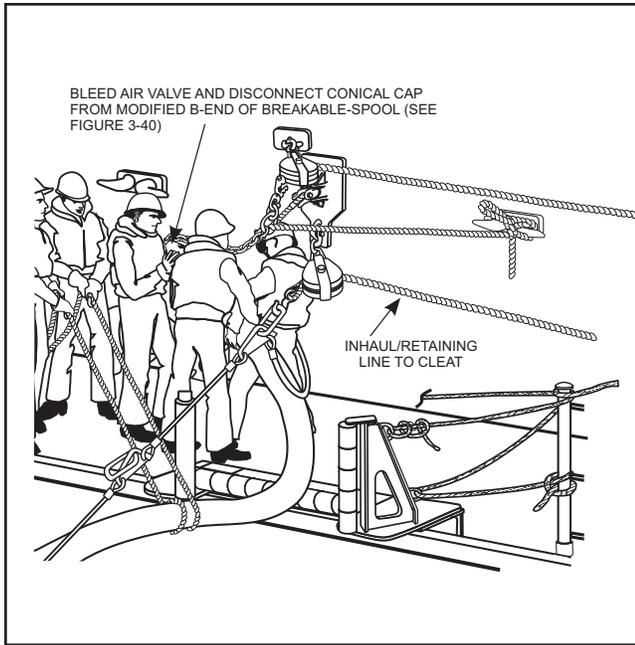


Figure 5-17. Disconnecting the Conical Cap

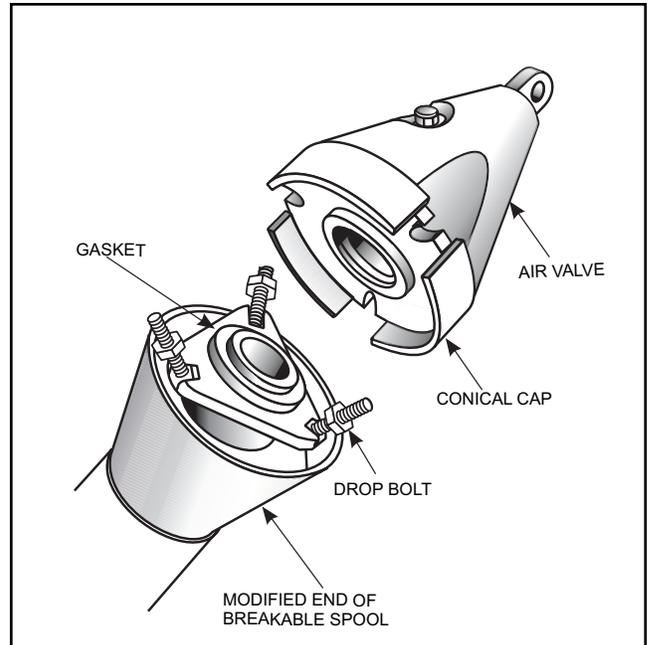


Figure 5-18. Conical Cap and Modified B-End of Breakable Spool Coupling

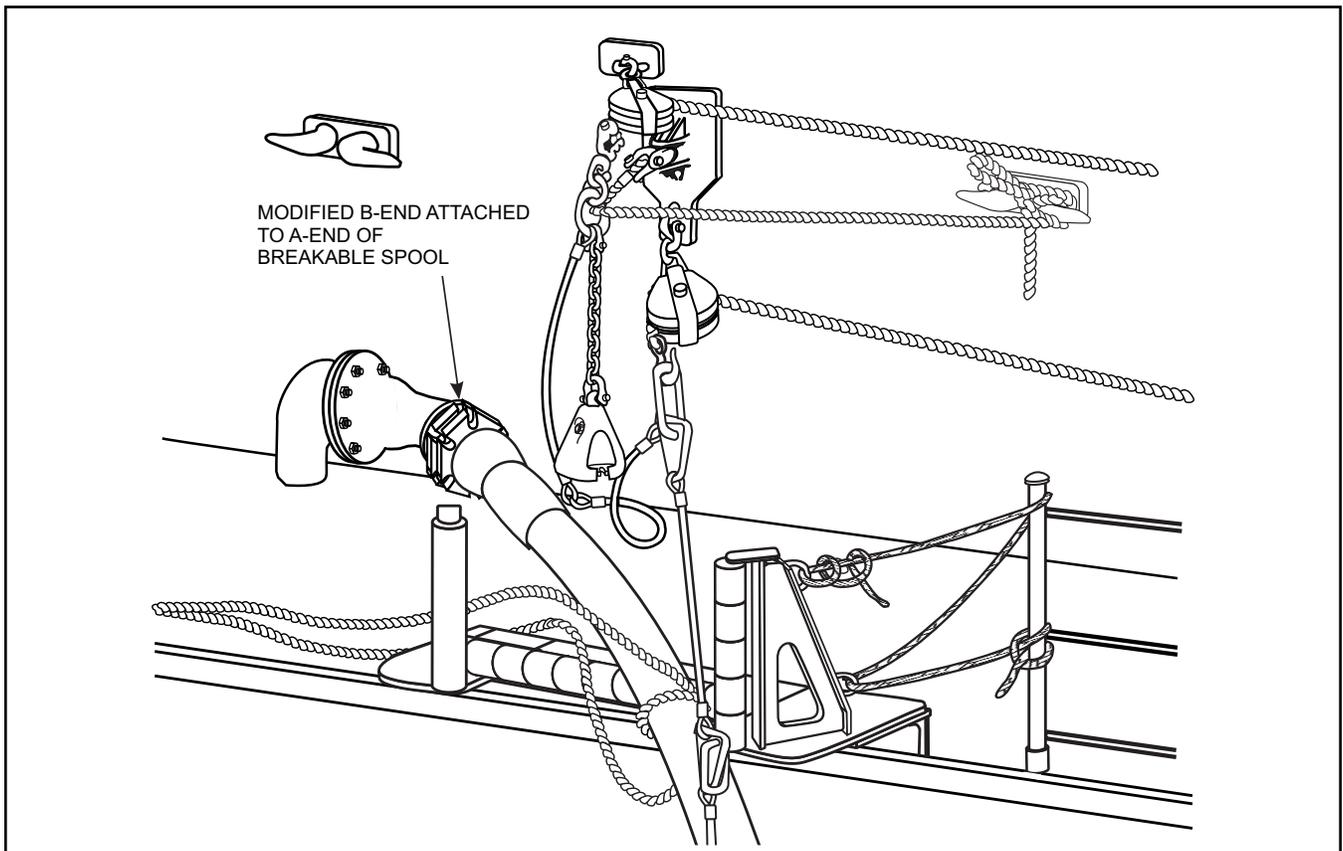


Figure 5-19. Receiving Station Rigged for Fuel Transfer

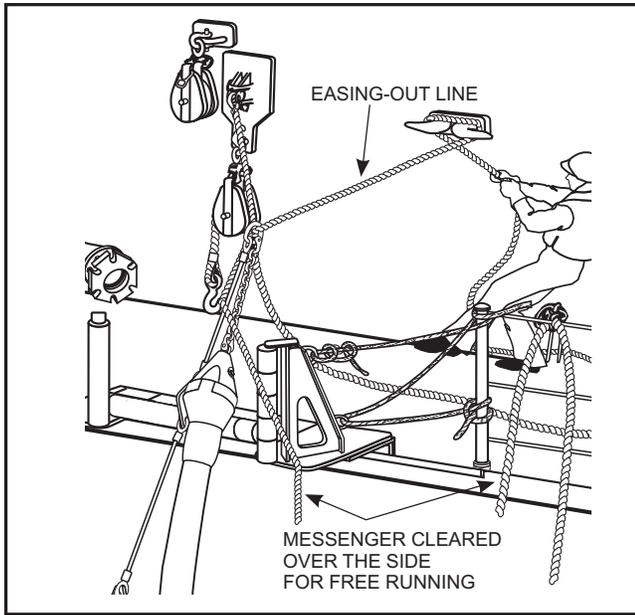


Figure 5-20. Easing the Hose Overboard

5.7.6.3 Disengaging the Rig

1. When within about 500 gallons (1.9 m³) of the fuel required to complete the transfer, signal the delivery ship to “Cease pumping” by displaying a red signal during daylight or a red wand at night. The delivery ship will display a red signal when pumping has stopped.

2. Upon receipt of “Stopped pumping,” signal the delivery ship to “Start blowdown” by displaying a white flag (or amber light). 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 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 5-20).
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 both the hose and breakable-spool coupling are clear of the ship’s side.

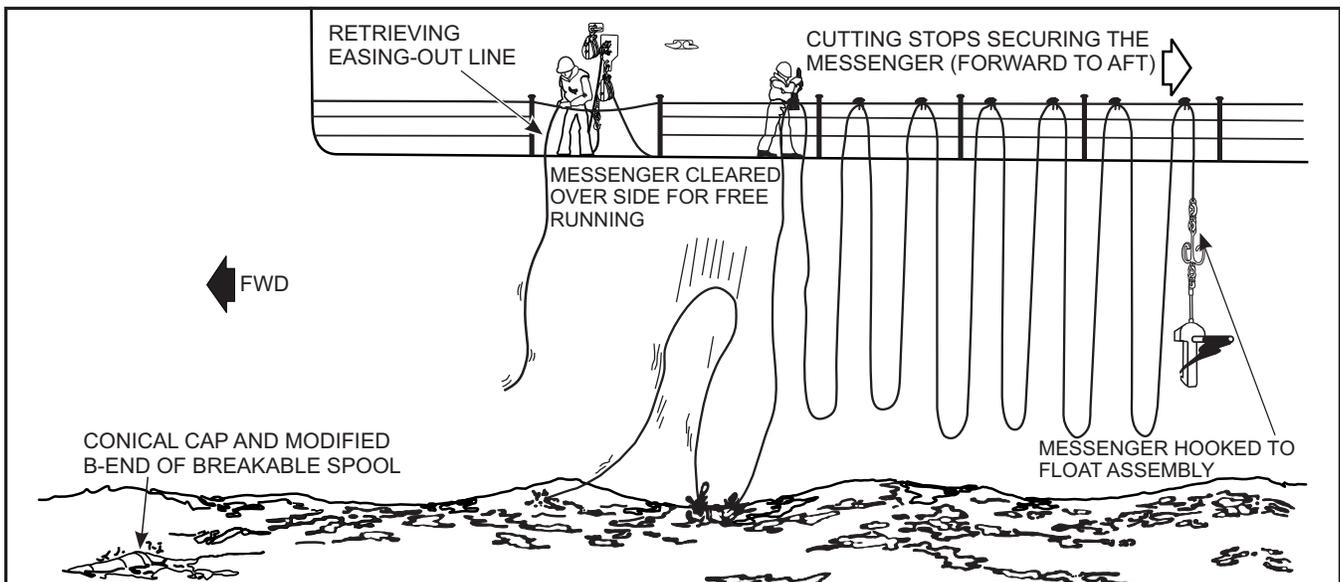


Figure 5-21. Hose Messenger Rigged for Disengaging

9. Gradually reduce ship's speed to reduce the bight of hose in the towed rig. When the hose is tending forward, ease it 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 5-21) securing the bights of the 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.

5.7.6.4 Astern Fuel 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 polyethylene pig, launching and receiving stations, associated hardware, and air supplied from the delivery ship's service air system. (See Appendix J for details.)

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.

5.7.6.5 Emergency Breakaway for Astern Fueling Rig. 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 receiving ship 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.

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.

5.7.7 Astern Fueling With 2-1/2-Inch (63.5 mm) Hose

5.7.7.1 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 5-22. 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 5-23) 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 5-23. (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 5-22.

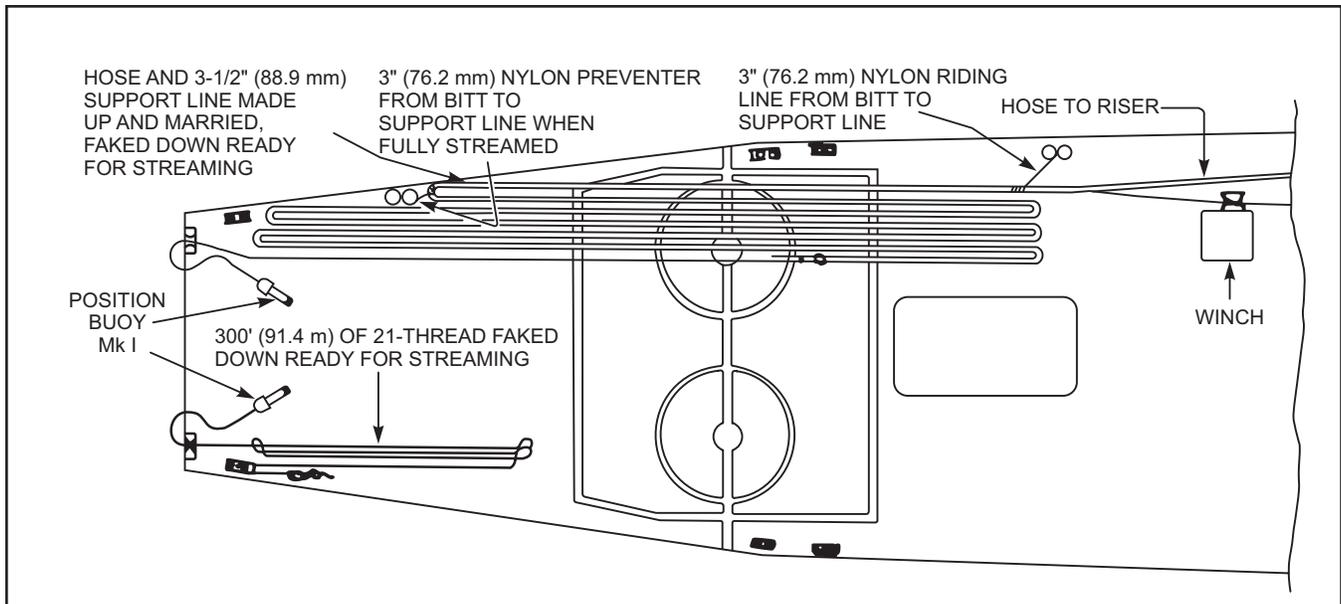


Figure 5-22. Typical Astern Fueling Station Keeping With 2-1/2-Inch (63.5 mm) Hose

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 5-22 and 5-23.)

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 pickup float to the end of the 25-foot (7.6 m) messenger, and fake the messenger on the fantail ready for streaming.

Note

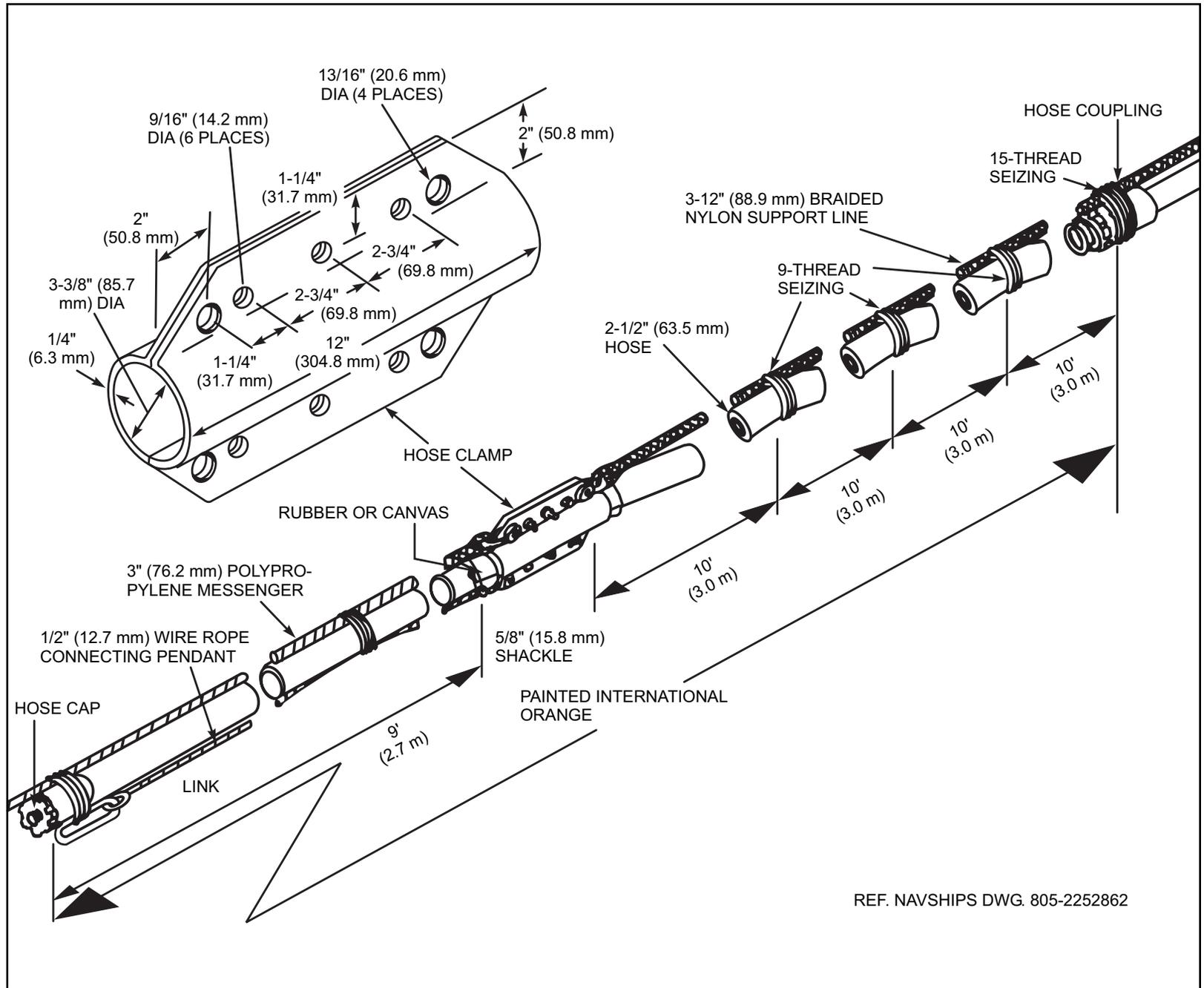
- Paint the outboard 50-foot (15.2 m) length of hose international orange.
- The messenger pickup float may be one of several buoyant objects. Metal spheres, such as those used on ATF and ARS, are small, light, and ideal for day use. However, there is no practical way of securing adequate lighting for night refueling. The position buoy Mk I is recommended because it is stable and can be fitted with a flagstaff or lights.

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.

5.7.7.2 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.

Figure 5-23. Arrangement of Outboard End of 2-1/2-Inch (63.5 mm) Hose Assembly



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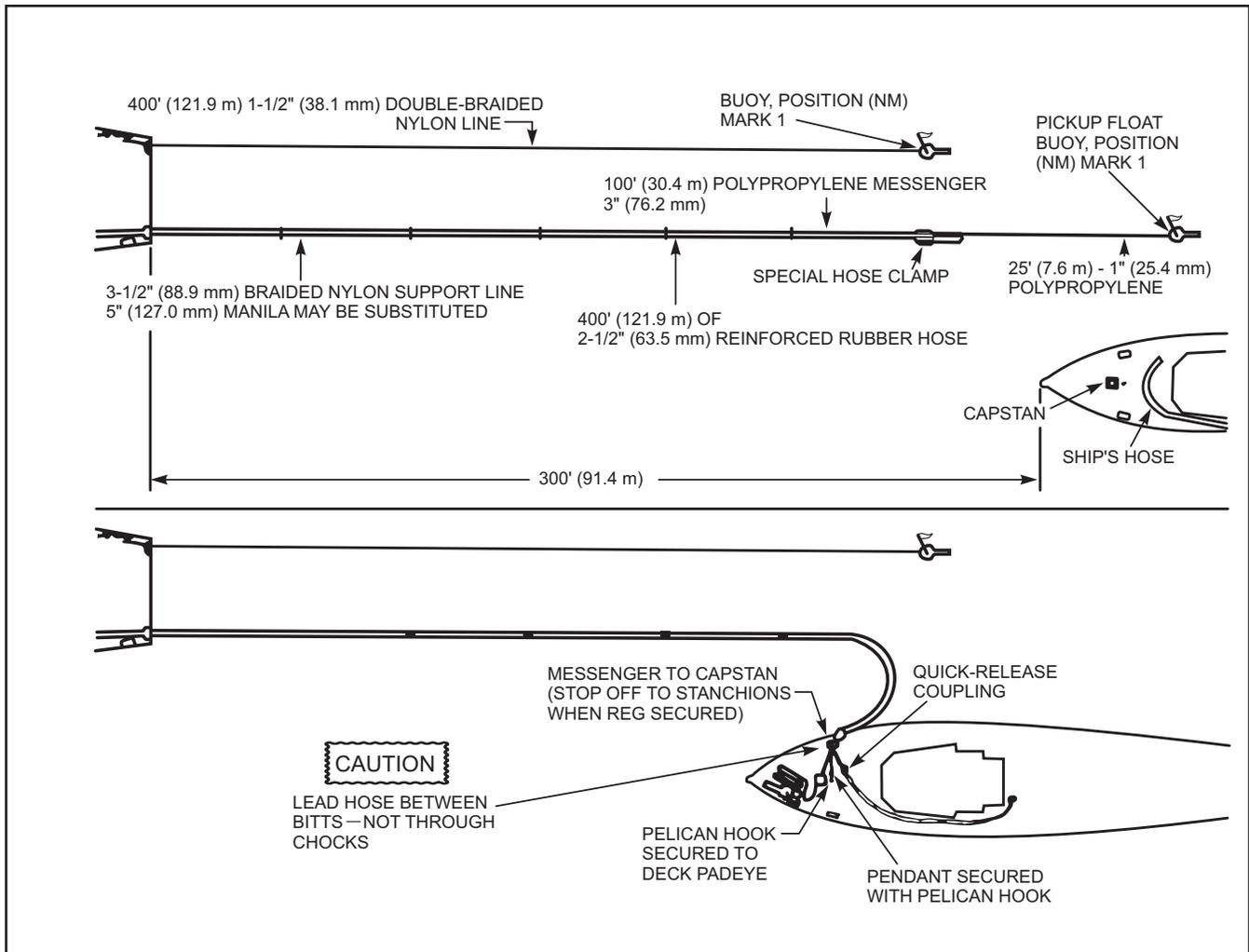


Figure 5-24. Streaming Astern Fueling 2-1/2-Inch (63.5 mm) Hose (Sheet 1 of 2)

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 bits. 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.

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 5-24).

5.7.7.3 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 bits 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 bits on the receiving side of the ship (Figure 5-24).

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-inch (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.

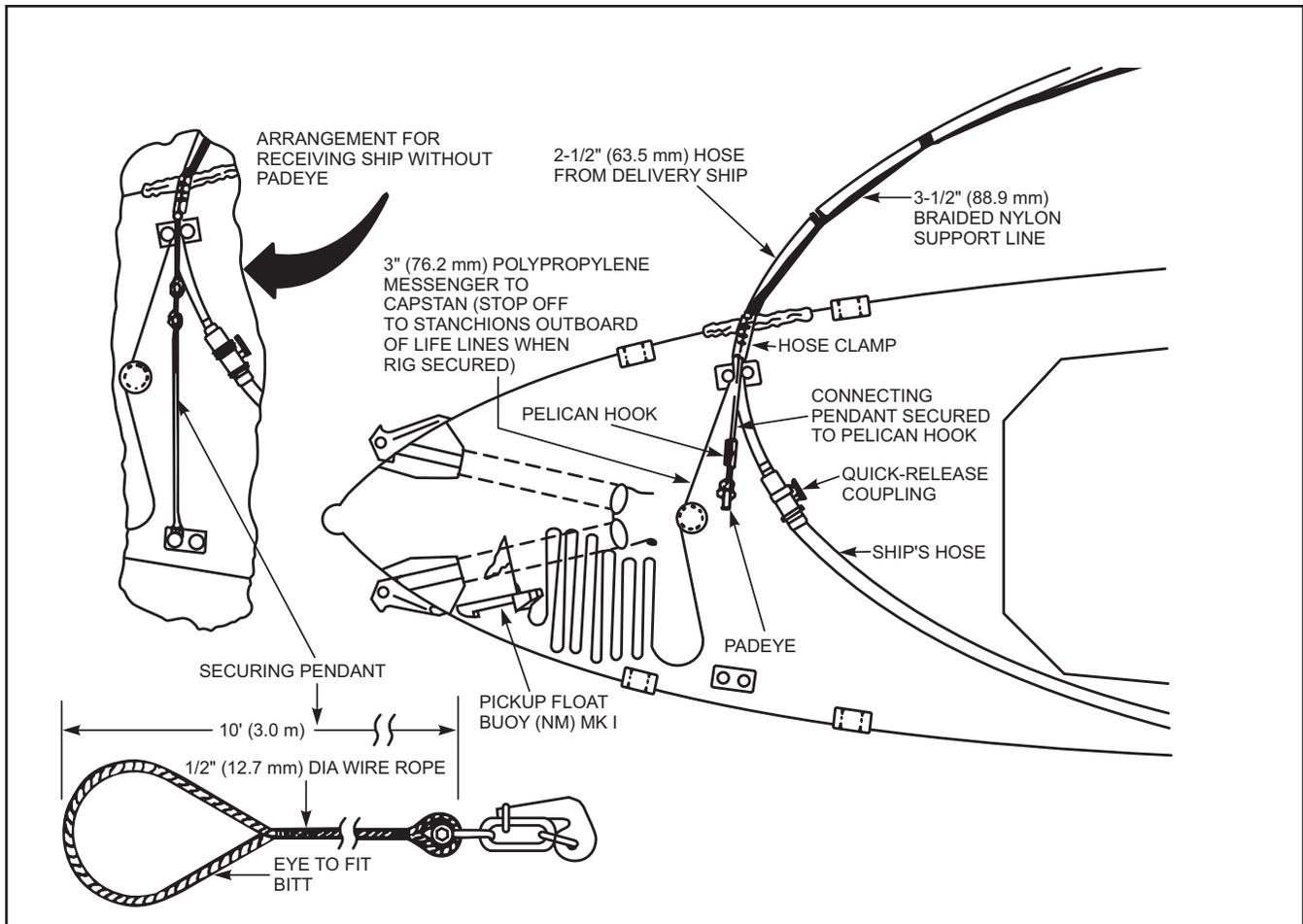


Figure 5-24. Streaming Astern Fueling 2-1/2-Inch (63.5 mm) Hose (Sheet 2 of 2)

Make approach on the pickup float (position buoy Mk I), and retrieve the float. Lead the messenger between the bits 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 bits. An additional preventer may be secured at the bits 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 bits 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.

5.7.7.4 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.

ITEM	NOMENCLATURE	QUANTITY REQUIRED	SPARES REQUIRED
1	2-1/2" (63.5 mm) Fueling Hose	24	10
2	2-1/2" (63.5 mm) Quick-Release Coupling	1	1
3	2-1/2" (63.5 mm) Hose Cap	1	1
4	Buoy	Position (NM) Mark 1	2
5	3-1/2" (88.9 mm) Braided Nylon	600' (182.8 m)	600' (182.8 m)
5a	5" (127.0 mm) Manila Line (Note 1)	900' (274.3 m)	
6	1-1/2" (38.1 mm) Braided Nylon	1	
7	Coil 9 Thread	1	
8	3" (76.2 mm) Polypropylene	100' (30.4 m)	100' (30.4 m)
9	1" (25.4 mm) Polypropylene	25' (7.6 m)	25' (7.6 m)
10	Coil 15 Thread	1	
11	Special Hose Clamp (Note 2)	1	1
12	3" X 8" (76.2 X 203.2 mm) Long Link (Note 2)	1	1

NOTES: (1) May be substituted for 3-1/2" (88.9 mm) braided nylon if nylon is not available.
(2) STD PLAN 805-2252862

Figure 5-25. Required Parts for Astern Fueling 2-1/2-Inch (63.5 mm) Hose Rig

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.

5.7.7.5 Emergency Breakaway. Refer to paragraph 5.7.6.5.

5.7.7.6 Control Signals. The control signals used shall be in accordance with Figure 5-2.

5.7.7.7 Required Parts. Refer to Figure 5-25.

5.8 TANKER REPLENISHMENT

5.8.1 Scope. The U. S. military services use tankers to transport petroleum products from point to point throughout the world. These tankers are operated by shipping companies under a contract or a charter with MSC.

They have limited FAS equipment installed for transferring petroleum products at sea by the alongside method. ("Limited" in that they can refuel only those fleet units that can pass a span wire or fuel STREAM rig.)

Selected tankers are also equipped for delivering fuel by the astern method or by the alongside method using modular fuel delivery stations that can deliver a fuel STREAM rig.

The U.S. Navy supports the installation of such equipment in order to increase national defense capabilities. This FAS 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.

5.8.1.1 Tanker Characteristics and Capabilities. U.S. flag tankers presently equipped with a limited FAS capability are listed in Figure 5-28 at the end of the chapter.

5.8.1.1.1 Astern Refueling. Some U.S. flag tankers are equipped for delivering fuel by the astern method. Refer to paragraphs 5.7.3 through 5.7.6.5 for procedures.

5.8.1.1.2 Alongside Refueling. For alongside refueling, tankers are equipped to receive the spanwire rig or fuel STREAM rig (see Figure 5-26). 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, 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.

5.8.1.1.3 Modular Fuel Delivery Stations. Modular fuel delivery stations, installed on selected tankers, have two port-side STREAM fuel delivery stations that are operated in accordance with Chapter 3 procedures.

5.8.1.2 Personnel Duties. A tanker's crew varies from 24 to 32 personnel, 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. The chief engineer should be located in the machinery spaces. He should be prepared to answer bells promptly and handle any possible emergency.

5.8.1.2.1 Planning. When planning replenishments with merchant vessels, operational limitations should be considered because of the small size of merchant crews.

5.8.2 Communication 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.

5.8.2.1 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 INMARSAT identification
4. PIM
5. Working frequency guarded in the MF to HF range (for ship-to-ship communications during the hours stipulated by the tanker).

5.8.2.1.1 Maritime Preposition Ship Communications. Each MPS squadron is capable of the full spectrum of Navy communications, but the individual ships have unclassified record communications only. Each ship does have a tactical secure UHF (KY58).

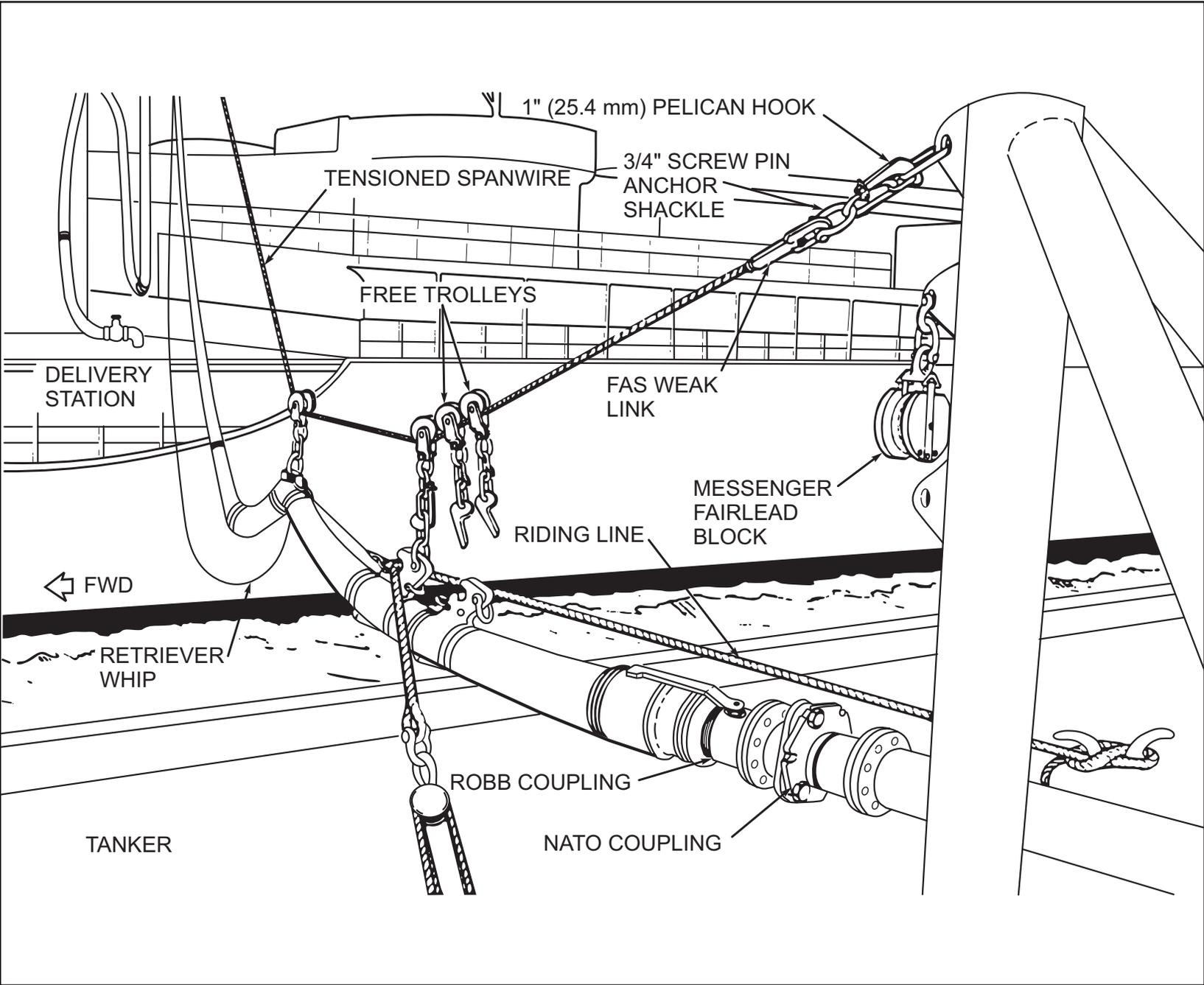


Figure 5-26. Spanwire Rig Connection on Tanker

Additionally, each MPS squadron has a MARISAT (telephone) including STU-III capability.

5.8.2.2 Communication Methods

5.8.2.2.1 Frequencies. INMARSAT is the primary means for sending and receiving long-range communications. 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.

5.8.2.2.2 Tanker. A tanker 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.

5.8.2.2.3 Fleet Unit. After a tanker is assigned to a FAS operation, the fleet unit will communicate with the tanker as appropriate. An early message addressed to the tanker will indicate:

1. 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 (e.g., 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).

5.8.2.3 Position and Intended Movement 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 PIM includes several changes of course and speed, additional numerals for 3, 4, and 5 may be signaled.)

5.8.2.4 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.

5.8.2.4.1 Military Sealift Command Control. When a tanker is scheduled to a specific FAS 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.

5.8.2.4.2 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 210640 Z3 USNS AMERICAN EXPLORER TAO 165//DEP NAPLES, ITALY 210640Z3 DI 14.5K OPS IAW COMSERVFOR-SIXFLT OPORD 201-66//END

2. The usual Arrival Report after completion of the operation.

5.8.3 Communication Facilities and Tanker Equipment

5.8.3.1 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.

5.8.3.2 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.

5.8.3.3 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 INMARSAT terminal with bridge voice remote unit.

5.8.3.4 Cryptosystem. 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.

5.8.3.5 Communication Publications. Tankers hold H.O. 102, International Code of Signals. Tankers do not hold ACP 131, Communication Instructions — Operating Signals.

5.8.4 Course and Speed for Alongside Refueling. When rendezvous has been effected, the naval commander designates the course and speed for the FAS 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.

5.8.4.1 Course

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 1° or 2° of the designated course.
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.
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).

5.8.4.2 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.

5.8.4.3 Station-Keeping Alongside

5.8.4.3.1 Distance Between Ships. The distance between ships that 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).

5.8.4.3.2 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.

5.8.5 Alongside Replenishment Procedures.

Since tankers cannot pass an alongside fueling rig to receiving ships, they are limited to refueling fleet units that can pass the spanwire rig or fuel STREAM rig to them. Information about these rigs is provided in Chapters 3 and 4. 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.”

5.8.5.1 Tanker Spanwire Refueling

5.8.5.1.1 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.

5.8.5.1.2 Use of Quick-Release Couplings by Tankers. A 6-inch (152.4 mm) breakable-spool quick-release (NATO) coupling and/or a combined quick-release coupling and valve (Robb coupling) are used in refueling. (See Figures 3-11 and 3-12.) Masters of tankers should ensure that crew members 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.

5.8.5.1.3 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.

5.8.5.1.4 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.

5.8.5.1.5 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.

5.8.5.1.6 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. The shot line is attached to the STAR messenger (see Figure 2-9 and paragraph 2.3.5). The phone/distance line, station phone line, and span wire are attached to the messenger.

5.8.5.1.7 Passing the Rig. As the fleet unit passes the lines and the rig, the tanker receives them using these procedures:

1. Hauls in the shot line and the first messenger.
2. Secures the phone/distance line with the zero flag 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 (30.5 cm) snatch block below the padeye for the span wire, and leads the end to a winch.
5. Continues to haul in on the messenger until the pelican hook on the span wire comes aboard.
6. Secures the pelican hook to the padeye on the tripod or kingpost and detaches the messenger from the span wire. (The fleet unit takes up slack in the span wire.)
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 that 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.

5.8.5.2 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 m³/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 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. If piping system allows, tankers should have the pumps running and be recirculating the cargo through a drop line while ships are connecting up. Tankers without recirculating piping should have pumps on standby ready for pumping. When the connection is completed and the fleet unit signals "Commence pumping," the tanker opens the discharge valve and closes the drop line valve, or starts the cargo pump, thereby commencing cargo transfer.
3. The tanker strips tanks continuously into an after tank, but final stripping is not done during the refueling operation.

5.8.5.3 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.

5.8.5.4 Clearing the Hose

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. As an alternative to a blowdown or back suction, both ships leave valves open and position the hoses to gravity drain.

5.8.5.5 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 that they deem 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.

5.8.6 Departure

1. After blowdown/gravity drain, 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 span wire is eased over the side with an easing-out line.



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.

5.8.7 Emergency Breakaway. Tanker personnel should be instructed in the emergency breakaway procedures given in Chapter 2.

Personnel 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 personnel. 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 slackened the span wire. The deck crew member who trips 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 span wire.
6. Return the phone/distance line and station-to-station phone line after the hose and span wire are clear.

5.8.8 Logistic Support. When a tanker is under the operational control of a fleet unit, the fleet unit will provide logistic support.

1. The naval commander arranges for mail delivery to the tanker.
2. When consolidation is to be performed in port, the naval commander arranges for tugs and pilot, if such assistance is required by the tanker.
3. 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.

5.8.9 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.

5.8.9.1 MSC 4020-4 Discharge Report.

The tanker shall make a Routine precedence message report upon completion of cargo transfer in the following format:

FROM: Tanker Name
 TO: COMSC WASHINGTON DC//PM3//
 INFO: DFMC FT BELVOIR//BID//
 NAVPETOFF ALEXANDRIA VA
 (Ship's owner-operator)
 (Petroleum inspector and/or MSC
 representative 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.

5.8.9.2 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 (MSC Report 4020-4).

5.8.9.3 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 5-27. Also, commanding officers of fleet units are requested to furnish COMSC a narrative evaluation of the operation, unclassified if possible.

5.8.10 Emergency Safety Measures. The possibility of deteriorating weather conditions makes it mandatory that both ships be prepared for emergencies, such as man overboard.

5.8.10.1 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. Should a person fall overboard:

1. A lifebuoy is dropped, and at least six short blasts are sounded on the ship's whistle.
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. When no lifeguard ship is assigned, an emergency breakaway must be made. After breakaway, the fleet unit maneuvers to recover the person, while the tanker maintains course. When safely clear, the tanker also maneuvers as necessary to assist in recovering the person.

5.8.10.2 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.

5.8.11 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 synthetic highline is used to transfer light 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 hand tended; winches and capstans must not be used. The synthetic highline has a maximum safe transfer load of 600 lb (272 kg).

5.8.12 Tensioned Highline Transfers. Selected USNS cargo ships are 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 6.

5.8.13 Extended Fleet Operations. Appendix E contains standard operating procedures for MSC-controlled tankers assigned to extended fleet operations.

From: _____
 (name of tanker)

To: Commander, Military Sealift Command, Navy Department, Washington, D.C. 20398

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 5-27. Refueling Report

5.9 REFERENCES

ATP 16, Replenishment at Sea

Damage Control/Casualty Control Book

NAVSEA S9086-TK-STM-010/571, Naval Ships Technical Manual, Chapter 571, Underway Replenishment

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

NAVSEA 0955-LP-020-8010, Double-Probe Fueling System

NAVSEA S9571-A1-HBK-010, UNREP Station Capabilities Handbook

Tanker (MS/SS)	Radio Call Sign	DWT (2)	LOA (3)	Beam (3)	Draft (3)	Normal Speed (Kt)	Height of Highest Radar to Load Line (3)	Max. Refuel Rate Per Station (bbl/h) (4)	Stations (Per Side)	Distance From Bow to Station (3)			Cargo Capacity (2) (Thousands of bbl) (5)
										FWD	MID	AFT	
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)	4,000 (635.96)	3	512' (156.06)	688' (209.70)	929' (283.16)	2,014 (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)	4,000 (635.96)	3	512' (156.06)	688' (209.70)	929' (283.16)	2,014 (271,622)
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)	4,000 (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)	4,000 (635.96)	2	366' (111.56)	–	481' (146.61)	272 (36,683)
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)	4,000 (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)	4,000 (635.96)	2	366' (111.56)	–	481' (146.61)	272 (36,683)
COURIER (C) (1) (7)	KCBK	35,100 (35,662)	711'3" (216.79)	84'0" (25.60)	34'5" (10.49)	16.0	101'0" (30.78)	4,000 (635.96)	2	328' (99.97)	–	538' (163.98)	240 (32,368)
SEA RIVER 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)	4,000 (635.96)	2	325' (99)	–	473'5" (144.3)	637 (85,910)
SEA RIVER 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)	4,000 (635.96)	2	409' (124.66)	–	565' (172.21)	510 (68,782)
SEA RIVER 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)	4,000 (635.96)	2	325' (99)	–	473'5" (144.3)	637 (85,910)
SEA RIVER 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)	4,000 (635.96)	2	325' (99)	–	473'5" (144.3)	637 (85,910)
FALCON CHAMPION (C) (7)	WFJN	33,542 (34,078)	668'1" (203.63)	84'0" (25.6)	36'0" (10.97)	16.0	110'2" (33.58)	4,000 (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)	4,000 (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)	4,000 (635.96)	2	274' (83.51)	–	394' (120.09)	281 (37,898)
FALCON LEADER (C) (7)	WFJM	33,542 (34,078)	668'1" (203.63)	84'0" (25.6)	36'0" (10.97)	16.0	110'2" (33.58)	4,000 (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)	4,000 (635.96)	2	274' (83.51)	–	394' (120.09)	281 (37,898)

Figure 5-28. Industry-Owned U.S. Flag Tankers Equipped for Limited Refueling
(As of 1 December 1995) (Sheet 1 of 3)

Tanker (MS/SS)	Radio Call Sign	DWT (2)	LOA (3)	Beam (3)	Draft (3)	Normal Speed (Kt)	Height of Highest Radar to Load Line (3)	Max. Refuel Rate Per Station (bbl/h) (4)	Stations (Per Side)	Distance From Bow to Station (3)			Cargo Capacity (2) (Thousands of bbl) (5)
										FWD	MID	AFT	
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)	4,000 (635.96)	2	482' (146.91)	–	657' (200.25)	625 (84,291)
LIBERTY BELL (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)	4,000 (635.96)	2	573'2" (174.70)	–	655' (199.64)	662 (89,282)
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)	4,000 (635.96)	2	366'6" (111.71)	–	481'3" (146.69)	268 (36,144)
MORMACSTAR (C) (6)	KGDF	39,232 (39,860)	688'6" (209.85)	90'0" (27.43)	35'1" (10.69)	16.0	102'9" (31.32)	4,000 (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)	4,000 (635.96)	2	366'6" (111.71)	–	481'3" (146.69)	268 (36,144)
NEW YORK SUN (C) (6)	WSKD	34,434 (34,985)	612'0" (186.53)	91'0" (27.73)	36'9" (11.20)	15.3	108'0" (32.91)	4,000 (635.96)	2	244' (74.37)	–	384' (117.04)	254 (34,260)
OMI CHAMPION (C) (7)	KIGP	37,874 (38,480)	660'0" (201.16)	90'0" (27.43)	36'8" (11.18)	16.2	120'0" (36.58)	4,000 (635.96)	3	316' (96.32)	397' (121)	474' (144.48)	281 (37,898)
OMI 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)	4,000 (635.96)	3	304' (92.66)	382' (116.43)	461' (140.51)	281 (37,898)
OMI 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)	4,000 (635.96)	3	309' (94.18)	389' (118.57)	464' (141.43)	281 (37,898)
OVERSEAS ALICE (C) (6)	WOVL	37,814 (38,419)	660'2" (201.22)	90'1" (27.45)	36'8" (11.18)	16.0	85'0" (25.90)	4,000 (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)	4,000 (635.96)	1	–	–	634' (193.24)	620 (83,618)
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)	4,000 (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)	4,000 (635.96)	1	–	–	634' (193.24)	619 (83,483)
OVERSEAS VALDEZ (C) (6)	WOVS	37,814 (38,419)	660'2" (201.22)	90'1" (27.45)	36'8" (11.18)	16.0	85'0" (25.90)	4,000 (635.96)	2	316' (96.31)	–	472' (143.86)	281 (37,898)
OVERSEAS VIVIAN (C) (6)	KA AZ	38,814 (38,419)	660'2" (201.22)	90'2" (27.48)	36'8" (11.18)	16.0	85'0" (25.90)	4,000 (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)	4,000 (635.96)	1	–	–	634' (193.24)	619 (83,483)

Figure 5-28. Industry-Owned U.S. Flag Tankers Equipped for Limited Refueling
(As of 1 December 1995) (Sheet 2 of 3)

Figure 5-28. Industry-Owned U.S. Flag Tankers Equipped for Limited Refueling
(As of 1 December 1995) (Sheet 3 of 3)

Tanker (MS/SS)	Radio Call Sign	DWT (2)	LOA (3)	Beam (3)	Draft (3)	Normal Speed (Kt)	Height of Highest Radar to Load Line (3)	Max. Refuel Rate Per Station (bbl/h) (4)	Stations (Per Side)	Distance From Bow to Station (3)			Cargo Capacity (2) (Thousands of bbl) (5)
										FWD	MID	AFT	
PATRIOT (C) (1) (7)	KGBQ	35,100 (35,662)	711'3" (216.79)	84'0" (25.60)	34'5" (10.49)	16.0	101'0" (30.78)	4,000 (635.96)	2	328' (99.97)	–	538' (163.98)	240 (32,368)
RANGER (C) (7)	KCBG	35,100 (35,662)	711'3" (216.79)	84'0" (25.60)	34'5" (10.49)	16.0	101'0" (30.78)	4,000 (635.96)	2	328' (99.97)	–	538' (163.98)	240 (32,368)
ROVER (C) (7)	KCBH	35,100 (35,662)	711'3" (216.79)	84'0" (25.60)	34'5" (10.49)	16.0	101'0" (30.78)	4,000 (635.96)	2	328' (99.97)	–	538' (163.98)	240 (32,368)
KEYSTONE 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)	4,000 (635.96)	1	–	326'8" (99.57)	–	181 (24,411)
KEYSTONE 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)	4,000 (635.96)	1	–	326'8" (99.57)	–	181 (24,411)
PAUL BUCK (C) (1) (7)	KDGR	32,600 (33,122)	615'0" (187.45)	90'1" (27.46)	36'0" (10.97)	16.0	104'6" (31.85)	4,000 (635.96)	2	284' (86.56)	–	429' (130.76)	238
SAMUEL L. COBBS (C) (1) (7)	KCDJ	32,600 (33,122)	615'0" (187.45)	90'1" (27.46)	36'0" (10.97)	16.0	104'6" (31.85)	4,000 (635.96)	2	284' (86.56)	–	429' (130.76)	238
GUS W. DARNELL (C) (1) (7)	KCEK	32,600 (33,122)	615'0" (187.45)	90'1" (27.46)	36'0" (10.97)	16.0	104'6" (31.85)	4,000 (635.96)	2	284' (86.56)	–	429' (130.76)	238
LAWRENCE H. GIANELLA (C) (1) (7) (8)	WLBV	32,600 (33,122)	615'0" (187.45)	90'1" (27.46)	36'0" (10.97)	16.0	104'6" (31.85)	4,000 (635.96)	2	284' (86.56)	–	429' (130.76)	238
RICHARD G. MATTHIENSEN (C) (1) (7) (6)	WLBX	32,600 (33,122)	615'0" (187.45)	90'1" (27.46)	36'0" (10.97)	16.0	104'6" (31.85)	4,000 (635.96)	2	284' (86.56)	–	429' (130.76)	238
<p>NOTES:</p> <p>(1) Indicates tankers under charter to MSC on 1 December 1995. (2) Data contained in parenthesis reflects units in metric tons. (3) Data contained in parenthesis reflects units in meters. (4) Data contained in parenthesis reflects unit 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. (8) Equipped with MFDS. (C) Ship has coasted tanks.</p> <p>General: Tankers under charter to MSC are required to meet static-test load for attachment points.</p>													

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, red-blue triangles for F76, 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 signals.

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 leading 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 5-29. Refueling Checklist — 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 2 ½-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, 2 ½-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, yellow-blue triangles for F44, and white for water, for station marking.

Figure 5-30. Loose Hardware for Each Refueling Station — Tankers

CHAPTER 6

Solid Cargo Transfer — STREAM Rigging and Operation

6.1 BASIC CONSIDERATIONS

A number of different methods can be used for transfer of solid cargo between ships. The preferred method is STREAM, when both the delivery ship and the receiving ship have the capability to use it.

This chapter covers transfers of solid cargo between U.S. Navy ships, including MSC ships, and selected merchant ships using the STREAM rig. This chapter also covers transfers of ammunition, missiles, and their components. Solid cargo may also be transferred using one of the Burton methods in Chapter 5. For transfers of solid cargo between ships of the NATO nations, see ATP 16.

6.1.1 Rig Selection. Select the rig to be used for a particular replenishment operation on the following bases:

1. Type and quantity of cargo
2. Capacity of the rig and associated fittings
3. Weight of the heaviest load and size of the largest load
4. Weather and sea conditions at the time of transfer
5. Type and location of receiving station.

STREAM rigs in order of preference are:

1. STREAM with all-tensioned wires
 - a. Traveling SURF
 - b. STAR (preferred for non-sliding padeye stations)
2. STREAM with hand-tended outhaul.

For data on transfer stations, which is useful in selecting the rig, refer to these sources:

1. UNREP Station Capabilities Handbook, NAVSEA S9571-A1-HBK-010
2. Fleet Underway Replenishment Guide, COMNAV-SURFPACINST 3180.2 or COMNAVSURF-LANTINST C9010.1 series.

The requirements of the following paragraphs apply to the type of STREAM rig selected.

6.1.2 Wire Rope. Wire rope used in STREAM rigs is in accordance with paragraph 2.3.1. Sizes and lengths for various rigs are specified in the table below.

WIRE ROPE	SIZE IN INCHES (mm)	MINIMUM LENGTH IN FEET (m)
HIGHLINE (Note)	1 (25.4)	800 (243.8)
INHAUL	1/2 (12.7) 3/4 (19.0)	800 (243.8)
OUTHAUL	1/2 (12.7)	1,200 (417.6)
Note: Only certified highlines (NSN 4010-01-309-7439) are to be installed.		

6.1.3 Rig Load Capacities and Highline Wire Rope Safety. The safe load conditions and ram tensioner pressure settings are given in Figure 6-1. Safety of the rig depends on highline wire rope inspection and periodic replacement. Criteria are in each ship's PMS and must be adhered to strictly.

SHIP	STATION	RAM FLASK PRESSURE IN PSI (kPa) (1) (2) (3)	MAXIMUM SAFE LOAD IN POUNDS (kg) (2) (4)	
			SEA STATE CALM to 3 SEPARATION 60 ft — 120 ft (18.3 — 36.6 m)	SEA STATE 3 to 5 SEPARATION 120 ft — 150 ft (36.6 — 45.7 m)
AO-177 thru AO-180 and AO-186	3, 4	1,950 (13,436)	8,750 (3,969)	5,700 (2,586)
AOE-1 thru AOE-4	1, 5, 6, 10, 11, 14, 18	1,950 (13,436)	8,750 (3,969)	5,700 (2,586)
AOE-6 thru AOE-8 and AOE-10	1, 4, 5, 6, 9, 12	1,950 (13,436)	8,750 (3,969)	5,700 (2,586)
T-AO-187 thru T-AO-204	3, 4	1,950 (13,436)	8,750 (3,969)	5,700 (2,586)
T-AE-26 and AE-27 thru AE-29	3, 4, 5, 6, 8, 9, 10	1,950 (13,436)	8,750 (3,969)	5,700 (2,586)
AE-32 thru AE-35	3, 4, 5, 6, 8, 9, 10	1,950 (13,436)	8,750 (3,969)	5,700 (2,586)
T-AFS-1, -3, -4, -7	2, 4, 5, 7, 8, 10	1,950 (13,436)	8,750 (3,969)	8,750 (3,969)
T-AFS-2 and -6	2, 4, 5, 6, 7, 8, 10	1,950 (13,436)	8,750 (3,969)	5,700 (2,586)
T-AFS-5	2, 4	1,950 (13,436)	8,750 (3,969)	5,700 (2,586)
	5, 6, 7, 8, 10	1,250 (8,613)	5,600 (2,540)	3,700 (1,678)

NOTES: (1) Ram pressure with ram in down (secured) position.
(2) Maximum ram pressure and maximum load transfer to receiving ship padeye tested to 50,000 pounds (22,675 kg). For receiving ships with padeye tested to less than 50,000 pounds (22,675 kg), see Figure B-2 for ram pressures and maximum transfer loads.
(3) Data contained in parentheses reflects units in kiloPascal (kPa).
(4) Data contained in parentheses reflects units in kilograms (kg).

Figure 6-1. Ram Tensioner Air Pressure for STREAM Stations Transferring Solid Cargo and Missiles

Replenishment ships can transfer loads weighing up to the capacity of the CDR (5,700 lb (2,584 kg)) to receiving ships with STREAM receiving stations static tested to 50,000 lb (22,675 kg), so long as the load will clear the deck edge of the receiving ship.

Decrease these load capacities to loads shown in Appendix B, Figure B-2, when replenishing under adverse sea and weather conditions or when the

receiving station padeye is tested to less than 50,000 lb (22,675 kg).

6.1.4 Heavy-Lift Transfer. Loads weighing over 5,700 lb (2,584 kg) require special consideration for transfer by STREAM rig. The procedures to be employed for heavy-lift transfer (including aircraft engines) by STREAM rig are described in paragraph 6.17. Heavy Burton is a viable method for heavy-lift

transfer, when no other alternative is available. See paragraph 7.6.

6.1.5 Transfer of Ammunition, Missiles, and Components. The transfer of ammunition and missiles at sea is the most exacting and hazardous of all replenishment operations. The greatest care must be taken to avoid accidents that could result in the destruction of both the ammunition ship and the ship(s) alongside. Great emphasis must be placed on the safe and expeditious handling of ammunition and missiles. For transfers between ships of the NATO nations, see ATP 16.

6.1.5.1 Personnel Requirements. Personnel engaged in the transfer of ammunition and missiles must know and observe the safety precautions while handling explosives. They must also be thoroughly familiar with the methods used and with their limitations. This knowledge will ensure safe and expeditious handling. NAV-SEA OP 3347 contains safety precautions and handling procedures applicable to ammunition and missiles.

Because various types of mobile and nonmobile handling equipment are used in transferring ammunition and missiles, personnel who work with handling equipment should be familiar with the contents of NAVSEA OP 2173. This publication details the uses and limitations of the equipment.

It is of particular importance that care be used when handling new types of ammunition and missiles. Technical developments, especially in missiles, lead to new transfer methods and handling equipment. Personnel must master new techniques in handling ammunition and missiles to achieve safe and expeditious transfers.

WARNING

All persons who handle explosives shall be qualified and certified in compliance with the latest issue of OPNAVINST 8023.2.

6.1.5.2 Characteristics of Ammunition Ships. Ammunition ships are specifically designed to transport and transfer ammunition and missiles. Their holds are sheathed, ventilated, and sprinklered for cargo safety. Some ships have facilities for handling special weapons; others have VERTREP facilities. Certain ammunition ships are equipped for transfer of fuel and provisions as well as ammunition and missiles.

Normal replenishment speed for ammunition ships when transferring ammunition and missiles is 12 to 16 knots. Fast combat support ships and major combatants can transfer ammunition and missiles at higher speeds when weather and sea conditions permit. The replenishment speed will be promulgated by the OTC (see paragraph 2.2.2).

For data on transfer stations and capabilities of ships, refer to these sources:

1. UNREP Station Capabilities Handbook, NAV-SEA S9571-A1-HBK-010
2. Fleet Underway Replenishment Guide, COMNAVSURFPACINST 3180.2 or COMNAVSURFLANTINST C9010.1 series
3. Fleet and type commanders' directives.

6.1.5.3 Palletized Ordnance. Conventional ammunition is normally transferred on pallets. Transfer of palletized ordnance requires the use of special slings. For data on the configurations of palletized ordnance unit loads that have been authorized for transfer at sea, refer to MIL-STD 1323 series drawings, NAVSEA S9570-AA-MMA-010, and NAVSEA OP 3206, Volumes 1, 2, and 3. Ammunition ships carry pallet trucks for use by receiving ships in clearing pallets from the landing area.

6.1.5.4 Preparing Missiles and Boosters. Missiles and boosters are normally transferred either in their containers or in the Mk 6 dolly. The receiving ship's strikedown system dictates the choice of container or dolly. NAVSEA OP 3192 and OP 3206 contain procedures for loading and unloading missiles and boosters into and from Mk 6 missile transfer dollies. Missile components are normally transferred on pallets. Ammunition ships carry Mk 45 handlift trucks for use by receiving ships in handling containers. The Mk 45 handlift truck is attached to each end of a container to move the load from the landing area to the strikedown equipment for decanning.

6.2 LOADING AND HANDLING OF CARGO

The procedures for loading and handling cargo in paragraphs 2.9 through 2.9.4 apply to this chapter.

6.2.1 Loading for Transfer of Ammunition and Missiles. Planning prior to a replenishment operation ensures proper loading of the ammunition ship and an orderly transfer of ammunition and missiles between ships.

6.2.1.1 Cargo Plan. Ammunition ships are loaded in accordance with a specific cargo plan, which shows the location of each item of cargo. The plan is based on requirements forwarded by the fleet to the ordnance facility. Personnel at the ordnance facility prepare the preliminary cargo plan, using the replenishment schedule as a guide. They provide some flexibility in the plan to accommodate possible changes in the replenishment schedule.

6.2.1.2 Cargo Stowage. Representatives from both the delivery ship and the ordnance facility determine the final stowage of cargo at a preloading conference. They must consider the following items:

1. Designated deck-loading capacity of the ship
2. Cubic volume and weight of items of cargo
3. Distribution of cargo for proper trim and stability at sea as scheduled transfers of cargo are made
4. Provision for adequate, clear, working spaces within the cargo area
5. Safe location of cargo in relation to the ship's vulnerability to mine or collision damage
6. Metal dunnage system usage requirements
7. Explosive compatibility of ordnance material.

6.2.1.3 Loading. The ordnance facility does the loading; however, the ship's commanding officer retains the final responsibility for ensuring that his ship is properly loaded within its designed capabilities.

Loading procedures must comply with NAVSEA OP 3206, and must also be in accordance with U.S. Coast Guard, Code of Federal Regulations (46 CFR, Part 146), Transportation or Storage of Military Explosives. Except as authorized by CNO, deviations from the requirements of 46 CFR, Part 146, are not permitted. Should a situation arise in which it appears to be infeasible to meet the requirements of 46 CFR, Part 146, a request for a waiver of the specific requirements may be submitted to CNO via NAVSEA. This policy is currently set forth in OPNAVINST 8023.2. However, the policy is not to be construed so as to interfere with the authority of the commanding officer of any ship that transports military explosives as cargo to take emergency action for the safety of his ship or to meet any military emergency. Should such emergency action

result in deviations from the requirements of 46 CFR, Part 146, the deviations shall be reported to CNO at the earliest opportunity.

6.3 PREPARING SHIPS FOR TRANSFER

Careful planning by personnel of both the delivery ship and the receiving ship is necessary for successful transfer of provisions and general stores. Personnel should begin preparations prior to rendezvous.

6.3.1 Rigs and Fittings. Personnel shall be familiar with the rigs and fittings to be used and with the individual ship's plan. Personnel who are responsible for hooking up rigs and fittings shall take these steps:

1. Examine the label plates adjacent to the rig's attachment points, prior to use.
2. Ensure that each fitting is used only for its approved purpose.
3. Determine that the static-tested loads are in accordance with Figure B-2.

Deviations from the ship's plan are not recommended. When deviations are necessary, approval shall be requested from the type commander. NAVSEA should be advised of any requirements that necessitate deviations, so that corrective actions may be taken.

Fleet-issued publications provide information on the replenishment capabilities of ships and should be reviewed prior to preparing transfer stations.

Use of the checklists in Appendix D will ensure that all necessary equipment is available at transfer stations. Figures 6-37 and 6-38 at the end of this chapter list hardware that should be available at transfer stations.

6.3.2 Personnel Duties. Assign personnel in accordance with the requirements of the rigs to be used and the number of stations to be manned.

6.3.3 Transfer at Night. Additional preparations for a replenishment operation at night are detailed in Chapter 2.

6.3.4 Heavy-Lift Transfer Preparations. For additional preparations and special handling equipment for heavy-lift transfer, see paragraph 6.16 and Figure 6-36.

6.3.5 Transfer of Ammunition and Missiles.

Ammunition and missiles can be transferred by STREAM and nontensioned methods. Since STREAM is the preferred method, the details for transferring ammunition and missiles will be discussed in this chapter. The common preparations in Chapter 2 also apply. Preparations for transfer by VERTREP should be made in accordance with the instructions in Chapter 10.

This chapter and Chapter 7 list the rigs in order of preference, the basis for selecting the rig, and information on preparing transfer stations on the delivery and receiving ships. Use the lists of hardware in Figures 6-37 and 6-38 or Figures 7-17 and 7-18 and the checklists in Appendix D to ensure that all necessary equipment is available at the transfer stations for the rigs to be used. Assign personnel duties in accordance with replenishment requirements. Give specific attention to the following preparations:

1. Limit breakout of ordnance prior to the replenishment operation to that required to preclude a significant reduction in the transfer rate.
2. Both ships provide wedges, chocks, preventers, and so forth, to prevent rolling and shifting of ammunition on deck.
3. Cover landing areas with rubber matting, when bare ammunition is to be transferred (i.e., when an item is not in a transfer dolly, in its prescribed container, or on a pallet).
4. The receiving ship's plans must provide for keeping the landing area clear for arriving cargo and for expediting strikedown. Make maximum use of mechanical handling and strikedown equipment.
5. If the receiving ship does not have pallet trucks or enough Mk 45 handlift trucks, it should request the delivery ship to send them over at the beginning of the transfers. The delivery ship should have special handling equipment ready for transfer, when the receiving ship comes alongside. The receiving ship must return special handling equipment to the delivery ship, when the transfers are completed.
6. Adequately pad decks, bulkheads, and gun mounts in the vicinity of the transfer stations to prevent damage to ammunition and missiles during the transfers.

6.3.5.1 Exchange of Information

6.3.5.1.1 Receiving Ship. After the replenishment schedule has been determined, each scheduled receiving ship should provide the delivery ship with the following information:

1. Commodity identification by type and quantity (include mode/identification numbers) specifically required at each station.
2. Order for transfer of missiles and boosters: booster-booster, missile-missile; or booster-missile, booster-missile.
3. Direction that missiles and boosters should face during transfer, as required by the receiving ship's strikedown system.
4. Need to receive partial pallet loads of ammunition, if full pallet loads cannot be handled.
5. Requirements for special handling equipment to expedite strikedown.
6. Tartar missile handling-lug orientation.

Note

Tartar missiles are loaded with the A-side up; if they are to be loaded with the B-side up, the missiles must be rolled over on the delivery ship.

7. Missile return arrangements. When the receiving ship plans to return missiles, it shall advise the delivery ship of:
 - a. Number and type of missiles
 - b. Sequence within the transfer cycle: before receiving new missiles, or alternately receiving and returning missiles
 - c. Requirements for handling bands or other handling equipment.

6.3.5.1.2 Delivery Ship. The delivery ship shall advise the receiving ship on the following items:

1. Transfer stations to be used
2. Transfer rigs to be used

3. Breakaway procedures to be used when transfers are completed
4. Any required deviations from the receiving ship's desired plan.

6.3.5.2 Invoices. Ammunition and missiles transferred at sea are normally accompanied by itemized invoices. Check and sign original invoices and return them to the delivery ship in the last empty container. If time does not permit this, return them by guard mail or regular mail at a later date.

6.3.5.3 Reports. It is the delivery ship's responsibility to prepare and submit reports required for the loss of or damage to ammunition and missiles during transfer; this responsibility is the receiving ship's, once ammunition and missiles safely reach her deck.

6.4 TRANSFER OF AMMUNITION AND MISSILES

Transfer ammunition and missiles in accordance with the procedures in this chapter and Chapter 7 for the transfer rig selected and the procedures for ammunition and missile transfer described below. The common procedures in Chapter 2 also apply. Refer to Chapter 10 for special procedures to be followed when ammunition and missiles are transferred by helicopter (VERTREP).

Note

The requirements in paragraph 6.1.5.1 apply to personnel who transfer and handle ammunition and missiles.

6.4.1 Load Limitations. Loads for transfer must meet requirements for the transfer rig used and for the type of ammunition or missile to be transferred. The following requirements must be adhered to rigidly:

1. Safe transfer loads and load limitations established by NAVSEA for the transfer method used (see this chapter and Chapter 7)
2. Types of loads, weight limitations, and handling equipment prescribed in NAVSEA OP 3206 for the transfer of ammunition and missiles.

Limit loads for transfer to those that can be safely handled under existing conditions. Commanding officers should reduce loads below the permissible maximums during adverse conditions.

6.4.2 Test Loads. Prior to transfer of any type of live ammunition, test the rig to be used by cycling a

dummy load. The weight of the dummy load must be comparable to the weight of the load to be transferred.

6.4.3 Handling and Transfer Procedures. Useful sources of information on the transfer of ammunition and missiles are NAVSEA OP 3206, MIL-STD 1326 series, and NAVSEA S9570-AA-MMA-010.

The following procedures apply to transfers of ammunition and missiles:

1. Use mechanical handling and strikedown equipment, such as roller conveyors and ammunition slides, whenever they are available. They will reduce the work involved in manually lifting and moving ammunition. They will also decrease the likelihood of damage to materials and injury to personnel.
2. Transfer missiles and missile components simultaneously; so that, if the replenishment operation is interrupted, missiles that are already on board the combatant will be complete for operational purposes.
3. The order for transfer of missiles and boosters is specified by the combatant, as determined by its strikedown system. For example, the order for transfer of Terrier/Standard ER missiles to a CG-47 Class ship is:

Booster-booster, missile-missile;

or,

Booster-missile, booster-missile.
4. The direction that missiles face during transfer is also specified by the combatant, since the forward end of the missile must face the launcher, after the missile has passed through the combatant's strikedown system.
5. When an awkward or sensitive missile or ammunition load is to be transferred, use tag lines and steadying lines or a Mk 1 strongback to prevent the load from rotating and to control the pendulum action of the load. Refer to paragraphs 6.6.7 through 6.6.7.4 and Figures 6-8 through 6-11.
6. To expedite transfer of Tartar/Standard MR missiles, the delivery ship must properly align the rail components with a standard rail gauge. This should be done prior to sending the dolly to the receiving ship for either on-loading or off-loading of missiles.

7. If the receiving ship does not have the unloading area or the capability to handle full pallet loads, the ammunition ship should send over partial pallet loads.
8. Transfer loose rounds and individual small containers in skip boxes, metal pallet crates, or cargo nets.
9. Once a transfer dolly is unloaded, return it to the delivery ship for reloading and retransfer. After transfers are completed, return remaining dollies and pallets, empty containers, handling bands, pallet trucks, Mk 45 handlift trucks, and so forth to the delivery ship. Return small items in a skip box or net.

6.4.4 Safety. Personnel engaged in handling ammunition and missiles must know and comply with all safety precautions regarding the methods and equipment for handling ammunition and missiles. They must also be thoroughly familiar with the general safety precautions in paragraph 2.10.1 and wear the safety equipment required by paragraph 2.10.2.

All necessary precautions must be taken to prevent damage to ammunition and missiles during transfer, such as adequate padding on decks, bulkheads, and gun mounts.

Special precautions for transfer of ammunition and missiles are described in the paragraphs below.

6.4.4.1 Fire Precautions. Except in freezing weather, replenishment ships make ready for use (1) one fire hose with applicator attached at each transfer station and (2) one additional hose at each hold, elevator access, or compartment containing or working military explosives, when the hatch serving the hold is open. These lines shall be of sufficient length to reach all portions of the hold or compartment.

Ships other than replenishment types shall make ready two fire hoses with applicators attached at each transfer station.

All fire hoses shall be charged, except in freezing weather.

On carriers, when compliance would result in charged saltwater hoses crossing fire control or damage control boundaries (Zebra hatches), quick-reel AFFF systems may be used, in lieu of saltwater hoses, provided that overhead sprinklers in the hangar bay are available and the appropriate conflagration stations are manned.

6.4.4.2 Winch Precautions. Winch operators are responsible for the safety and efficiency of the transfer operation. Inhaul and outhaul winch operators must act independently, after the rig captain has told them to proceed, when passing the rig, during the transfer, and when retrieving the rig. The highline winch operator must also act independently, when passing and retrieving the highline, and when maintaining the ram tensioner in the safe zone (as required). Winch operators should be in communication with station-to-station phone talkers, the rig captain (when he desires), and winch watchers.

6.5 STREAM SYSTEM — INTRODUCTION

In a STREAM transfer, cargo is suspended from a trolley that rides on a tensioned wire highline from a STREAM transfer station on the delivery ship to a receiving station on the receiving ship. The tension in the highline supports the trolley and suspended load during the transfer. Highline tension is applied by the ram tensioner and remains the same regardless of ship motion or ship separation until the distance between ships exceeds the amount of wire rope available on the winch drum.

The type of STREAM rig used depends on the products for transfer, available attachment points, and available STREAM equipment at the delivery and receiving stations. Figure B-2 provides rig capacities — that is, load weight versus highline tensioning versus distance between ships. Figure 6-2 shows a STREAM rig with all-tensioned wires. Paragraphs 6.6 and 6.7 describe STREAM equipment at the delivery and receiving stations and outline the principles of STREAM operation.

6.6 DELIVERY SHIP — STREAM EQUIPMENT

Most of the STREAM equipment is installed at the STREAM transfer station on the delivery ship. Figure 6-37 at the end of the chapter contains a list of hardware required at the delivery station.

6.6.1 Highline Winch Antislack Device and Ram Tensioner. The highline supports the trolley and suspended load. Reeving of the highline through the ram tensioner ensures constant load support, regardless of ship motion. The ASD provides a constant pull on the highline so that wire on the drum does not become slack during rigging operations. The ASD will be located either (1) between the highline winch and the ram tensioner or (2) outboard of the ram. As the distance between ships varies, the ram tensioner, working with the highline winch, maintains a constant tension in the highline by taking in or paying out wire. The ram tensioner consists of a large hydraulic cylinder with an air/oil accumulator. It automatically adjusts for ship's roll and

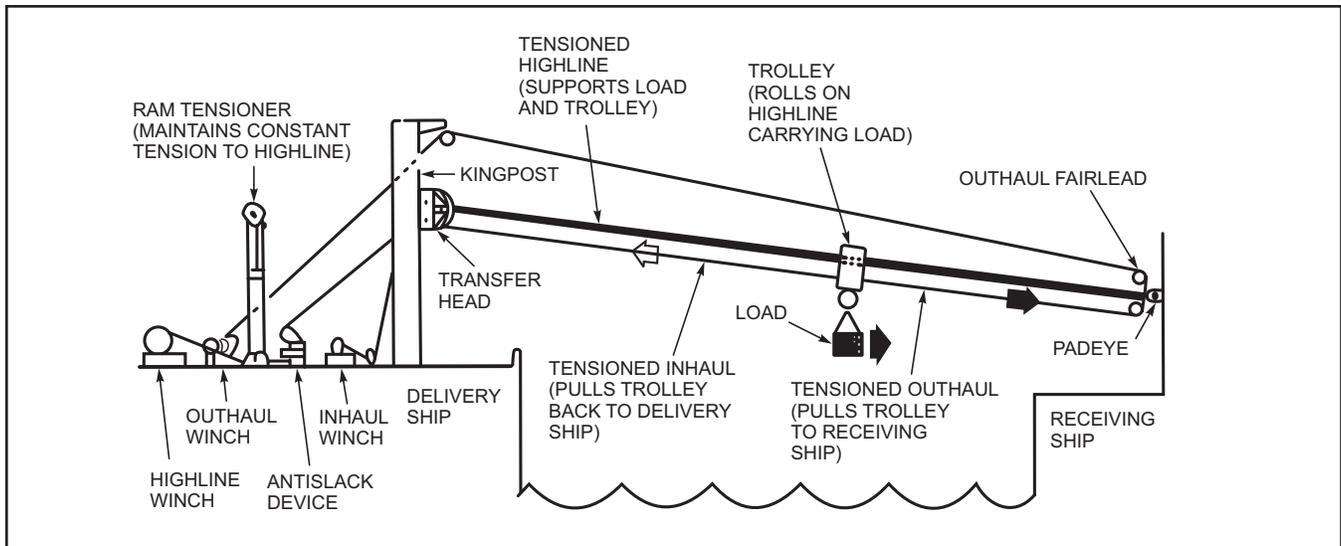


Figure 6-2. STREAM Rig (All Tensioned Wires)

minor changes in hull separation. The highline winch operator or automatic ram control takes in and pays out wire only to compensate for any larger change in the distance between ships. The ram tensioner is shown in cross-section in Figure 6-3.

WARNING

Ram tensioners use a phosphate ester fire resistant hydraulic fluid per MIL-H-19457D. This fluid is safe to use when handled properly and cautiously. Post in a conspicuous place the caution described in paragraph B.1, Appendix B. Brief personnel who may come in contact with this fluid on the following safety precautions:

1. Avoid inhalation, ingestion, skin and eye contact. If exposed, remove contaminated clothing. Immediately wash exposed skin with soap and water, and rinse eyes for 15 minutes with water. Seek medical aid. Launder contaminated clothing immediately, using oily clothing method.
2. Keep food, smoking material, and drink away from areas where fluid is being handled or stored.
3. Wash hands thoroughly with soap and water immediately after handling fluid.

Discard any contaminated food, smoking materials, or drink.

4. Respiratory and eye protection is required in the area of leaks that result in a fine mist or spray in the air.
5. Wear protective clothing in keeping with the work task. Stock numbers of appropriate protective clothing are listed in NAVSEAINST 5100.13.
6. Follow precautions of NAVSEAINST 5100.13 when handling or cleaning up spills of phosphate ester fluid.

WARNING

Older ram tensioners may still contain fluid made to MIL-H-19457B, sometimes called Cellulube 220A or Fyrquel 220 PM. This fluid contains Tri-Orthocresyl-Phosphate (TOCP), which can be absorbed into the body through the skin and may affect certain nerve functions. This older, more hazardous fluid may be identified by its green color and should be changed to the current nonneurotoxic fluid at the first opportunity. Fluid made to MIL-H-19457C is blue in color.

6.6.1.1 Rigging the Highline. The ram tensioner is prepared generally in accordance with procedures given in Appendix B. The ram is extended to its full-up

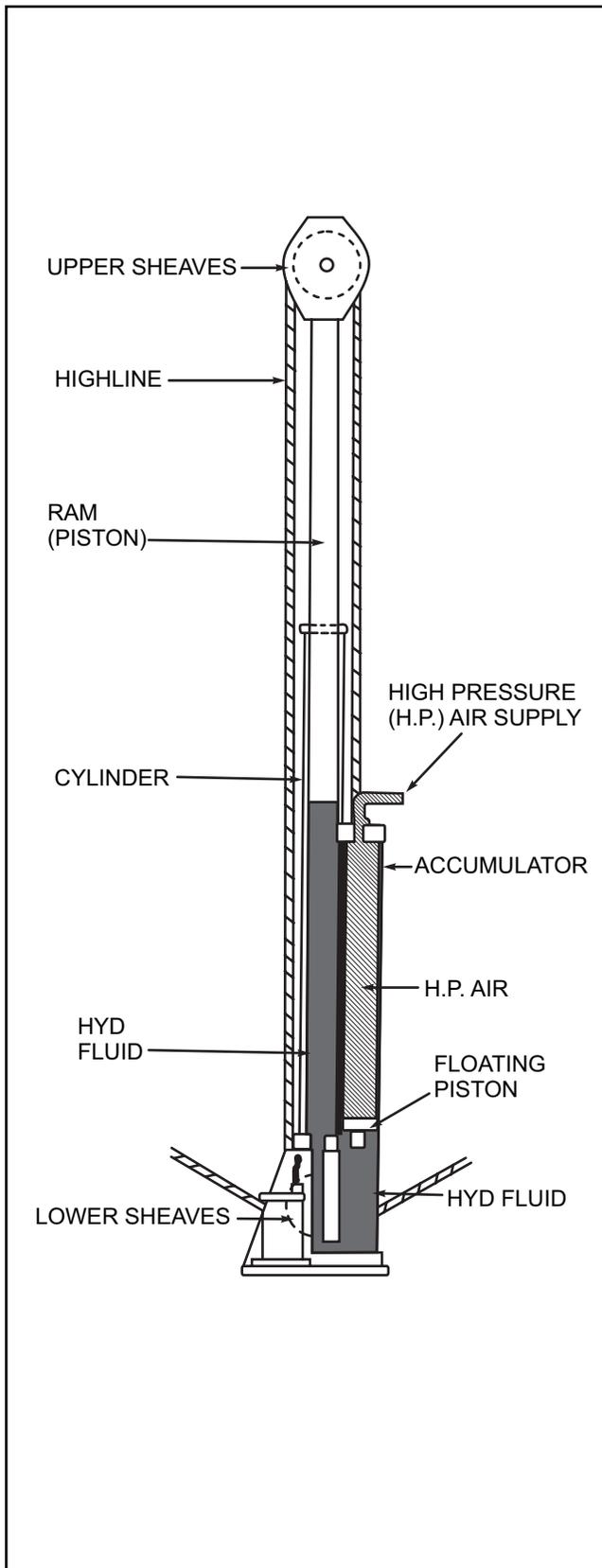


Figure 6-3. Ram Tensioner (Cross-Section)

position and remains extended while the highline is passed. The highline winch operator pays out wire through the ram until the highline reaches the receiving station (see Figure 6-4). Ensure that the highline ASD is in the ON position, so that slack wire is pulled to prevent fouling on the highline winch drum.

6.6.1.2 Tensioning the Highline. When the highline is connected at the receiving station, the highline winch operator takes in wire and compresses the ram to about midstroke. The highline ASD should be turned OFF. Tension is set in the highline as soon as the ram starts compressing. The predetermined ram pressure provides the amount of tension in the highline.

6.6.1.3 Operating the Highline. Once the ram is depressed to midstroke, the highline will haul in with any upward movement of the ram and pay out with any downward movement of the ram. This action compensates for normal ship motion. The ram compresses to pay out wire when the ships move apart and extends to haul in wire when the ships move closer together. The highline winch operator hauls in or pays out wire only to keep the ram within the safety zone.

The amount of tension in the highline can be varied to suit (1) the static-tested load of the padeye at the receiving station and (2) the weight of the load to be transferred. Increasing or decreasing the weight of the load on the trolley will increase or decrease the highline's catenary, *but will not change the tension in the highline.*

Note

Be sure that the air pressure and volume are in accordance with operating instructions. Ensure ram operating air valves are fully open. Partially closed valves will cause relief valve to lift.

The amount of tension in the highline depends on the pressure of the air in the ram tensioner's accumulator. For every 100 psi (689 kPa) of air, there is about 1,000 lb (454 kg) of tension in the highline. For example, 1,950 psi (13,443 kPa) of air will put about 19,500 lb (8,845 kg) of tension in the highline.

6.6.2 Inhaul and Outhaul Winches. The inhaul and outhaul winches at the delivery station move the trolley and suspended load along the tensioned highline

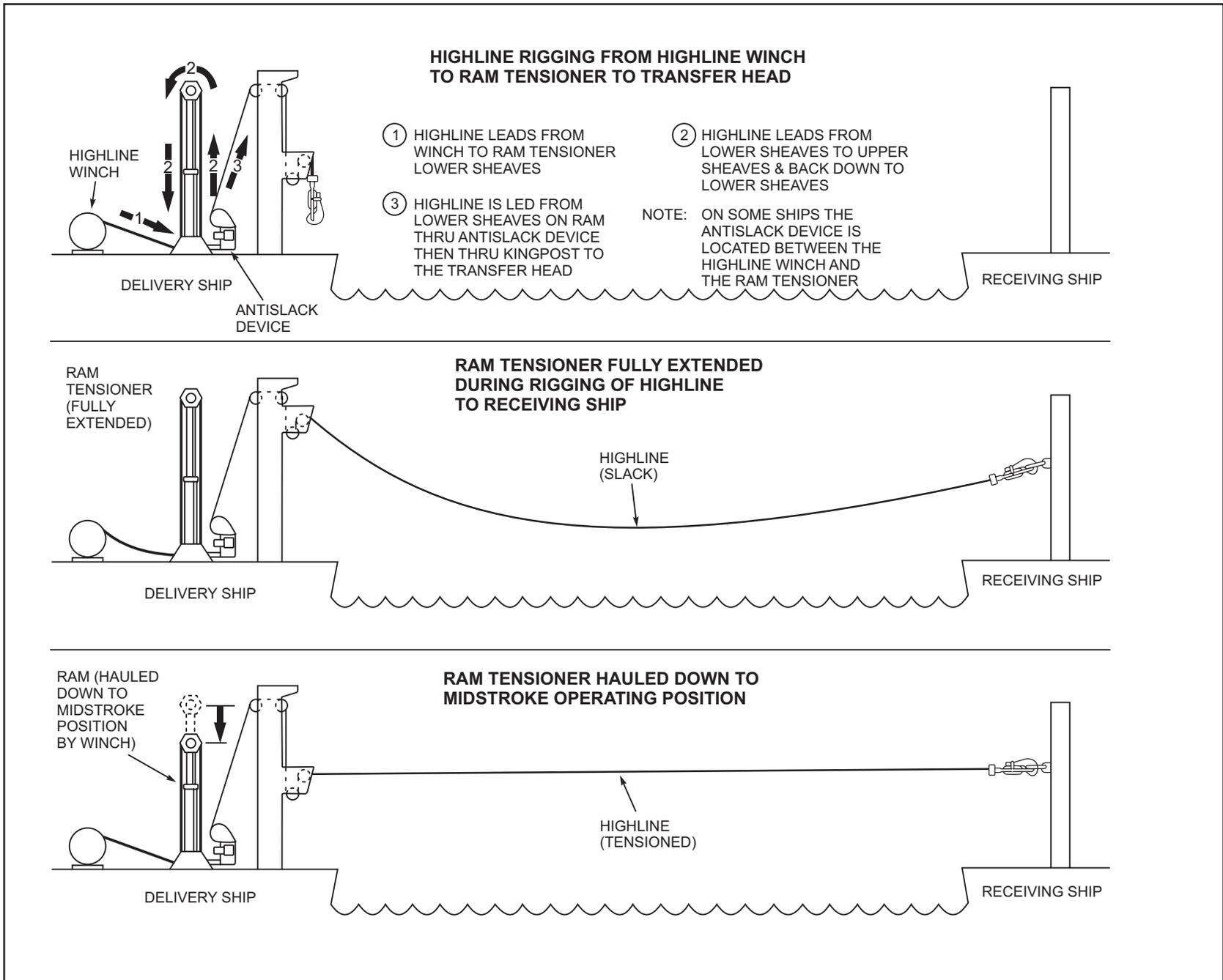


Figure 6-4. Ram Tensioner Operation

(see Figure 6-5). When using one of the STREAM rigs with all-tensioned wires, the wire rope outhaul is fairled through a block at the top of the kingpost at the delivery station, reeved through a fixture secured (after passing) at the receiving station (see SURF, paragraph 6.6.5), and attached to the outboard side of the trolley. The wire rope inhaul is attached to the inboard side of the trolley. The outhaul hauls the trolley to the receiving station; the inhaul hauls it back to the delivery station. STREAM inhaul and outhaul winches can be operated in two modes: *speed* control and *tension* control. The Navy standard hauling winch incorporates the inhaul and outhaul in one winch bed.

6.6.2.1 Speed Control (Used during rigging and unrigging). Just like most cargo winches, inhaul and outhaul winches operated in *speed* control respond to the movement of the control handle only. The further the control handle is moved, the greater the speed of the winch. (If installed, ensure that the ASD is ON and operating before paying out winches in *speed* control.) When the winch operator moves the control handle in the “pay out” direction, the winch runs out more wire. When he moves the handle in the “haul in” direction, the winch reels in wire. When the handle is in “neutral” (hands-off position), the internal brake sets and the winch drum should not move.

WARNING

Never move the sliding block while the inhaul winch is in speed control.

6.6.2.2 Tension Control. In *tension* control, the inhaul and outhaul winches respond not only to the movement of the control handle but also to a tension-sensing mechanism in the winch. In *tension* control, the internal brake is released at all times. When the winch operator switches the winch to *tension* control and his control handle is in “neutral,” the winch immediately hauls in, applying and maintaining a minimum tension of about 1,000 lb (454 kg) to 1,500 lb (680 kg) in the wire rope.

CAUTION

Inhaul and outhaul winches when put in *tension* control immediately haul in to put 1,000 lb (456.5 kg) to 1,500 lb (680 kg) of tension on the wire ropes. The bitter ends of the inhaul and outhaul must always be properly secured and personnel must be clear of the lines before switching winches to *tension* control.

The tension-sensing mechanism measures tension in the wire rope, either directly from the wire rope, or through pressure changes in the hydraulic fluid. Moving the control handle in the “increase tension” direction increases tension in the wire; moving the control handle all the way in the “increase tension” direction applies about 4,500 lb (2,041 kg) to 5,000 lb (2,268.5 kg) of tension in the wire.

The difference in the amount of tension in the inhaul and outhaul wires is what causes the trolley to move in the direction of higher tension. The operation of the inhaul and outhaul is illustrated in Figure 6-5.

6.6.2.3 Tension Control Compensates for Ship Motion. The major reason for *tension* control in the inhaul and outhaul winches is to prevent a tightline condition caused by ship movement during transfer. The winch attempts to maintain the tension “ordered” by the position of the control handle — either minimum tension or some increased tension in one of the winches when moving the trolley — by responding to the tension measured by the tension-sensing mechanism. The inhaul and outhaul winches either pay out or haul in wire rope in an attempt to maintain the “ordered” tension as the distance between ships changes.

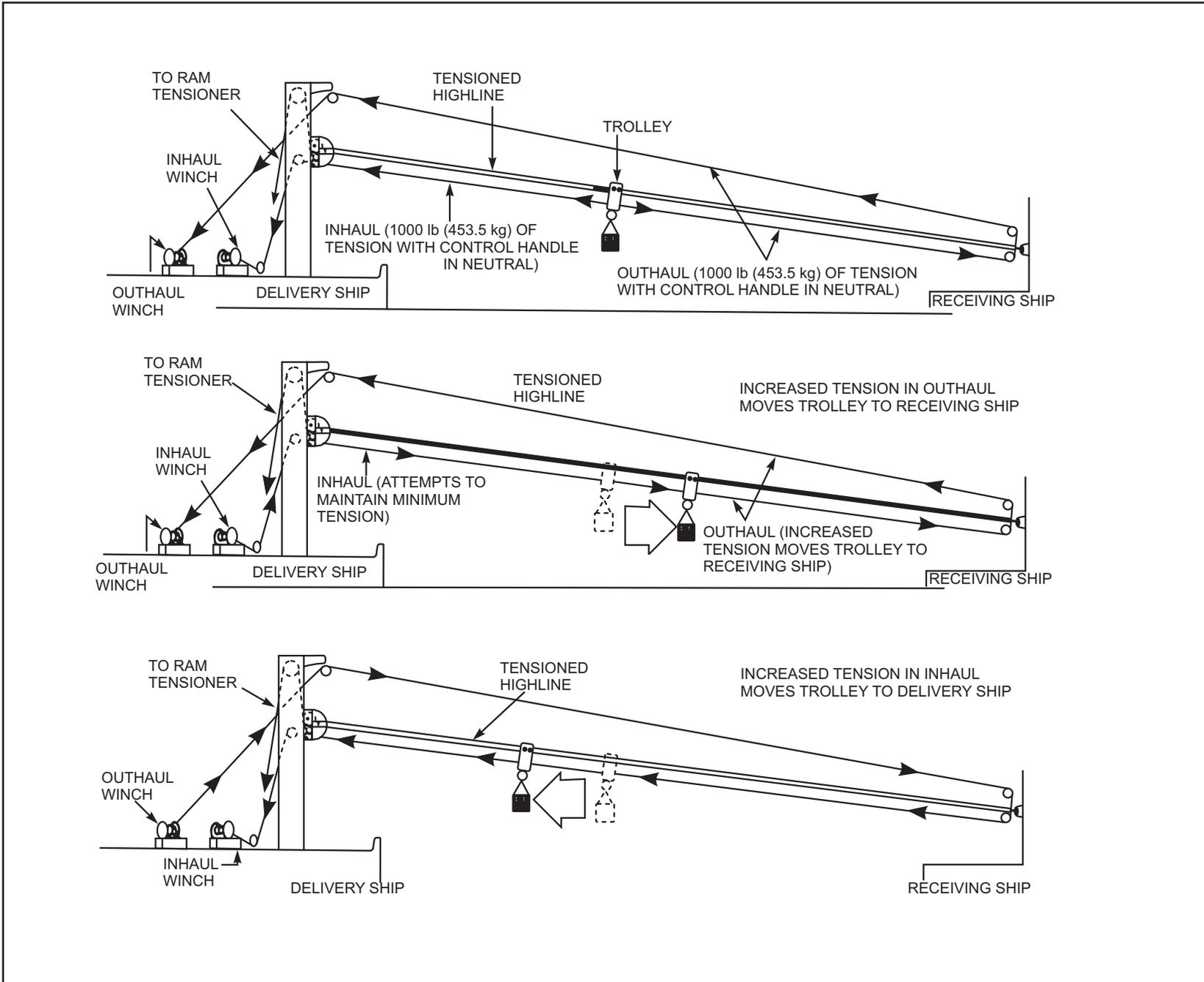
6.6.3 STREAM Transfer Station. A STREAM transfer station includes as major equipment a kingpost, a sliding block, and a STREAM transfer head. The sliding block is driven by chains or hydraulic pistons up and down on a track inside the kingpost (see Figure 6-6). Inside the sliding block and transfer head are sheaves through which the highline and inhaul are reeved. Since the sliding block carries the transfer head, its movement controls the vertical travel of the transfer head, highline, trolley, and suspended load. The sliding block is lowered close to the deck for rigging STREAM, raised to the top of the kingpost to lift a load from the deck and transfer it, and lowered far enough to bring the empty cargo hook close to the deck for picking up the next load. This feature provides good load control.

6.6.4 Trolley. The STREAM trolley is used in all STREAM rigging (see Figure 6-7).

6.6.4.1 Trolley Support Arms. Where provided, trolley support arms serve as a support to the STREAM trolley when it is placed against the transfer head. They provide the transfer station with a means of control for the trolley when the highline is in the detensioned mode.

6.6.5 Standard Underway Replenishment Fixture. On all-tensioned wire rigs, the SURF is used to fairlead the tensioned outhaul at the receiving station. It is furnished by the delivery station and hauled by

Figure 6-5. Inhaul and Outhaul Rigged With Winches in Tension Control



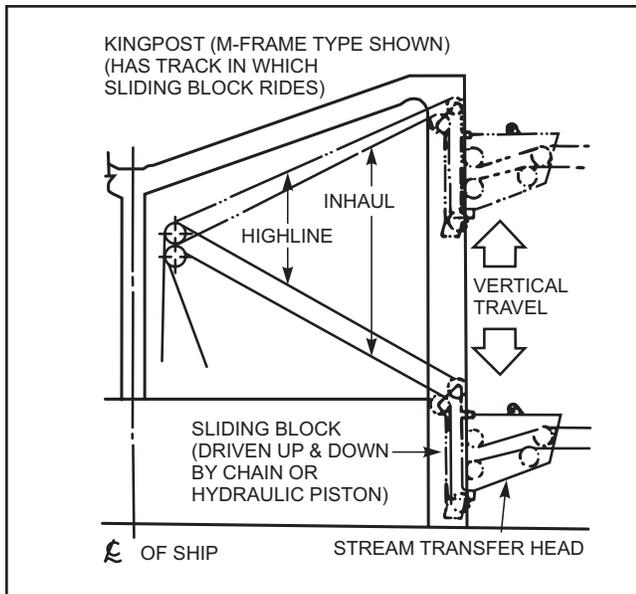


Figure 6-6. STREAM Transfer Head

messenger along the tensioned highline to the receiving station. The SURF has a pair of sheaves to fairlead the outhaul (see Figure 6-23). The highline is reeved through one of the two support tubes located between the sheaves. Two support tubes are provided to permit off-setting of the highline to clear the outhaul. When the SURF is used alone, it is called a traveling SURF (see Figures 6-15 and 6-23).

6.6.6 SURF Traveling Actuated Remotely Rig. A STAR rig is a STAR latch assembly bolted to a SURF (see Figure 6-16). A STAR probe is secured at the outboard end of the highline (see Figures 6-13 and 6-16). The latch assembly and probe mate automatically when the rig is passed to the receiving station. They are remotely unlatched when the rig is retrieved. The STAR rig eliminates the need to send personnel aloft for these purposes.

6.6.7 Special Handling Equipment for Transfer of Ammunition and Missiles. Ammunition, missiles, and components require special handling equipment for intership transfer because of the large weight and/or size of the load and because missiles and components are easily damaged during transfer. Figure 6-8 illustrates a missile transfer in a Mk 6 missile transfer dolly to a sliding-padeye and a fixed-padeye receiving station.

6.6.7.1 Mk 6 Missile Transfer Dolly. Use the Mk 6 missile transfer dolly to transfer noncontainerized missiles and boosters. It is constructed of tubular steel and has a dead-man brake system, castored wheels

(which permit manhandling of the dolly and load on deck), shock absorbers on each wheel, and fold-down side bumpers. The dolly provides mobility and shock protection for the missile or booster load.

6.6.7.2 Cargo Drop Reel. Install the CDR to the STREAM trolley whenever missiles and components are delivered to a fixed padeye (see Figures 6-8 and 6-9). Steadying lines rigged to the load are required. For CDR operation, see paragraph 6.15.

6.6.7.3 Positive Lock. A positive lock is provided with the CDR. Rig it to the CDR to prevent accidental lowering of the load (see Figure 6-10). A cable extender is provided for the safety chain part of the positive lock (see Figure 6-10). Use it with a retrograde load when the CDR is not two-blocked.

6.6.7.4 Mk 1 Strongback. Install the Mk 1 strongback to the STREAM trolley whenever missiles and components are delivered to a sliding padeye, regardless of what container is used (see Figures 6-8 and 6-11).

6.7 RECEIVING SHIP — STREAM EQUIPMENT

There are four basic receiving stations for STREAM rigs:

1. Sliding-padeye
2. Fixed-padeye
3. Pendant
4. STREAM support leg (CV only).

Figure 6-38 at the end of the chapter contains a list of hardware required at the receiving station.

6.7.1 Sliding-Padeye Receiving Station. Loads up to the full capacity of the STREAM rig can be sent to or returned from a sliding-padeye receiving station (see Figure B-2). Figure 6-12 shows a bulkhead-mounted, sliding-padeye receiving station; other types in use are portable, retractable, and overhead stowed. The padeye is powered to move up or down in a guide track mounted on the kingpost. It is lowered to a point near the deck for attaching the highline, raised to the top of the kingpost for receiving a load, and lowered far enough to land the load on deck. This feature provides good load control and also allows the receiving station to return heavy loads. The cargo hook adapter and Mk 1 strongback are attached to the trolley for transfers to a sliding-padeye receiving station. A Mk 5 strongback is used for transfer

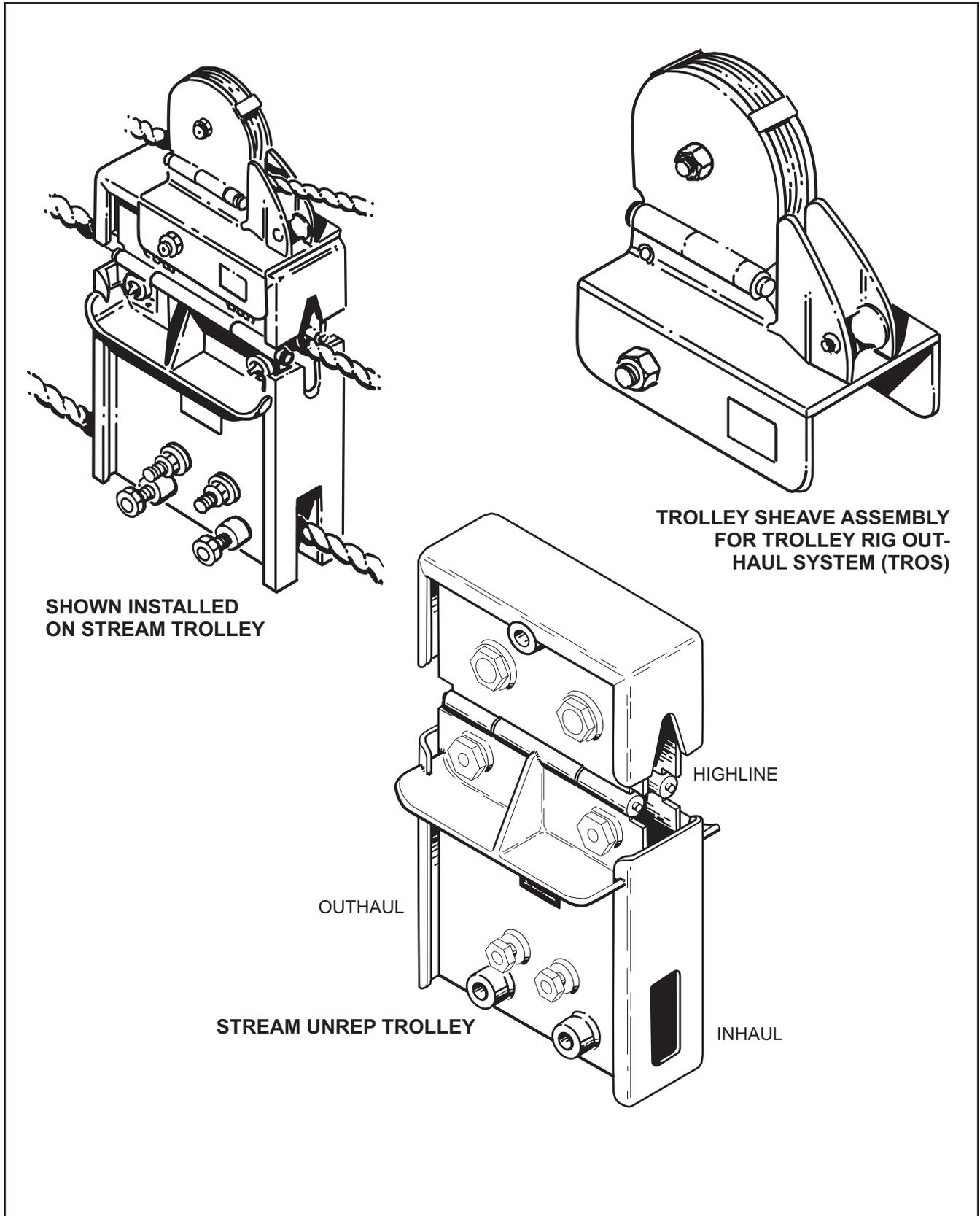


Figure 6-7. STREAM Trolleys

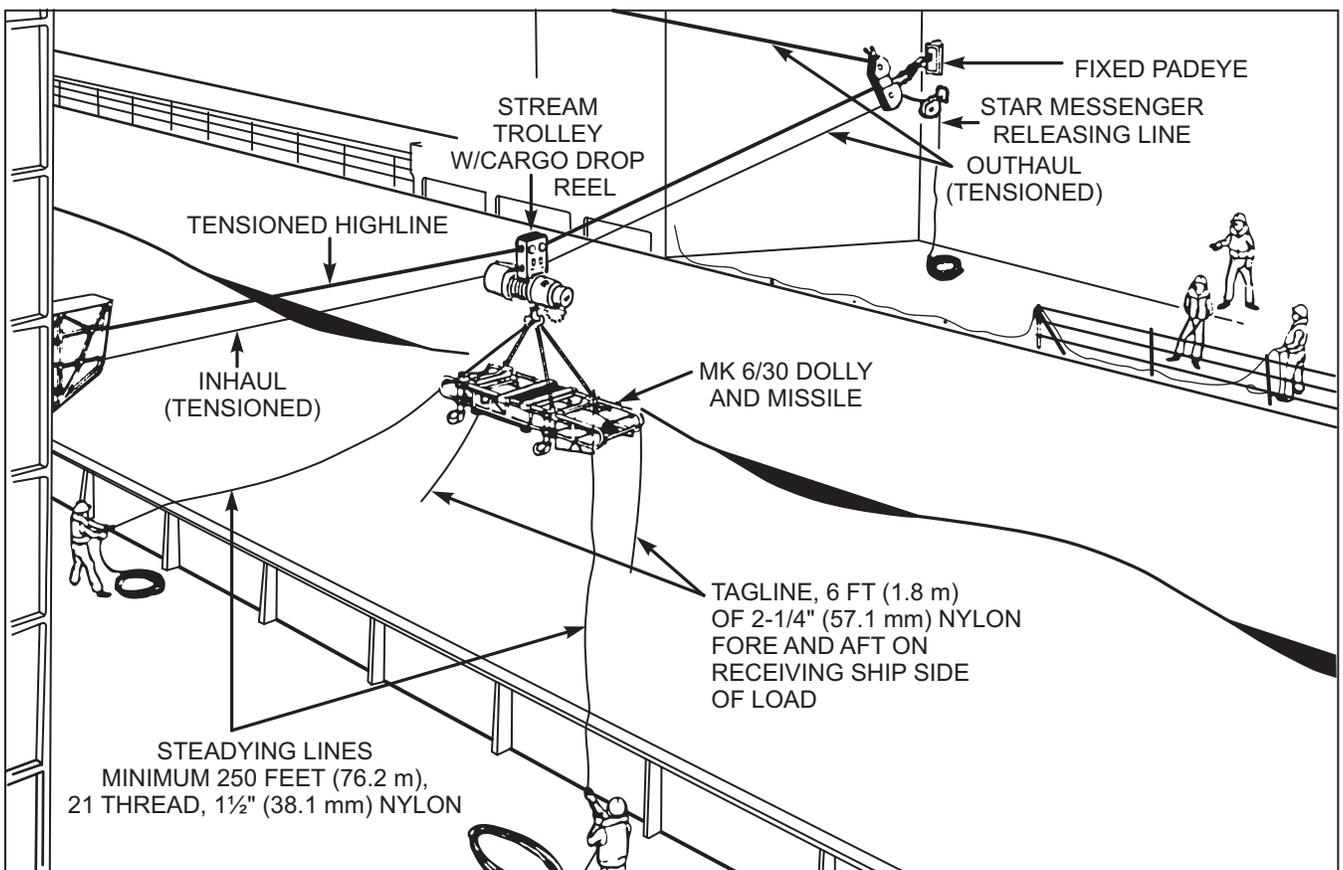
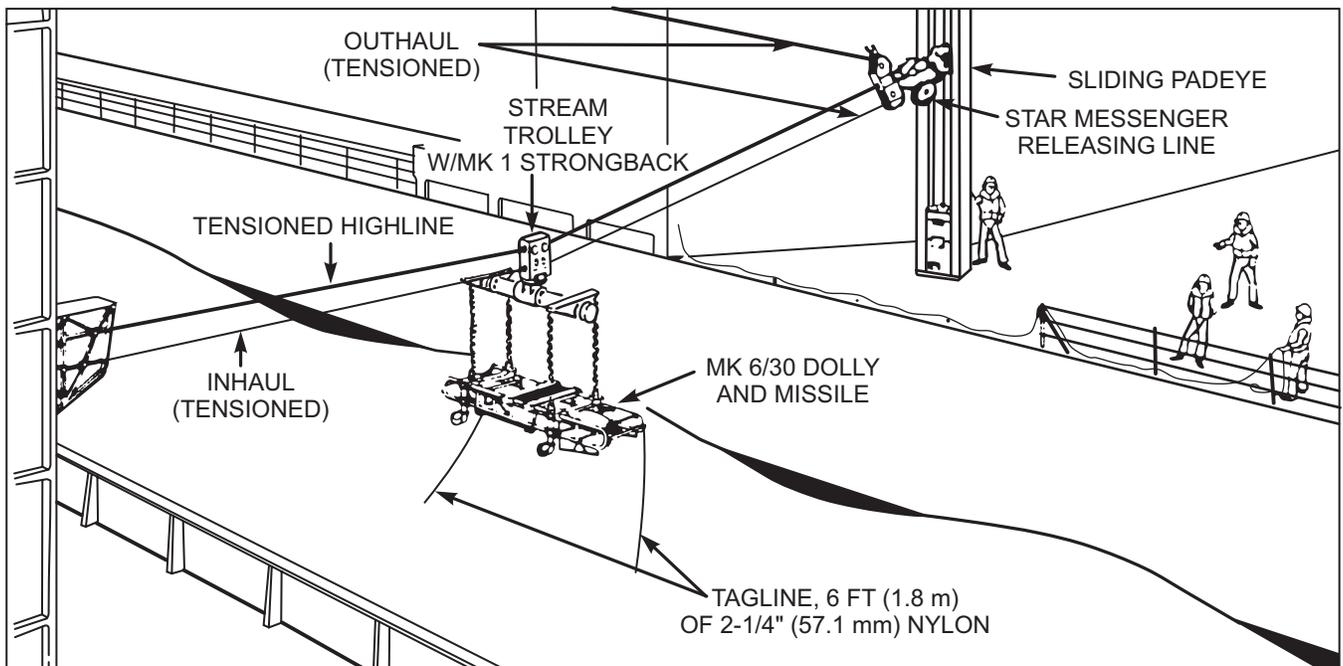


Figure 6-8. Missile Transfer in Mk 6 Dolly To Sliding Padeye (Upper) or to Fixed Padeye (Lower)

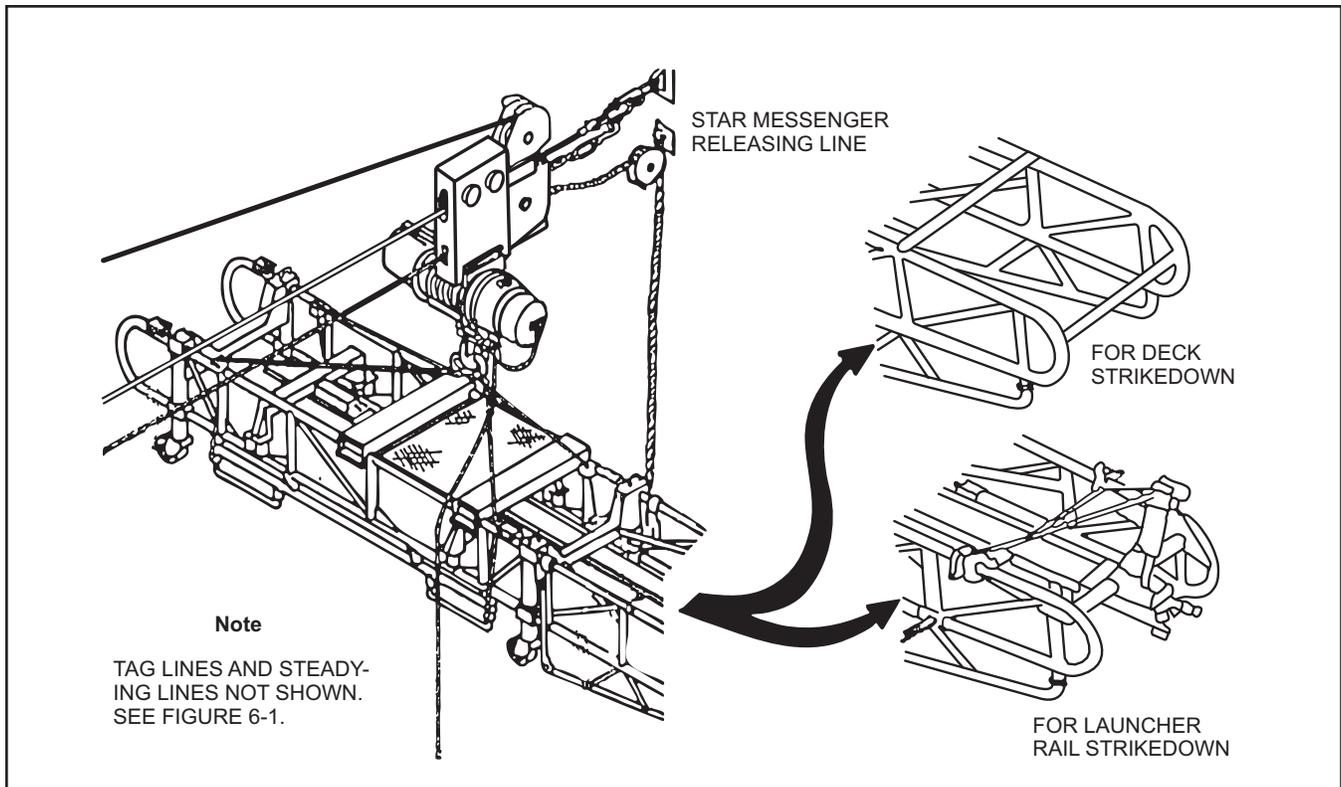


Figure 6-9. Cargo Drop Reel With Mk 6 Dolly

of heavy lifts to a sliding padeye. The CDR is normally not needed but may be used. For sliding-padeye operating procedures, see paragraph 6.14.

6.7.2 Fixed-Padeye Receiving Station. Fixed padeyes are permanently mounted on a bulkhead, kingpost, or outrigger above the landing area. Figure 6-13 shows a typical rigging of a fixed-padeye receiving station. Although fixed-padeye mountings vary from ship to ship, all must meet certain requirements for attachment of the STREAM rig:

1. One padeye with a long link — for connecting the 1-3/8 inch (36.9 mm) pelican hook on the highline.
2. One or two additional padeyes — for attaching the fairlead block(s) for the rig messenger or outhaul (depending on the STREAM rig used).
3. When the receiving station provides a hand-tended or winch-tended outhaul, the padeye for the fairlead block must be 6 inches (152.4 mm) to 18 inches (457.2 mm) below the padeye for the highline — to give direct pull on the trolley.

Since a fixed padeye keeps the highline at a single point above the landing area, a CDR must be attached to the trolley for lowering the load at the receiving station. Paragraph 6.15 provides procedures for operating the CDR. In case there is a casualty to the CDR, the tension/detension method may be used to lower the load (see paragraph 6.16).

6.7.3 Pendant Receiving Station. A pendant receiving station, like the fixed-padeye receiving station, keeps the highline at a fixed height above the deck. Figure 6-14 shows a typical rigging of a pendant receiving station. The pendant is 1-1/8 inch (28.5 mm) wire rope with an eye and a long link at each end. The pelican hook on the highline is attached to the outboard long link (toward the delivery ship), the pendant is hauled into working position, and the long link on the inboard end is secured to a pelican hook shackled to a deck padeye. The pendant is used primarily with a kingpost, tripod, or STREAM support leg.

Some installations may have rigging platforms that permit access to the pelican hook at the kingpost. Use extreme caution when tripping the kingpost pelican hook and clear the station prior to easing the highline over the side with the easing-out line.

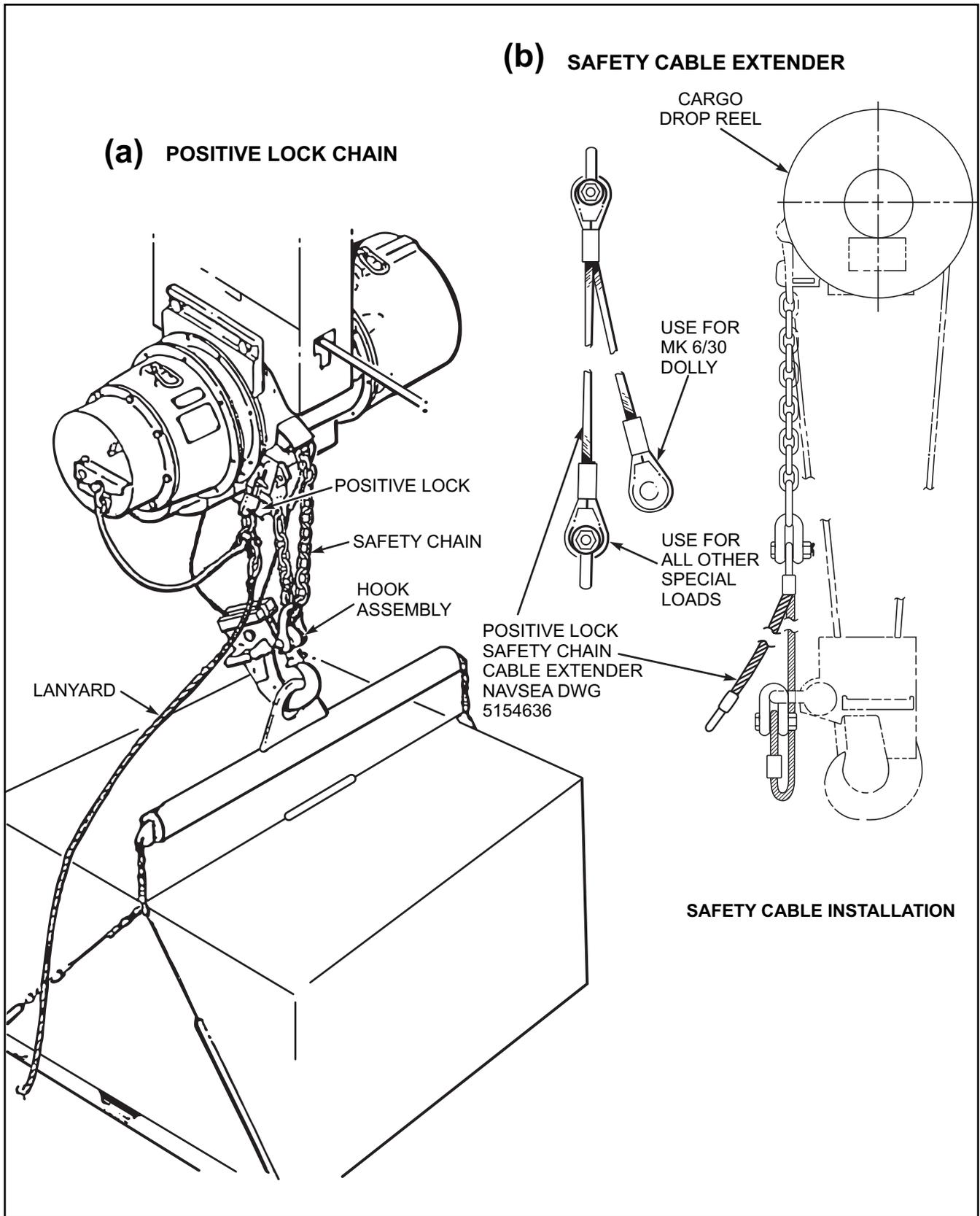


Figure 6-10. Positive Lock Safety Chain and Cable Extender

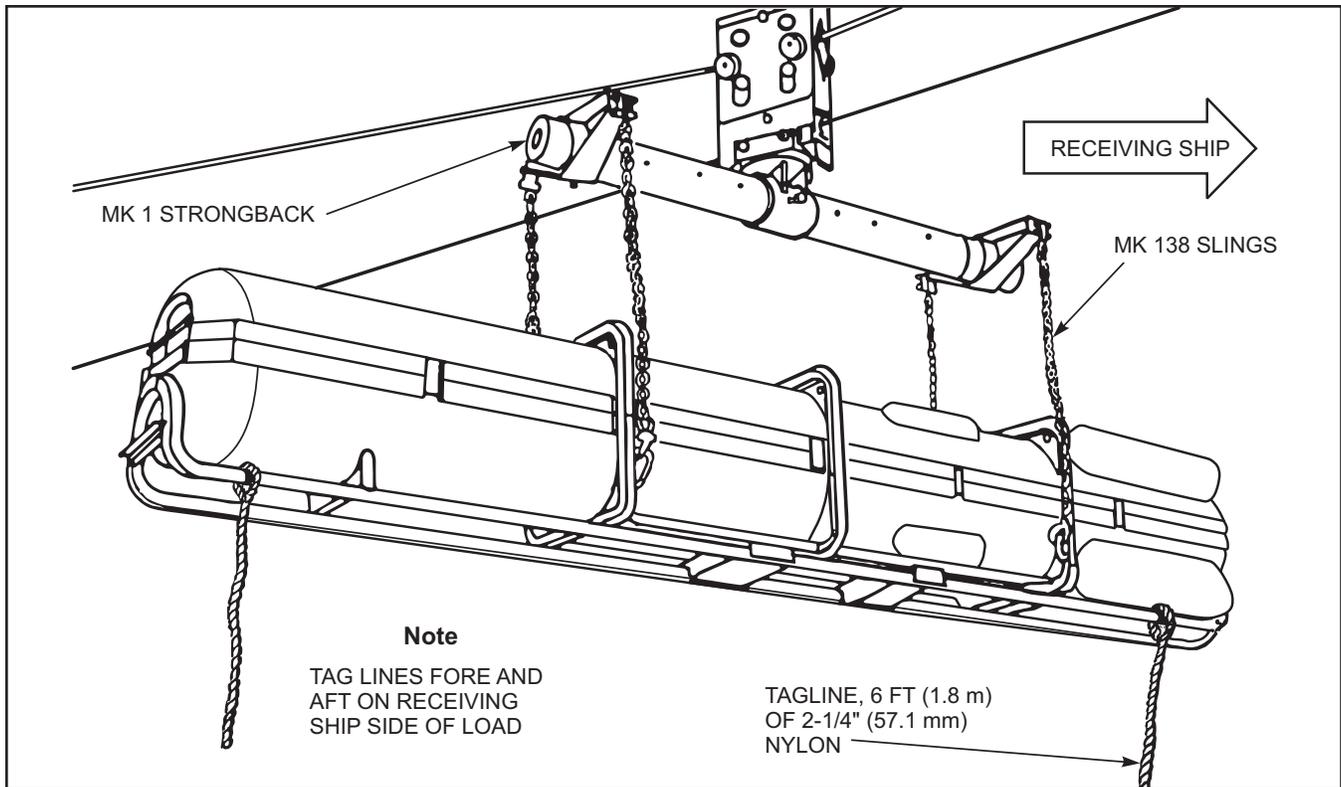


Figure 6-11. Mk 1 Strongback With Mk 183 (ASROC) Container

6.7.3.1 Rigging a Pendant Receiving Station.

Rigging of a pendant receiving station is done according to the following steps:

1. Place the pendant in the saddle on top of the kingpost, so that the long link for attaching the pelican hook is within easy reach at deck level.
2. Install the securing pin in the kingpost to keep the pendant free for running, but restrained from jumping out of the saddle.
3. Secure a 3-inch (76.2 mm) haul-down line (length to suit) to the length of pendant outboard of the kingpost. Use a 7/8-inch (22.2 mm) safety anchor shackle.
4. Shackle a pelican hook to a deck padeye for attaching the inboard end of the pendant after the pendant has been raised to working height.
5. Rig a two-fold purchase: attach one end of the tackle to a downhaul pad near the inboard end of the pendant; secure the other end of the tackle to a deck padeye near the one with the pelican hook.
6. Lead the hauling part of the tackle through a snatch block (for a fairlead) and then to an area where men can haul in on the tackle.
7. After the highline has been sent over, remove all twists of the messenger from around the highline and attach the pelican hook on the highline to the long link on the outboard end of the pendant.
8. Rig the easing-out line (see paragraph 2.2.11.5) through the pelican hook long link and secure.
9. Haul in on the tackle to raise the highline and the outboard end of the pendant to working height.
10. Secure the long link on the inboard end of the pendant to the pelican hook attached to the deck padeye.
11. The highline is now ready for tensioning (see paragraph 6.9.2(5)).

6.7.3.2 Retrieving the Rig From a Pendant Receiving Station.

The delivery station hauls the trolley back, detensions the outhaul, hauls the SURF back, and

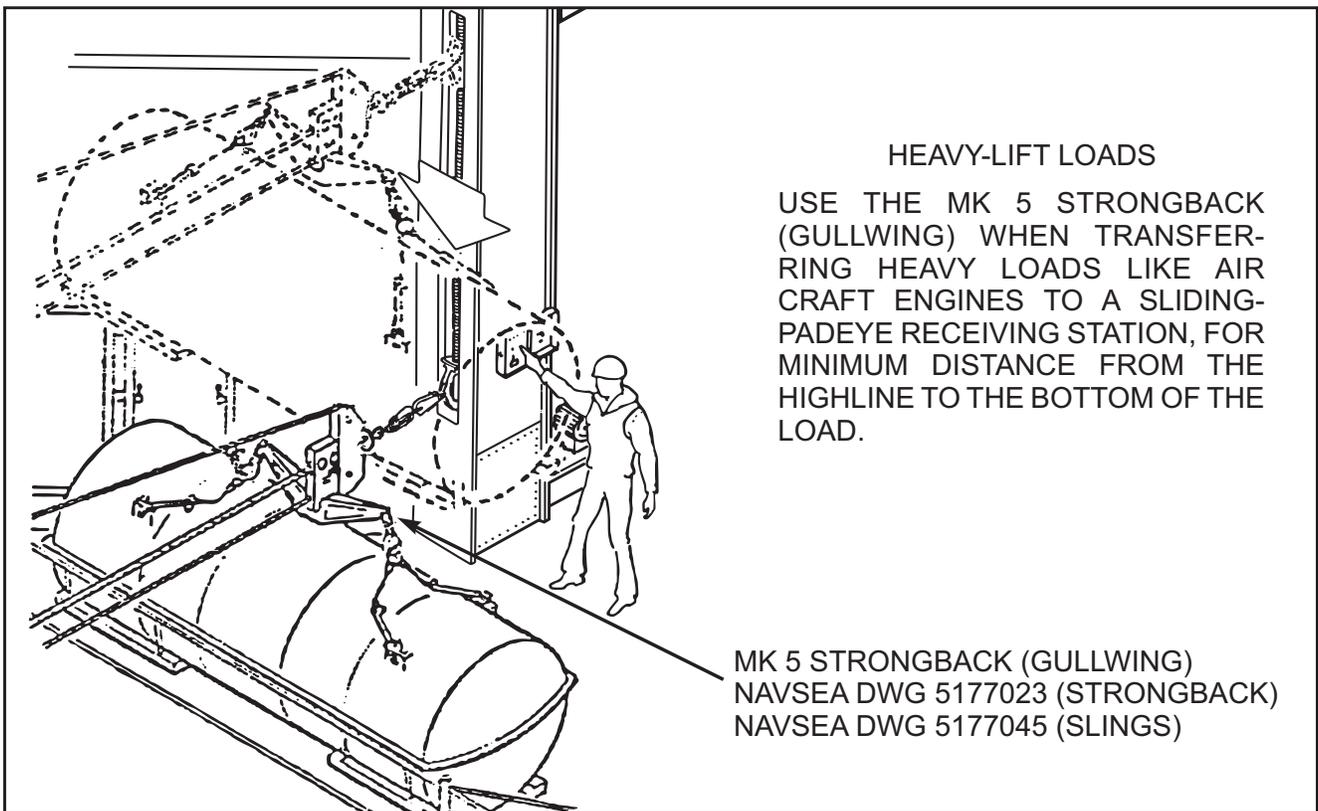
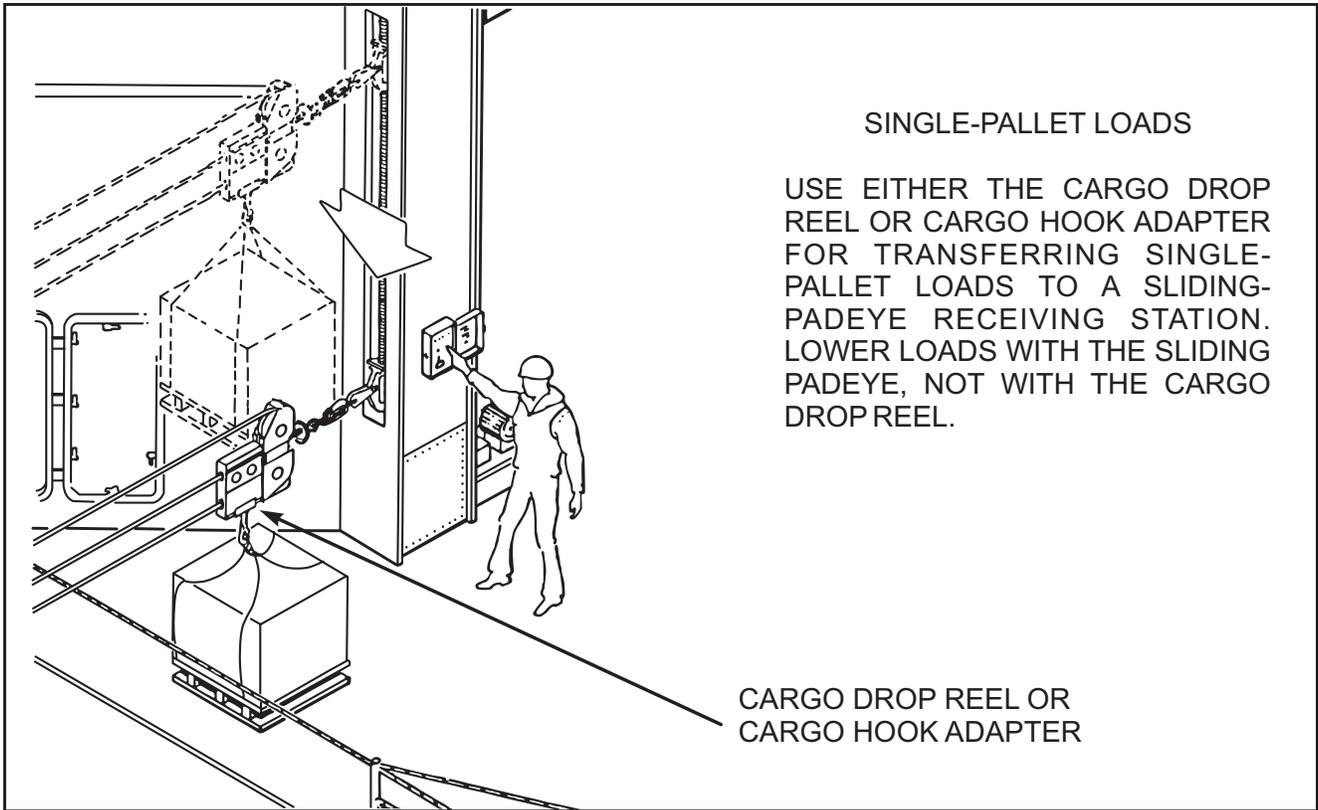


Figure 6-12. Sliding-Padeye Receiving Station (Typical) — Shown With STREAM With Traveling SURF (Sheet 1 of 2)

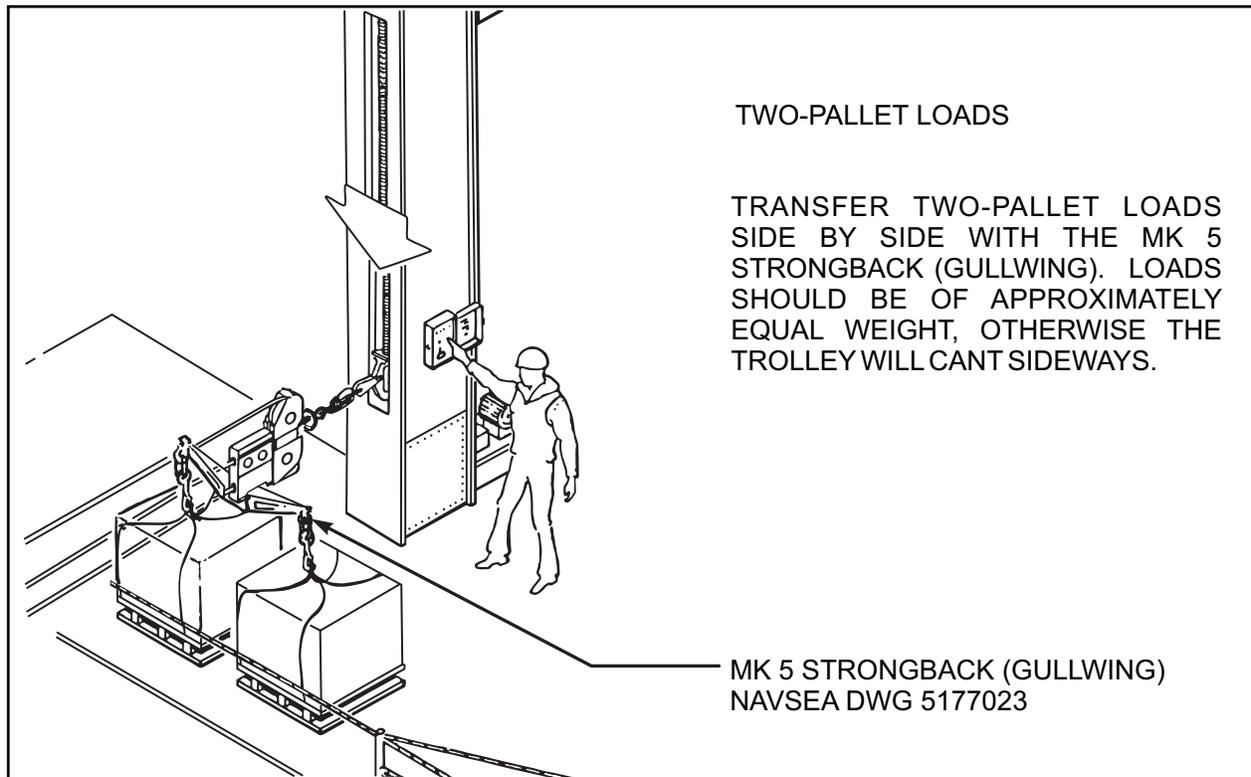
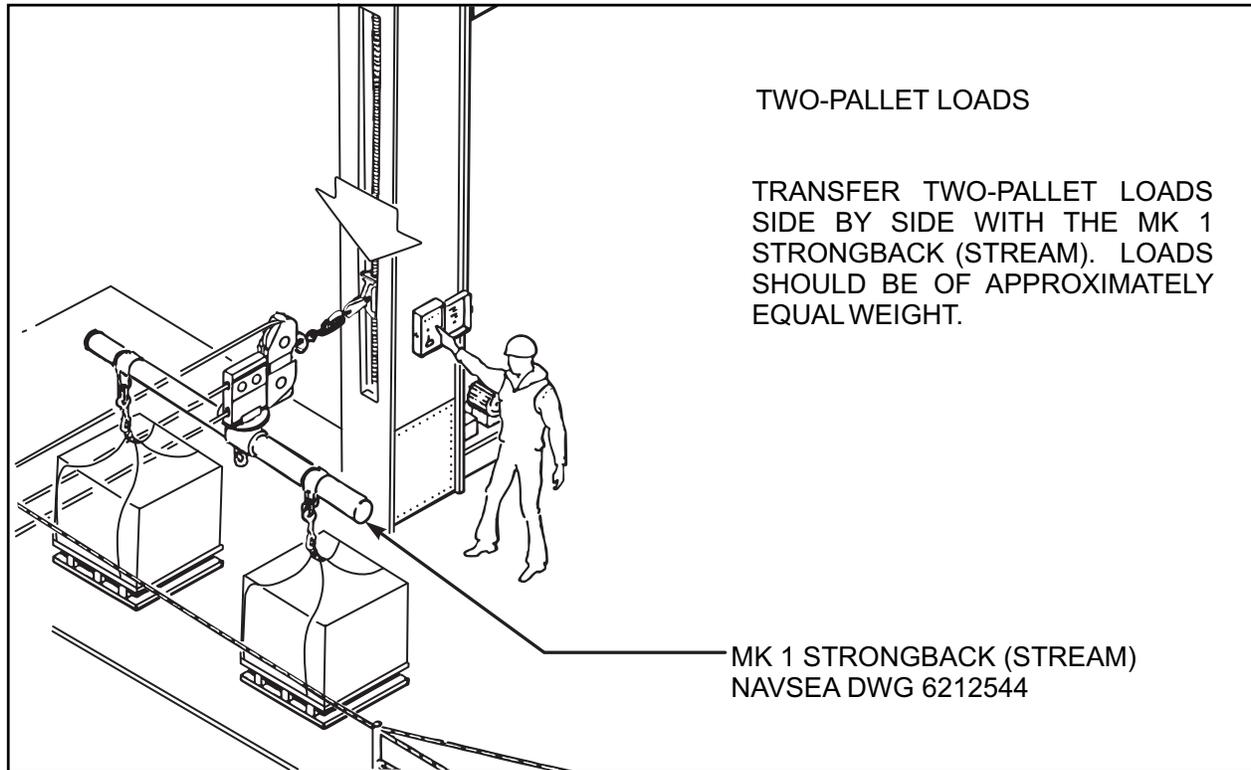


Figure 6-12. Sliding-Padeye Receiving Station (Typical) — Shown With STREAM With Traveling SURF (Sheet 2 of 2)

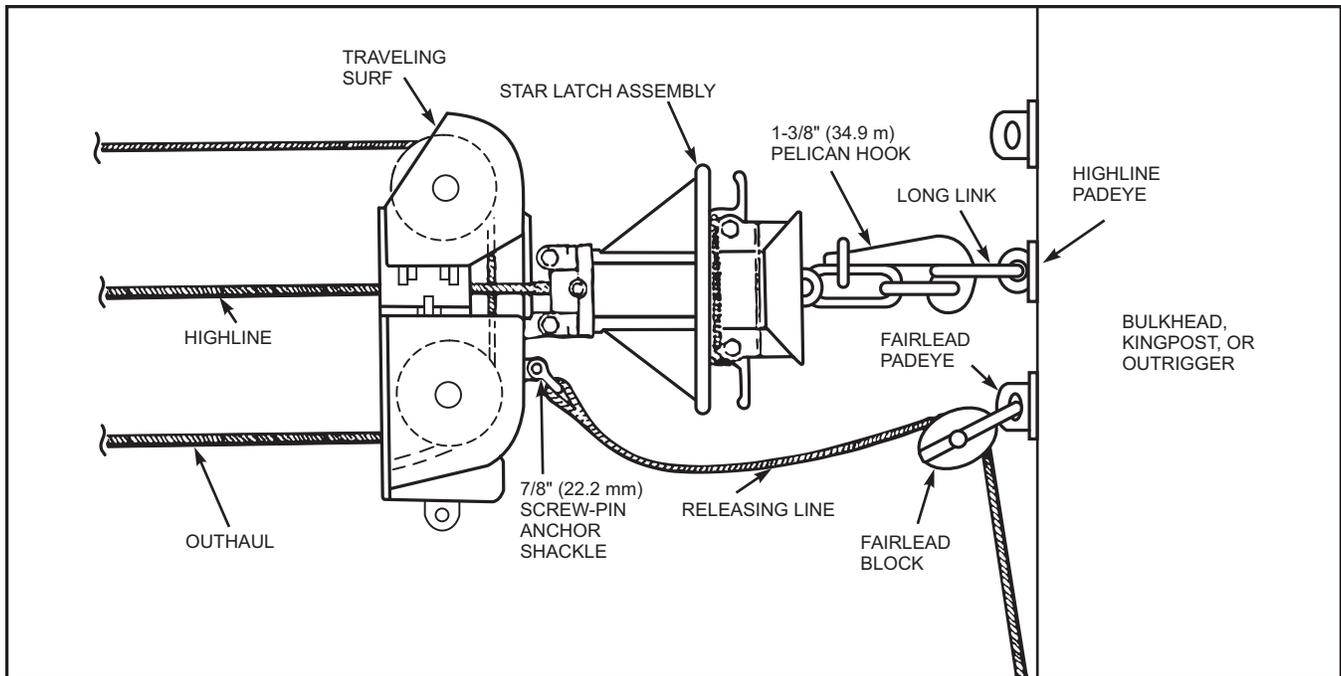


Figure 6-13. Fixed Padeye Receiving Station (Typical) — Shown With STREAM With STAR

detensions the highline (see paragraph 6.9.4 (5)). After the highline is detensioned, the receiving station:

1. Tends the haul-down line, leads to a cleat, and holds.
2. Hauls in on the tackle to take the strain off the pelican hook at the deck padeye.
3. On signal from the delivery station, trips the pelican hook at the deck padeye.

WARNING

Trip the pelican hook on the deck padeye before tripping the pelican hook on the highline. Receiving station must *not* trip either pelican hook until the highline is slack *and* the signal has been given by the delivery station.

4. Eases out on the tackle to lower the outboard end of the pendant and the pelican hook on the highline to within reach at deck level.
5. Continues to hold the haul-down line to keep the pelican hook on the highline from moving outboard.

6. Trips the pelican hook on the highline.

7. Eases the highline over the side with easing-out line as the delivery station hauls in the highline.

6.7.4 STREAM Support Leg Receiving Station.

The STREAM support leg, installed in carriers, is a pendant receiving station. The support leg is installed in the overhead inside the hangar deck and folds up out of the way when not in use. Rigging and retrieving procedures are similar to paragraphs 6.7.3.1 and 6.7.3.2.

6.8 STREAM SYSTEM — DESCRIPTION

All STREAM rigs use a tensioned highline to support the trolley and suspended load, but there are different ways of rigging the outhaul and different methods of lowering the load at the receiving station. The following STREAM rigs are discussed in the paragraphs that follow:

1. STREAM with STAR (paragraph 6.9)
2. STREAM with traveling SURF (paragraph 6.10)
3. STREAM with hand-tended outhaul (paragraph 6.11)
4. STREAM consolidation (paragraph 6.12).

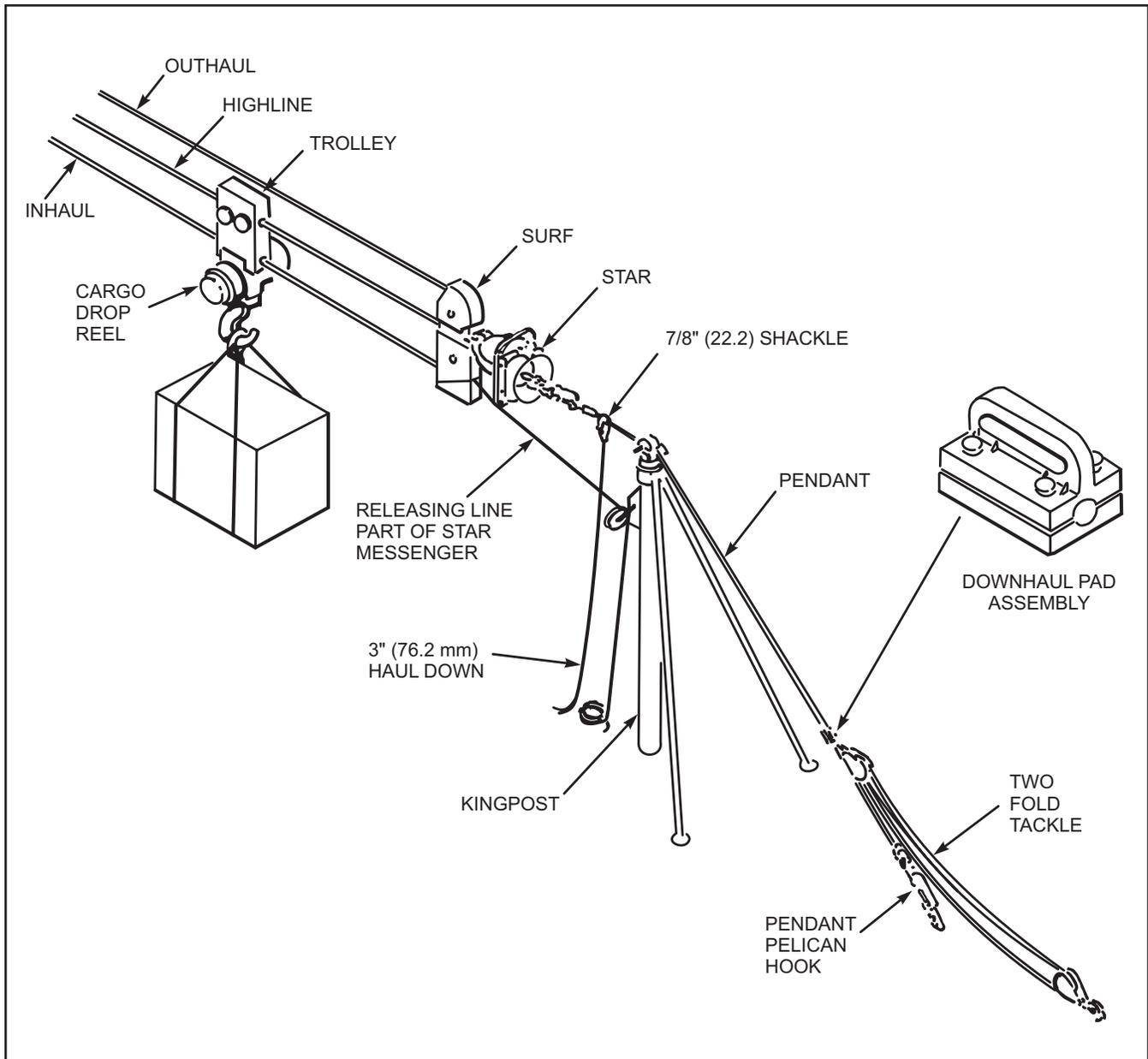


Figure 6-14. Pendant Receiving Station (Typical) — Shown With STREAM With STAR

STREAM rigs can be rigged to a sliding-padeye, fixed-padeye, or pendant receiving station or to another STREAM delivery station. Load-lowering methods (beginning at paragraph 6.13) describe these transfers:

1. A cargo hook is attached to the trolley when delivering a load to a sliding-padeye receiving station or another STREAM delivery station (see paragraph 6.14).
2. A CDR reel is attached to the trolley (for lowering the load at the receiving station) when delivering a load to a fixed-padeye or pendant receiving station (see paragraph 6.15).
3. An alternate method that can be used for lowering or raising loads at the receiving station is tension/detension (see paragraph 6.16).

STREAM station equipment should be started up as described in the STREAM System Operability Test or in the technical manual.

STREAM rigs in order of preference for various receiving stations (see Figure 6-15) are:

1. STREAM with STAR (recommended for non-sliding-padeye stations) (paragraph 6.9)
2. STREAM with traveling SURF (required for heavy lift to CV with sliding-padeye) (paragraph 6.10)
3. STREAM with hand-tended outhaul (paragraph 6.11).

6.9 STREAM WITH STAR

STREAM with STAR is an all-tensioned wire rig. Winches at the delivery station tend the highline, inhaul, and outhaul. The STAR latch assembly is bolted onto the traveling SURF and the outhaul is reeved through the SURF. The highline end fitting is inserted into the STAR probe and attached to the standard pelican hook using the STAR shear pin adapter or a 7/8 inch (22.2 mm) safety anchor shackle. Figure 6-16 shows the major assemblies.

The highline is passed by STAR messenger to the receiving station and is connected there by the pelican hook to the long link on the padeye or pendant. The highline is tensioned by hauling in the slack wire and compressing the ram tensioner. The SURF, which provides a fairlead for the outhaul, rides on the highline. The STAR and SURF are hauled by messenger along the highline until the STAR latch assembly slides over the STAR probe and the latches engage on the probe. The receiving station slacks the messenger, the delivery station tensions the outhaul, and the rig is ready to operate.

STREAM with STAR can be rigged to a sliding-padeye, fixed-padeye, or pendant receiving station. For transfers to a sliding-padeye receiving station, use the cargo STREAM strongback or cargo hook. For transfers to a fixed-padeye or pendant receiving station, use the CDR.

WARNING

Use STREAM with traveling SURF vice the STAR latch assembly when conducting transfers to and from aircraft carriers equipped with sliding padeyes.

Figures 6-37 and 6-38 at the end of the chapter list hardware that should be available at transfer stations.

6.9.1 Preparing STREAM With STAR

(1) DELIVERY SHIP. (See Figure 6-17.)

Note

Place trolley in support arms where applicable.

1. Attach the inhaul to the STREAM trolley. Reeve the highline through the trolley.
2. Install the CDR, cargo STREAM strongback, or cargo hook onto the trolley. *The drop reel is installed with the brake release lanyard aft.*
3. Reeve the outhaul through the SURF. Attach the outhaul to the trolley.
4. Reeve the highline through the SURF support tube. *Insert the highline on the same side as the outhaul outrigger on the kingpost.*
5. Reeve the highline through the STAR latch assembly. Insert the highline into the probe until the highline end fitting sticks out of the end of the probe. (See Figure 6-17.)
6. For a highline winch without a slip clutch, install a highline shear pin adapter. Connect the highline shear pin adapter to the highline end fitting. Use a bolt and a cotter pin from a 7/8-inch (22.2 mm) safety anchor shackle. (For a highline winch equipped with a slip clutch, do not use the highline shear pin.) If the highline winch has a slip clutch in the winch drum, use a 7/8-inch (22.2 mm) safety anchor shackle to connect the highline end fitting to the pelican hook and omit step 7. Rig shackle as shown in Figure 6-21.

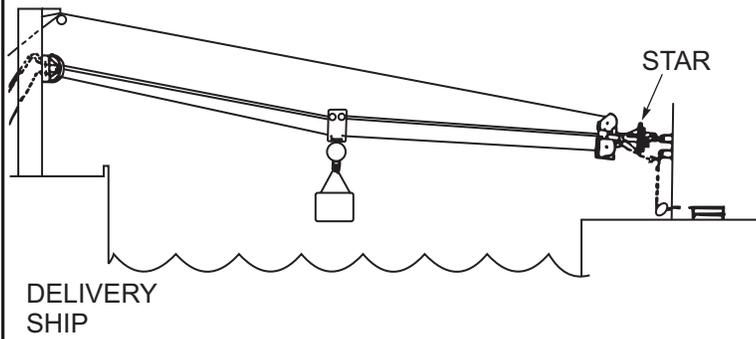


Do not use the STREAM pelican hook (with bail) with this rig.

7. Attach the standard 1-3/8-inch (36.9 mm) pelican hook to the highline shear pin adapter. Connect a 50,000 lb (22,675 kg) shear pin directly to the pelican hook.
8. Attach the STAR latch assembly to the SURF. Use the SURF pad bolt. Ensure that the centerline of the STAR latch assembly aligns with the SURF support tube (which contains the highline).

RECEIVING STATION WITHOUT WINCH

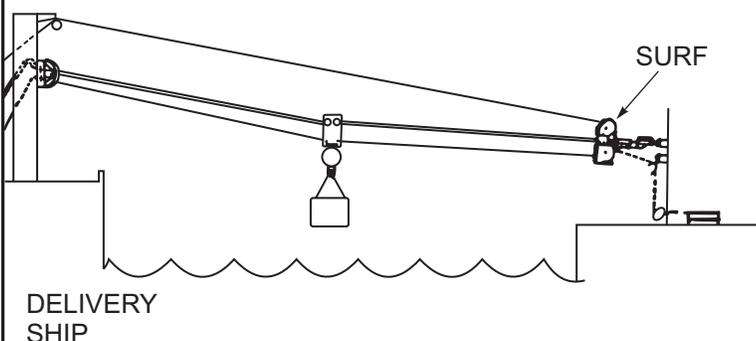
STREAM with Messenger-Rigged STAR



An all-tensioned wire rig with highline and hauling line tended by delivery ship. Highline and hauling line passed separately using manpower on receiving ship. STAR provides automatic hookup of fairlead for hauling line.

(See paragraph 4.8)

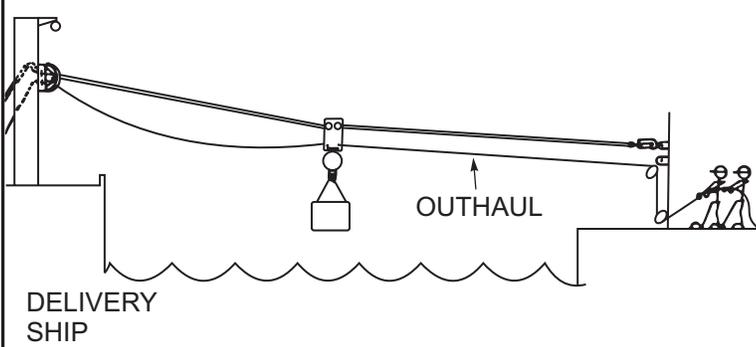
STREAM with Traveling SURF



An all-tensioned wire rig with highline and hauling line tended by delivery ship. Highline and hauling line passed separately using manpower on receiving ship. Requires manual hookup of SURF (fairlead for hauling line).

(See paragraph 4.9)

STREAM with Hand-Tended Outhaul



Tensioned wire highline and nontensioned wire inhaul tended by delivery ship. Outhaul hand-tended by receiving ship. Used when outhaul winch is not available on either ship or when receiving ship's attachment point cannot support all-tensioned rig.

(See paragraph 4.9)

Figure 6-15. STREAM Rig Configurations

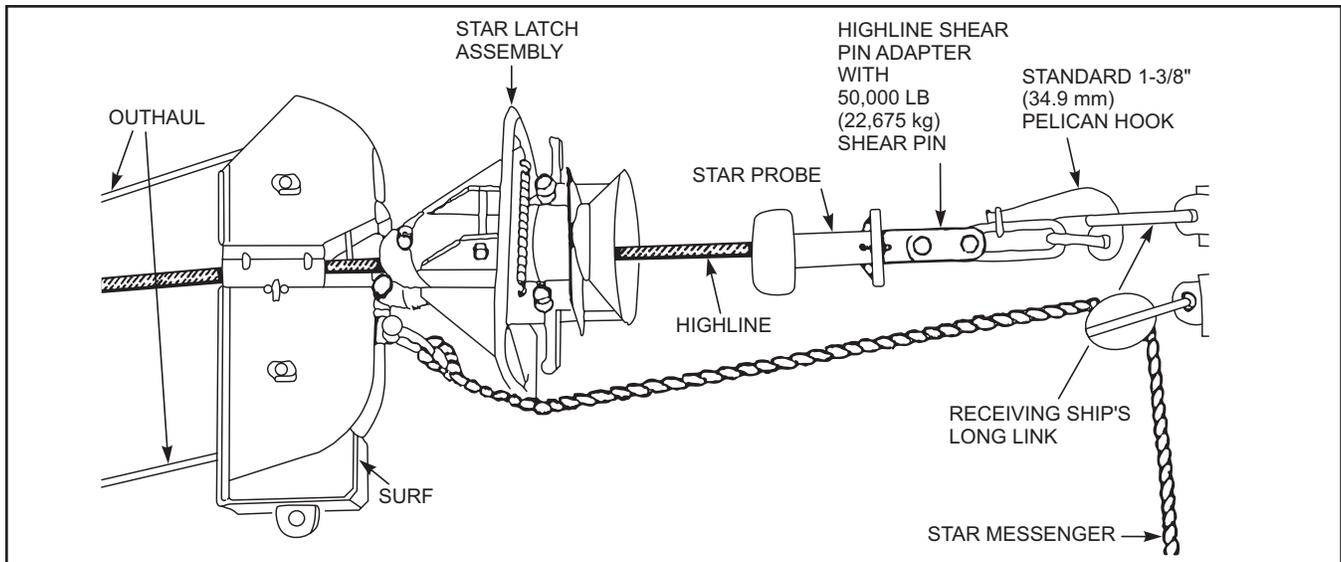


Figure 6-16. STREAM With STAR When Highline Winch Has No Slip Clutch in Drum — Major Assemblies

9. Cock both STAR latches by pushing the latches toward the SURF. (See Figure 6-18.)

10. Fake out the STAR messenger (shown in Figure 2-9). Attach the inboard end of the messenger to the messenger padeye on the SURF. Stop off the highline to the messenger 350 feet (106.6 m) from the inboard (shackled) end of the messenger. Stop off first to the probe fitting guide ring (see Figure 6-19). Place the next stop on the highline just inboard of the probe fitting. Then place one more stop about 12 inches (30.5 cm) inboard of the second stop.

11. Attach the station phone line and the lead line messenger for the phone/distance line (if required).

12. Ensure that all necessary 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 the fairlead block for the messenger.
2. Install the deck fairlead snatch blocks.
3. Ensure that all necessary working and repair tools and safety equipment are on station and that personnel are briefed, properly dressed, and on station.
6. At a pendant receiving station, rig the pendant.

5. Provide an easing-out line on station. See paragraph 2.2.11.5.

6.9.2 Passing STREAM With STAR

(1) DELIVERY SHIP. (See Figure 6-20.)

1. With the STREAM transfer head in the down position, switch the inhaul winch to *tension* control and the outhaul winch to *speed* control.

WARNING

The inhaul winch must be in *tension* control before moving the STREAM transfer head.

2. Send over the shot line attached to the messenger.

(2) RECEIVING SHIP

1. Receive the shot line and haul in. When the messenger comes aboard, install the messenger in the rigging and fairlead blocks and continue to haul in.
2. When the station phone line and the lead line messenger for the phone/distance line come aboard, disconnect them and move them clear of the area.
3. Attach the phone/distance line to the lead line messenger and signal the delivery station to haul in.

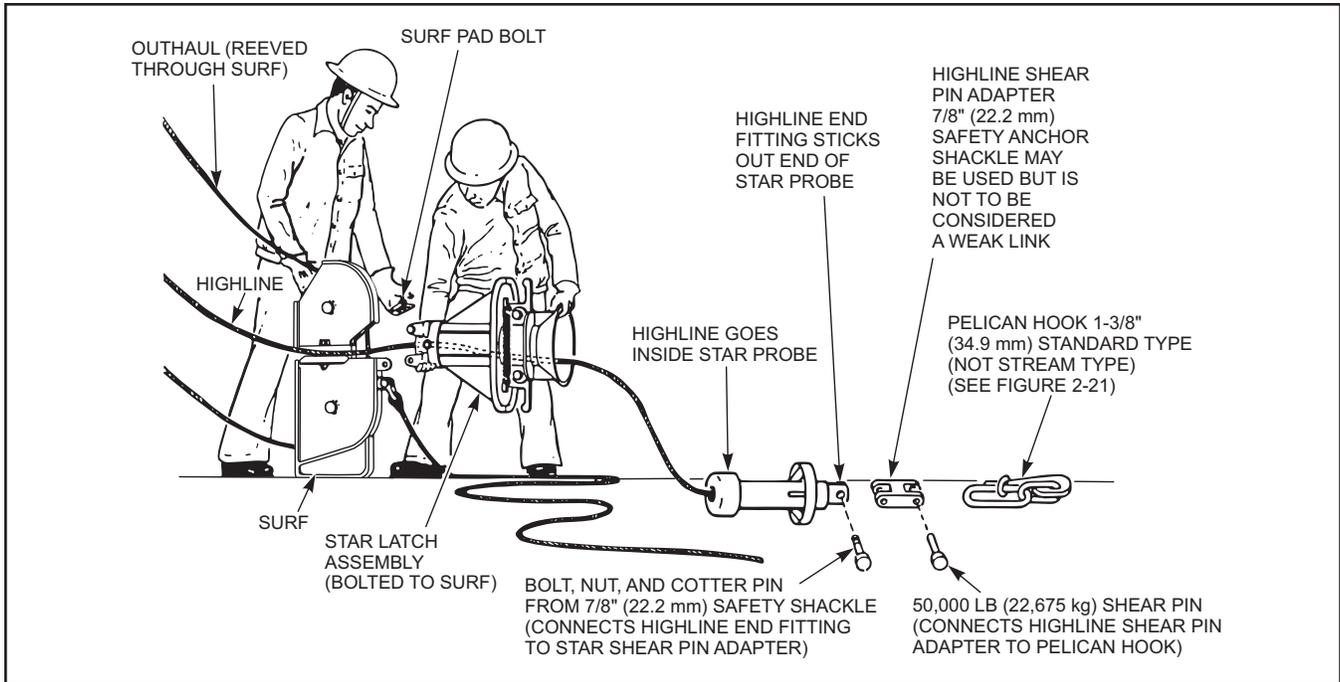


Figure 6-17. STREAM With STAR — Preparation of SURF, STAR Latch Assembly, and Highline Shear Pin for Highline Winch Without Slip Clutch in Drum

4. Connect the phone and establish voice communication with the delivery station.
5. Continue to haul in the messenger.

(3) DELIVERY SHIP

1. Haul in the lead line messenger. When the zero end of the phone/distance line is aboard, attach it to the outermost rail, clear of the transfer station. Fake down the lead line messenger free for running and disconnect it from the phone/distance line.
2. Raise the STREAM transfer head to the full-up position. Pay out the highline.
3. Ensure the highline ASD is ON. On stations where the ASD is located outboard of the ram tensioner, the ASD shall be used to pull the slack wire through the ram tensioner. This will assist personnel at the receiving station in hauling the highline across and prevent fouling of the highline winch.

(4) RECEIVING SHIP. (See Figure 6-21.)

1. Haul in the messenger until the highline comes aboard.

Note

Before attaching the pelican hook, make sure that the messenger is not twisted around the highline. If it is twisted, the SURF will not haul in close enough to latch the STAR to the STAR probe.

2. Attach the pelican hook to the long link on the padeye or pendant. (Cut the first stop if necessary.) Use the correct cotter pin (see Figure 2-21).
3. Install the easing-out line through the pelican hook's long link and secure.

Note

- If rigging to a sliding padeye with the easing-out padeye and staple on the traveling carriage, install the easing-out line through the pelican hook. Coil and stop off (with sail twine) to the pelican hook.
- If rigging to a sliding-padeye or sliding-padeye block with the easing-out padeye and staple on the kingpost, secure the easing-out line to the padeye. Coil and stop off (with sail twine) to the easing-out padeye.

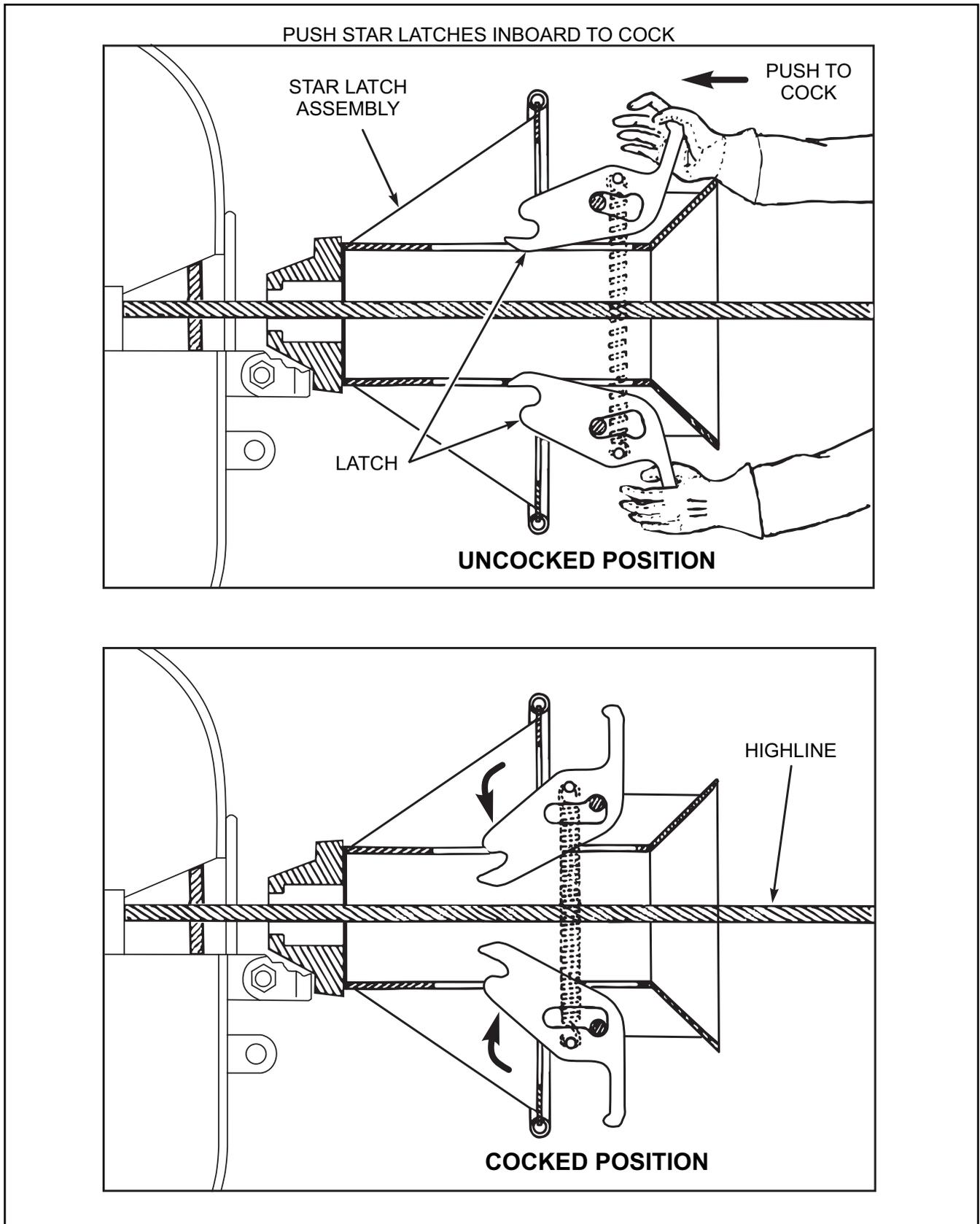


Figure 6-18. STREAM With STAR — Cocking the Latches

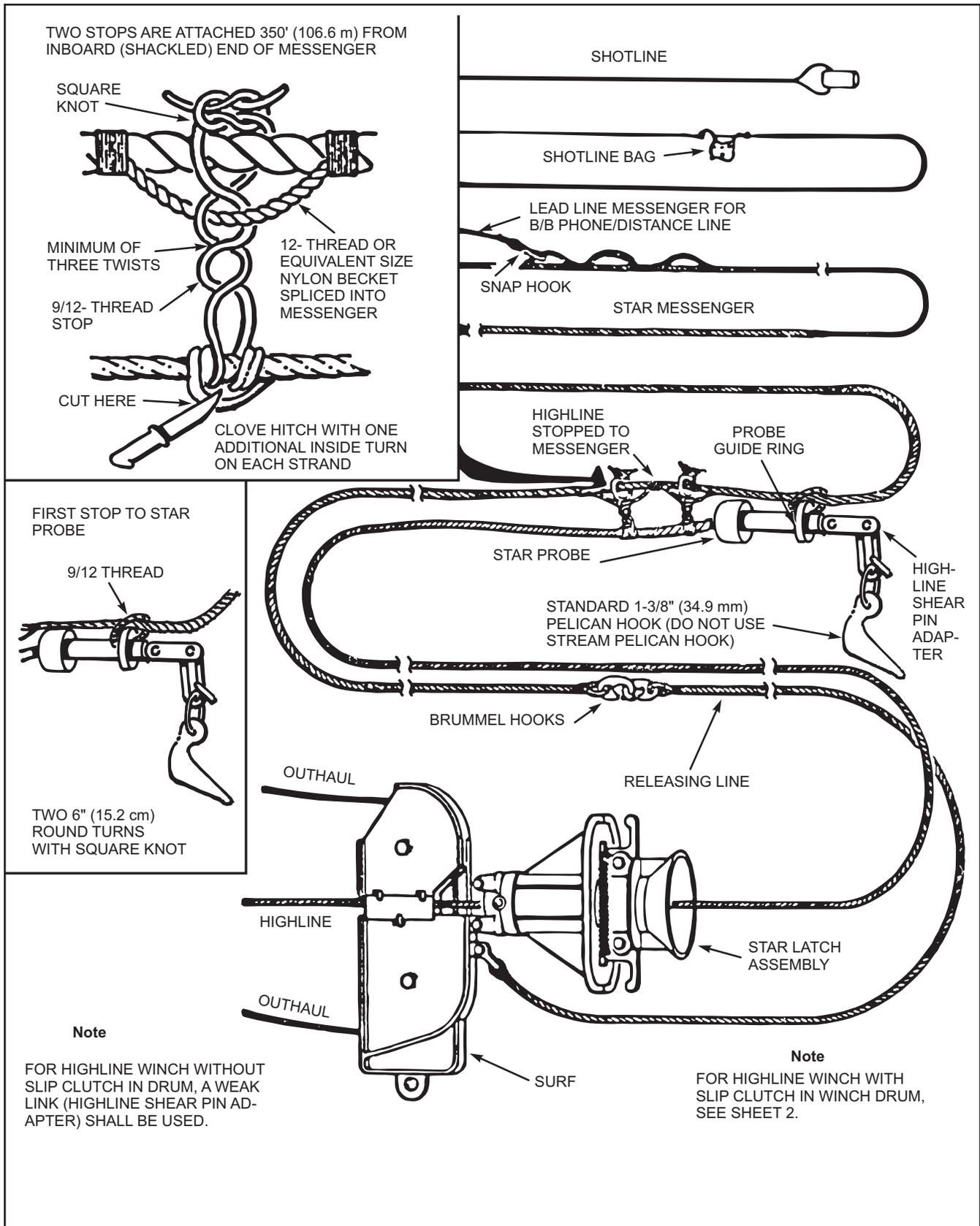


Figure 6-19. STREAM With STAR — Rig Layout at the Delivery Station (Sheet 1 of 2)

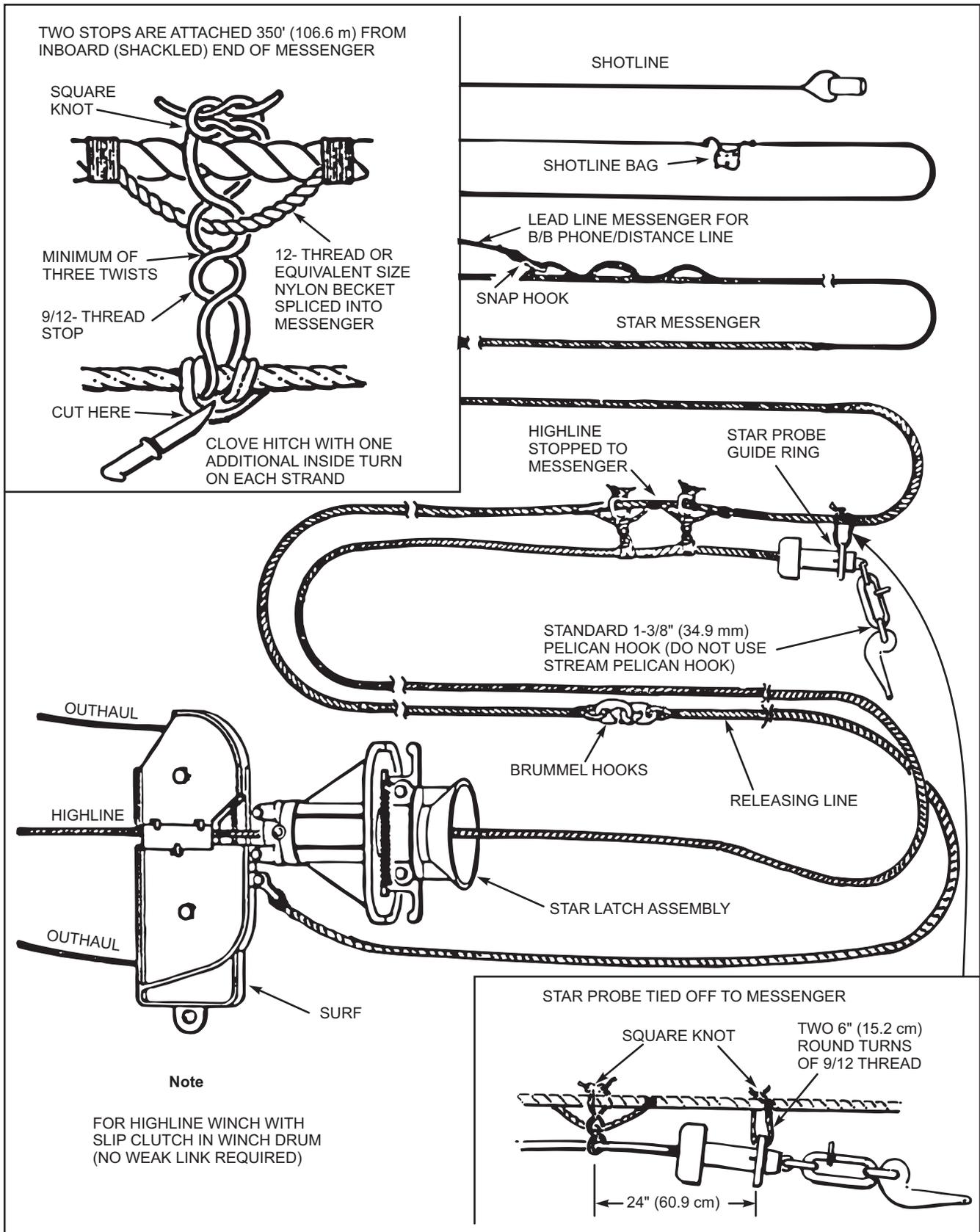


Figure 6-19. STREAM With STAR — Rig Layout at the Delivery Station (Sheet 2 of 2)

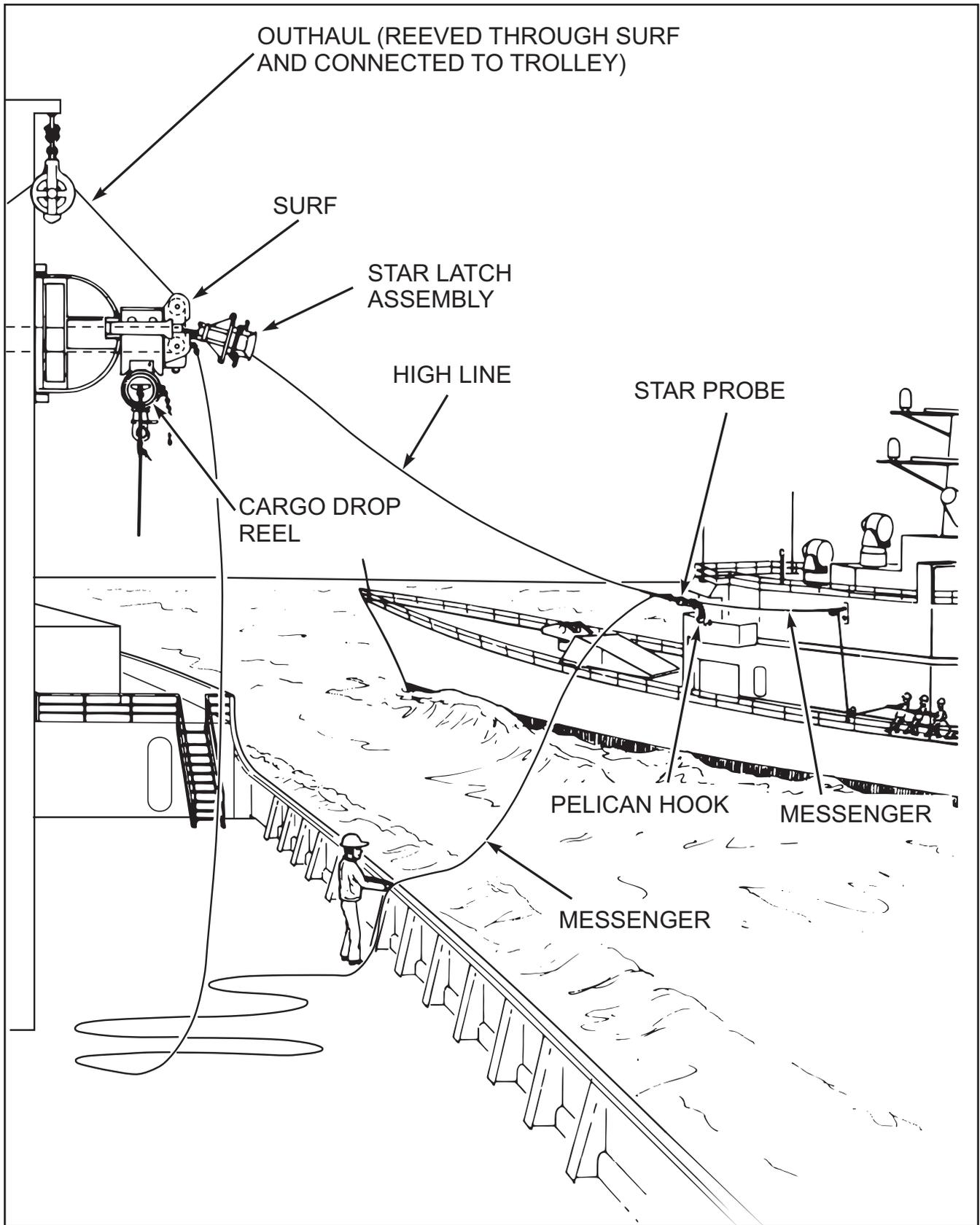


Figure 6-20. STREAM With STAR — Passing the Rig

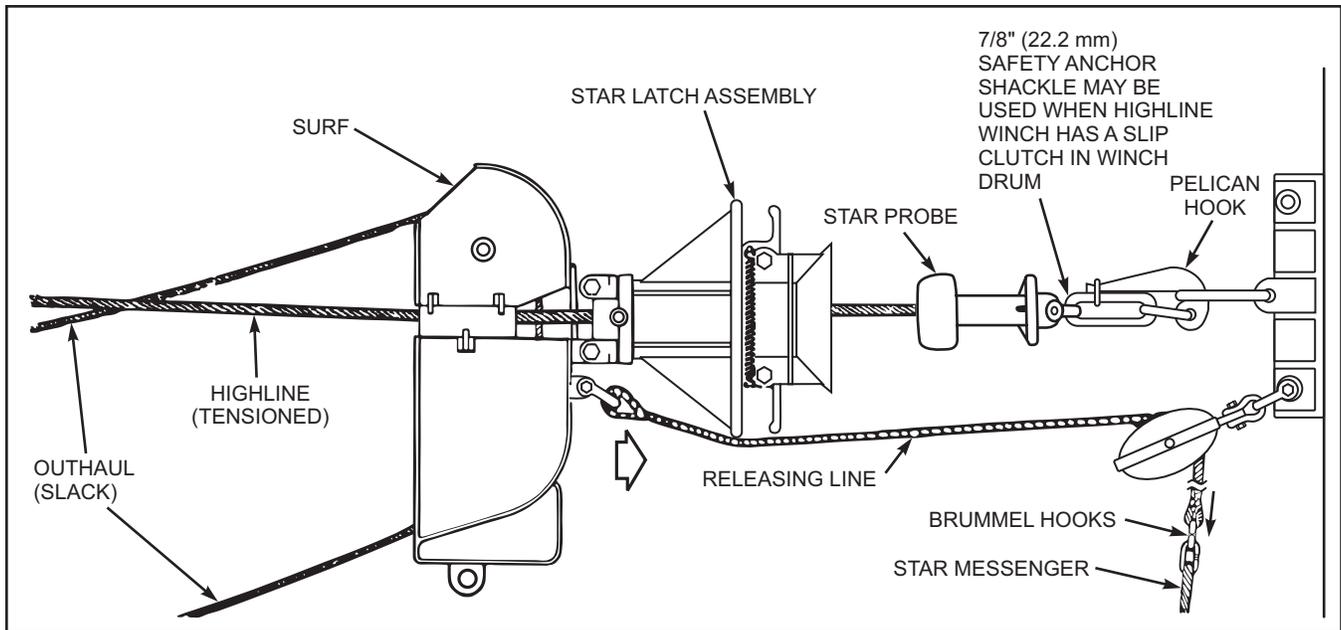


Figure 6-21. STREAM With STAR for Highline With Slip Clutch in Drum — Haul Into Receiving Station

4. After the easing-out line is secure, cut the remaining stops.

Note

At a pendant receiving station, shift the messenger to the snatch block on the pendant's end fitting (if available), raise the pendant, and secure it to the deck padeye.

5. Clear personnel from the immediate area.
6. Notify the bridge and delivery station: "Ready to tension highline."

(5) BOTH SHIPS

1. The receiving station's phone talker notifies his bridge and the delivery station: "Ready to tension highline at station." This alerts the bridge that tension will be applied shortly. Bridge will grant permission to tension highline.
2. When the message is received at the delivery station, the phone talker there informs his bridge: "We are tensioning highline at station ____." At the same time, the rig captain instructs the winch operator to tension the highline. No response is required from the bridge, unless it is negative. When the highline is tensioned, the ASD, if installed, should be turned OFF until the rig is to be retrieved.

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

4. If the receiving ship's bridge determines that it does not want to tension the highline anytime after it has received word that the receiving station is ready, it shall *immediately* notify both the delivery ship's bridge and the receiving station. The delivery ship's bridge shall in turn 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 highline.

(6) DELIVERY SHIP

1. When the highline has been tensioned, lower the STREAM transfer head to the full-down position. Ensure that there is sufficient slack in the outhaul to prevent the SURF from drawing against the transfer head and parting the shear pin. Open the trolley support arms (if applicable).

WARNING

The trolley support arms must be opened before the STAR latch assembly is mated to the STAR probe.

2. Raise the transfer head to the full-up position and slack the outhaul.

(7) RECEIVING SHIP. (See Figure 6-21.)

1. Haul in the messenger to pull the SURF and STAR latch assembly across.
2. When the STAR latch assembly comes in contact with the head of the STAR probe, the latches will momentarily tilt open and then snap back closed after they have passed the head of the STAR probe. This indicates that the STAR rig is latched onto the STAR probe.
3. Secure the bitter end of the releasing line to a cleat, clear of the operating area, but with 1 or 2 feet (30.4 or 60.9 cm) of slack.

Note

If rigging to a sliding padeye, disconnect main messenger from 60 foot (18.2 m) releasing line at the brummel hooks. Leave the 60-foot (18.2 m) releasing line reeved through the fairlead block on sliding padeye, coil releasing line in a small coil, and secure with sail twine to the bottom of STAR latch assembly.

4. Stand clear of the rig.
5. Signal the delivery station to tension the outhaul.

(8) DELIVERY SHIP

On signal, remove the excess slack from the outhaul and switch the outhaul winch to *tension* control.

(9) BOTH SHIPS

The STREAM system is now ready for transfer.

6.9.3 Operating STREAM With STAR



Rig captain, signalman, and winch operators at the delivery station must be alert for signals from the receiving station.

All load hauling and control is accomplished by the inhaul and outhaul winches at the delivery station. See paragraph 6.14 for load-lowering procedures at a sliding-padeye receiving station when using a cargo hook. See

paragraph 6.15 for load-lowering procedures at a fixed-padeye or pendant receiving station when using the CDR. The CDR is the primary method; however, the tension/detension method (paragraph 6.16) can be used to pick up return loads that exceed the lifting capacity of the CDR.

6.9.4 Retrieving STREAM With STAR

(1) DELIVERY SHIP

Note

Because of STREAM transfer installations, the height and position of the transfer head may vary for some ships when capturing the trolley.

1. With the STREAM transfer head in the full-up position, retrieve the trolley and two-block it to the transfer head. Inhaul winch remains in *tension* control.

WARNING

When the outhaul winch is switched from *tension* control to *speed* control, the winch brake automatically sets if the control handle is in neutral. Therefore, perform the next step exactly as described or a tightline condition can develop.

2. Move the outhaul winch's control lever to the payout position, and then switch to speed control in accordance with installed STREAM system instructions.
3. Slack the outhaul and tend.

(2) RECEIVING SHIP

1. Remove the releasing line from the cleat.

Note

If rigged to a sliding padeye, lower the sliding padeye, remove the sail twine securing the releasing line to the STAR latch assembly, and uncoil the releasing line.

2. Haul in on the releasing line until the STAR latch assembly is released from the STAR probe. The latches will tilt open to indicate unlatching.
3. Ease the SURF outboard with the releasing line and cast free.

(3) DELIVERY SHIP

WARNING

The SURF must be released from the receiving station before the trolley support arm's restraining bar is closed and secured.

1. Retrieve the SURF and the STAR latch assembly.
2. Move the transfer head to the full-down position and close the trolley support arms (if applicable).
3. Raise the transfer head to the full-up position.

(4) RECEIVING SHIP

Notify the bridge and delivery station: "Ready for detensioning highline."

(5) BOTH SHIPS

1. The receiving station's phone talker notifies both his bridge and the delivery station: "Ready to detension highline at station ____." This alerts the bridge that the highline will be detensioned shortly. Bridge will grant permission to detension highline.
2. When the message is received at the delivery station, the phone talker there informs his bridge: "We are detensioning highline at station ____." At the same time, the rig captain instructs the winch operator to turn ON the ASD, if installed, and to pay out the highline, which allows the ram tensioner to extend and slacken the highline. 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 highline at station ____."
4. If the receiving ship's bridge determines that it does not want to detension the highline anytime after it has received word that the receiving station is ready, it shall *immediately* notify both the delivery ship's bridge and the receiving station. The delivery ship's bridge shall in turn *immediately* pass the word to the delivery station: "Do not detension at station ____." The rig captain shall *immediately* instruct the winch operator to stop detensioning the highline.

(6) DELIVERY SHIP

When the highline is slack, signal the receiving station to trip the pelican hook. Prior to tripping the pelican hook, the delivery station rigs a lizard line to the highline and belays it to ensure a proper fairlead into the trolley.

WARNING

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

(7) RECEIVING SHIP

1. On signal, haul in on the easing-out line to take the strain off the pelican hook. (If the highline is attached to a sliding padeye, lower the sliding padeye and break the sail twine that holds the coiled easing-out line. Haul in on the easing-out line to take the strain off the pelican hook.)
2. Trip the pelican hook.
3. Ease the highline clear of the deck edge and release the easing-out line.
4. Signal the delivery station to haul in the highline and the station phone line.

(8) DELIVERY SHIP

1. Haul in the highline and the station phone line.
2. Disconnect the phone/distance line.

(9) RECEIVING SHIP

Haul in the phone/distance line.

6.9.5 Emergency Breakaway for STREAM With STAR. Emergency breakaway is an accelerated breakaway using the standard procedures described in the preceding paragraph. The following procedures also apply:

1. Permission from bridge to detension wire is not required.
2. Use emergency breakaway signals in Appendix C.
3. Clear the station of all nonessential personnel.

4. Retrieve all loads expeditiously.
5. Detension the outhaul in accordance with approved procedures.
6. Release the STAR rig and start retrieving.
7. Do not attempt to capture trolley in transfer head trolley stowage arms or use a lizard line to fairlead the highline wire rope for retrieval.
8. Detension the highline. When the highline is slack, delivery station signals "Trip the pelican hook."

WARNING

- Never trip a tensioned wire
 - Never cut a tensioned wire.
9. If unable to disconnect the rig, continue to pay out until all wire is free of the drum.

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.

10. Advise bridge that all lines are clear.

6.10 STREAM WITH TRAVELING SURF

STREAM with traveling SURF is an all-tensioned wire rig. Winches at the delivery station tend the highline, inhaul, and outhaul. The outhaul is reeved through the SURF. Figures 6-22 and 6-23 show STREAM with traveling SURF.

The highline is passed by messenger to the receiving station and is connected there by the STREAM pelican hook to the long link on the padeye or pendant. The highline is tensioned by hauling in the slack wire and compressing the ram tensioner. The traveling SURF, which provides a fairlead for the outhaul, rides on the highline. The outhaul is payed out in speed control and the traveling SURF is hauled by messenger to the receiving station and secured by the SURF hook to the STREAM pelican hook. The delivery station tensions the outhaul and the rig is ready to operate.

STREAM with traveling SURF is an alternate rig for transfers to destroyers or to receiving stations that do not have a winch available. It can be rigged to a sliding-padeye, fixed-padeye, or pendant receiving station. This rig is generally undesirable for transfers to a receiving station that does not have a sliding padeye or that does not have a rigger-access platform near the attachment point (as shown in Figure 6-14). It is less desirable than STREAM with STAR. For transfers to a sliding-padeye receiving station, use the Mk 1 strongback or cargo hook. For transfers to a fixed-padeye or pendant receiving station, use the CDR.

Figures 6-37 and 6-38 at the end of the chapter list hardware that should be available at transfer stations.

6.10.1 Preparing STREAM With Traveling SURF

(1) DELIVERY SHIP. (See Figure 6-22.)

1. Attach the inhaul to the STREAM trolley. Reeve the highline through the trolley.
2. Install the CDR, Mk 1 strongback, or cargo hook onto the trolley. *The drop reel is installed with the brake release lanyard aft.*
3. Reeve the outhaul through the SURF. Attach the outhaul to the trolley.
4. Reeve the highline through the SURF support tube. Insert the highline in the same side as the outhaul outrigger on the kingpost.
5. For a highline winch not equipped with a slip clutch, secure the the 1-3/8-inch (36.9 mm) STREAM pelican hook to the highline using a highline sheer pin adapter assembly. For a highline winch equipped with a slip clutch, secure the 1-3/8-inch (36.9 mm) STREAM pelican hook to the highline using a 7/8-inch (22.2 mm) safety anchor shackle.
6. Attach the SURF hook to the SURF.
7. Fake out the STAR messenger. Attach the inboard end of the messenger to the eye of the SURF. Stop off the highline to the messenger 350 feet (106.6 m) from the inboard (shackled) end of the messenger. Stop off first to the shackle on the highline end fitting, then use two stops on the highline about 12 inches (30.5 cm) apart. (Refer to Figure 6-22 for the way to tie the stops.)
8. Attach the station phone line and the lead line messenger for the phone/distance line (if required).

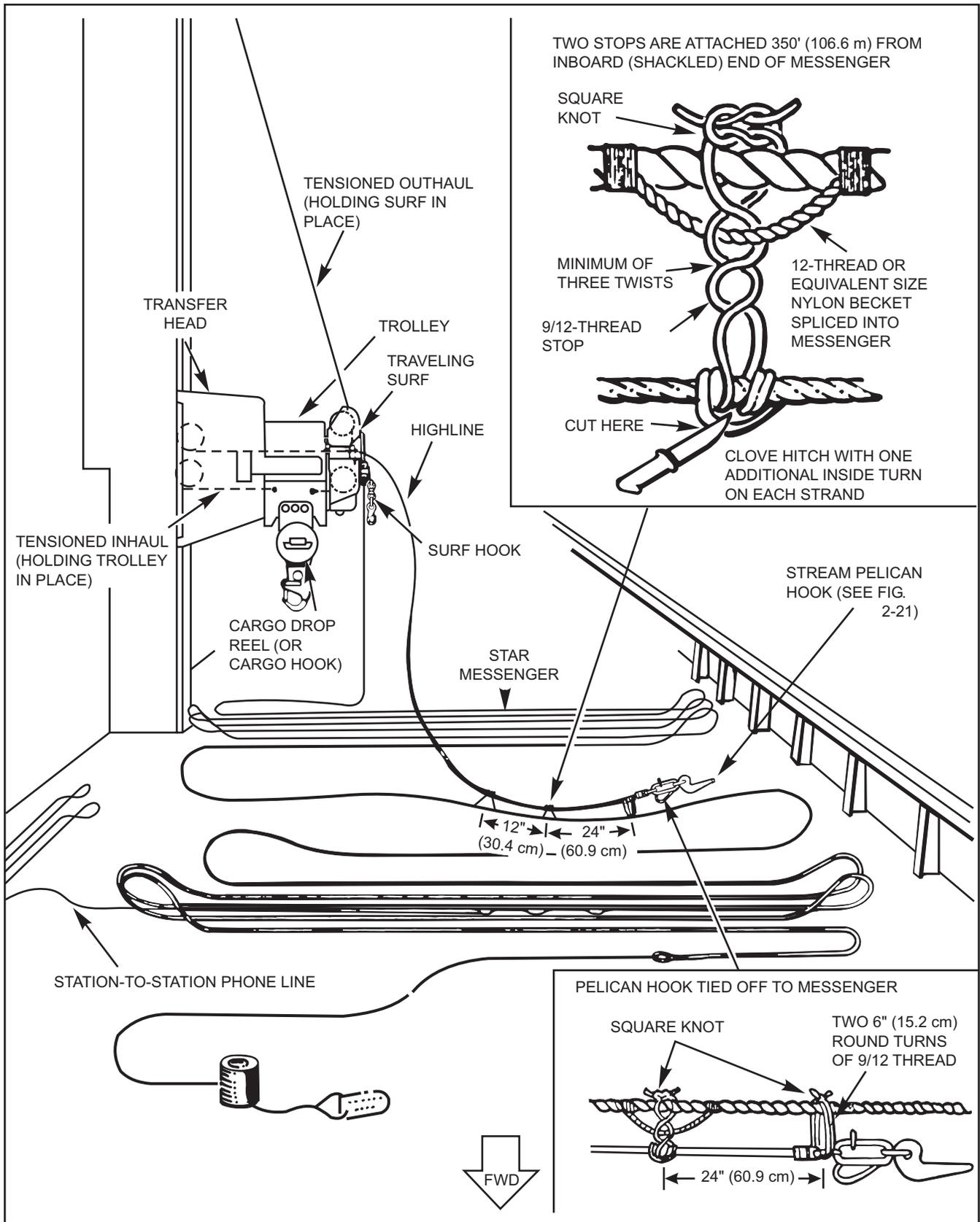
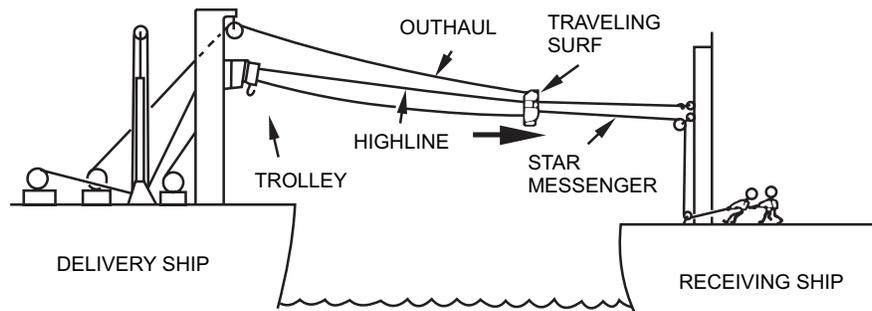
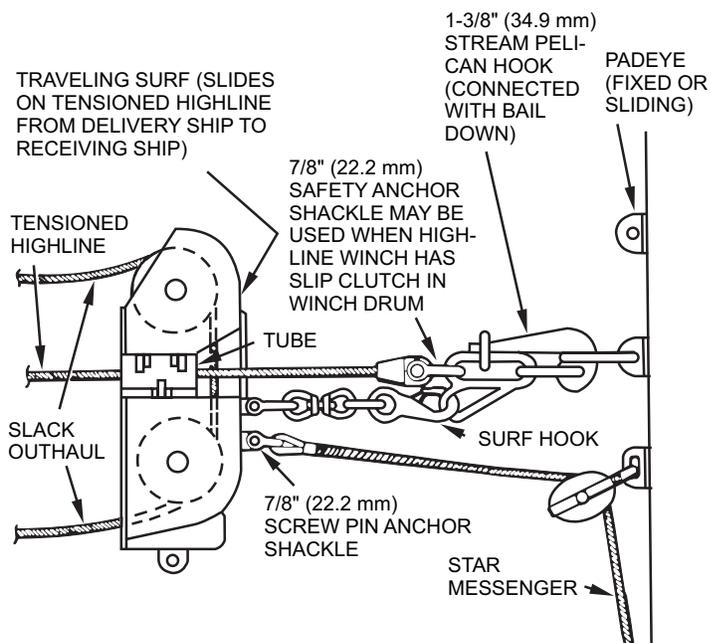


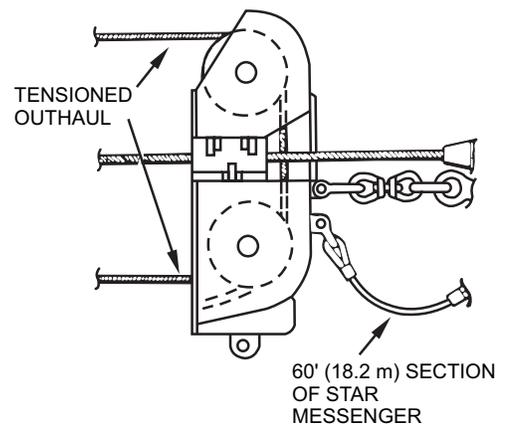
Figure 6-22. STREAM With Traveling SURF — Preparation of Typical Delivery Station



1. STREAM TRAVELING SURF RIG BEING HAULED ON TENSIONED HIGHLINE BY RECEIVING SHIP.



2. TRAVELING SURF ATTACHED TO STREAM PELICAN HOOK.



3. OUTHAUL TENSIONED AFTER HOOKUP.

Figure 6-23. STREAM With Traveling SURF — Rigging at the Receiving Station

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

(2) RECEIVING SHIP. (See Figure 6-23.)

1. Install the fairlead block for the messenger.
2. Install the deck fairlead snatch blocks.
3. Ensure that all necessary working and repair tools and safety equipment are on station and that all personnel are briefed, properly dressed, and on station.
4. At a pendant receiving station, rig the pendant.
5. Provide an easing-out line on station. See paragraph 2.2.11.5.

6.10.2 Passing STREAM With Traveling SURF

(1) DELIVERY SHIP

1. With the STREAM transfer head in the down position, take up slack, switch the inhaul winch to *tension* control and the outhaul winch to *speed* control, and then raise the transfer head.

WARNING

The inhaul winch must be in *tension* control before moving the STREAM transfer head, when rigging or unrigging.

2. Send over the shot line attached to the messenger.

(2) RECEIVING SHIP

1. Receive the shot line and haul in. When the messenger comes aboard, install the messenger in the rigging and fairlead blocks and continue to haul in.
2. When the station phone line and the lead line messenger for the phone/distance line come aboard, disconnect them and move them clear of the area. Continue heaving in on the station phone line until the delivery station signals avast, and then tend.
3. Attach the phone/distance line to the lead line messenger and signal the delivery station to heave around.

4. Connect the phone and establish voice communication with the delivery station.
5. Continue to haul in the messenger.

(3) DELIVERY SHIP

1. Haul in the lead line messenger. When the zero end of the phone/distance line is aboard, attach it to the outermost rail, clear of the transfer station. Fake down the lead line messenger free for running and disconnect it from the phone/distance line.
2. Raise the STREAM transfer head to the full-up position. Pay out the highline.
3. Ensure the highline ASD is ON. When the ASD is installed outboard of the ram tensioner, the ASD will pull wire rope through the ram tensioner and prevent fouling of the wire on the highline winch.

WARNING

When the ASD is installed inboard of the ram tensioner, the ASD will prevent fouling of wire on the highline winch. It may be necessary for personnel to pull the slack highline through the ram. This will assist personnel at the receiving station in hauling the highline across.

(4) RECEIVING SHIP. (See Figure 6-23.)

1. Haul in the messenger until the highline comes aboard.

Note

Before attaching the STREAM pelican hook, make sure that the messenger is not twisted around the highline. If it is twisted, the SURF will not haul in close enough to be connected to the bail of the STREAM pelican hook.

2. Attach the STREAM pelican hook to the long link on the padeye or pendant. Attach it with the bail down. (Cut the first stop if necessary.) Use the correct cotter pin (see Figure 2-21).
3. Install the easing-out line through the pelican hook's long link and secure.

Note

- If rigging to a sliding padeye with the easing-out padeye and staple on the traveling carriage, install the easing-out line through the pelican hook. Coil and stop off (with sail twine) to the pelican hook.
 - If rigging to a sliding padeye or sliding block with the easing-out padeye and staple on the kingpost, secure the easing-out line to the padeye. Coil and stop off (with sail twine) to the easing-out padeye.
4. After the easing-out line is secure, cut the remaining stops.

Note

At a pendant receiving station, raise the pendant and secure it to the deck padeye.

5. Clear personnel from the immediate area.
6. Notify the bridge and delivery station: "Ready to tension highline."
- (5) BOTH SHIPS

Procedures for tensioning the highline are given in paragraph 6.9.2 (5), steps 1 through 6.

(6) DELIVERY SHIP

1. When the highline has been tensioned, lower the STREAM transfer head to the full-down position. Open the trolley support arms (if applicable).
2. Raise the transfer head to the full-up position and slack outhaul in *speed* control as receiving station hauls in on messenger.

(7) RECEIVING SHIP. (See Figure 6-23.)

1. Haul in the messenger to pull the SURF across.
2. When the SURF is two-blocked against the highline end fitting, attach the SURF hook to the bail on the bottom of the STREAM pelican hook.
3. Slack the messenger and disconnect the main messenger from the 60-foot (18.2 m) releasing line at the brummel hooks. Coil the messenger and pass it back to the delivery station as a return load.
4. Coil the 60-foot (18.2 m) releasing line down and secure it clear of the load area.

Note

If rigging to a sliding padeye, coil up the 60-foot (18.2 m) releasing line, stop off with sail twine, and allow to hang from the 7/8-inch (22.2 mm) screw pin anchor shackle on the SURF block, clear of the outhaul wire.

5. Stand clear of the rig.
6. Signal the delivery station to tension the outhaul.

(8) DELIVERY SHIP

On signal, remove excess slack from the outhaul and switch the outhaul winch to *tension* control.

(9) BOTH SHIPS

The STREAM system is now ready for transfer.

6.10.3 Operating STREAM With Traveling SURF

Rig captain, signalman, and winch operators at the delivery station must be alert for signals from the receiving station.

All load hauling and control is accomplished by the inhaul and outhaul winches at the delivery station. See paragraph 6.14 for load-lowering procedures at a sliding-padeye receiving station when using a cargo hook. See paragraph 6.15 for load-lowering procedures at a fixed-padeye or pendant receiving station when using the CDR. The CDR is the primary method; however, the tension/detension method (paragraph 6.16) can be used to deliver or pick up loads that exceed the lifting capacity of the CDR.

6.10.4 Retrieving STREAM With Traveling SURF**(1) DELIVERY SHIP****Note**

Because of STREAM transfer station installations, the height and position of the transfer head may vary for some ships when capturing the trolley.

1. With the STREAM transfer head in the full-up position, retrieve the trolley and two-block it to the

transfer head. Inhaul winch remains in *tension* control.

WARNING

When the outhaul winch is switched from *tension* control to *speed* control, the winch brake automatically sets if the control handle is in neutral. Therefore, perform the next step exactly as described or a tightline condition can develop.

2. Move the outhaul winch's control lever to the pay-out position, and then switch to *speed* control in accordance with installed STREAM system instructions.
3. Slack the outhaul and tend.

(2) RECEIVING SHIP

1. On signal, haul in on the releasing line to take the strain off the SURF hook.

Note

If rigged to a sliding padeye, lower the sliding padeye, remove the sail twine securing the releasing line to the 7/8-inch (22.2 mm) screw pin anchor shackle, and uncoil the releasing line. Haul in on the releasing line to take the strain off the SURF hook.

2. Disconnect the SURF hook from the bail of the STREAM pelican hook.
3. Ease the SURF outboard with the releasing line and cast free.

(3) DELIVERY SHIP

WARNING

The SURF must be released from the receiving station before the trolley arms are closed and secured.

1. Haul in the outhaul to retrieve the SURF.
2. When the SURF reaches the delivery station, move the transfer head to the full-down position and engage the trolley stowage arms.

3. Raise the transfer head to the full-up position.

(4) RECEIVING SHIP

Notify the bridge and delivery station: "Ready to detension highline."

(5) BOTH SHIPS

Procedures for detensioning the highline are given in paragraph 6.9.4 (5), steps 1 through 6.

(6) DELIVERY SHIP

When the highline is slack, signal the receiving station to trip the pelican hook. Prior to tripping the pelican hook, the delivery station rigs a lizard line to the highline and belays it to ensure a proper fairlead into the trolley.

WARNING

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

(7) RECEIVING SHIP

1. On signal, haul in on the easing-out line to take the strain off the pelican hook. (If the highline is attached to a sliding padeye, lower the sliding padeye and break the sail twine that holds the coiled easing-out line. Haul in on the easing-out line to take the strain off the pelican hook.)
2. Trip the pelican hook.
3. Ease the highline clear of the deck edge and release the easing-out line.
4. Signal the delivery station to haul in the highline and the station phone line.

(8) DELIVERY SHIP

1. Haul in the highline and the station phone line.
2. Disconnect the phone/distance line.

(9) RECEIVING SHIP

Haul in the phone/distance line.

6.10.5 Emergency Breakaway for STREAM With Traveling SURF. Emergency breakaway is an accelerated breakaway using the standard procedures in the preceding paragraph. The following procedures also apply:

1. Permission from bridge to detension wire is not required.
2. Use emergency breakaway signals in Appendix C.
3. Clear the station of all nonessential personnel.
4. Retrieve all loads expeditiously.
5. Detension the outhaul in accordance with approved procedures.
6. Release traveling SURF and start retrieving.
7. Do not attempt to capture trolley in transfer head trolley stowage arms or use a lizard line to fairlead the highline wire rope for retrieval.
8. Detension the highline. When the highline is slack, delivery station signals "Trip the pelican hook."

WARNING

- Never trip a tensioned wire.
 - Never cut a tensioned wire.
9. If unable to disconnect the rig, continue to pay out until all wire is free of the drum.

CAUTION

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

10. Advise bridge that all lines are clear.

6.11 STREAM WITH HAND-TENDED OUTHAUL

The STREAM trolley and suspended load are hauled to the receiving station using the messenger/outhaul. The receiving ship provides line handlers. The delivery station pays out the inhaul with the inhaul winch in *speed* control as personnel at the receiving station heave around on the outhaul. The delivery station maintains the STREAM transfer head at the full-up position on the kingpost during the transfer to reduce the force needed to haul the load across. Figure 6-24 shows STREAM with hand-tended outhaul.

STREAM with hand-tended outhaul can be rigged to a sliding padeye, fixed-padeye, or pendant receiving station. For transfers to a sliding-padeye receiving station, use the cargo hook. For transfers to a fixed-padeye or pendant receiving station, use the CDR.

Figures 6-37 and 6-38 at the end of the chapter list hardware that should be available at the transfer stations.

6.11.1 Preparing STREAM With Hand-Tended Outhaul

(1) DELIVERY SHIP

1. Attach the inhaul to the STREAM trolley. Reeve the highline through the trolley. Insert the outhaul pendant in the trolley (if required).
2. Install the CDR or cargo hook. *The drop reel is installed with the brake release lanyard aft.*
3. Secure the 1-3/8-inch (36.9 mm) STREAM pelican hook to the highline. Use a 7/8-inch (22.2 mm) safety anchor shackle.
4. Install the stopper plate on the highline end fitting.
5. Fake out the messenger/outhaul. Do not use the 60-foot (18.2 m) section of the STAR messenger. Stop off the highline to the messenger 290 feet (88.4 m) from the inboard (shackled) end of the messenger. Stop off first to the shackle on the highline end fitting, then use two stops on the highline about 12 inches (30.5 cm) apart. (Refer to Figure 6-22 for the way to tie the stops.)

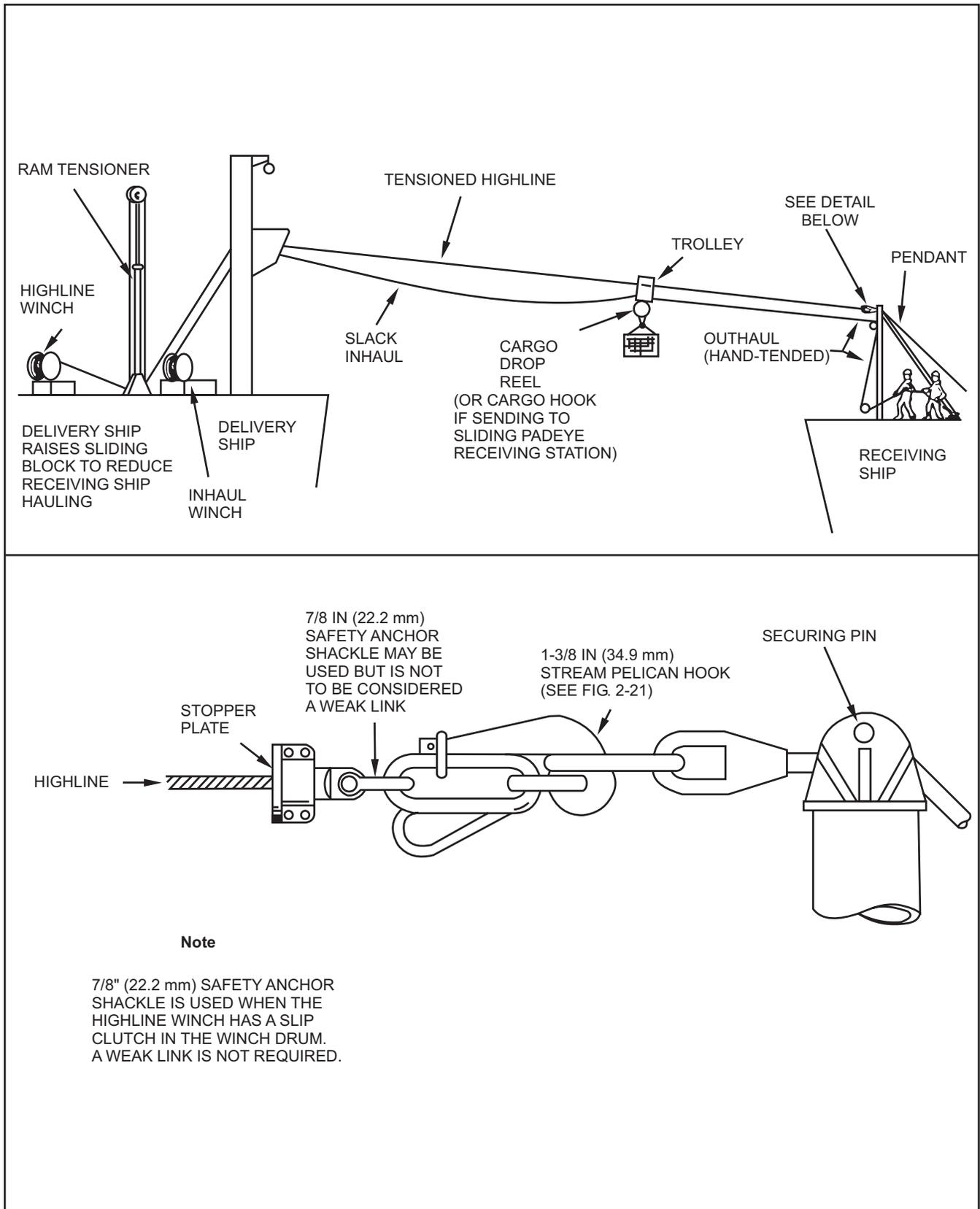


Figure 6-24. STREAM With Hand-Tended Outhaul

6. Attach the inboard end of the messenger/outhaul to the trolley. (Shackle the inboard end to the outhaul pendant on the trolley, if one was rigged.)
7. Attach the station phone line and the lead line messenger for the phone/distance line (if required).
8. Ensure that all required working and repair tools and safety equipment are on station and that personnel are briefed, properly dressed, and on station.

(2) RECEIVING SHIP

1. Attach the fairlead block for the messenger/outhaul below and close to the long link for the pelican hook on the highline.
2. Ensure that all required working and repair tools and safety equipment are on station and that personnel are briefed, properly dressed, and on station.
3. At a pendant receiving station, rig the pendant.
4. Provide an easing-out line on station. See paragraph 2.2.11.5.

6.11.2 Passing STREAM With Hand-Tended Outhaul

(1) DELIVERY SHIP

1. With the STREAM transfer head in the down position, switch the inhaul winch to *tension* control.

WARNING

The inhaul winch must be in *tension* control before moving the STREAM transfer head, when rigging or unrigging.

2. Send over the shot line attached to the messenger.

(2) RECEIVING SHIP

1. Receive the shot line and haul in. When the messenger comes aboard, install the messenger in the fairlead blocks and continue to haul in.
2. When the station phone line and the lead line messenger for the phone/distance line come aboard, disconnect them and move them clear of the area.
3. Attach the phone/distance line to the lead line messenger and signal the delivery station to haul in.

4. Connect the phone and establish voice communication with the delivery station.
5. Continue to haul in the messenger/outhaul.

(3) DELIVERY SHIP

1. Haul in the lead line messenger. When the zero end of the phone/distance line is aboard, attach it to the outermost rail, clear of the transfer station, and disconnect the lead line messenger.
2. Pay out the highline. Raise the STREAM transfer head to the full-up position.
3. Ensure the highline ASD is ON. When the ASD is installed outboard of the ram tensioner, the ASD will pull wire rope through the ram tensioner and prevent fouling of wire on the highline winch.

WARNING

When the ASD is installed inboard of the ram tensioner, the ASD will prevent fouling of wire on the highline winch. It may be necessary for personnel to pull slack highline through the ram. This will assist personnel at the receiving station in hauling the highline across.

(4) RECEIVING SHIP

1. When the highline comes aboard, remove all twists of the messenger from around the highline and attach the pelican hook to the long link on the padeye or pendant. (Cut the first stop if necessary.) Use the correct cotter pin (see Figure 2-21).
2. Install the easing-out line through the pelican hook's long link and secure.

Note

- If rigging to a sliding padeye with the easing-out padeye and staple on the traveling carriage, install the easing-out line through the pelican hook. Coil and stop off (with sail twine) to the pelican hook.
- If rigging to a sliding padeye or sliding block with the easing-out padeye and staple on the kingpost, secure the easing-out line to the padeye. Coil and stop off (with sail twine) to the easing-out padeye.

3. After the easing-out line is secure, cut the remaining stops.

Note

At a pendant receiving station, raise the pendant and secure it to the deck padeye.

4. Clear personnel from the immediate area.
5. Notify the bridge and delivery station: "Ready to tension highline."

(5) BOTH SHIPS

Procedures for tensioning the highline are given in paragraph 6.9.2 (5), steps 1 through 6.

(6) DELIVERY SHIP

Haul in slack to tension the highline. Switch the inhaul winch to *speed* control.

(7) BOTH SHIPS

STREAM with hand-tended outhaul is now ready for transfer.

6.11.3 Operating STREAM With Hand-Tended Outhaul. The trolley and suspended load are hauled to the receiving station by personnel at the station who heave around on the outhaul. The delivery station keeps the STREAM transfer head at the top of the kingpost so that the load will be coming downhill for most of the distance during the transfer. Personnel at the receiving station may have to pull the load the last few feet on the uphill side of the catenary in the highline. The inhaul winch is kept in *speed* control during the transfer and is used to haul the trolley back to the delivery station. Since the outhaul is hand tended, the receiving station controls the load.

WARNING

Personnel assigned to a hand-tended line shall be positioned inboard of the line and shall stay a minimum of 6 feet (1.8 m) from the fairlead blocks.

The inhaul winch operator at the delivery station must remain alert for signals from the receiving station. When the trolley is against the STREAM transfer head, the inhaul winch must be in *tension* control before raising or lowering the transfer head.

6.11.4 Retrieving STREAM With Hand-Tended Outhaul

(1) DELIVERY SHIP

1. With the STREAM transfer head in the full-down position, retrieve the trolley and two-block it to the transfer head.
2. Haul in the outhaul.

(2) RECEIVING SHIP

Tend the outhaul as the delivery station retrieves.

(3) DELIVERY SHIP

Ensure that the inhaul winch is in *tension* control, and then raise the transfer head to the full-up position.

(4) RECEIVING SHIP

Notify the bridge and delivery station: "Ready for detensioning highline."

(5) BOTH SHIPS

Procedures for detensioning the highline are given in paragraph 6.9.4 (5), steps 1 through 6.

(6) DELIVERY SHIP

When the highline is slack, signal the receiving station to trip the pelican hook. Prior to tripping the pelican hook, the delivery station rigs a lizard line and belays it to ensure a proper fairlead into the trolley.

WARNING

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

(7) RECEIVING SHIP

1. On signal, haul in on the easing-out line to take the strain off the pelican hook. (If the highline is attached to a sliding padeye, lower the sliding padeye and cut the sail twine that holds the coiled easing-out line. Haul in on the easing-out line to take the strain off the pelican hook.)
2. Trip the pelican hook.

3. Ease the highline clear of the deck edge and release the easing-out line.
4. Signal the delivery station to haul in the highline and the station phone line.

(8) DELIVERY SHIP

1. Haul in the highline and the station phone line.
2. Disconnect the phone/distance line.

(9) RECEIVING SHIP

Haul in the phone/distance line.

6.11.5 Emergency Breakaway for STREAM With Hand-Tended Outhaul. Emergency breakaway is an accelerated breakaway using the standard procedures described in the preceding paragraph. The following procedures also apply:

1. Permission from bridge to detension wires is not required.
2. Use emergency breakaway signals in Appendix C.
3. Clear the station of all nonessential personnel.
4. Retrieve all loads expeditiously. Slack outhaul.
5. Do not attempt to capture trolley in transfer head trolley stowage arms or use a lizard line to fairlead the highline wire rope for retrieval.
6. Detension the highline. When highline is slack, delivery station signals "Trip the pelican hook."

WARNING

- Never trip a tensioned wire.
 - Never cut a tensioned wire.
7. Commence hauling in all hand-tended lines. (If hand-tended lines interfere with the breakaway, the lines should be cut.)
 8. If unable to disconnect the rig, continue to pay out until all wire is free of the drum.



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.

9. Advise bridge that all lines are clear.

6.12 STREAM CONSOLIDATION

Various STREAM rigs can be used when two replenishment ships are consolidating; however, STREAM with messenger-rigged STAR, STREAM with traveling SURF, or STREAM with receiving-ship-tended outhaul (tensioned) should be selected.

1. If only one of the replenishment ships has a STREAM delivery capability, it provides the STREAM rig (highline, trolley, and basic rig hardware).
2. If both replenishment ships have STREAM delivery capability, four combinations of rigs can be used:
 - a. STREAM with STAR (paragraph 6.9).
 - b. STREAM with traveling SURF (paragraph 6.10).
 - c. STREAM with receiving-ship-tended outhaul (tensioned).

Note

The receiving station uses its inhaul as the rig's outhaul. The receiving station operates its inhaul winch in *tension* control to provide an all-tensioned wire rig. The receiving station switches its inhaul from *speed* control to *tension* control after its whip is connected to the trolley at the delivery station. For breakaway, the delivery station secures the trolley and then the receiving station switches its inhaul winch to *speed* control and tends slack to disconnect from the trolley.

- d. STREAM with receiving-ship-tended outhaul (nontensioned).

Note

The receiving station uses its inhaul as the rig's outhaul. When the inhaul winch is operated in *speed* control, movement of the sliding block may result in a tightline condition. If winch operation is limited to *speed* control only, the sliding block may be left raised and the CDR used to lower the loads to the deck.

6.13 STREAM LOAD-LOWERING METHODS

With STREAM rigs, the wires used to transfer the loads are fairled from high points at the delivery and receiving station. This ensures that the loads will safely clear the deck edges and stay clear of the water during transfer. The delivery station keeps the highline tensioned throughout the transfer cycle to control the loads. The loads are raised from and lowered to the decks without detensioning the rig. The delivery station raises and lowers loads by moving the STREAM transfer head up and down (see paragraph 6.6.3). One of three methods are used at the receiving station to lower the loads after transfer:

1. The receiving station lowers the STREAM rig and load, while the rig remains tensioned, by lowering the padeye to which the highline is attached. This method requires a sliding padeye at the receiving station.
2. The receiving station lowers the load, while the rig remains tensioned and the highline remains at a fixed height above the deck attached to a padeye or pendant. This method requires the delivery station to rig a CDR on the trolley.
3. The delivery station momentarily detensions the rig after the load has reached the receiving station and is hanging over the landing area. This method requires the use of special operating procedures.

Operating procedures for each method are covered in the following paragraphs.

6.14 SLIDING PADEYE

The sliding padeye has a function at the receiving station (Figure 6-25) similar to that of the sliding block at the delivery station. It raises and lowers the padeye to which the highline is attached. Lower the padeye to bring the rig close to the deck so that the incoming load can be easily detached. Raise the padeye to the up

position so that the trolley can be hauled back to the delivery station.

A sliding padeye at the receiving station permits rigging with increased speed and safety at deck level, gives constant load control throughout the transfer cycle, and allows the receiving station to return heavy loads to the delivery station.

Only a cargo hook is required on the trolley when the STREAM rig is operated to a sliding-padeye receiving station. The use of a Mk 1 or Mk 5 strongback may be necessary to accommodate height and width of some loads or when double lifts are feasible.

6.14.1 Receiving Station's Rigging Procedure.

Most sliding padeyes have been designed to receive the STREAM rig. Rig STREAM with the padeye at the down position. Raise the padeye to the up position before receiving a load.

6.14.2 Sliding Padeye Operation

1. During the transfer cycle, keep the padeye in the up position so that the load clears the deck edge (see Figure 6-25).
2. When the load is over the landing area (usually the trolley is two-blocked to the SURF), lower the padeye to bring the load to the deck.
3. Lower the padeye until the sling(s) on the load slack and can be easily detached from the cargo hook or load.
4. After the load has been detached, raise the padeye to the up position so that the delivery station can haul the trolley back.

6.15 CARGO DROP REEL

The CDR is a device used to lower a load from a trolley on a tensioned highline. Its use allows STREAM to be rigged by ships having only a fixed-padeye, pendant, or support leg receiving station. The CDR does not provide the same degree of load control as the sliding padeye, but it does allow the load to be lowered under the control of the receiving station.

The delivery station provides the CDR and attaches it to the trolley (Figure 6-26). The CDR has a 5,700 lb (2,584 kg) capacity. Paragraphs 6.15.1 through 6.15.6 provide operating procedures for load transfer. Paragraphs 6.15.7 and 6.15.8 provide operating procedures for heavy load return.

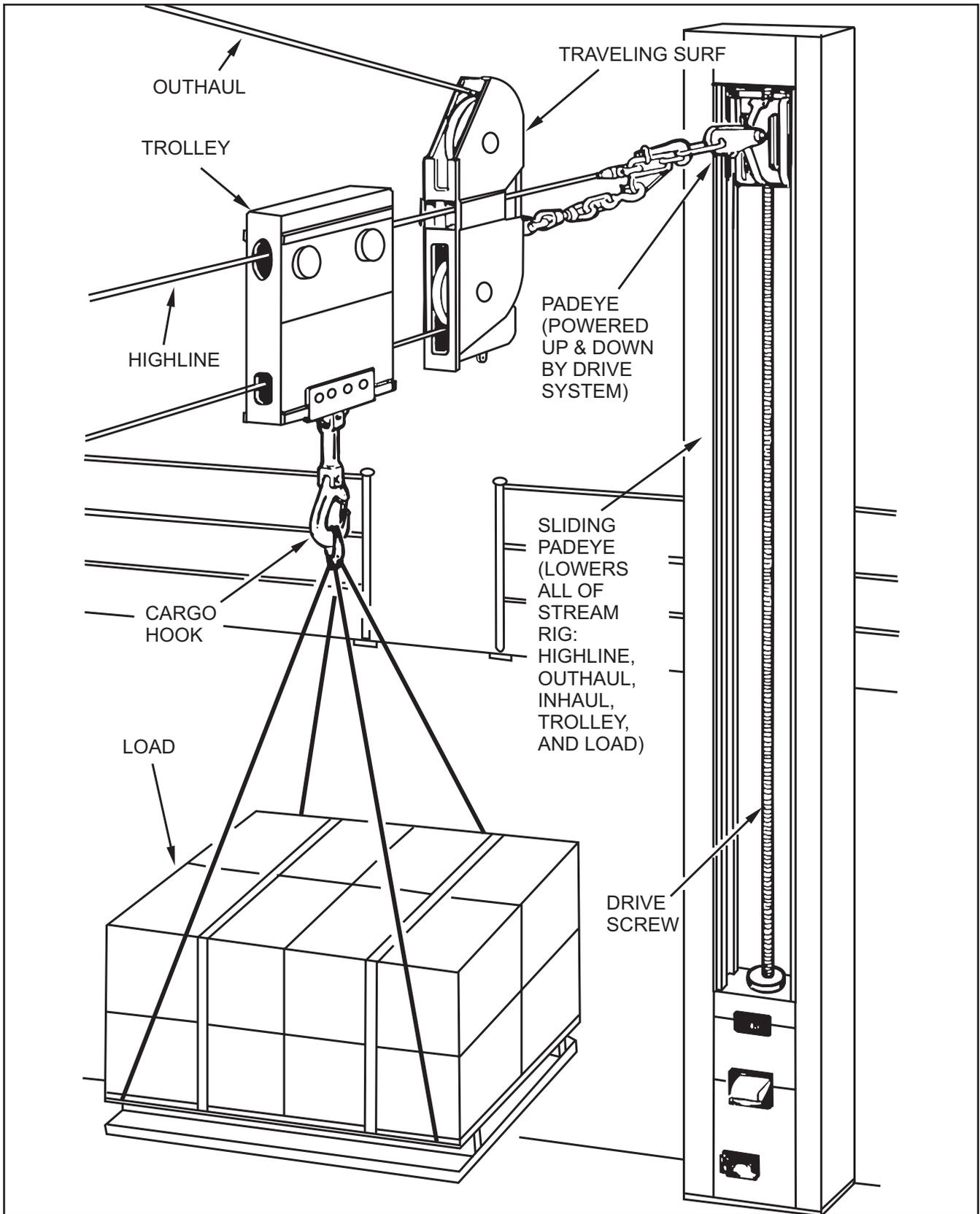


Figure 6-25. Sliding-Padeye Receiving Station — Receiving the Load

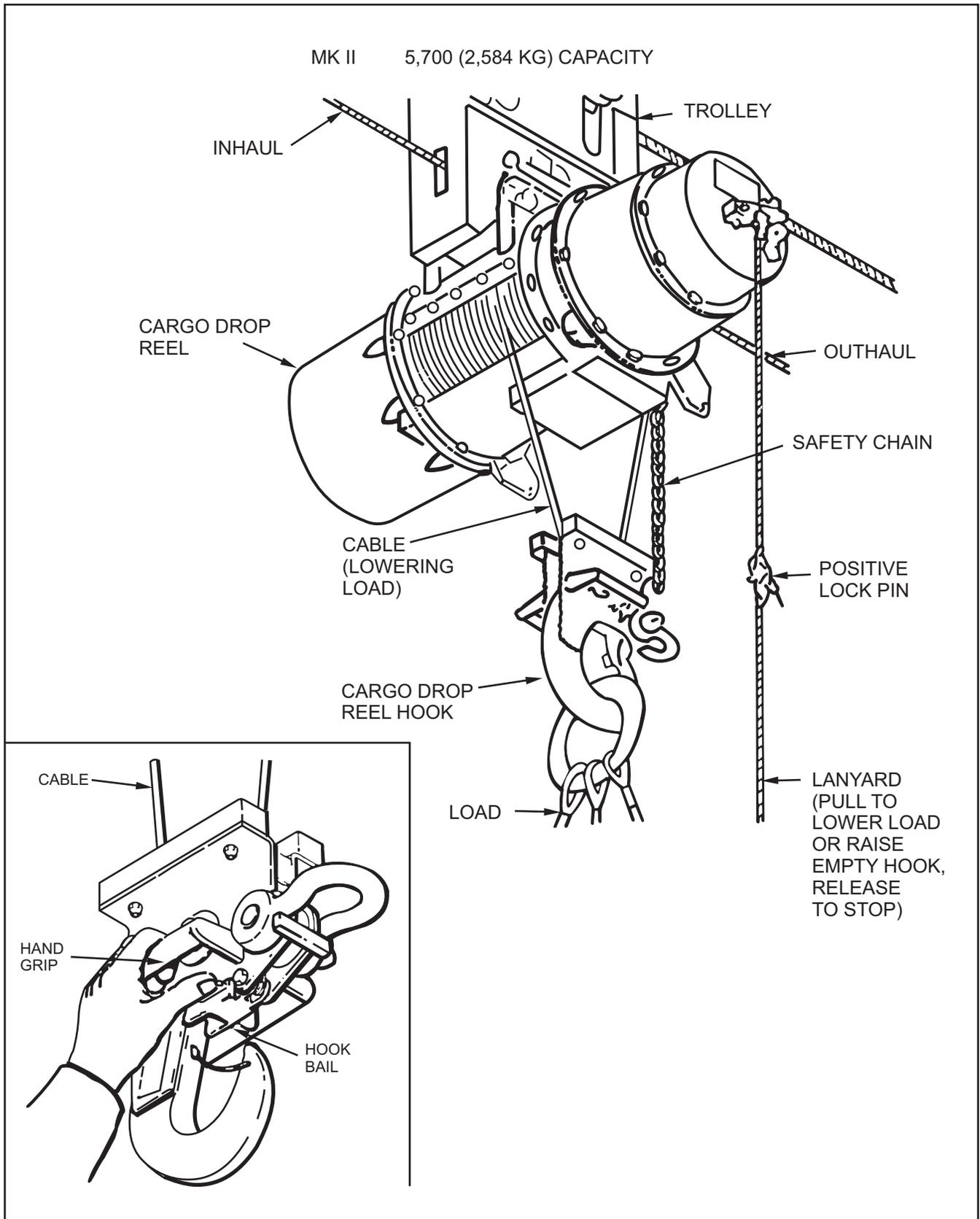


Figure 6-26. Cargo Drop Reel

6.15.1 Delivery Station's Preparations. Before the first load is transferred, the delivery station exercises the CDR:

1. Attach a dummy load to the hook and raise the transfer head 10 to 15 feet (3 to 6.5 m).
2. Pull on the brake release lanyard, and lower the load.
3. Slack the lanyard at least once to stop the load while it is lowering.
4. Ensure that the brake holds and that the linkage operates freely and smoothly.
5. Detach the hook from the dummy load, pull on the lanyard, and return the hook to the two-blocked position.

Note

When the brake release lanyard is slacked, the brake will set and the hook will stop — whether it is going up or down. When the lanyard is pulled, the hook will go up or down.

6.15.2 Brake Release Lanyard. A pull of about 50 lb (22.6 kg) on the brake release lanyard releases the static brake on the CDR's drum. The pull must be applied continuously for the load to lower to the deck. If the load on the hook is less than 150 lb (68 kg), the spring motor causes the drum to haul in wire and raise the hook. If the load is more than 400 lb (181 kg), the load overcomes the spring motor and lowers at a controlled rate. (See Figure 6-27.)

6.15.3 Cargo Drop Reel Lanyards. CDR lanyards are to be fabricated in accordance with NAVSHIPS Dwg 2580211 (15-foot (6.6 m) and 30-foot (9.1 m) lanyards). The 15-foot (6.6 m) lanyard is used for normal station transfers. The 30-foot (9.1 m) lanyard is used with ships that have rig attachment points 20 feet (6.2 m) or more above the transfer deck.

6.15.4 Cargo Drop Reel Hook. Hand grips on the hook assist cargo handlers when they pull down to get slack in the sling (see Figure 6-26).

6.15.5 Removing the Sling From Palletized Stores. To remove the sling from palletized stores, the receiving station uses these procedures after the trolley and palletized load have been hauled across by the outhaul:

1. The CDR operator takes the brake release lanyard in hand, stands clear of the load, and pulls the lanyard to lower the load (Figure 6-28).
2. As the load nears the deck, the cargo handlers rotate the load to place sling loops on the forward and aft sides of the load (Figure 6-28).
3. When the load reaches the deck, the CDR operator keeps pulling the brake release lanyard (Figure 6-29).
4. Cargo handlers haul down hard on the sling to get slack (Figure 6-29).



The next step must be performed exactly as described or the CDR will start to rewind.

5. When cargo handlers have enough slack to slip the sling from the pallet, the CDR operator slacks the lanyard to hold the hook in the down position (Figure 6-30).
6. Cargo handlers slip the sling from the pallet (Figure 6-30).
7. One cargo handler hand-tends the sling legs outboard, clear of the load and other cargo handlers (Figure 6-31). At the same time, the CDR operator pulls the brake release lanyard to haul the hook and empty sling up (Figure 6-31).
8. Signal the delivery station to haul back the trolley and sling.
9. When the empty sling legs are high enough to clear the deck edge, the CDR operator slacks the brake lanyard and tends the lanyard clear of the deck edge.
10. If there is room, stack empty pallets outboard of the landing area with the sling (open) ends of the pallets facing forward and aft.
11. Every third or fourth load, cargo handlers engage the sling to the empty pallets for return to the delivery station. When planning to return empty pallets, pull additional slack in the sling. Empty pallets or other retrograde material must weigh less than 150 lb (68 kg) per load or the CDR will not hoist the load clear of the deck.

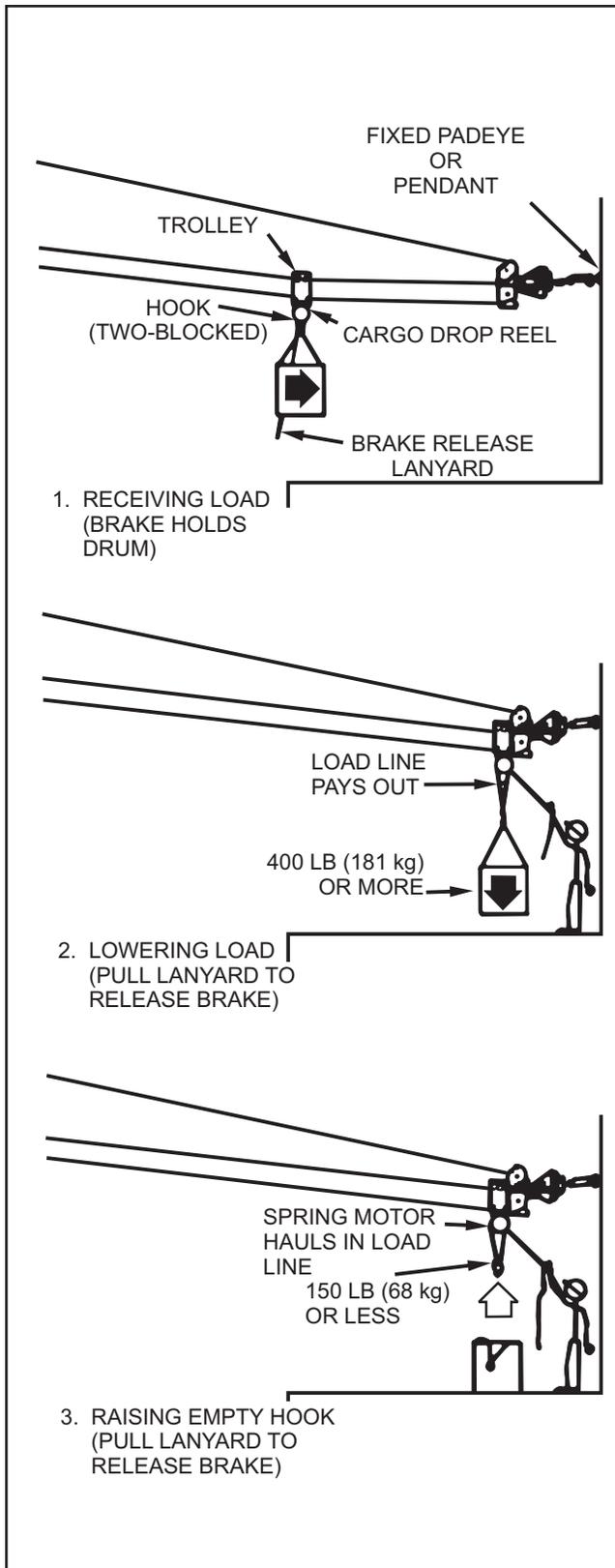


Figure 6-27. Cargo Drop Reel — Lowering Load at Fixed Padeye or Pendant Receiving Station

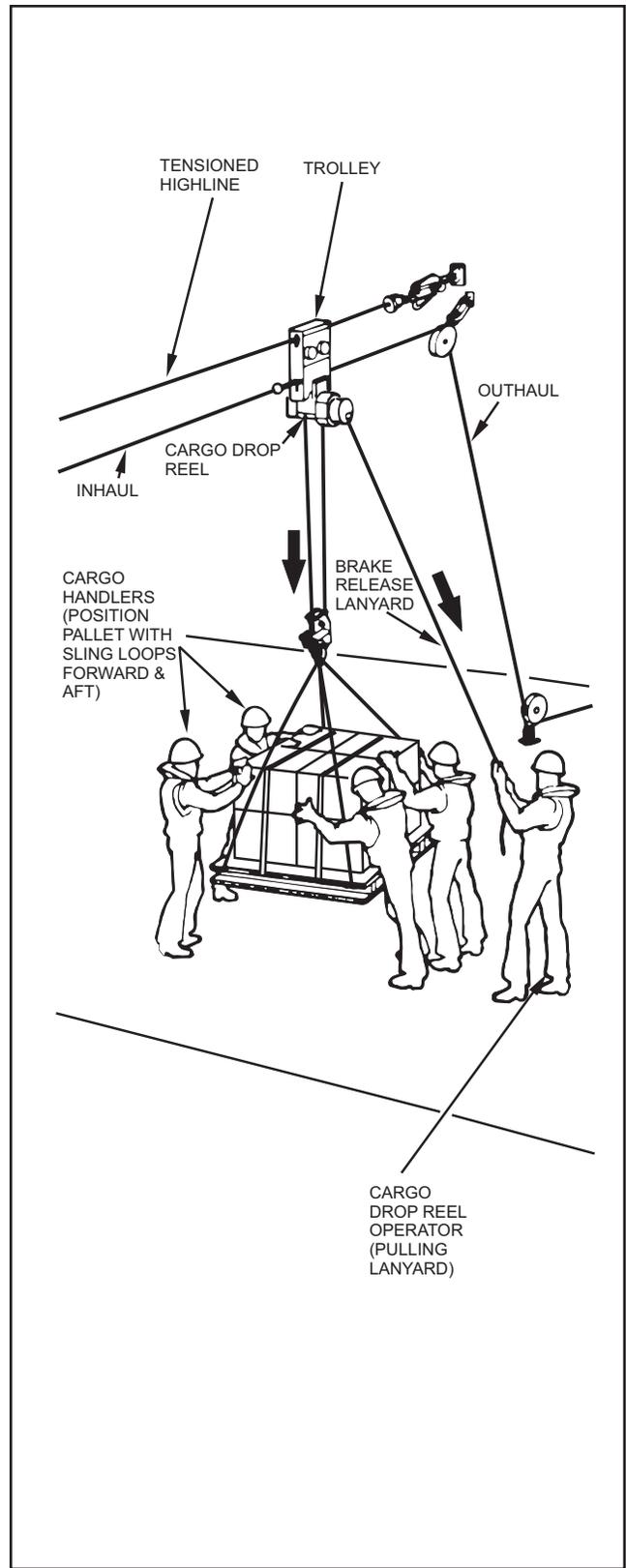


Figure 6-28. Handline Palletized Stores as Load Arrives Aboard

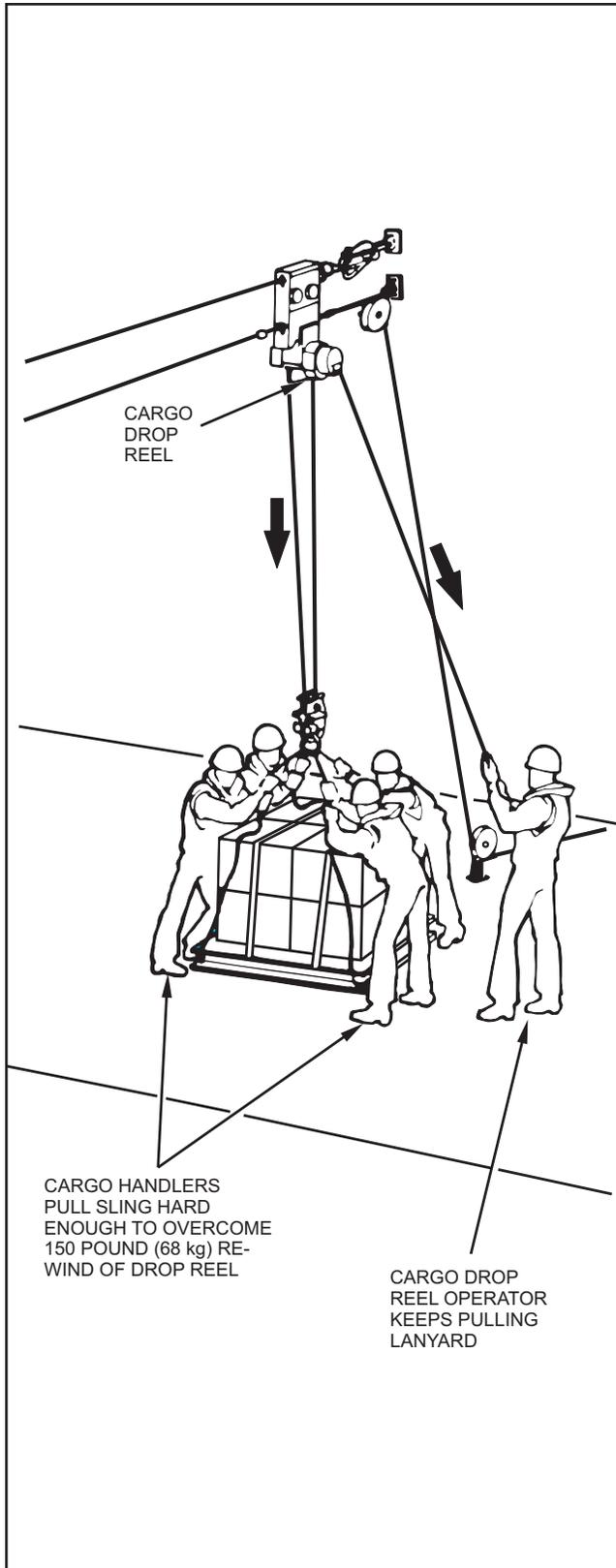


Figure 6-29. Hauling Down on Sling To Get Slack

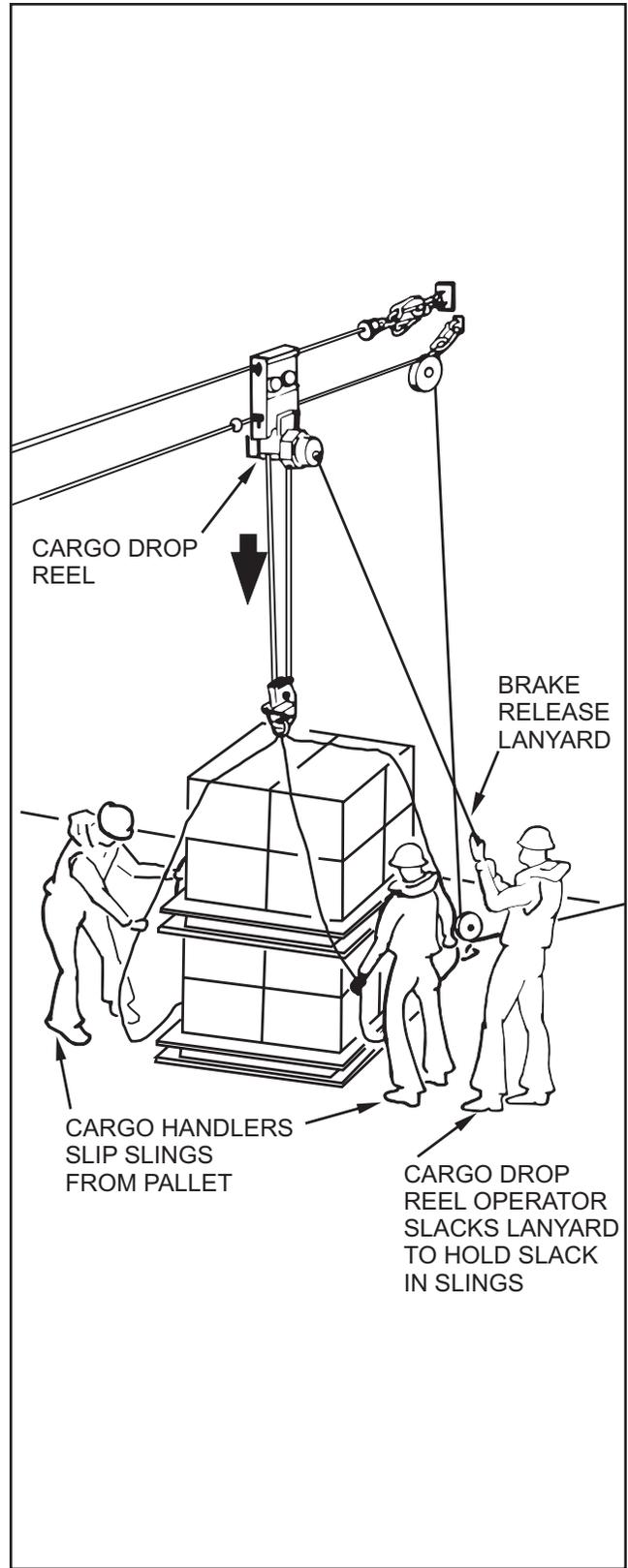


Figure 6-30. Slipping Sling From Stores Pallet

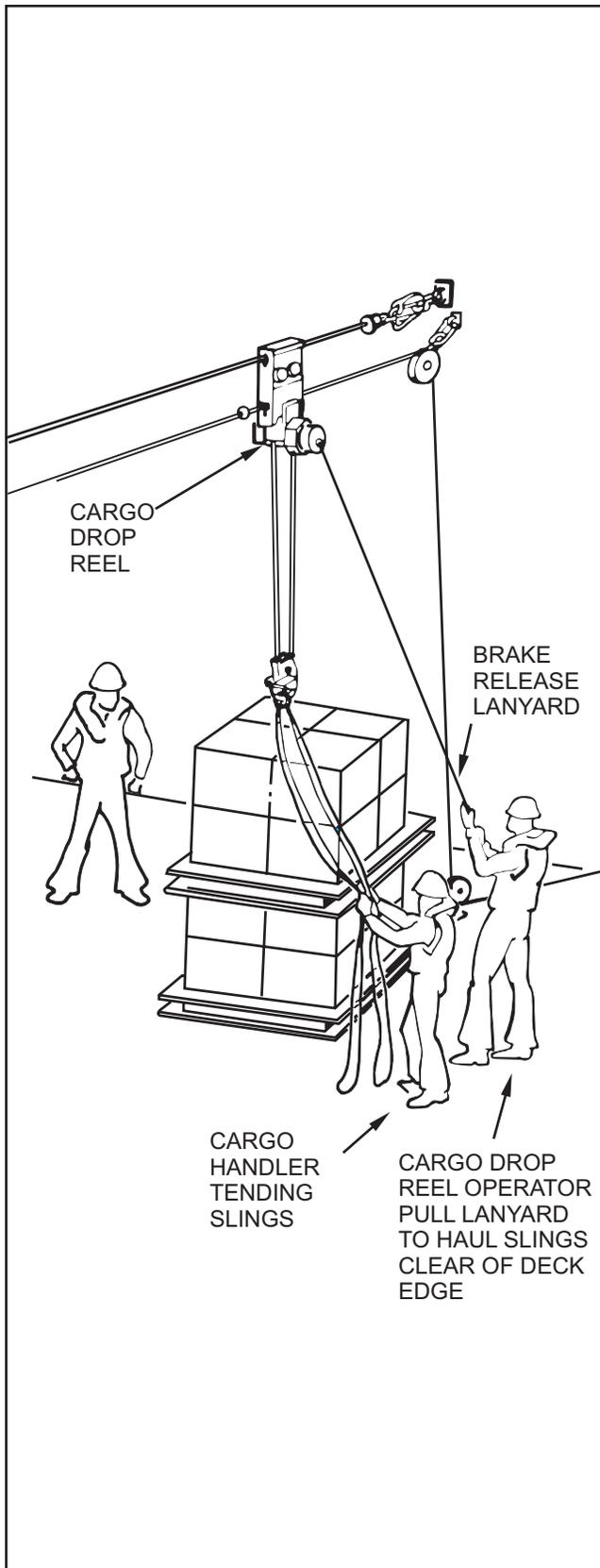


Figure 6-31. Returning Sling

12. When slings are engaged on the return load, the CDR operator pulls on the lanyard to release the brake. The hook will go up and lift the empty pallets clear of the deck. Cargo handlers assist by lifting on the pallets (Figure 6-32).

Note

Retrograde material must weigh less than 150 lb (68 kg) per load. If retrograde material weighs in excess of 150 lb (68 kg) and no other means of lifting is available, use the threefold method (paragraph 6.15.8).

6.15.6 Removing Sling From Palletized Ordnance. To remove slings from palletized ordnance, remove slings from CDR hook/hook adapter, and signal the delivery station to retrieve the trolley. Return first set of slings after disconnecting slings from the second load. (See Figure 6-33.)

6.15.7 Heavy Load Return. Loads in excess of 150 lb (68 kg) can be returned by the following method or by one of the tension/detension methods presented in paragraph 6.16.

(1) DELIVERY SHIP

1. Lower the CDR hook sufficiently to allow the receiving station to hook up the load.
2. Raise the transfer head, and send the trolley to the receiving station.
3. Lower the transfer head to the full-down position.
6. Hold the trolley at the receiving station with the outhaul in tension control.

(2) RECEIVING SHIP

1. Clear the landing area of all personnel except cargo handlers needed to position and hook up the load.
2. Position the return load under the highline as near the deck edge as possible, but safe for hook-up.
3. Stand clear of the load.
4. Signal the delivery station to position the trolley over the load.

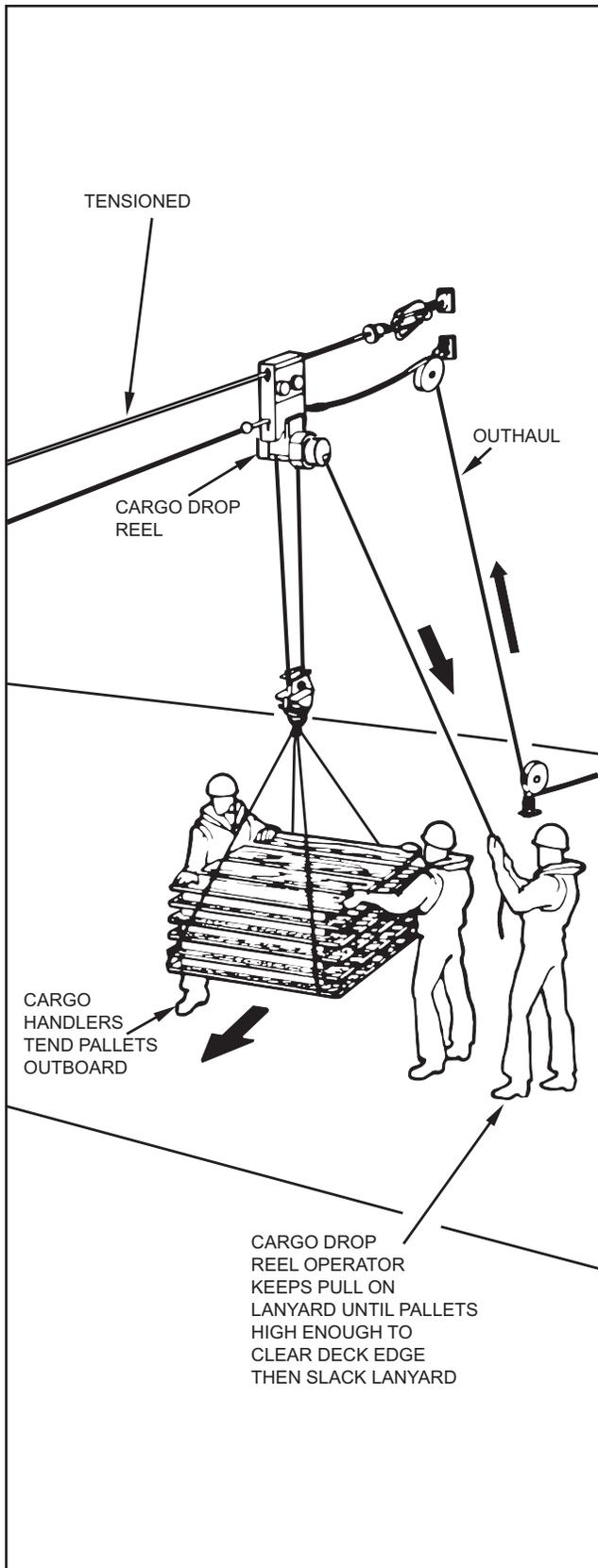


Figure 6-32. Returning Empty Pallets

(3) DELIVERY SHIP

Operate the inhaul and outhaul winches to position the trolley over the load being returned.

(4) RECEIVING SHIP

1. Secure the CDR hook to the sling, pull the lanyard to release the brake, and take up all slack in the CDR's cable.
2. Maintain the brake released and signal the delivery station to raise the transfer head.

(5) BOTH SHIPS

The delivery station raises the transfer head to the full-up position. The receiving station releases the brake release lanyard to set the brake immediately when the transfer head starts to raise. The load should lift clear of the deck. If the load does not lift clear of the deck, use one of the tension/detension methods (paragraph 6.16).

(6) DELIVERY SHIP

On signal from the receiving station, haul in slowly until the load clears the receiving station's deck edge, then retrieve the load.

(7) BOTH SHIPS

If several loads are being returned and no loads are being sent, the delivery station should use the CDR in addition to the transfer head to lower returned loads to her deck, in lieu of lowering the transfer head to the full-down position. When the load is on the delivery station's deck and is released from the hook, leave the hook extended and return the trolley and CDR to the receiving station for the next load.

6.15.8 Heavy Load Return With Threefold. Use a threefold tackle provided by the delivery station to return loads in excess of 150 lb (68 kg). The delivery station sends the receiving station (1) the SURF with the threefold shackled to the padeye on the SURF and (2) the trolley and CDR with the CDR hook extended. The receiving station prepares for load return by (1) attaching the CDR hook to the load and (2) securing the threefold's quick-release hook to a shackle on the CDR hook. Line handlers at the receiving station haul in on the threefold to lift the load as the CDR raises the CDR hook.

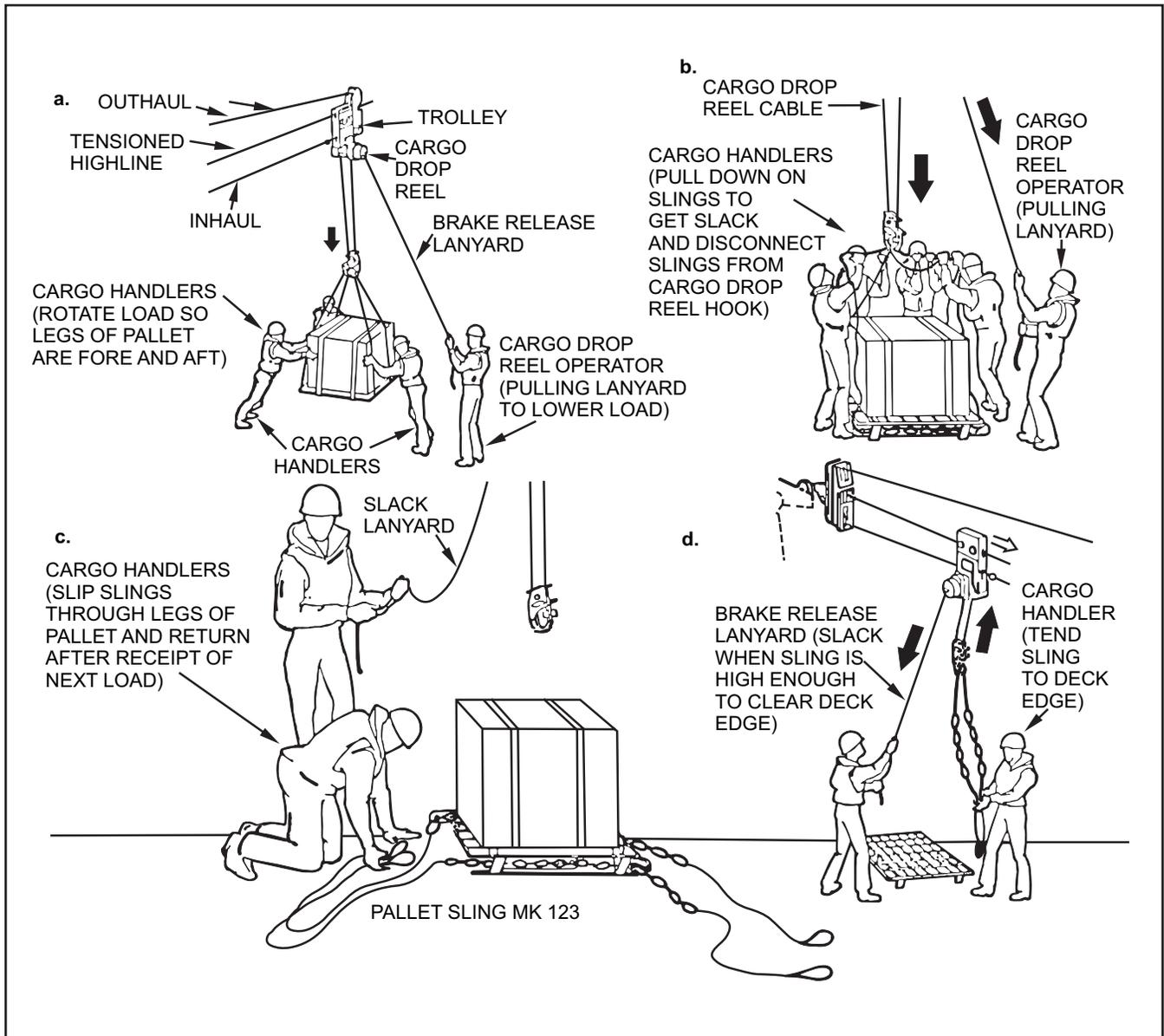


Figure 6-33. Handling Palletized Ammunition

(1) DELIVERY SHIP

When the highline is connected and tensioned, shackle the threefold to the SURF as shown in Figure 6-34.

(2) RECEIVING SHIP

Haul over the SURF and connect.

(3) DELIVERY SHIP

Tension the outhaul.

(4) RECEIVING SHIP

1. Pull on the tail of the threefold to break the sail twine that stops off the hauling line.
2. Pay out the hauling line until the quick-release hook on the lower block of the threefold is within reach of the cargo handlers.
3. Lead the hauling line to a fairlead or snatch block on a deck pad.
4. Secure the threefold block out of the way.

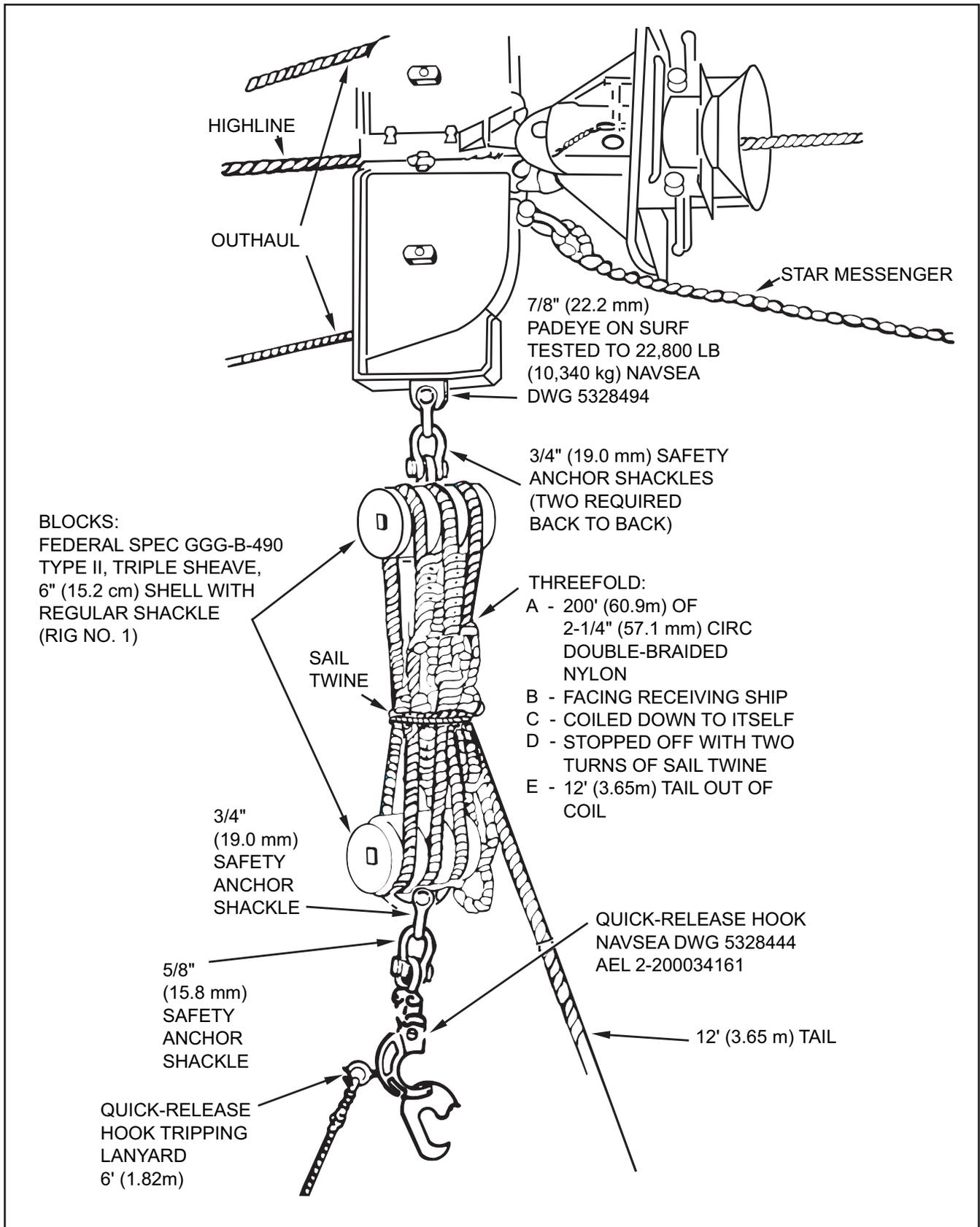


Figure 6-34. Heavy Load Return Using Threefold — Rigging at Delivery Station

5. Position the return load under the highline.
6. Signal the delivery station to send over the trolley.

(5) DELIVERY SHIP

1. Lower the CDR hook to a point where the cargo handlers at the receiving station will be able to reach it.
2. Raise the transfer head, and send over the trolley and CDR.

(6) RECEIVING SHIP

1. Attach the sling on the return load to the CDR hook (Figure 6-35).
2. Attach the quick-release hook on the threefold to the shackle on the CDR hook.
3. Pull on the brake release lanyard to take slack out of the CDR's cable.

(7) DELIVERY SHIP

Lower the transfer head to the full-down position.

(8) RECEIVING SHIP

1. Load is ready to be raised. Station a sufficient number of line handlers on the hauling line of the threefold.

Note

The number of line handlers required to lift the load will depend on the weight of the load. A Mk 6 dolly with missile, for example, requires 12 to 15 line handlers for lifting. The threefold can be used to raise loads that weigh up to the capacity of the CDR (5,700 lb (2,584 kg)).

2. Pull the brake release lanyard on the CDR.
3. Line handlers haul in on the hauling line.

Note

The threefold, attached to the CDR hook, will carry the weight of the load. The CDR will not sense weight and will reel in the CDR hook.

4. When the load is high enough to clear the deck edge (about 2 feet (60 cm) in most cases), release the lanyard to set the brake.
5. Slack off on the hauling line.

Note

The CDR now holds the load.

6. Pull the tripping lanyard on the quick-release hook to disengage the threefold from the CDR hook.
7. Secure the threefold block out of the way.
8. Signal the delivery station to retrieve the load.

(9) DELIVERY SHIP

1. On signal from the receiving station, raise the transfer head to the full-up position. This provides more clearance under the load (at the receiving station).
2. Haul in slowly until the load clears the receiving station's deck edge, then retrieve the load.

6.16 TENSION/DETENSION OF STREAM RIG

Note

STREAM with STAR rig will not be used for tension/detension.

The third method of lowering and raising the load at the receiving station is tension/detension. This method can be used for delivery or return of loads when the following are taken into consideration:

1. Use the CDR to deliver a load, if a CDR is available and the load to be transferred is within its capacity (5,700 lb (2,584 kg)).
2. If the CDR is attached to the trolley and the load to be returned exceeds 150 lb (68 kg) (the maximum weight that the CDR's spring motor will pick up), use either the method of heavy load return described in paragraph 6.15.7 or the rig configuration with tensioned outhaul described in paragraph 6.16.1. This tension/detension method is normally used for load return only.

Note

Loads weighing from 5,700 lb to 10,000 lb (2,584 to 4,536 kg) may be transferred by one of the heavy-lift methods described in paragraph 6.17.

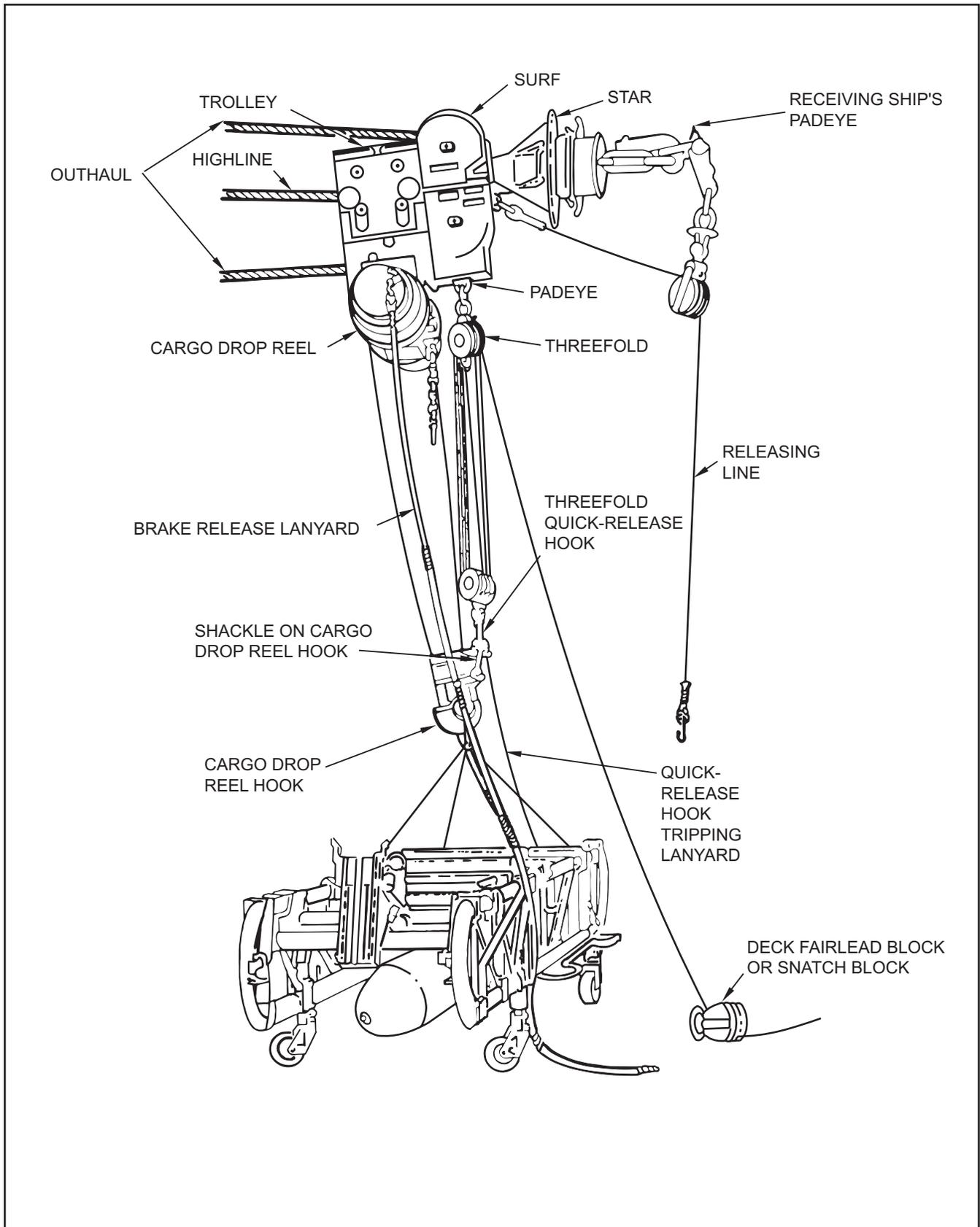


Figure 6-35. Heavy Load Return Using Threefold — Attaching Load at Receiving Station

STREAM rigs are capable of transferring loads up to 9,000 lb (4,082 kg). Controlling the load during tensioning and detensioning requires knowledge of these procedures, close coordination, and winch operators with skill.

6.16.1 STREAM With Tensioned Outhaul and Cargo Drop Reel (paragraphs 6.9 and 6.10). Weight of the load to be returned is limited by (1) the CDR's capacity (5,700 lb (2,584 kg)) and (2) the maximum tension capability of the delivery station's outhaul winch (varies from 3,000 to 5,500 lb (1,360 to 2,494 kg), depending on winch type). Both inhaul and outhaul winches are kept in *tension* control.

(1) RECEIVING SHIP

Position the return load under the highline as near the deck edge as possible, but safe for hook-up, and stand clear of the load. Signal the delivery station to send the trolley.

(2) DELIVERY SHIP

1. Lower the CDR hook sufficiently for the receiving station to hook up the load. Raise the transfer head, and send the trolley to the receiving station.
2. Raise the transfer head to the full-up position. Hold the trolley at the receiving station with the outhaul in *tension* control.

(3) RECEIVING SHIP

Clear the landing area of all personnel, except cargo handlers needed to position and hook up the load.

(4) DELIVERY SHIP

Operate the inhaul and outhaul winches to position the trolley over the load being returned.

(5) RECEIVING SHIP

Secure the CDR hook to the sling. Pull the brake release lanyard to release the brake, and take up all slack in the CDR's cable. Maintain the brake *released*. Signal the delivery station to detension the highline, and inform the bridge that the highline is being detensioned.

(6) DELIVERY SHIP

1. Signal the receiving station that you are going to detension the highline, and inform the bridge that you are detensioning the highline. Pay out on the highline winch until the ram is fully extended and the highline is slack (inhaul and outhaul winches in *tension* control).
2. When the highline is being slacked, the trolley will tend to run outboard. Load control is maintained by the outhaul winch in *tension* control. Tend hauling and highline winches for best position of trolley over the load.

(7) RECEIVING SHIP

As the CDR lowers during detensioning, continue to hold the brake *released* for maximum take-up of cable. When all slack is taken up, continue to hold the brake *released* and signal the delivery station to tension the highline. It is not necessary to two-block the hook to the CDR. Adequate lift will be obtained for the load to clear the deck edge.

(8) BOTH SHIPS

Inform the bridge that you are tensioning the highline.

(9) DELIVERY SHIP

Haul in on the highline winch control and tension the highline. Maintain trolley position and load control with the outhaul winch.

(10) BOTH SHIPS

As the highline is tensioned, the CDR will start to raise. The receiving station *immediately* releases the lanyard to set the brake. The load will lift clear of the deck. The delivery station must increase tension on the outhaul immediately after the lanyard is released to keep the load from running outboard.

(11) RECEIVING SHIP

Signal the delivery station to haul in on the trolley. If several loads are being returned, the delivery station should use the CDR in addition to the transfer head to lower the load to her deck, instead of lowering the transfer head full-down. The CDR hook will be lowered sufficiently for the receiving station to hook up the next load.

6.17 STREAM HEAVY-LIFT TRANSFER METHODS

Heavy-lift loads are loads that weigh between 5,700 lb and 10,000 lb (2,584 kg and 4,536 kg). The CDR (see Figure 6-26) is designed to transfer loads up to 5,700 lb (2,584 kg). Heavy-lift loads can be transferred by increasing the ram tension air pressure at a heavy STREAM delivery station. A heavy STREAM delivery station has a highline winch that can tension the highline to 19,500 lb (8,845 kg). (For light STREAM delivery station heavy-lift, see paragraph 6.17.4.) Transfer of heavy-lift loads by the methods used below requires that:

1. Only the most experienced winch operators available shall be used.
2. The first lieutenant or ship's bos'n shall be present on each ship at the transfer station in use.

WARNING

The first lieutenant or ship's bos'n shall inspect the trolley's label plate before conducting heavy lift and ensure that the load lift weight does not exceed the trolley's rated working load.

CAUTION

Use only STREAM with traveling SURF when conducting heavy-lift transfers to sliding-padeye receiving stations.

6.17.1 Heavy-Lift Transfer From a Heavy STREAM Delivery Station to a Sliding-Padeye Receiving Station. If care is exercised, a heavy STREAM delivery station can transfer loads weighing 5,700 to 10,000 lb (2,584 to 4,082 kg) to a sliding-padeye receiving station as follows:

1. Set ram tensioner air pressure at 2,250 psi (15,168 kPa) air. See Appendix B for procedures to use.

CAUTION

Once the transfer is completed, set the ram pressure to 1,950 psi (13,436 kPa) air or less. Continued use of the STREAM rig at 2,250 psi (15,168 kPa) air when transferring loads weighing less than 9,000 lb (4,082 kg) will unnecessarily accelerate wear on the highline winch.

2. Use the Mk 5 strongback rigged as shown in Figure 6-12 to reduce the distance between the highline and the bottom of the load.
3. Use the adjustable slings shown in Figure 6-36 between the strongback and the load.

6.17.2 Special Consideration for Heavy-Lift Transfer of Loads Weighing 9,000 to 10,000 lb (4,082 to 4,536 kg) From a Heavy STREAM Delivery Station. In addition to the heavy-lift requirements in paragraph 6.17.1, the following applies for transfer of loads weighing 9,000 to 10,000 lb (4,082 to 4,536 kg):

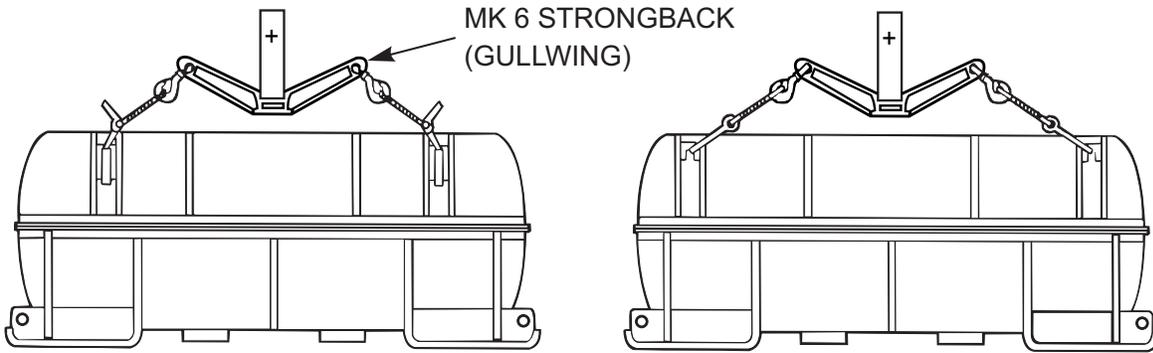
1. Sea state must be calm to 3.
2. Distance between ships should not exceed 120 feet (36.5 m).

6.17.3 STREAM Heavy-Lift Transfer of Aircraft Engines to Carriers. When transferring an aircraft engine to a carrier, the distance between ships should be 100 to 120 feet (30.4 to 36.5 m) and the sling should be as short as possible. It may be necessary for the carrier to induce a starboard list. If possible, transfer an aircraft engine between aft stations. Double Burton (see paragraph 7.6) is a viable method when no other alternative is available.

6.17.4 Mk 5 Strongback Procedures

(1) DELIVERY SHIP

1. Have three sets of Mk 5 strongback slings available at the transfer station.



ADJUSTABLE SLINGS FOR TRANSFER OF AIRCRAFT ENGINES

SHORT SLING ARRANGEMENT

- TF-30 LONG CONTAINER (183" (480 cm))
- TF-41 LONG CONTAINER (144" (366 cm))
- J-57
- *J-79
- J-52
- *T-56
- *T-58
- *T-64
- *T-65

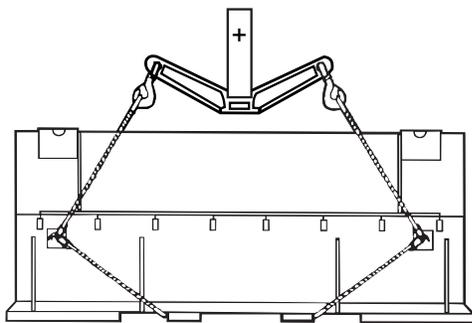
LONG SLING ARRANGEMENT

- TF-30 SHORT CONTAINER (162" (411 cm))
- TF-41 SHORT CONTAINER (359" (353 cm))
- TF-34

*TWO POINT PICKUP

Note

A F110 container sling arrangement for attachment to the lower half lifting rings can be fabricated as follows:



**F110 ENGINE CONTAINER
(ALUMINUM)**

With Mk 5 Strongback and Lifting Straps
Through Forklift Pockets
(Safety Straps are Slack) (see Note)

1. Four 68-inch (1.7 m) slings made from 1/2-inch (12.7 mm) diameter wire rope swaged eyes with thimbles rigged from a 7/8-inch (22.2 mm) safety anchor shackle at the container lifting ring to a 7/8-inch (22.2 mm) safety anchor shackle on the Mk5 strongback (gullwing) outboard hook.
2. Two 124 inch (3.15 m) safety straps made from 1/2-inch (12.7 mm) diameter wire rope swaged eyes with thimbles rigged from the 7/8-inch (22.2 mm) safety anchor shackle at the lifting ring through the forklift pockets on the container to the opposite side.
3. Each sling and safety strap to be load tested to 10,000 lb (4,536 kg).

Figure 6-36. Adjustable Slings for Transfer of Aircraft Engines

2. Shackle number 1 set of slings to first load; then, while first load travels to receiving ship, shackle number 2 set of slings to second load.

(2) RECEIVING SHIP

Remove number 1 set of slings from Mk 5 strongback; remove shackles from first load while empty strongback travels back to the delivery ship.

(3) DELIVERY SHIP

Connect number 2 set of slings to Mk 5 strongback. While second load travels to receiving ship, shackle number 3 set of slings to third load.

(4) RECEIVING SHIP

Remove number 1 set of slings from Mk 5 strongback and connect number 3 set of slings to Mk 5 strongback. While third load travels to receiving ship, shackle number 1 set of slings to fourth load.

Note

Clear loads from receiving station prior to removing slings from containers.

6.18 REFERENCES

ATP 16, Replenishment at Sea

OPNAVINST 8023.2, U.S. Navy Explosive Safety Policies, Requirements, and Procedures

MIL-STD 1323, Palletizing Fleet Issue Unit Loads

NAVSEA S59570-AD-CAT-010, UNREP Hardware and Equipment Manual

NAVSEA OP 4, Ammunition Afloat

NAVSEA OP 2173, Approved Handling Equipment for Weapons and Explosives, Volumes 1 and 2

NAVSEA OP 3192, Missile Transfer Dolly Mk 6 Mods 1, 2, 3, and 4

NAVSEA OP 3206, Handling and Stowage of Naval Ordnance Aboard Ammunition Ships, Volumes I, II, and III

NAVSEA OP 3347, U.S. Navy Ordnance Safety Precautions

NAVSEA OP 3565/NAVAIR 16-1-529, Radio Frequency Hazards to Ordnance, Personnel, and Fuel

NAVSEA OP 4118; Handling, Packaging, and Transportation of Underwater Mines Mk 52, Mk 55, Mk 56, and Mk 57

NAVSEA S9571-AA-MMA-010, Underway Replenishment Ordnance Handling Equipment and Transfer Units

NAVSEA S9571-A1-HBK-010, UNREP Station Capabilities Handbook

U.S. Coast Guard, 46 CFR, Part 146, Transportation or Storage of Military Explosives

Equipment*	STREAM Rigs for All Ships			Ref. Para.
	STAR	Traveling SURF	Hand-Tended Outhaul	
Adapter, Highline End Fitting	1	1	1	
Adapter, Highline Shear Pin	1 (Note 1)	1 (Note 1)	1 (Note 1)	6.9
Bolo With Shotline	1 (Note 2)	1 (Note 2)	1 (Note 2)	2.3.4
Cargo Drop Reel	1 (Note 3)	1 (Note 3)	1 (Note 3)	6.15
Gun, Line-Throwing NAVSEA SW-350-AL-MMO-010	1 (Note 2)	1 (Note 2)	1 (Note 2)	2.3.4
Hook, Cargo With Swivel and Trolley Adapter	1 (Note 4)	1 (Note 4)	1 (Note 4)	6.14
Hook, Pelican, 1-3/8" (34.9 mm) STANDARD	1	—	1	6.9 6.11
Hook, Pelican, 1-3/8" (34.9 mm) STREAM	—	1	(Note 5)	6.10
Latch, STAR Assembly	1	—	—	6.9
Line, Station-to-Station Phone	1	1	1	2.3.7
Link, Combination	—	—	—	
Marker, Transfer Station or Light Box	1	1	1	2.4.4.2 2.5.4
Messenger, STAR	1	1	1 (Note 6)	2.3.5
Messenger, Lead Line	1 (Note 7)	1 (Note 7)	1 (Note 7)	2.3.6
Paddles, Signal (Set) or Wands (Set)	1	1	1	2.4.4.3
Pendant, 1/2" (12.7 mm) x 13-1/2" (330.6 mm) With Drum Fitting and Eye Splice	—	—	1	6.11
Phone, Sound-Powered	2	2	2	2.4.1

Figure 6-37. STREAM Hardware for Delivery Ship — One Station (Sheet 1 of 2)

Equipment*	STREAM Rigs for All Ships			Ref. Para.
	STAR	Traveling SURF	Hand-Tended Outhaul	
Pins, Cotter, Steel	(Note 8)	(Note 8)	(Note 8)	
Plate, Stopper	—	—	1	6.11
Projectile, Gun, Line-Throwing With Shotline	2 (Note 2)	2 (Note 2)	2 (Note 2)	2.3.4
Shackle, 7/8" (22.2 mm) Safety Anchor	— (Note 9)	1 (Note 9)	1 (Note 9)	2.3.3
Shackle, 1-3/8" (34.9 mm) Safety Anchor	— (Note 11)	— (Note 11)	— (Note 11)	2.3.3
SURF, Traveling	1	1	—	6.10
Tackle, Three-fold 200' (61.0 m) of 2-1/4" (57.1 mm) CIRC, double-braided	(Note 10)	(Note 10)	(Note 10)	6.15.8
Trolley, STREAM	1	1	1	6.5.5
Tools, UNREP Working and Repair (Set)	1	1	1	2.3.9
<p>*Refer to UNREP Hardware and Equipment Manual, NAVSEA S9570-AD-CAT-010</p> <p>NOTES: 1. Required when hipline winch drum does not have a slip clutch. 2. Not required for rigs to CV, LPH, or other ship with aircraft on deck. 3. Not required when rigged to sliding padeye or another STREAM station. 4. Not rigged when rigged to fixed padeye, pendant, or STREAM support leg. 5. May be used as alternate for standard pelican hook. 6. Without 60-foot (18.2 m) releasing line. 7. Required only for station where phone/distance line will come across. 8. As required to secure safety shackles and pelican hooks (see Figure 2-21). 9. Additional as required. 10. Required for threefold method of returning cargo drop reel loads in excess of 150 lb (68.0 kg). 11. To secure or charge ram tensioner.</p>				

Figure 6-37. STREAM Hardware for Delivery Ship — One Station (Sheet 2 of 2)

Equipment*	STREAM Rigs for All Ships			Ref. Para.
	STAR	Traveling SURF	Hand-Tended Outhaul	
Block, Snatch, 10" (254.0 mm) or 12" (304.8 mm)	(Note 1)	(Note 1)	(Note 1)	6.9, 6.10, 6.11
Bolo With Shotline	2	2	2	2.3.4
Fitting, 3/4" (19.0 mm) Eye Socket (Fiege)	—	—	—	
Gun, Line-Throwing NAVSEA SW-350-AL-MMO-010	1	1	1	2.3.4
Line, Easing-out	1	2	1	2.2.11.5
Line, B/B Phone/Distance	1 (Note 2)	1 (Note 2)	1 (Note 2)	2.3.6
Line, Station-to-Station Phone	—	—	—	2.3.7
Marker, Transfer Station or Light Box	1	1	1	2.4.4.2, 2.5.4
Messenger, STAR	—	—	—	2.3.5
Paddles, Signal (Set) or Wands (Set)	1	1	1	2.4.4.3
Phone, Sound-Powered	2	2	2	2.4.1
Pins, Cotter, Steel	(Note 3)	(Note 3)	(Note 3)	
Projectile, Gun, Line-Throwing With Shotline	2	2	2	2.3.4
Shackle, Safety Anchor	(Note 4)	(Note 4)	(Note 4)	2.3.3
Tools, UNREP Working and Repair (Set)	1	1	1	2.3.9
<p>*Refer to UNREP Hardware and Equipment Manual, NAVSEA S-9570-AD-CAT-010</p> <p>NOTES: 1. As required to fairlead messenger. 2. Required only for station where phone/distance line will come across. 3. As required to secure safety shackles. 4. As required.</p>				

Figure 6-38. STREAM Hardware for Receiving Ship — One Station

CHAPTER 7

Solid Cargo Transfer — Burton Rigging and Operation

7.1 BASIC CONSIDERATIONS

Solid cargo can be transferred using Burton methods; however, STREAM is the preferred method, when both the delivery ship and the receiving ship have the capability to use it (see Chapter 6).

This chapter covers transfers of solid cargo between U.S. Navy ships, including MSC ships and selected merchant ships, using Burton methods. For transfers of solid cargo between ships of the NATO nations, see ATP 16.

7.1.1 Rig Selection. Select the rig to be used for a particular replenishment operation on the following bases:

1. Type and quantity of cargo
2. Capacity of the rig and associated fittings
3. Weight of the heaviest load and size of the largest load
4. Weather and sea conditions at the time of transfer
5. Type and location of receiving station.



Two restrictions apply to Burton rig transfers:

1. Ships with third- and fourth-generation hauling winches are prohibited from using their hauling winch.
2. Weak-link end fittings shall not be used.

Single Burton rigs are first in order of preference, followed by heavy-lift Burton and double-Burton rigs.

Ships may also transfer personnel, light fleet freight, and mail by synthetic highline (see Chapter 9) or by helicopter (see paragraph 9.8 and Chapter 10). For transfer of ammunition and missiles between ships, see Chapter 6.

For data on transfer stations, which is useful in selecting the rig, refer to these sources:

1. UNREP Station Capabilities Handbook, NAVSEA S9571-A1-HBK-010
2. Fleet Underway Replenishment Guide, COMNAVSURFPACINST 3180.2 or COMNAVSURF LANTINST C9010.1 series.

The requirements of the following paragraphs apply to the Burton rig selected.

7.1.2 Wire Rope. Wire rope used in nontensioned rigs is in accordance with paragraph 2.3.1 and Figure 7-1. The whip used in the rig must meet the minimum requirements set forth in Figure 7-1 for diameter and length of the wire.

7.1.3 Rig Load Capabilities. Safe load capacities for Burton rigs are given in Figure 7-1 and NAVSEA directives and must be adhered to rigidly. Decrease these load capacities when replenishing under adverse sea and weather conditions. Care must be taken to ensure that loads for transfer are compatible with both the static-tested loads of the attachment points (see Figure 7-1) and the rated capacities of the winches (see Figure 7-2).

7.1.4 Rig Fittings. The requirements for rig fittings in paragraphs 2.6.1 through 2.6.6 apply to the fittings used in Burton rigs.

7.1.5 Catenary. Catenary is the angle that the whip takes from the outboard fairlead block to the load. The flatter the catenary, the greater the tension in the wire.

NONTENSIONED RIG (Note 1)	WIRE ROPE		MAXIMUM SAFE TRANSFER LOAD IN POUNDS (kg)	RECEIVING SHIP'S ATTACHMENT POINT STATIC-TESTED LOAD (Note 2) AND REQUIRED WEAK LINK (Note 3)	
	DIAMETER IN INCHES (mm)	LENGTH IN FEET (m)		25,000 to 50,000 lb (11,338 to 22,675 kg) PLUS 25,000 lb (11,338 kg) WEAK LINK	50,000 lb (22,675 kg) AND WEAK LINK ON RIG SECURED TO THIS ATTACHMENT POINT
SINGLE BURTON (Note 4)	3/4 (19.0)	600 (182.8)	See Figure 5-2	Attachment point may be stressed to the breaking strength of the wire rope (50,000 lb or 22,675 kg). Use only experienced operators.	SAFE No weak link is required.
HEAVY BURTON (Note 5)	7/8 (22.2) 1 (25.4)	800 (243.8)	12,000 (5,442) (Note 6)		
DOUBLE BURTON (Note 7)	3/4 (19.0)	1,000 (304.8)	12,000 (5,442)		

NOTES: 1. STREAM-equipped ships with third- and fourth-generation winches are prohibited from using their hauling winches for Burton rigs.
 2. Static-tested loads are based on test data on label plates at attachment points.
 3. Highline winches with a slip clutch in the winch drum do not require weak links.
 4. Navy standard hauling winches are authorized for Burton rigs.
 5. Highline wire rope on STREAM-equipped ships.
 6. Highline winches with ram tensioners fully extended and ram flasks charged as per Figure 4-1.
 7. Double-Burton wire rope is continuous length.

Figure 7-1. Load Capabilities of Burton Rigs, Minimum Requirements for Wire Rope, and Static-Tested Loads of Attachment Points

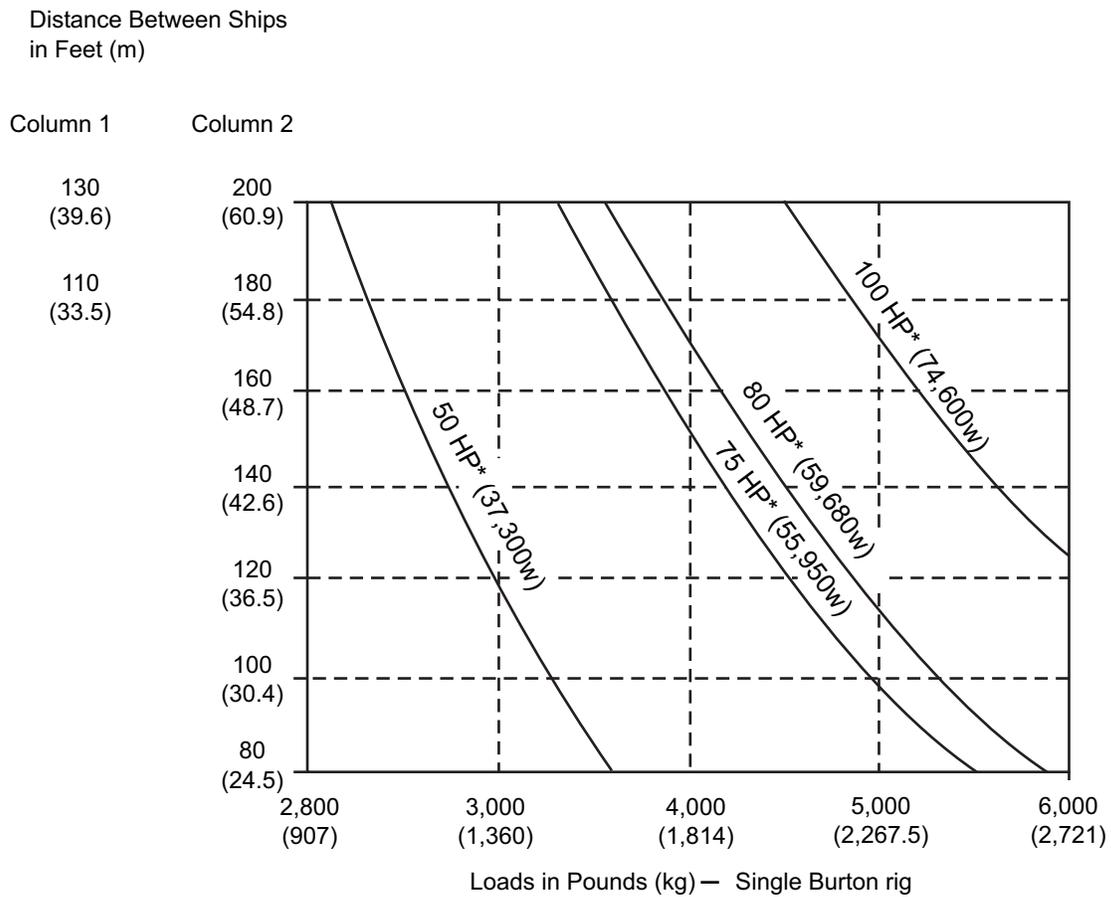
Stress can be reduced by keeping the load as low as practicable during the transfer. As the load crosses between the ships, lower the load to trace a good catenary, but keep it high enough to prevent immersion. Hoist the load — at the beginning and at the end of the transfer — only enough to clear the side of the ship. Figure 7-3 illustrates the line stresses in both whips during burtoning.

7.1.6 Return of an Empty Cargo Hook. A very dangerous condition can develop when winch operators return an empty cargo hook to the delivery ship, because the catenary usually flattens out. Winch operators

normally want to speed up the winches to return the empty cargo hook as quickly as possible. Speed at the expense of safety of personnel and with risk to equipment and ships is not acceptable. Winch operators must ensure that they return an empty cargo hook as though it were a full load and that they maintain a proper catenary in the whips.

7.2 LOADING AND HANDLING OF CARGO

The procedures for loading and handling cargo in paragraphs 2.9 through 2.9.4 apply to this chapter.



Use column 1 when transferring to CV shell padeyes with elevator down or hangar padeyes with elevator up.

Use column 2 when transferring to sponson stations or outriggers on CVs and for cruiser and UNREP ship types.

To use graph, plot ship separation and load to be transferred with an X. If X is to left of HP (w) rating for receiving ship, transfer can be made without equipment overload. If X is to right, receiving ship winch will be overloaded.

*Name plate HP (w) on receiving ship burton winch.

Figure 7-2. Maximum Transfer Loads for Single-Burton Rig Without Winch Overload

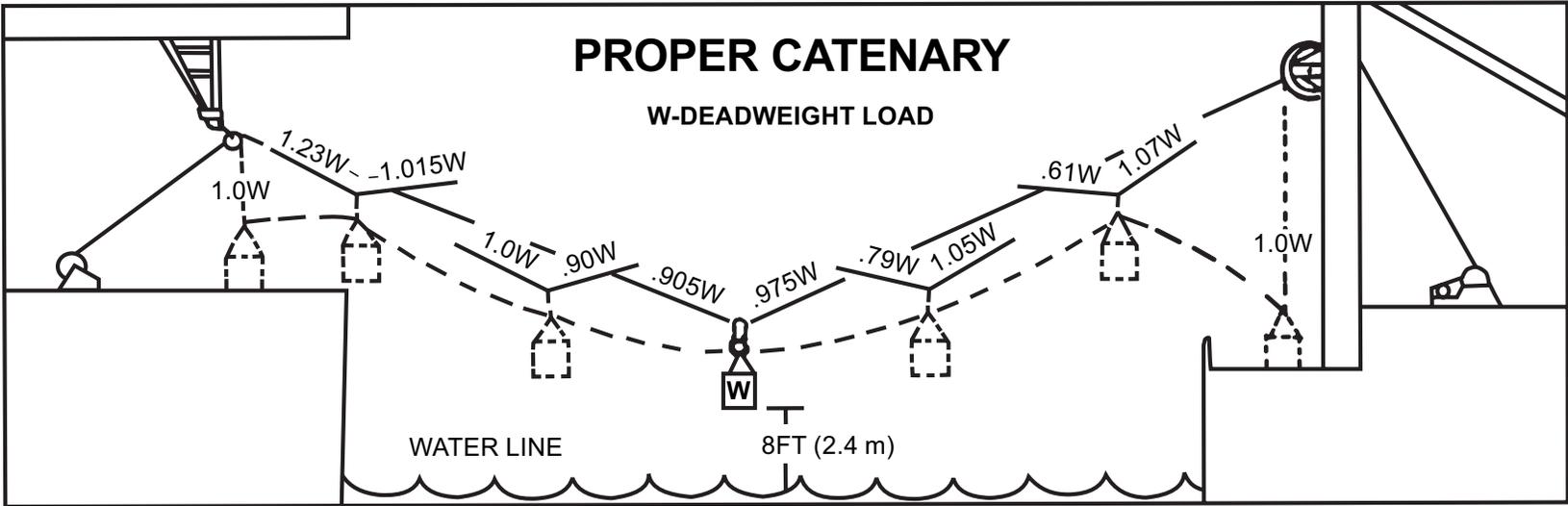
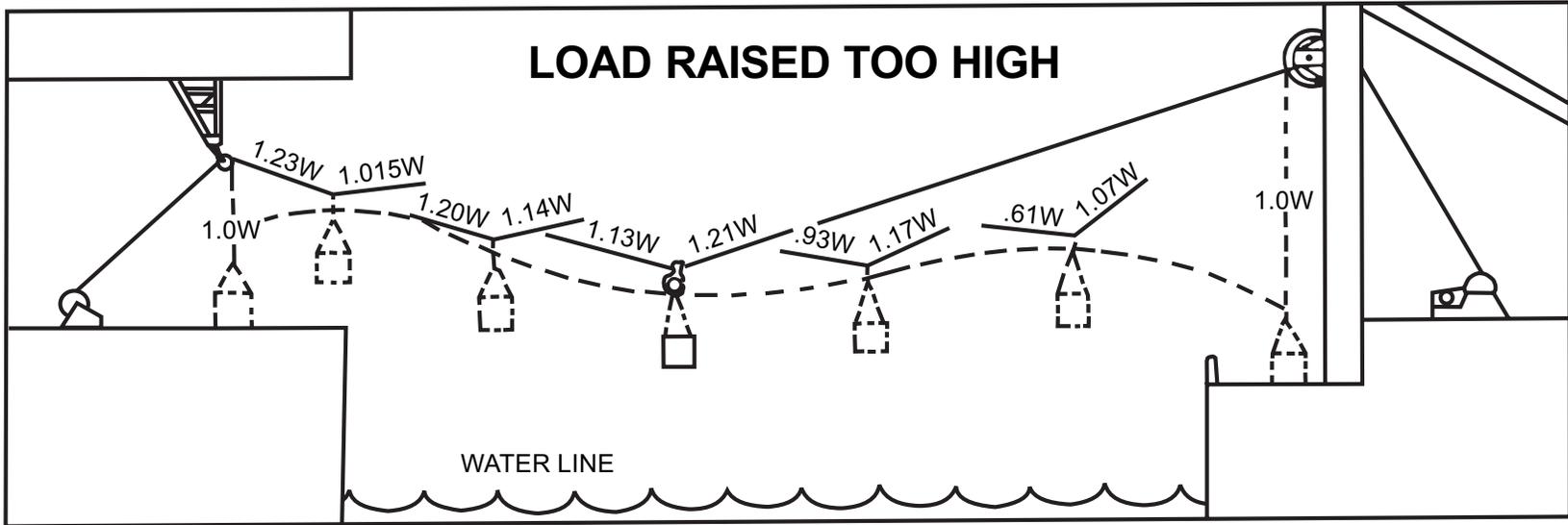


Figure 7-3. Line Loads in Burton Wires



7.3 PREPARING SHIPS FOR TRANSFER

Careful planning by personnel of both the delivery ship and the receiving ship is necessary for successful transfer of provisions and general stores. Personnel should begin preparations prior to rendezvous.

7.3.1 Rigs and Fittings. Personnel shall be familiar with the rigs and fittings to be used and with the individual ship's plan. Personnel who are responsible for hooking up rigs and fittings shall take these steps:

1. Examine the label plates adjacent to the rig's attachment points, prior to use.
2. Ensure that each fitting is used only for its approved purpose.
3. Determine that the static-tested loads are in accordance with Figure 7-1.

Deviations from the ship's plan are not recommended. When deviations are necessary, the approval of the commanding officer is required. The type commander and NAVSEA should be advised of any requirements that necessitate deviations, so that corrective actions may be taken.

Fleet-issued publications provide information on the replenishment capabilities of ships and should be reviewed prior to preparing transfer stations.

Use of the checklists in Appendix D will ensure that all necessary equipment is available at transfer stations. Figures 7-9 and 7-10 at the end of this chapter list hardware that should be available at transfer stations.

7.3.2 Personnel Duties. Refer to paragraph 2.11 and Figure 2-23.

7.3.3 Transfer at Night. Additional preparations for a replenishment operation at night are detailed in Chapter 2.

7.4 BURTON METHODS

When burtoning, both transfer stations provide a whip to support the load. The delivery station pays out its whip and the receiving station hauls in its whip as they work the load across. The rigging that the stations use will depend on the size of the load, on weight requirements, and on the equipment available at the station. For rigging for basic Burton, see paragraphs 7.5 through 7.5.4; for rigging for heavy and double Burton, see paragraphs 7.6 through 7.6.4.2.

7.4.1 Conditions for Burtoning. Specific conditions that must be met, when rigging any method of burtoning, are listed below:

1. Attachment points must have been static tested to and labeled for a system load of 50,000 lb (22,675 kg). Examples are a kingpost's padeyes and links, an M-frame's outrigger padeyes, and a CV's deck padeyes.
2. The minimum height of attachment points at each station is 17 feet (7.1 m) above the deck.
3. The maximum distance from the tie plate to the bottom of the load is 12 feet (3.6 m).
4. Any boom that is used with a Burton rig must have a minimum lifting capacity of 10 tons (9.0 t).
5. Fixed-length preventers used on booms must be adequate for single-whip, underway burtoning. The minimum diameter of wire rope for preventers is 1-1/8 inches (28.5 mm).
6. No two, adjacent, Burton rigs shall be fastened to a single attachment point — that is, to the same boom head, padeye, long link, or pendant. Because 3/4-inch (19.0 mm) wire rope is used in Burton rigs, the system could develop up to 200,000 lb (90,700 kg) of stress, if double rigged from the same attachment point.

Note

Additional conditions for heavy-lift and double-whip burtoning are listed in paragraph 7.6.2.1.

7.5 BASIC BURTON

Ships may rig burtoning from a fixed attachment point or outrigger on a kingpost (Figure 7-4a) or from a sliding block (Figures 7-4b and 7-4c) at a STREAM station.

A Burton station on a delivery ship generally consists of a cargo winch and a kingpost with an outrigger. The cargo winch provides the Burton whip, which is reeved through the kingpost (Figure 7-4a).

Note

For a Burton station rigged from a sliding block at a STREAM station, see paragraph 7.5.5.

A Burton station on a receiving ship may be rigged from a kingpost or a fixed attachment point that meets location and test-load requirements.

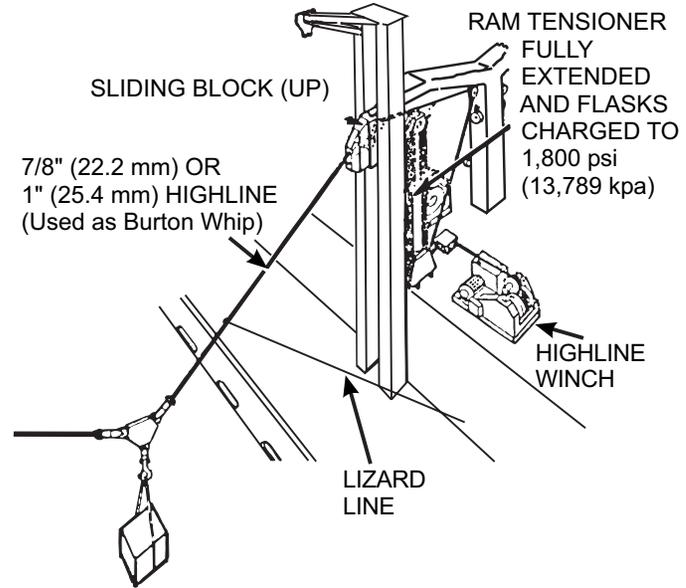
ALL PREVENTERS AND
GUYS ARE NOT SHOWN

LIZARD LINES ARE REQUIRED ON THE
DELIVERY AND RECEIVING SHIPS ON
ALL BASIC BURTON CONFIGURATIONS.

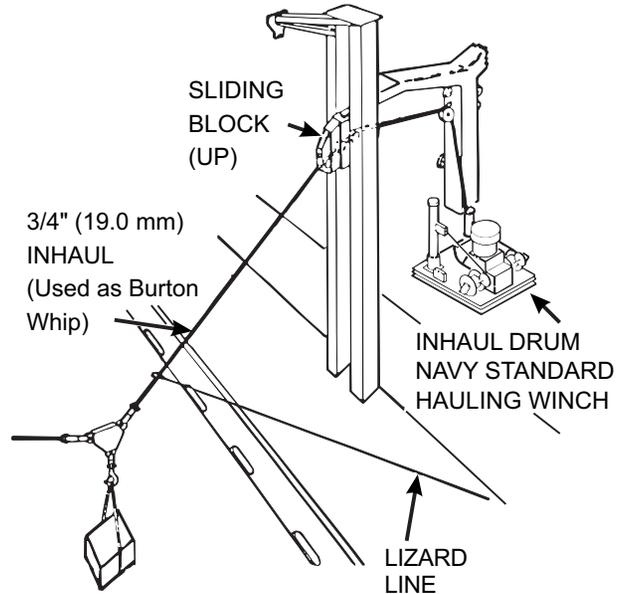
CAUTION

THIRD- AND FOURTH-GENERATION
HAULING WINCHES ARE NOT TO BE
USED FOR ANY BURTON RIG

b. RIGGED FROM TRANSFER HEAD WITH HIGHLINE



c. RIGGED FROM TRANSFER HEAD WITH INHAUL



a. RIGGED FROM OUTRIGGER

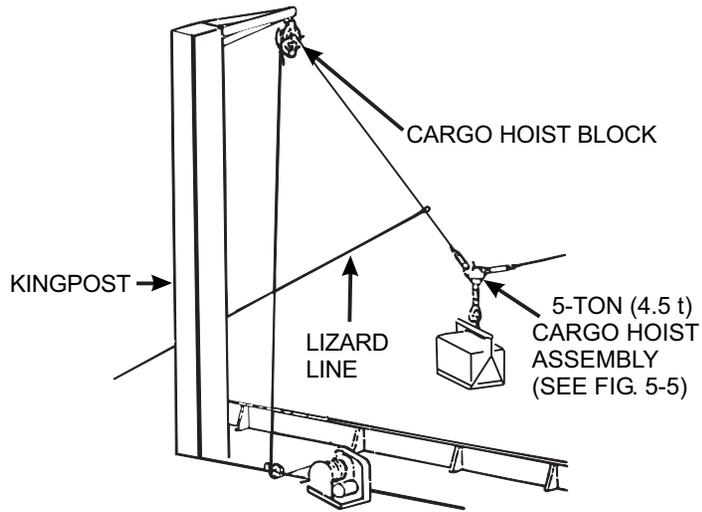


Figure 7-4. Basic Burton Configurations

Rig transfer stations in accordance with the ships' plans and within the static-tested load indicated on the label plate at each attachment point (see Figure 7-1). Maximum safe transfer loads are given in Figure 7-2.

Rigging for transfer by the basic Burton method must meet the following requirements:

1. The whip provided by each station must meet the minimum requirement in paragraph 7.1.2.
2. Rigging at each station must meet the conditions for any method of burtoning listed in paragraph 7.4.1.
3. A whip from each station is attached to the 5-ton (4.5 t) cargo hoist assembly shown in Figure 7-5. Swivels are to be used between the whips and the tie plate.
4. (a) A Burton whip with a soft eye shall have the thimble secured in the eye with three 3/4-inch (19.0 mm) wire rope clips, prior to attaching the whip to the tie plate swivel. (b) A Burton whip with a fiege fitting or poured socket fitting shall be attached with shackles of appropriate size.
5. A lizard line shall be attached to each whip to haul down the hook and assist hook-up or unhook of loads in the load landing area. Circumference of manila or synthetic line for lizard lines is 2-1/4 inches (57.1 mm) to 3 inches (76.2 mm). This lizard line shall be a minimum of 250-feet (76.2 m) long and shall have a 3/4-inch (19.0 mm) safety anchor shackle connected to an eye splice at one end.

Specific rigging and transfer procedures for the basic Burton method are provided in paragraphs 7.5.1 through 7.5.4.

7.5.1 Rigging the Receiving Station. The procedures below apply to the rigging of a basic Burton station from a suitable fixed attachment point.

1. Secure the Burton block to the appropriate pad-eye, in accordance with the ship's plan.
2. Place a shackle spliced to a manila or synthetic lizard line around the Burton whip. Use a 3/4-inch (19.0 mm) safety anchor shackle.
3. Reeve the bitter end of the Burton whip through the Burton block, lead the end to the winch, and spool the wire onto the drum.

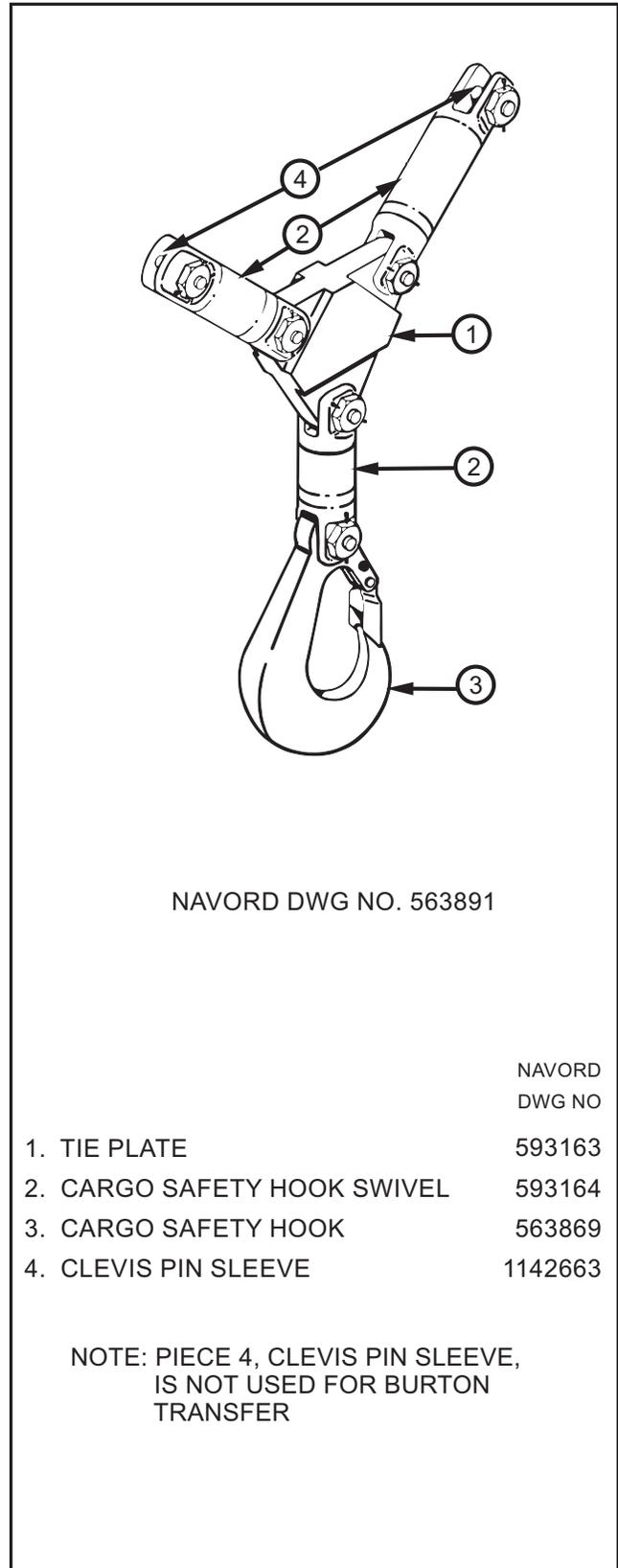


Figure 7-5. Five-Ton (4.5 t) Cargo Hoist Assembly

4. Fake down the rig messenger on deck, clear for running, with the end fitting near the transfer station.
5. Secure the rig messenger to the Burton whip, in-board of the end fitting. Use a 3/4-inch (19.0 mm) safety anchor shackle.
6. Attach the station phone line and phone/distance line (if it is required at the Burton station) to the rig messenger.

Note

The tie plate is rigged by the delivery station.

7.5.2 Passing the Lines. The procedures below apply when the receiving ship is a CV, LPH, or any ship with aircraft on deck. The procedures are the same for other receiving ships, except that the delivery ship provides the bolo or gun line.

1. The receiving station sends over the bolo or gun line.
2. When the delivery station has the bolo or gun line in hand, personnel at the receiving station bend their end of the bolo or gun line onto the rig messenger.
3. The delivery station hauls the rig messenger aboard.
4. Personnel at the delivery station detach the station phone line and phone/distance line (if required), and walk them — forward or aft — clear of the transfer station.
5. The delivery station continues to haul over the rig messenger, until the Burton whip comes aboard.
6. The delivery station fakes down the rig messenger on deck, so that it is clear for running when breakaway is ordered.
7. The delivery station uses the bulwark gripper to hold the Burton whip from running free while connecting the whip to the tie plate swivel and rigging plate (Figure 7-5). Use a 7/8-inch (22.2 mm) safety anchor shackle when the wire rope is larger than 3/4 inches (19.0 mm) in diameter.

Note

This completes preparations for the use of the basic Burton rig.

7.5.3 Transferring the Load. Successful burtoning depends on teamwork between the winchmen at both stations. A constant tension should be maintained on each whip, despite the relative movement caused by rolling and yawing.

1. The delivery station hauls down on the lizard line and attaches the load to the cargo hook.
2. The delivery station heaves in on its Burton whip and hoists the load clear of the deck rail.
3. The receiving station takes a strain on its Burton whip, as the delivery station slacks away on its whip, and the load is worked across.

Note

Transfer catenary provisions of paragraph 7.1.5 and line loads in Figure 7-3 apply.

4. When the load is hanging from the receiving station's attachment point, the receiving station slacks its whip and lowers the load to the deck.
5. The receiving station hauls down on the lizard line and disconnects the load from the cargo hook.
6. To return the empty cargo hook for the next load, the delivery station takes a strain on its Burton whip, as the receiving station slacks away on its whip.

Note

An empty cargo hook must be returned as prescribed in paragraph 7.1.6.

7. The receiving station returns handling gear and retrograde at times mutually agreed upon by both stations.
8. The ship with the slower winch will set the pace for the speed of transfer.

7.5.4 Retrieving the Rig. The delivery station:

1. Shackles the rig messenger to the receiving station's Burton whip, behind the end fitting.
2. Attaches the station phone line and phone/distance line (if required) to the rig messenger.
3. Uses the bulwark gripper to hold the Burton whip from running free.

4. Disconnects the receiving station's Burton whip from the tie plate swivel.
5. Pays out the rig messenger.

The delivery station, with the permission of the receiving station, may disconnect the receiving station's Burton whip from the tie plate swivel and cast the whip into the water. The station phone line and phone/distance line are returned on their own lead line messengers.

WARNING

Ensure that personnel on the receiving ship stand forward of the station, if it is agreed to cast the whip into the water.

7.5.5 Ships Rigged for STREAM. Three variations of the Burton rig can be used from any STREAM station, provided that the whip is a minimum of 800 feet (243.8 m) of 3/4-inch (19.0 mm) wire rope. Rig the 1-inch (27.4 mm) or 7/8-inch (22.2 mm) highline or the 3/4-inch (19.0 mm) Burton whip, as in Figures 7-4b and 7-4c; or lead a 3/4-inch (19.0 mm) whip on the out-haul directly from a kingpost outrigger, as in Figure 7-4a. When using the highline or inhaul, raise the sliding block to lift the load from the deck and lower it on return of the empty cargo hook to retrieve the hook. Operation of these rigs is the same as that outlined above for the basic Burton rig. See the CAUTION in paragraph 7.1.1.

7.6 HEAVY BURTON

Heavy Burton includes transfers by single-whip rigs of loads up to 6,000 lb (2,721 kg) in weight and by heavy-lift/double-whip rigs of loads up to 12,000 lb (5,442 kg) in weight. These rigs may be used in any sea condition suitable for single-whip burtoning, except that the combined ship roll should not exceed 5°. If overriding operational circumstances require a heavy-lift transfer, and the combined ship roll exceeds 5°, the following general rules shall apply to the replenishment operation:

1. Both ships' commanding officers must agree that the operational circumstances warrant the transfer.
2. Use only the most experienced winch operators available.
3. Thoroughly inspect all rigging equipment, just prior to the transfer.

4. The first lieutenant or ship's bos'n shall be present at the Burton station.
5. The maximum distance from the rigging or load attachment point to the bottom of the load should be the minimum possible (the maximum allowable distance is 12 feet (3.6 m)).

7.6.1 Single-Whip, 6,000 lb (2,721 kg), Burton Transfer. Loads up to 6,000 lb (2,721 kg) in weight may be transferred using a single-part, 3/4-inch (19.0 mm), wire rope. Rigging and transfer shall be the same as for the basic Burton rig (see paragraphs 7.5 through 7.5.4). Particular care must be taken during the transfer, inasmuch as the equipment used is operating at full rated capacity.

7.6.2 Heavy-Lift/Double-Whip, 12,000 lb (5,442 kg), Burton Transfer. A single- or multiple-unit load up to 12,000 lb (5,442 kg) in weight may be transferred using one of the heavy Burton combinations shown in Figure 7-6.

In the heavy-lift method, the highline is controlled by the highline winch and ram tensioner. Rigs IA and IB in Figure 7-6 use a 1-inch (27.4 mm) or 7/8-inch (22.2 mm) highline as the Burton whip. The ram tensioner should be fully extended and the ram flasks charged to the maximum rating of the highline winch. The STREAM transfer head should be raised to the full-up position.

CAUTION

Maintain the STREAM transfer head in the full-up position during transfer.

When rigging a highline from a STREAM station for heavy-lift transfer (Figure 7-7), shackle the end of the highline directly to the tie plate. Use a 7/8-inch (22.2 mm) safety anchor shackle.

In the double-whip method, a nonswiveling runner block is maintained at the midpoint of a continuous 3/4-inch (19.0 mm) whip. The runner block divides the line stress between the two parts of the wire. Use of continuous wire ensures that no more than one-half of the strain imposed during the transfer will be borne by any boom, winch, or fitting. Thus, if one winch fails, the entire load will not be imposed on the remaining winch. Each end of the wire is spooled onto a winch (the preferred method); or one end is spooled onto a winch and the other end is secured to a suitable fixed attachment point (if the other ship's station is

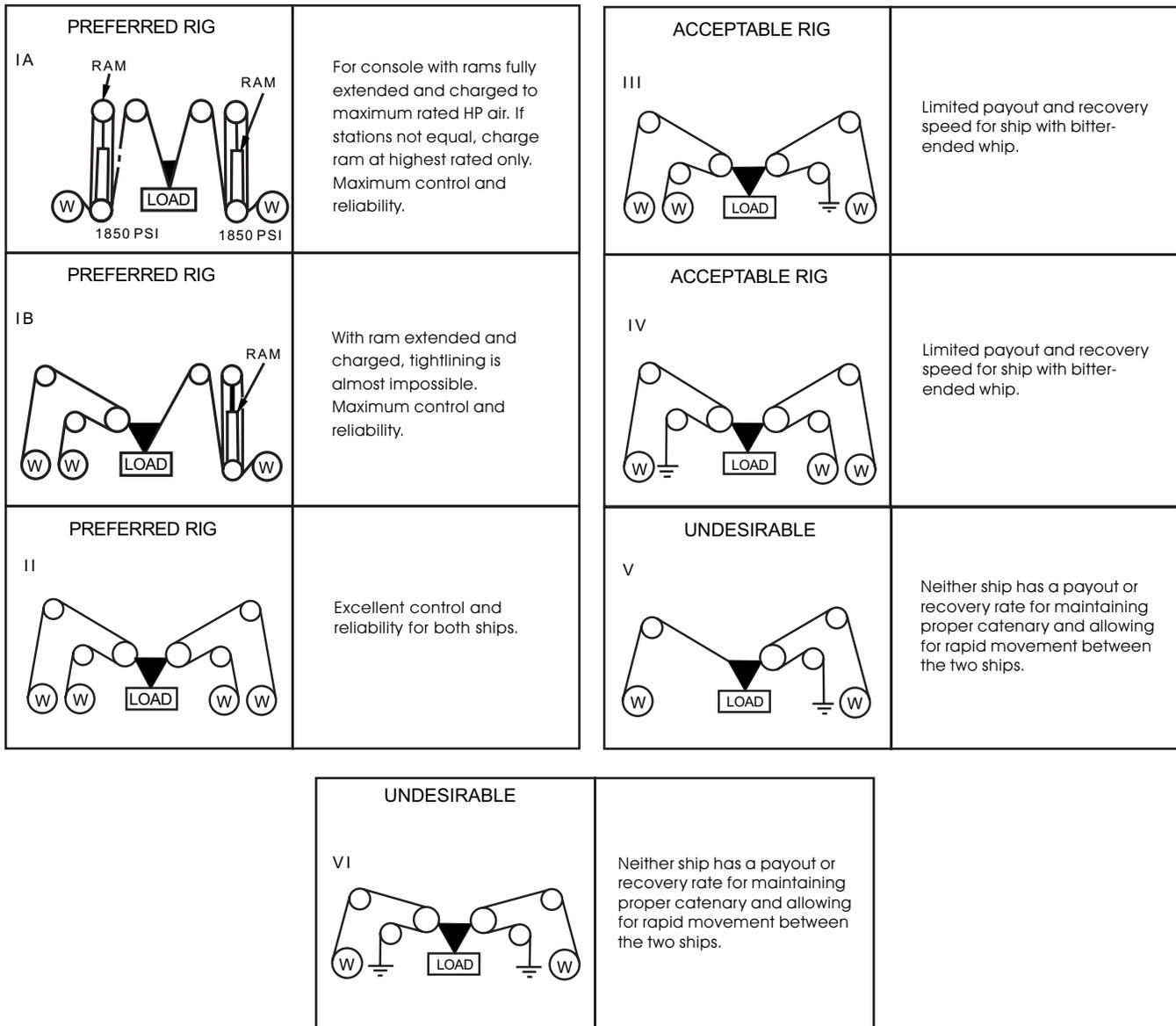


Figure 7-6. Possible Combinations of Heavy Burton

rigged by the preferred method). Refer to Figure 7-6. Winches that control the whip must provide sufficient payout and recovery speed to maintain the proper catenary during transfer and to allow for changes in the distance between ships.

7.6.2.1 Conditions for Heavy-Lift and Double-Whip Burtoning. Specific conditions that must be met, when rigging for heavy-lift and double-whip burtoning, are listed below:

1. Rigging on each station must meet the conditions for any method of burtoning listed in paragraph 7.4.1.

2. When rigging a double whip, the attachment points used should be approximately 20 feet (6.0 m) apart.
3. Under no circumstances will both ends of a double whip be led from the same boom or other single attachment point.
4. Runner blocks rigged to the tie plate must be nonswiveling. Swivels shall not be used between runner blocks and the tie plate.
5. Preventers rigged from booms should be located properly, because they tend to produce the greatest

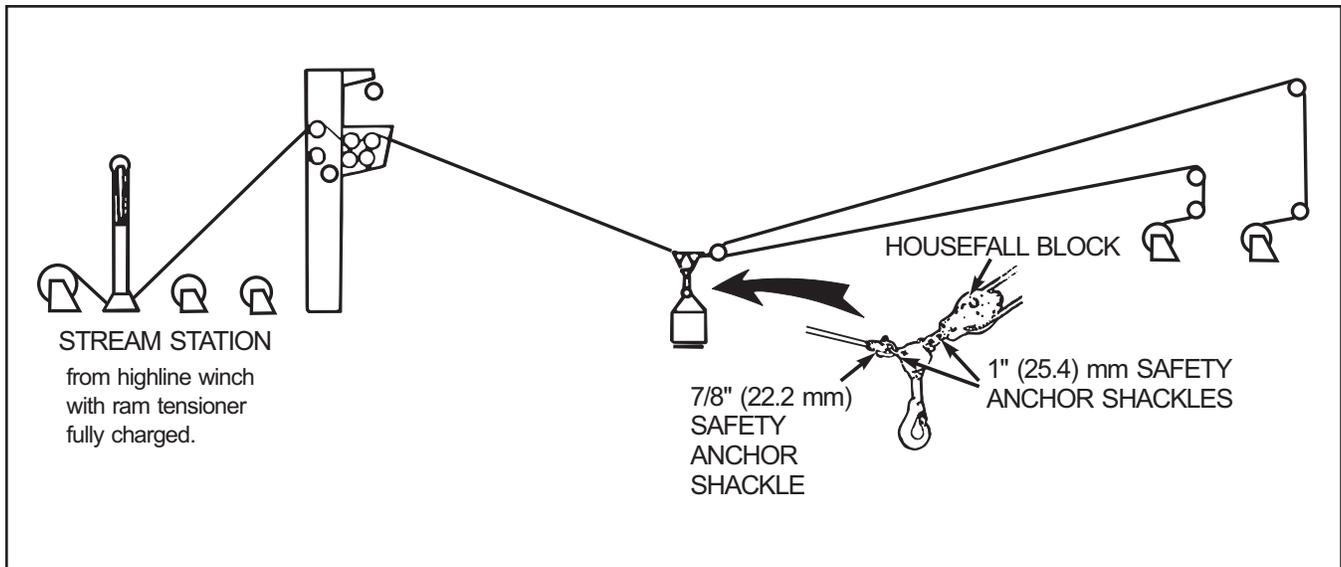


Figure 7-7. Basic Heavy-Lift/Double-Whip Burton Configurations

induced compressive stresses on the booms during transfers.

6. When using a double-whip rig, distance between ships will be maintained between 80 and 140 feet (24.3 and 42.6 m).
7. Winches at the delivery station must provide a payout and recovery speed of not less than 240 ft/min (1.2 m/s).

7.6.2.2 Rigging Combinations. Transfer stations may be rigged using several possible combinations of attachment points:

1. Two booms, one heeled forward and the other aft, plumbed over the landing area on the engaged side of the ship.
2. One boom and one kingpost or mast.
3. Two kingposts or masts, if the distance between them is not excessive and a suitable landing area is available.
4. Other attachment points on receiving ships, provided that they meet location and test-load requirements. (For example, on a carrier: an airplane crane or padeyes installed under the flight deck.)

Rig transfer stations in accordance with the ships' plans and within the static-tested load indicated on the label plate at each attachment point (see Figure 7-1).

Specific rigging procedures for the basic double-whip (two-boom) rig are provided in paragraphs 7.6.3 through 7.6.3.4; those for the alternate double-whip (boom-and-kingpost) rig, in paragraphs 7.6.4 through 7.6.4.2.

7.6.3 Basic Double-Whip (Two-Boom) Rig. For transfer of heavy loads, the conditions in paragraph 7.6.2.1 must be met. Each station provides a double whip (paragraph 7.1.2).

7.6.3.1 Rigging the Delivery Station. Two 10-ton (9.0 t) booms are rigged for transfer, starting with the after boom.

1. Spool one end of the Burton wire onto a winch near the landing area.
2. Reeve the other end of the wire through a 14-inch (37.6 cm), high-speed, cargo block at the heel of the boom; then up through a block at the head of the boom; and then down to the deck.
3. Pass the end of the wire through a 14-inch (37.6 cm), high-speed, nonswiveling, runner block. This block will be shackled to the tie plate in step 7.
4. Lead the end of the wire through a block at the head of the forward boom, then down through a block at the heel of the boom, and spool the wire onto a winch near the forward boom.

5. Adjust the wire, so that there is an equal amount of wire on each winch, and position the runner block at the midpoint of the wire.
6. Paint the wire white for a distance of 6 feet (1.8 m) on each side of the midpoint. This mark will provide the winch operator with a reference for keeping the runner block at the midpoint during transfers.
7. Secure the runner block to the tie plate (see Figure 7-8). Use a 1-inch (27.4 mm) safety anchor shackle.
8. Make ready two steadying lines. Attach steel safety snap hooks at the outboard ends. These lines will be attached to the loads before transfer.

7.6.3.2 Rigging the Receiving Station. If the receiving station has two 10 ton (9.0 t) booms, rig the station in the same way as the delivery station — except that the delivery station secures the runner block to the tie plate after lines are passed. (At a station with no suitable booms, rig the station from fixed attachment points that meet location and test-load requirements.) To complete preparations for transfer, the receiving station:

1. Fakes down the rig messenger on deck, clear for running.
2. Secures the rig messenger to the runner block using a bight of the whip.
3. Attaches the station phone line, the phone/distance line (if it is required at the Burton station), and two steadying lines to the rig messenger.

7.6.3.3 Passing the Lines

1. The receiving station sends over the rig messenger with the runner block and other lines attached.
2. The delivery station detaches the station phone line, phone/distance line, and steadying lines and continues to haul over the rig messenger, until the runner block comes aboard.
3. The delivery station fakes down the rig messenger on deck, so that it is clear for running when breakaway is ordered.
4. The delivery station uses the bulwark gripper to hold the whip from running free while connecting the whip to the tie plate swivel and rigging plate.

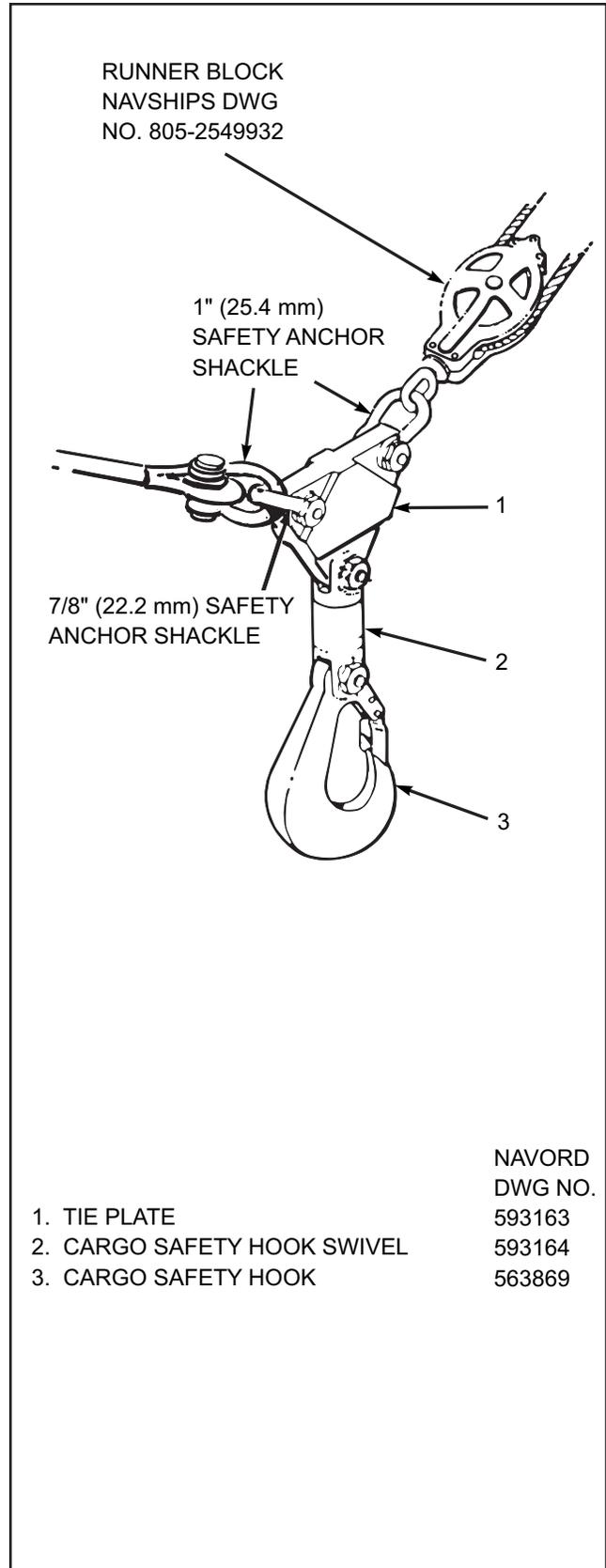


Figure 7-8. Cargo Hook Assembly for Double-Whip Rig

- The delivery station attaches the receiving station's runner block to the tie plate (Figure 7-8), using a 1-inch (27.4 mm) safety anchor shackle.

Note

This completes preparations for use of the double-whip (two boom) rig.

7.6.3.4 Transferring the Load. At each station, an experienced rig captain directs the winch operators by hand signals (see Appendix G). He shall ensure that an equal amount of wire is payed out by each winch. A safety observer should be assigned to each winch to ensure that at least seven turns of wire remain on the winch drum at all times.

- The delivery station attaches four steadying lines to the load (two supplied by the delivery station and two by the receiving station).
- The delivery station hooks the load to the cargo hook.
- The delivery station lifts the load while the receiving station holds its rig slack.
- When the load is high enough to clear the side at the delivery station, the load is started across. The receiving station hauls in its Burton whip as the delivery station pays out its Burton whip.
- During transfer, the runner blocks are kept within the white-painted marks on the Burton wires. Both stations tend the steadying lines.

Note

Transfer catenary provisions of paragraph 7.1.5 and line loads in Figure 7-3 apply.

- When the load is hanging over the landing area at the receiving station, the receiving station slacks its rig and lowers the load to the deck.
- The receiving station disconnects the load from the cargo hook.
- To return the empty cargo hook and the steadying lines to the delivery station for the next load, the receiving station pays out its Burton whip as the delivery station hauls in its Burton whip.

Note

An empty cargo hook must be returned as prescribed in paragraph 7.1.6.

- The receiving station returns handling gear and retrograde at times mutually agreed upon by both stations.

7.6.3.5 Retrieving the Rig. Return the empty cargo hook after transfer of the last load. The delivery station:

- Secures the rig messenger to the receiving station's runner block using a bight of the whip.
- Attaches the station phone line and phone/distance line (if required) to the rig messenger.
- Disconnects the receiving station's runner block from the tie plate.
- Pays out the rig messenger.

7.6.3.6 Breakout of Heavy Loads. Rig two booms on each side of the ship. (If two booms are not available, rig a boom and kingpost.)

- Attach runner blocks from both whips to the tie plate.
- Hook up the load, lift it out of the hold, and land it in the transfer area on the deck.
- When the load is on deck, disconnect the offside whip from the tie plate.
- Connect the receiving station's runner block to the tie plate.

An alternate method is to rig the off-side booms for yard-and-staying the load out of the hold and to use the on-side booms for transferring the load. This method permits simultaneous breakout and transfer.

7.6.4 Alternate Double-Whip (Boom-and-Kingpost) Rig. This rig may be used for transfers between a replenishment ship and a carrier, when the replenishment ship has only two booms available at one end of an active hold. Each station provides a double whip (paragraph 7.1.2). For transfer of heavy loads, the conditions in paragraph 7.6.2.1 must be met. In addition, the outboard guy and preventer from the boom must be led forward sufficiently to preclude chafing of the rig.

Breakout of loads should be completed, if practicable, prior to the approach of the receiving ship alongside. Simultaneous breakout and transfer is not possible with this rig.

The paragraphs below describe the procedures for rigging the delivery station and for hoisting the load out of the hold. The procedures for rigging the receiving

station, passing the lines, transferring the load, and retrieving the rig are essentially the same as those for the basic double-whip (two-boom) rig.

7.6.4.1 Rigging the Delivery Station. For a boom-and-kingpost rig, two booms at the forward end of the hold are used. The load is transferred from the port side of the delivery ship.

7.6.4.1.1 Rigging the Port Boom

1. Attach preventers to each side of the boom head.
2. Reeve one end of the Burton wire through the boom's head and heel blocks, lead the end to the No. 2 winch, and spool the wire onto the drum.
3. Rig a 3/4-inch (19.0 mm), 100-foot (30.4 m) long, wire pendant and two 12-inch (30.5 cm) snatch blocks from the boom:
 - a. Attach one snatch block to a fitting 4 feet (1.2 m) below the boom head.
 - b. Reeve the wire pendant through this block.
 - c. Secure one end of the pendant to the second snatch block. This block will be used in hoisting the load out of the hold (see paragraph 7.6.4.2, step 1).
 - d. Stop off the other end of the pendant to the side of the ship.
4. Top the boom into working position.
5. Lead the inboard preventer aft to the opposite kingpost or crosstree. Secure it, so that it is positioned at an approximately 90° angle to the boom and is 10 feet (3.0 m) below the boom's working position.
6. Lead the outboard preventer forward, and secure it to a fitting on the port side.
7. Take a strain on the guys, and secure them to their fittings.
8. Pass the remaining end of the Burton wire through a runner block.
9. Reeve the end of the wire through a fairlead block at the head of the port kingpost, lead the end to the No. 1 winch, and spool the wire onto the drum.

7.6.4.1.2 Rigging the Starboard Boom

1. Secure one end of a wire whip to a fitting 4 feet (1.2 m) below the boom head.
2. Pass the other end of the wire through a runner block.
3. Reeve the end of the wire through the boom's head and heel blocks, lead the end to the winch aft of the kingpost, and spool the wire onto the drum.
4. Attach a preventer to the outboard side of the boom head.
5. Hoist the boom to the desired working position.
6. Take a strain on the guys and the preventer, and secure them to their fittings.

Note

Remaining preparations at the delivery station are the same as for the basic double-whip (two-boom) rig.

7.6.4.2 Hoisting the Load Out of the Hold

1. Place a bight of the port-side Burton wire, forward of the runner block, into the snatch block that was suspended from the pendant below the port boom's head (see paragraph 7.6.4.1.1, step 3).
2. Take a strain on the pendant to two-block the snatch block, and secure the pendant to a fitting on the side of the ship.
3. Attach the runner blocks from the port and starboard whips to the tie plate.
4. Attach the load to the cargo hook.
5. Raise the load to the deck, suspended between the two booms. The No. 1 winch will be inoperative while the load is being hoisted out of the hold.
6. When the load is on deck, slack off the pendant to which the snatch block is secured.
7. Lower the snatch block to the deck, and release the Burton whip.
8. Detach the runner block from the starboard whip at the tie plate.

7.7 EMERGENCY BREAKAWAY PROCEDURES FOR BURTON RIGS

Note

The following procedures apply to rigs as indicated.

7.7.1 Single Burton. Disconnect the receiving station's whip and cast it overboard, clear of the deck edge. (If time precludes the return of a suspended load or empty cargo hook, each station shall pay out its wire and endeavor to maintain the load or hook centered between the ships as they separate, until all wires are run off of the winch drums.) If power is not available to a winch, clear the station of nonessential personnel. The winch watcher pays out the whip as rapidly as possible, using the magnetic or hydraulic hand brake, and controls the payout rate to prevent birdcaging on the winch drum.

7.7.2 Heavy-Lift Burton (Two Double Whips). When two double whips are in use and power is available to all winches or to one of two winches at each station:

1. Deposit the load or empty cargo hook at the nearest station. (Do not unhook the load. If the hook is empty, secure it with easing-out line.)
2. The other station maintains slack in the whip.
3. Cut the other station's whip, just outboard of the runner block.

Note

Cutting of the wire rope is required in this case, because of the time required to unshackle the runner blocks from the tie plate and to bend on the rig messenger to return the rig.

7.7.3 Heavy-Lift Burton (One Wire, Single-Part). When one of the wires in use is single-part and power is available to all winches or to one winch at the station using two winches:

1. Deposit the load or empty cargo hook at the station with the double whip. (Do not unhook the load. If the hook is empty, secure it with easing-out line.)
2. The other station maintains slack in the whip.
3. Disconnect the single whip from the tie plate and cast the whip overboard, clear of the deck edge. (If time precludes disconnecting the shackle that holds the single whip to the tie plate, the whip should be cut close to the end fitting.)

7.7.4 Heavy-Lift Burton (Both Wires, Single-Part). When both of the wires in use are single-part, deposit the load at the nearest station. Carry out the procedures for one wire, single-part (see paragraph 7.7.3).

7.7.5 Heavy-Lift Burton (Power Not Available). When power is not available to retrieve the rig, clear the station of nonessential personnel. The winch watcher pays out the whip as rapidly as possible, using the magnetic or hydraulic hand brake, and controls the payout rate to prevent birdcaging on the winch drum.

7.8 REFERENCES

UNREP Station Capabilities Handbook, NAVSEA S9571-A1-HBK-010

Fleet Underway Replenishment Guide, COMNAV-SURFPACINST 3180.2 series or COMNAV-SURFLANTINST C9010.1 series

ATP 16, Replenishment at Sea

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

DELIVERY SHIP EQUIPMENT	BURTON RIG		REMARKS
	BASIC	HEAVY/ DOUBLE	
Block, Housefall	*	1	See Note 1.
Block, Snatch	*	*	Sizes to suit rig used.
Bolo; with Shot Line	2	2	See Note 2.
Clip, Wire Rope; 3/4" (19.0 mm)	2	—	See Note 3.
Gripper, Bulwark	1	1	
Gun, Line-Throwing	1	1	See Note 2.
Hook, Cargo Safety; MK 2	1	1	
Light, One-Cell or Chemical	*	*	
Line, Lizard: 2-1/4" (57.1 mm) to 3" (76.2 mm)	1	—	Manila or synthetic line.
Line, Steadying (Load)	*	2 or *	
Line, Tag	*	*	
Marker, Transfer Station; or Light Box	1	1	
Paddles, Signal; or Wands	1 set	1 set	
Phone, Sound-Powered	2	2	See Note 4.
Pins, Steel Cotter	*	*	Sizes to suit safety shackles used.
Projectile, Gun Line; With Shot Line	2	2	See Note 2.
Shackle, Safety or Screw Pin (Anchor or Chain)	*	*	Types and sizes to suit rig used.
Shot Line Bag	1	1	See Note 2.
Swivel, Cargo Safety Hook, Mk 1	3	1	

Figure 7-9. Burton Rig Equipment for Delivery Ship — One Station (Sheet 1 of 2)

DELIVERY SHIP EQUIPMENT	BURTON RIG		REMARKS
	BASIC	HEAVY/ DOUBLE	
Tie Plate	1	1	
Tools, UNREP Working and Repair	1 set	1 set	See paragraph 2.3.9 and Figure 2-13.
Whip; 600 ft (182.8 m) of 3/4" (19.0 mm) Wire Rope (Note 5)	1	1 (Note 6)	
<p>*Quantity as required.</p> <p>NOTES: 1. For fairleading Burton whip: see Figures 7-4, 7-6, and 7-7. 2. See paragraph 2.3.4 for limitation on use to CV, LHA, LPH, or other ship with aircraft on deck. 3. Used to hold the thimble in the soft eye splice, when a regular or swage splice is not used. 4. One additional set is required for bridge-to-bridge communication. 5. Length of the whip is 800 ft (243.8 m) on ships using STREAM equipment to provide the whip. Lengths indicated are minimum requirements. 6. For a double whip, continuous wire rope with a minimum length of 1,000 ft (304.8 m) shall be used. If Rig IA or IB in Figure 7-6 is used, wire size is 7/8" (22.2 mm) or 1" (25.4 mm) for ships equipped with ram tensioners.</p>			

Figure 7-9. Burton Rig Equipment for Delivery Ship — One Station (Sheet 2 of 2)

RECEIVING SHIP EQUIPMENT	BURTON RIG		REMARKS
	BASIC	HEAVY/ DOUBLE	
Block, Housefall	*	1	See Note 1.
Block, Snatch	*	*	Types and sizes to suit rig used.
Bolo, with Shot Line	2	2	See Note 2.
Clip, Wire Rope; 3/4" (19.0 mm)	2	—	See Note 3.
Gun, Line-Throwing	1	1	See Note 2.
Light, One-Cell or Chemical	*	*	
Line, B/B Phone/Distance	1	1	See Note 4.
Line, Lizard: 2-1/4" (57.1 mm) to 3" (76.2 mm)	1	—	Manila or synthetic line.
Line, Sta/Sta Phone	1	1	
Line, Steadying (Load)	*	2 or *	
Marker, Transfer Station; or Light Box	1	1	
Messenger, STAR	1	1	
Messenger, B/B Phone/Distance Line	1	1	See Note 4.
Paddles, Signal; or Wands	1 set	1 set	
Phone, Sound-Powered	2	2	See Note 5.
Pins, Steel Cotter	*	*	Sizes to suit safety shackles used.
Projectile, Gun Line; With Shot Line	2	2	See Note 2.
Shackle, Safety or Screw Pin (Anchor or Chain)	*	*	Types and sizes to suit rig used.
Shot Line Bag	1	1	See Note 2.

Figure 7-10. Burton Rig Equipment for Receiving Ship — One Station (Sheet 1 of 2)

RECEIVING SHIP EQUIPMENT	BURTON RIG		REMARKS
	BASIC	HEAVY/DOUBLE	
Tools, UNREP Working and Repair	1 set	1 set	See paragraph 2.3.9 and Figure 2-13.
Whip; 600 ft (182.8 m) of 3/4" (19.0 mm) Wire Rope (minimum requirement)	1	1	
<p>*Quantity as required.</p> <p>NOTES: 1. For fairleading Burton whip: see Figures 7-4, 7-6, and 7-7. 2. See paragraph 2.3.4 for limitation on use to a CV, LHA, LPH, or other ship with aircraft on deck. 3. Used to hold the thimble in the soft eye splice, when a regular or swage splice is not used. 4. Required only for the station nearest the bridge, when more than one station is rigged. 5. One additional set is required for bridge-to-bridge communication.</p>			

Figure 7-10. Burton Rig Equipment for Receiving Ship — One Station (Sheet 2 of 2)

CHAPTER 8

Personnel Transfer — STREAM Rigging and Operation

8.1 BASIC CONSIDERATIONS

The transfer of personnel at sea is a critical operation. Personnel on both ships who are involved in the transfer must know the procedures in this chapter to ensure a safe and efficient transfer. Safety of the rig depends on highline wire rope inspection and periodic replacement. Criteria are in each ship's PMS and must be adhered to strictly.

Normal replenishment speed for ships transferring personnel is 12 to 16 knots. The replenishment speed and transfer stations to be used will be promulgated during the planning phase of the replenishment operation (see paragraph 2.2.2).

The STREAM rig can be used to quickly and safely transfer large numbers of personnel, including personnel confined in a Stokes litter. For transfer of personnel by hand-tended synthetic highline, see Chapter 9. For transfer of personnel by helicopter, see paragraph 9.7 and NWP 3-04.1M (formerly NWP 42).

8.2 TRANSFER OF PERSONNEL BY STREAM RIG

STREAM is the preferred rig for expeditiously transferring personnel while ships are underway. Since this rig uses the highline winch and the ram tensioner to furnish the load-carrying line, one ship must have a STREAM delivery station and the other ship may have a sliding block, sliding-padeye, or fixed-padeye station. Rigging must include a pelican hook with its bill stamped "Stream Pelican Hook," this hook is secured to a certified highline with a 7/8 inch (22.2 mm) safety anchor shackle (no weaklink allowed). The rigging can be shifted to stream with traveling surf (and vice versa) without disconnecting the tensioned highline. This feature minimizes time alongside during the replenishment operation.

8.3 PREPARING SHIPS FOR PERSONNEL TRANSFER

Make specific arrangements for receiving personnel. Assign an officer or enlisted escort to greet arrivals, to escort arrivals away from the landing area, and to brief personnel who are about to depart. This courtesy will prevent embarrassment to passengers, who may be unfamiliar with the routine, and will also speed movements to and from the landing area.

For transfers of personnel to a STREAM delivery station or a sliding-padeye receiving station, provide a one- or two-person transfer chair or a Stokes litter and a cargo hook or Mk 5 strongback at the STREAM delivery station. For delivery to a fixed-padeye receiving station, provide a one-person transfer chair or a Stokes litter and a cargo drop reel with wire preventer. The ship that provides the STREAM rig is responsible for the condition of the equipment and fittings.

8.4 PERSONNEL STREAM WITH HAND-TENDED OUTHAUL

Figure 8-1 shows the STREAM rig with hand-tended outhaul for transfer of personnel (called personnel STREAM for brevity). See Figures 6-37 and 6-38 at the end of Chapter 6 and Figures 8-2 through 8-4 for hardware required at transfer stations.

The STREAM trolley and suspended transfer chair are hauled over to the receiving station by a synthetic outhaul. The receiving ship provides line handlers. The delivery station pays out the inhaul as personnel at the receiving station heave around on the outhaul. The inhaul is used to haul the trolley and transfer chair back to the delivery station.

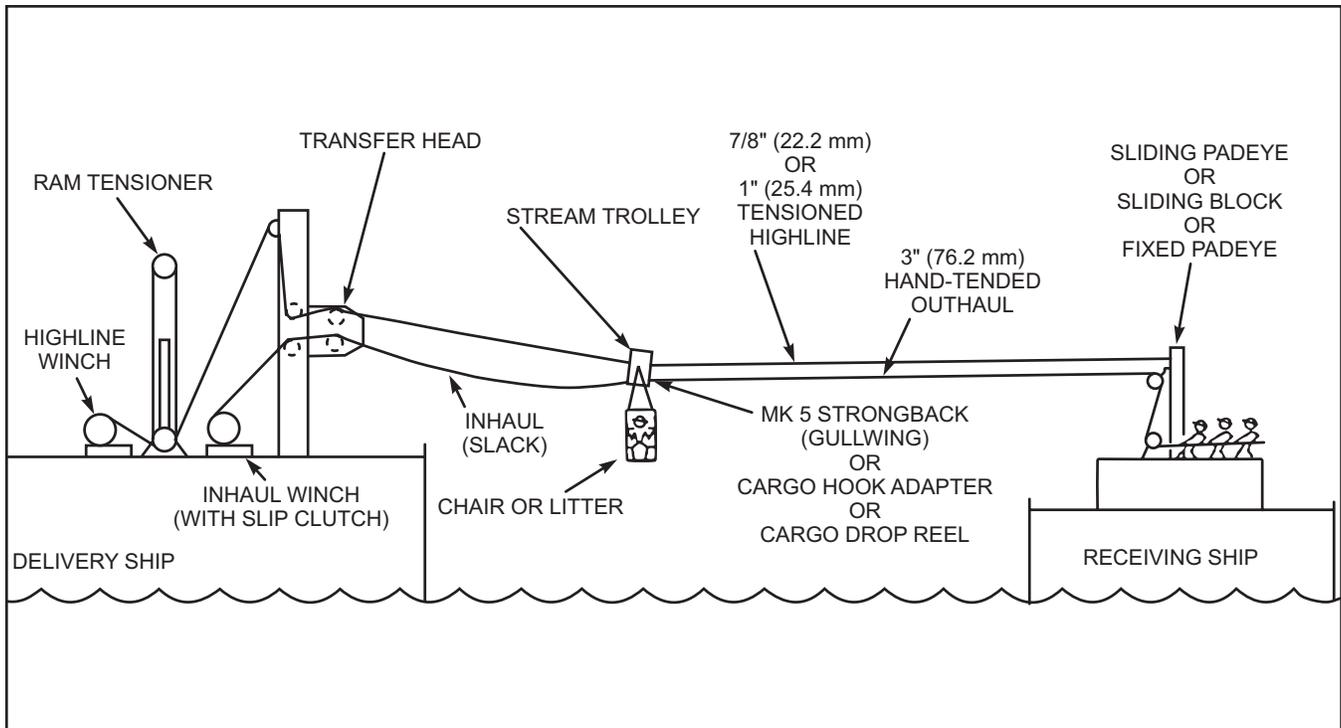


Figure 8-1. Personnel STREAM With Hand-Tended Outhaul

8.4.1 Inhaul

1. If the hauling winch used is a Navy standard hauling winch, the 3/4 inch (19.0 mm) wire rope from the hauling winch inhaul drum will be used as the inhaul.
2. If the inhaul winch is equipped with a slip clutch on the inhaul drum (see Figure 8-5), the wire rope from the inhaul drum will be used as the inhaul. Prior to use, test operate slip clutch in accordance with label plate on winch.
3. If the inhaul winch available is not Navy standard or is not equipped with a slip clutch (see Figure 8-6), a hand-tended synthetic line will be used as the inhaul. This line is described in paragraph 9.2.2.

Note

In the procedures in paragraphs 8.4.3 thru 8.4.9, the steps required for the three different inhaul arrangements are noted.

8.4.2 Outhaul. The receiving ship will use the STAR messenger (described in paragraph 2.3.5 and shown in Figure 2-9) as the outhaul. The STAR messenger is sent over by the delivery ship.



Ensure that the 60 foot (18.2 m) releasing line is disconnected at the brummel hooks and that the 7/8 inch (22.2 mm) safety anchor shackle is inserted through the 5 inch (127.0 mm) soft eye splice beside the brummel hook at the 740 foot (225.5 m) junction for attaching the STAR messenger to the STREAM trolley or the outhaul pendant. *Under no circumstances should the 60 foot (18.2 m) releasing line be used for personnel transfer.*

8.4.3 Preparing Personnel STREAM With Hand-Tended Outhaul. See Figures 8-2 and 8-3 for transfer chair details. See paragraph 8.4.8 and Figure 8-4 for transfer by Stokes litter.

(1) DELIVERY SHIP

1. *For hand-tended inhaul only:* Reeve a 3-inch (76.2 mm) synthetic inhaul (as described in paragraph 9.2.2) through a 10 inch (25.4 cm) snatch block attached to the transfer head and through a 10 inch (25.4 cm) snatch block located for proper fairlead to line handlers.

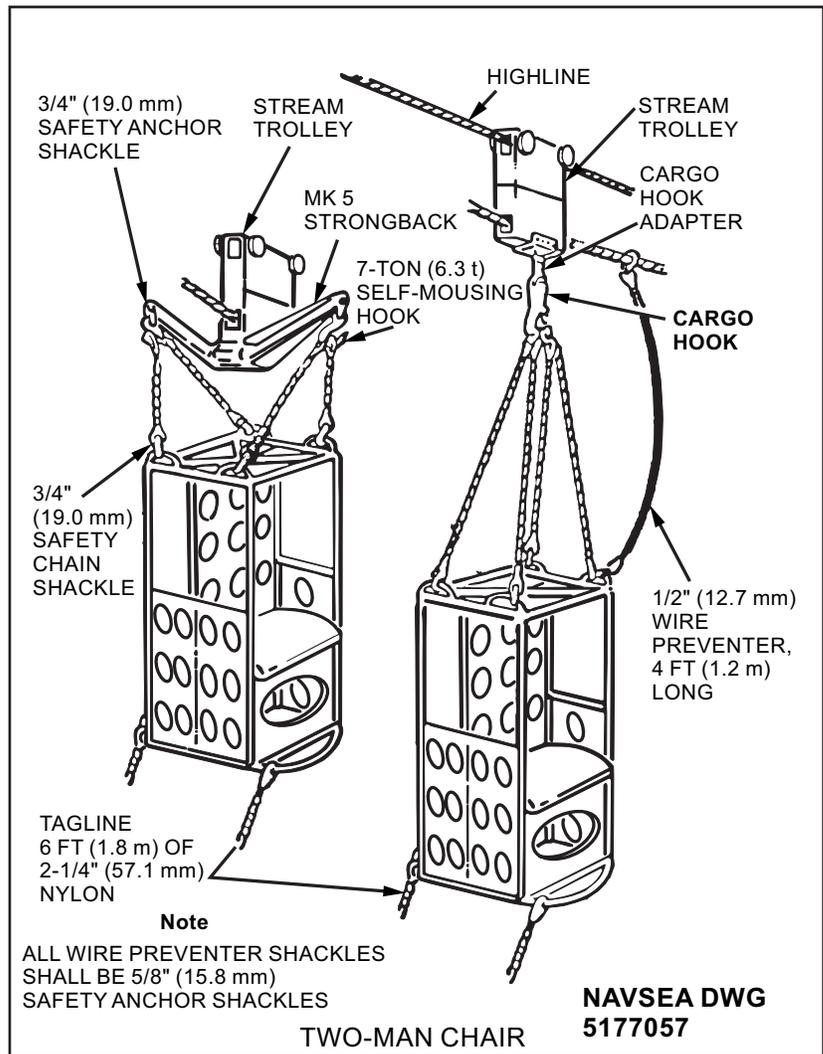
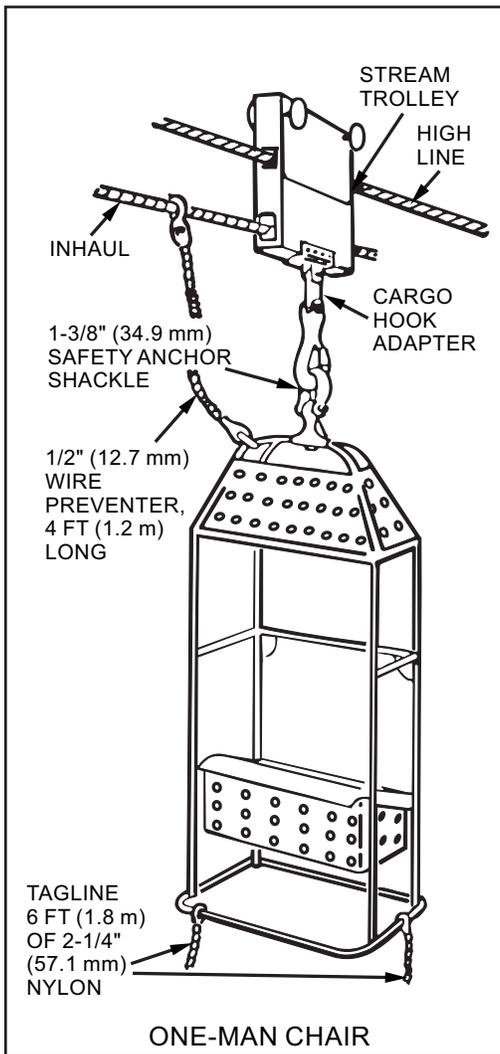
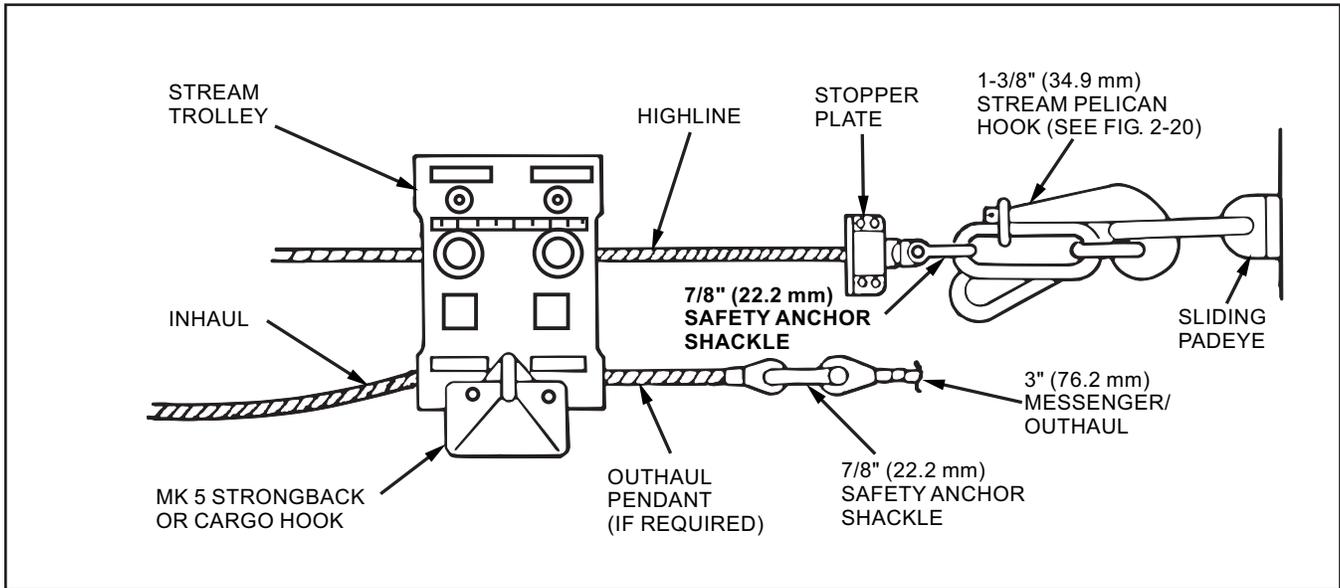


Figure 8-2. Personnel STREAM — Rigging Details for Transfer to Sliding-Padeye or Sliding-Block Receiving Station

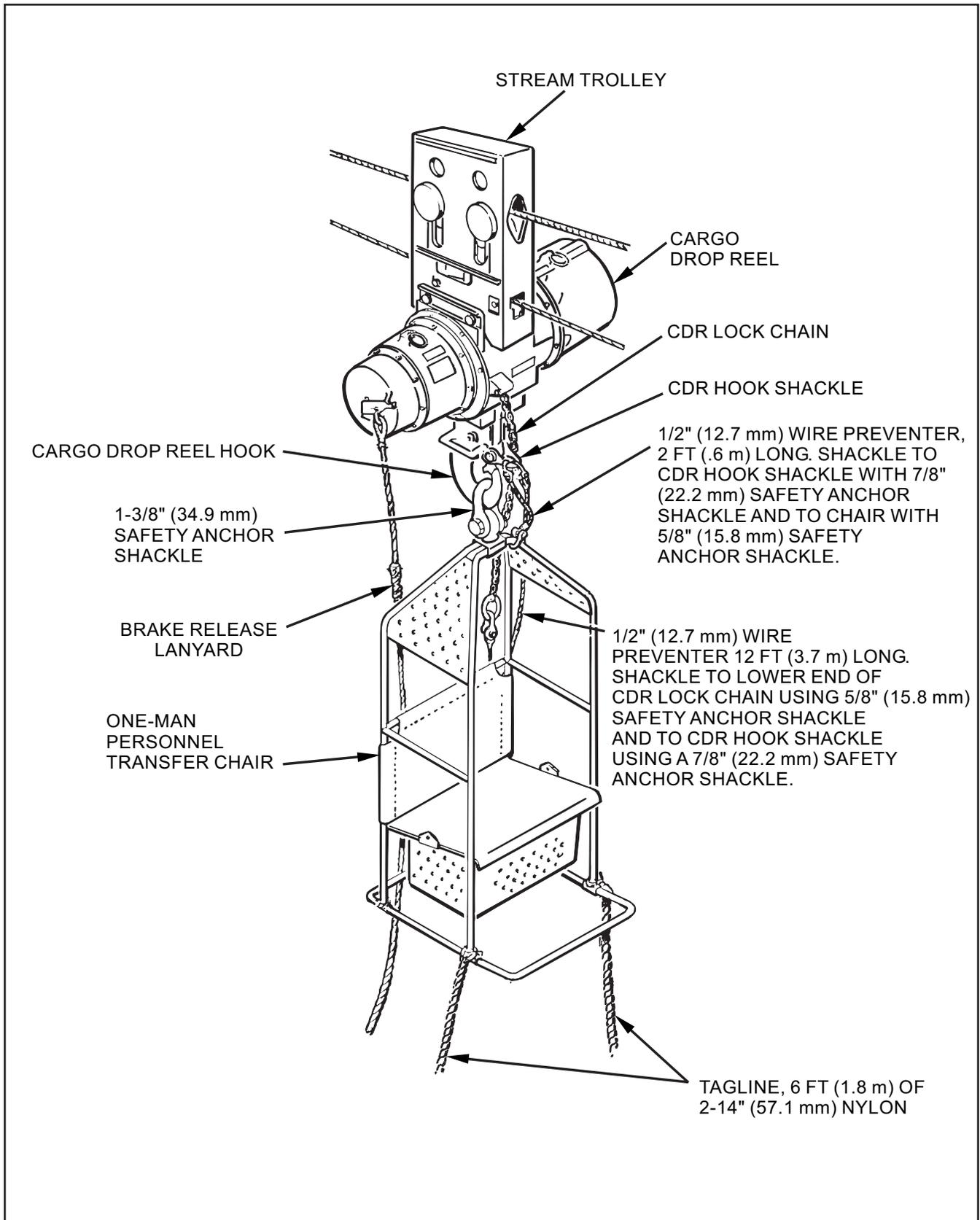


Figure 8-3. Personnel STREAM — One-Person Transfer Chair Supported by Cargo Drop Reel

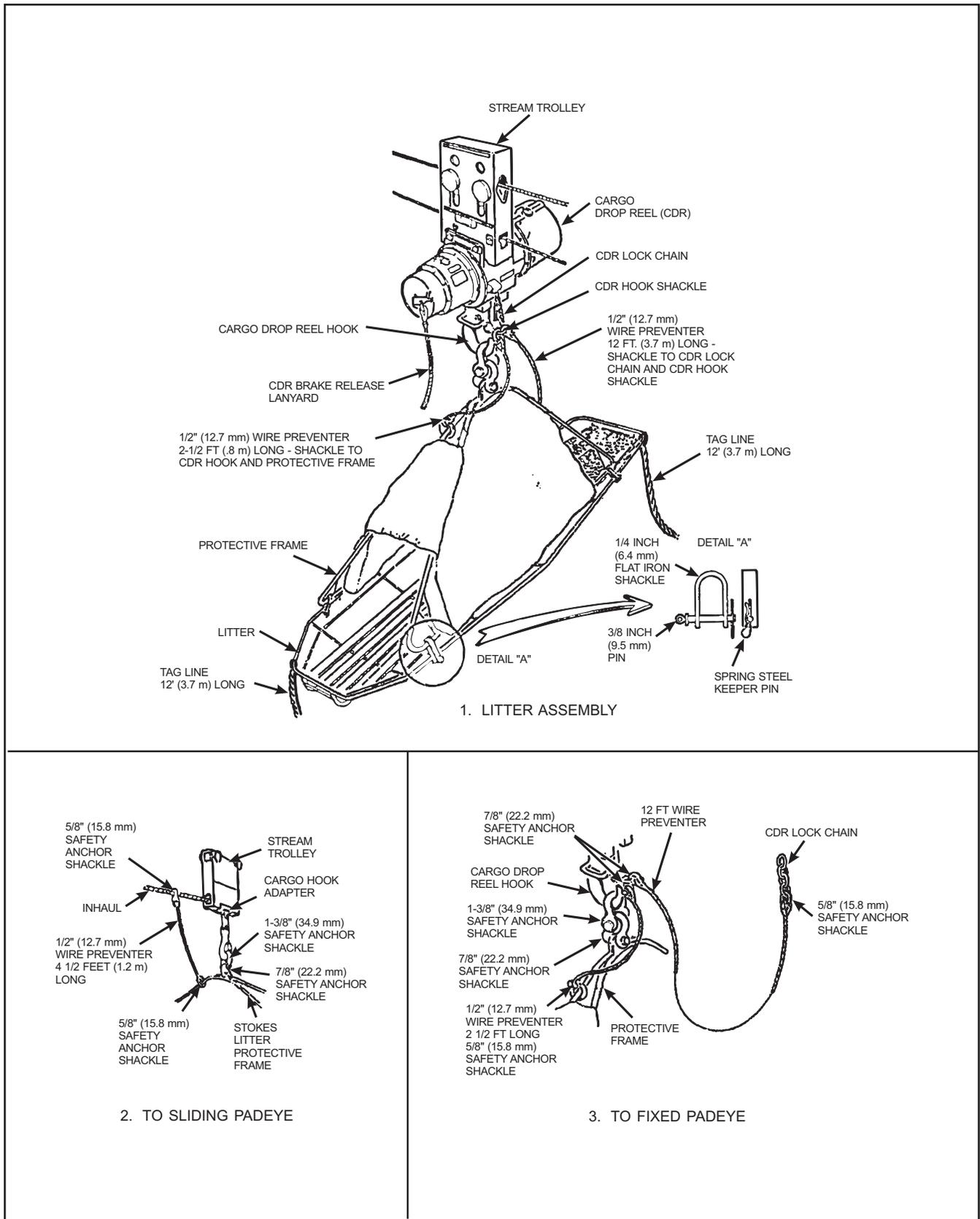


Figure 8-4. Personnel STREAM — Rigging Details for Transfer of Personnel in Stokes Litter

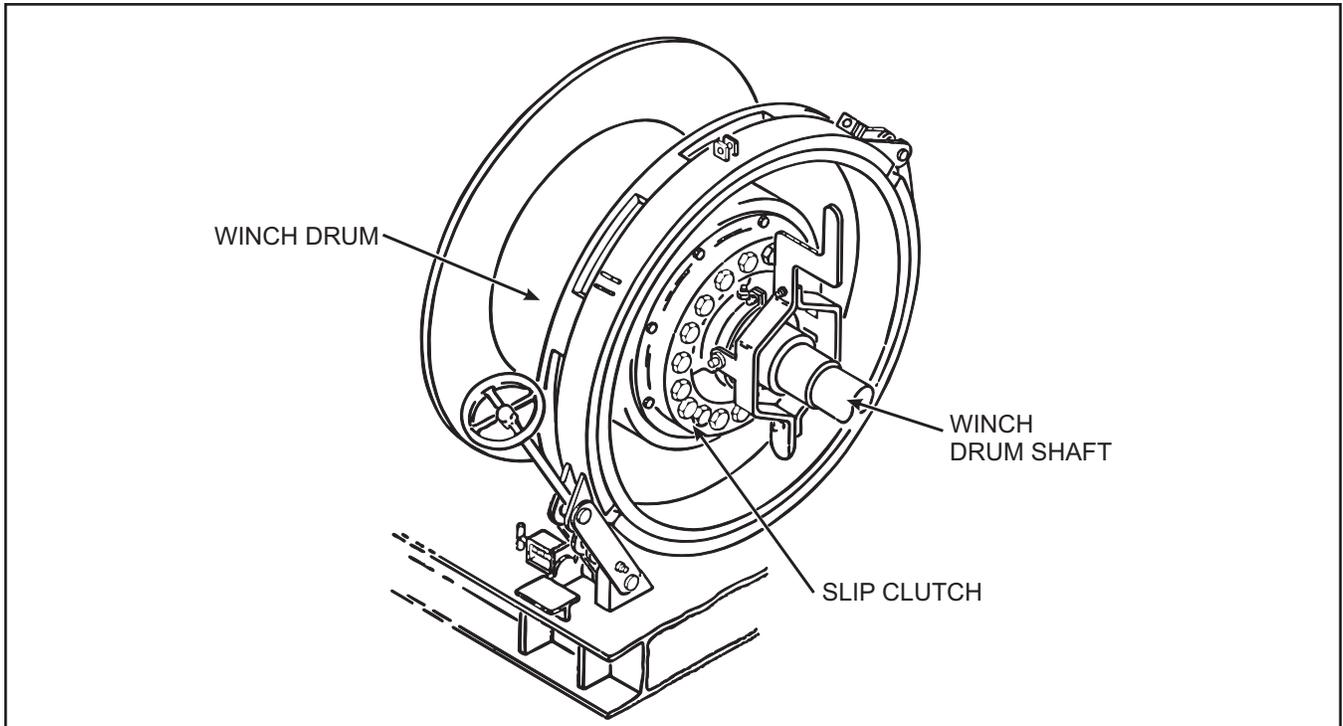


Figure 8-5. Typical Fourth Generation Inhaul Winch Drum With Slip Clutch

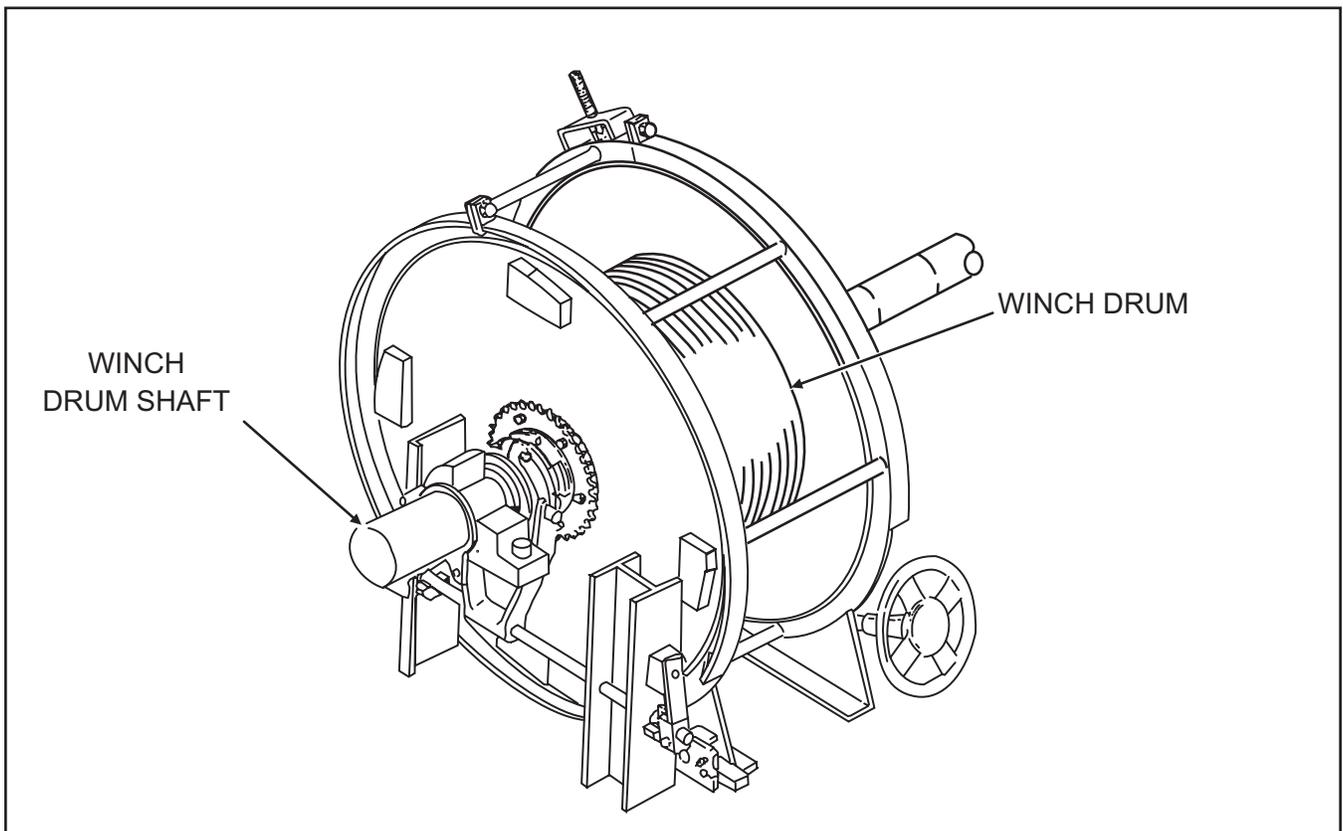


Figure 8-6. Typical Inhaul Winch Drum Without Slip Clutch

2. Attach the inhaul to the STREAM trolley. Reeve the highline through the trolley. Insert the outhaul pendant in the trolley (if required).
3. Install the Mk 5 strongback, cargo drop reel, or cargo hook onto the trolley. *The drop reel is installed with the brake release lanyard aft.*
4. Secure the 1-3/8-inch (34.9 mm) STREAM pelican hook to the highline. Use a 7/8-inch (22.2 mm) safety anchor shackle.
5. Install the stopper plate on the highline end fitting.
6. Fake out the messenger/outhaul. Stop off the highline to the messenger beckets. Stop off first to the shackle on the highline end fitting, then use two stops on the highline about 12 inches (30.4 cm) apart. (Refer to Figure 6-22).
7. Attach the inboard end of the messenger/outhaul to the trolley. Shackle the inboard end of the outhaul pendant on the trolley, if one was rigged. Use a 7/8-inch (22.2 mm) safety anchor shackle.
8. Attach the station phone line and the lead line messenger for the phone/distance line (if required).
9. Ensure that all required working and repair tools and safety equipment are on station and that personnel are briefed, properly dressed, and on station.

(2) RECEIVING SHIP

1. Attach the fairlead block for the messenger/outhaul below and close to the long link for the STREAM pelican hook on the highline. Attach a second fairlead block located for proper fairlead to line handlers.
2. Ensure that all required working and repair tools and safety equipment are on station and that personnel are briefed, properly dressed, and on station.
3. Ensure that a sufficient number of personnel are on station for tending the outhaul; minimum of 10 line handlers.
4. Provide an easing-out line on station. See paragraph 2.2.11.5.

8.4.4 Passing Personnel STREAM With Hand-Tended Outhaul

(1) DELIVERY SHIP

1. *For Navy standard hauling winch only:*
 - a. Secure outhaul whip to appropriate padeye.
 - b. Vent air from outhaul drum clutch by moving manual vent valve V-21 (see Figure 8-7) up to the VENT CLUTCH position.
 - c. Place MASTER STATION SELECTOR SWITCH in BOTH DRUMS ON position.
 - d. Slowly move SPEED control handle in the haul-in direction to bring the trolley to the transfer head, then to the haul-in HALF SPEED detent and leave in detent.
2. *For inhaul winch with slip clutch only:* Haul in to bring the trolley to the transfer head, then place winch in *tension* control.



Inhaul winch with slip clutch should be in *tension* control before the transfer head is moved.

3. Send over the shot line attached to the messenger.

(2) RECEIVING SHIP

1. Receive the shot line and haul in. When the messenger comes aboard, install the messenger in the fairlead blocks and continue to haul in.
2. When the station phone line and the lead line messenger for the phone/distance line come aboard, disconnect them and move them clear of the area.
3. Attach the phone/distance line to the lead line messenger and signal the delivery station to haul in.
4. Connect the station phone and establish voice communication with the delivery station.
5. Continue to haul in the messenger/outhaul.

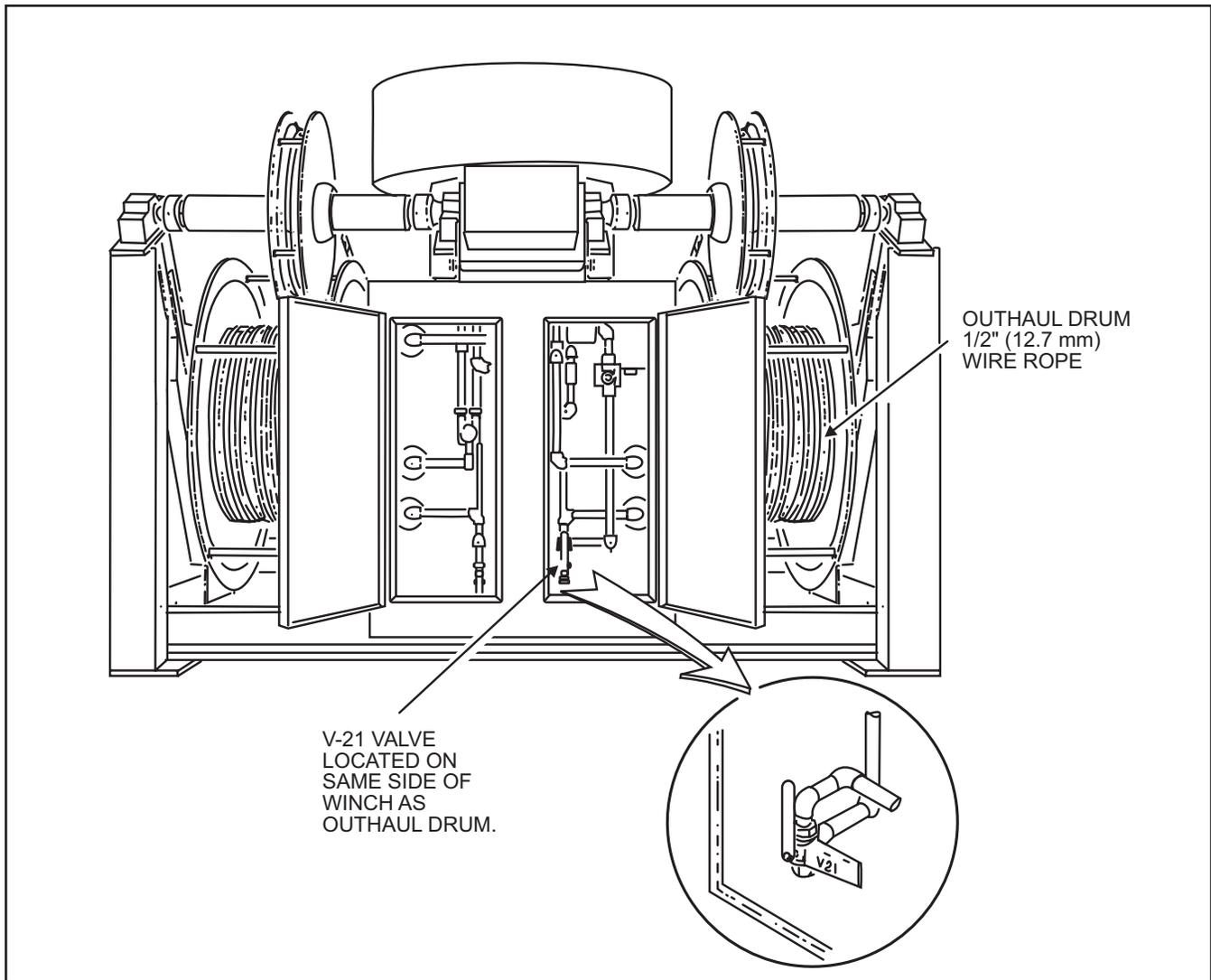


Figure 8-7. Location of Outhaul Vent V-21 in Navy Standard Hauling Winch

(3) DELIVERY SHIP

1. Haul in the lead line messenger. When the zero end of the phone/distance line is aboard, attach it to the outermost rail, clear of the transfer station, and disconnect the lead line messenger. Connect the bridge-to-bridge phone circuit.

Note

For hand-tended inhaul, ensure trolley remains two-blocked against transfer head when transfer head is moving.

2. Raise the STREAM transfer head to the full-up position. Pay out the highline.

3. Have personnel at the ram tensioner pull the slack highline through the ram. This will assist personnel at the receiving station in hauling the highline across and prevent fouling of the highline winch.

(4) RECEIVING SHIP

1. When the highline comes aboard, remove any twists of the messenger around the highline and attach the STREAM pelican hook to the long link on the padeye (see Figure 8-2). Attach it with the bail down. Cut the first stop if necessary. Use the correct cotter pin (see Figure 2-21).
2. Install the easing-out line through the pelican hook's long link and secure.

Note

Coil the easing-out line and stop off (with sail twine) to the pelican hook.

3. After the easing-out line is secure, slack the messenger and cut the remaining stops.
4. Clear personnel from the immediate area.
5. Notify the bridge and delivery station: "Ready to tension highline."

(5) BOTH SHIPS

Procedures for tensioning the highline are given in paragraph 6.9.2 (5), steps 1 through 4.

(6) DELIVERY SHIP

1. Haul in slack to tension the highline.
2. Lower the STREAM transfer head and attach the transfer chair (see Figures 8-2 and 8-3). Use a 1-3/8 inch-(34.9 mm) safety anchor shackle to attach the one-person chair to either the cargo hook or cargo drop reel. Use two 3/4-inch (19.0 mm) safety anchor shackles when rigging the two-person chair to either the cargo hook or Mk 5 strongback.
3. Attach a 1/2-inch (12.7 mm) wire preventer between the transfer chair and the rig (see Figures 8-2 and 8-3). Use 5/8-inch (15.8 mm) safety anchor shackles. (Not required with the Mk 5 strongback.)
4. When the transfer chair is attached and the wire preventer is rigged, open the trolley stowage arms.

Note

Before transferring personnel, the empty transfer chair shall be cycled from deck to deck.

5. *For inhaul winch with slip clutch only:* Ensure winch is in *tension* control before raising transfer head.
6. *For Navy standard hauling winch:* Ensure SPEED control handle is in haul-in HALF SPEED detent.
7. Raise transfer head until empty chair is clear of bulwark.
8. *Inhaul winch with slip clutch only:* Put winch in *speed* control.

9. *Navy standard hauling winch only:* Move SPEED control handle from HALF SPEED detent to centered position.

Note

Pay out inhaul wire rope from Navy standard hauling winch by using SPEED control handle.

10. Signal receiving station to haul in on outhaul.
11. Pay out the inhaul as receiving station hauls the trolley and empty chair across.
12. Tend the inhaul slack while the empty chair is at the receiving station.

(7) RECEIVING SHIP

WARNING

Personnel assigned to a hand-tended line shall be positioned inboard of the line and shall stay a minimum of 6 feet (1.8 m) from the fairlead block.

1. Haul in the outhaul to bring the trolley and empty chair aboard.
2. Lower the empty chair to the deck. (When using the cargo drop reel for transfers to a fixed padeye: (1) pull the brake release lanyard on the cargo drop reel; (2) pull down on the tag lines to lower the empty chair to the deck; (3) release brake release lanyard to set cargo drop reel brake; (4) pull the brake release lanyard and tend chair with tag lines as cargo drop reel raises chair to two-blocked position.)

(8) DELIVERY SHIP

CAUTION

Since the outhaul is hand tended and controls the trolley and chair from the receiving station, the inhaul winch operator must be alert for signals from the receiving station. All transfers shall be made with the winch in low speed.

1. On signal from the receiving station, haul in the trolley and empty chair with the inhaul and two-block the trolley to the STREAM transfer head.
2. *For inhaul winch with slip clutch only:* Put winch in *tension* control.
3. *For Navy standard hauling winch only:* Slowly move SPEED control handle to haul-in HALF SPEED detent and leave in detent.
4. Lower the transfer head to bring the empty chair to the deck.
3. *For Navy standard hauling winch only:* Slowly move SPEED control handle to haul-in HALF SPEED detent and leave in detent.
4. Lower transfer head until the chair reaches the deck; remove chair and wire preventer.
5. Remove the messenger/outhaul from the trolley and secure temporarily to bulwark. (Receiving station must hand tend the messenger slack.)
6. *For hand-tended inhaul only:* Hold trolley in place and disconnect hand-tended inhaul from trolley. Connect wire rope inhaul from inhaul winch.

(9) BOTH SHIPS

Personnel STREAM with hand-tended outhaul is ready for transfer of personnel.

8.4.5 Operating Personnel STREAM With Hand-Tended Outhaul. To transfer passengers, repeat the procedures for cycling the empty chair. When using the cargo drop reel for transfers from a fixed-padeye receiving station to a STREAM sliding block, personnel at the fixed-padeye receiving station load the chair as follows:

1. Pull the brake release lanyard.
2. Pull down on the tag lines to lower the empty chair to the deck.
3. Load the passenger.
4. Pull the lanyard and have 2 to 4 personnel lift the chair while the cargo drop reel retracts.
5. When the chair has been lifted as high as personnel can lift it, release the lanyard to set the cargo drop reel's brake.
6. Signal the inhaul winch operator (on the other ship's station) to haul in the chair.

8.4.6 Retrieving Personnel STREAM With Hand-Tended Outhaul and Connecting STREAM With Traveling SURF

(1) DELIVERY SHIP

1. Retrieve the trolley and two-block it against the transfer head.
2. *For inhaul winch with slip clutch only:* Place winch in *tension* control.

7. *For Navy standard hauling winch only:*
 - a. Move SPEED control handle from HALF SPEED detent to centered position.
 - b. Pressurize outhaul drum clutch by moving manual vent valve V-21 (see Figure 8-7) down to the NORMAL position.
 - c. Place MASTER STATION SELECTOR SWITCH in OUTHAUL DRUM ONLY position.
8. Reeve wire rope outhaul through the SURF and attach the traveling SURF to the highline.

Note

It is helpful to place the SURF on a pallet and use a forklift to raise it to the highline.

9. Attach the outhaul to the trolley.
10. Disconnect messenger at bulwark and attach the messenger to SURF. (Refer to Figure 6-22.)

(2) RECEIVING SHIP

1. Haul in the messenger to pull the SURF across.
2. When the SURF is two-blocked against the stopper plate, attach the SURF hook to the bail on the bottom of the STREAM pelican hook. (Refer to Figure 6-23.)
3. Slack the messenger and disconnect it from the SURF pendant.
4. Fake out the messenger free for running.
5. Stand clear of the rig.

6. Signal the delivery station to tension the outhaul.

(3) DELIVERY SHIP

1. *For Navy standard hauling winch only:* Remove slack from outhaul and tension outhaul by placing MASTER STATION SELECTOR SWITCH in BOTH DRUMS ON and slowly moving SPEED control handle to HALF SPEED detent.
2. *For other outhaul winches:* Remove excess slack from outhaul and tension outhaul by putting winch in *tension* control.

(4) BOTH SHIPS

The STREAM system is now ready for transfer of cargo.

8.4.7 Retrieving STREAM With Traveling SURF and Connecting Personnel STREAM With Hand-Tended Outhaul

(1) DELIVERY SHIP

1. With the STREAM transfer head in the full-up position, retrieve the trolley and two-block it to the transfer head. Hauling winches remain in tension control.



For winches that are not Navy standard: When the outhaul winch is switched from *tension* control to *speed* control, the winch brake automatically sets if the control handle is in neutral. Therefore, perform the next step exactly as described or a tightline condition can develop.

2. *For outhaul winches that are not Navy standard:* Move the outhaul winch's control lever to the payout position, and then switch to *speed* control. Tend the outhaul slack.
3. *For Navy standard hauling winch:*
 - a. Move SPEED control handle to centered position.
 - b. Place MASTER STATION SELECTOR SWITCH in OUTHAUL DRUM ONLY position.

c. Pay out outhaul using SPEED control handle and tend outhaul slack.

(2) RECEIVING SHIP

1. Attach the messenger/outhaul to the SURF, and haul in on the SURF.
2. Disconnect the SURF hook from the bail of the STREAM pelican hook.
3. Slack the messenger/outhaul.

(3) DELIVERY SHIP

Note

The messenger/outhaul is hand-tended. The outhaul winch operator must be alert for signals from the receiving station when retrieving the traveling SURF, so that the SURF will not override the messenger/outhaul.

1. Haul in to retrieve the SURF two-blocked against the trolley.
2. *For Navy standard hauling winch only:*
 - a. Move SPEED control lever to centered position.
 - b. Set MASTER STATION SELECTOR SWITCH in BOTH DRUMS ON position.
 - c. Move SPEED control lever to in-haul HALF SPEED detent; leave in detent.
3. *For other outhaul winches:* Tend outhaul as transfer head is lowered.
4. Lower transfer head.
5. Remove the messenger/outhaul and secure to bulwark. (Receiving station must hand tend the messenger slack.)
6. *For Navy standard hauling winch only:*
 - a. Move SPEED control handle to centered position.
 - b. Set MASTER STATION SELECTOR SWITCH in OUTHAUL DRUM ONLY position.

7. Pay out outhaul and remove outhaul from trolley and SURF.
8. Remove the SURF from the highline.
9. Insert the outhaul pendant in the trolley (if required).
10. Attach the messenger/outhaul to the trolley. (Shackle it to the outhaul pendant on the trolley, if one was rigged. Use a 7/8-inch (22.2 mm) safety anchor shackle.)
11. Attach the transfer chair and wire preventer (see Figures 8-2 and 8-3).

WARNING

Ships with an inhaul winch that is not Navy standard and does not have a slip clutch (see Figure 8-6) must use a hand-tended inhaul.

Note

See paragraph 8.4.1 for type of inhaul to be used.

12. *For hand-tended inhaul only:*
 - a. Hold trolley in place.
 - b. Place inhaul winch in *speed* control, pay out inhaul, and disconnect inhaul from trolley. Haul in inhaul and attach end fitting to stowage point on transfer head. Place inhaul in *tension* control.
 - c. Attach 3-inch (76.2 mm) synthetic inhaul (as described in paragraph 8.2.2) to trolley and reeve through a 10-inch (25.4 cm) snatch block attached to the transfer head and through a 10-inch (25.4 cm) snatch block located for proper fairlead to line handlers.
13. *For Navy standard hauling winch only:*
 - a. Secure outhaul whip to appropriate padeye.
 - b. Vent air from outhaul drum clutch by moving manual vent valve V-21 (see Figure 8-7) up to the VENT CLUTCH position.
 - c. Set MASTER STATION SELECTOR SWITCH in BOTH DRUMS ON position.

- d. Slowly move SPEED control handle to haul-in HALF SPEED detent.

14. *For inhaul winch with slip clutch only:* Place winch in *tension* control.

(4) BOTH SHIPS

Personnel STREAM is now ready for transfer of personnel.

8.4.8 Personnel STREAM Transfer by Stokes Litter. For hardware required, see Figure 8-4. Preparing, passing, and operating the rig shall be in accordance with paragraphs 8.4.3 through 8.4.5, except the Stokes litter will be used in place of the chair and except as noted below. The litter will be connected to provide a forward-to-aft orientation as it travels between the ships. Details of the litter and protective frame are shown in Figure 9-3. The following procedures apply.

(1) BOTH SHIPS

Special care will be given to assist the sick and wounded.

(2) DELIVERY SHIP

1. Connect the protective frame to the cargo hook or cargo drop reel hook using a 1-3/8-inch (34.9 mm) shackle and a 7/8-inch (22.2 mm) safety anchor shackle as shown in Figure 8-4.
2. Connect a 1/2-inch (12.7 mm) wire rope preventer to the protective frame using a 5/8-inch (15.8 mm) safety anchor shackle. Length of preventer is as follows:
 - a. If litter is to be transferred on a cargo hook, use a 4-1/2-foot (1.4 m) long wire rope preventer and shackle to the inhaul using a 5/8-inch (15.8 mm) safety anchor shackle.
 - b. If litter is to be transferred on a cargo drop reel, use a 2-1/2-foot (0.8 m) long wire rope preventer and shackle to cargo drop reel hook shackle using a 7/8-inch (22.2 mm) shackle.
3. If litter is to be transferred on a cargo drop reel, connect a 1/2-inch (12.7 mm) wire rope preventer, 12-feet (3.7 m) long, to the cargo drop reel hook shackle using a 7/8-inch (22.2 mm) safety anchor shackle. Shackle other end of 12-foot (3.7 m) preventer to the cargo drop reel lock chain using a 5/8-inch (15.8 mm) shackle.

Note

Do not install the trolley flotation bag, Figure 9-3, item D, on the STREAM trolley.

- If the receiving ship is providing the litter, the delivery ship will send over only the protective frame, fully rigged, with the 3/8-inch (9.5 mm) toggle pins and spring-steel keeper pins installed in the 1/4-inch (6.4 mm) flat iron shackles. (See Figure 8-4, detail "A".)

(3) BOTH SHIPS

If the receiving station is a fixed-padeye receiving station:

- Delivery ship will send cargo drop reel with cargo drop reel hook extended far enough to place litter/protective frame within reach of receiving station personnel.
- Receiving ship will pull cargo drop reel brake release lanyard and pull litter/protective frame down to proper location, then release lanyard to set cargo drop reel brake.

(4) DELIVERY SHIP

Send litter/protective frame to receiving ship.

(5) RECEIVING SHIP

Position litter and passenger under protective frame and attach litter to flat iron shackles on frame using 3/8-inch (9.5 mm) toggle pins secured with spring-steel keeper pins. (See Figure 8-4, detail "A".)

WARNING

Litter must be attached to protective frame flat iron shackles using 3/8-inch (9.5 mm) toggle pins secured with spring-steel keeper pins. (See Figure 8-4, detail "A".)

Note

If the receiving station is a fixed-padeye receiving station:

- When litter is secured to protective frame, pull cargo drop reel brake release lanyard.
- Have 2 to 4 personnel lift litter as cargo drop reel hook retracts.

- When litter is as high as personnel can lift it, release lanyard to set cargo drop reel brake.

(6) DELIVERY SHIP

Haul in litter.

8.4.9 Unrigging Procedures

- Return trolley to delivery station.
- For inhaul winch with slip clutch only:* Set winch in *tension* control.
- For Navy standard hauling winch only:* Move SPEED control handle to haul-in HALF SPEED detent; leave in detent.
- Lower transfer head.
- Remove the transfer chair or litter and retrieve the messenger/outhaul.
- Raise the STREAM transfer head.
- Detension the highline (see paragraph 6.9.4 (5), steps 1 through 4). Prior to tripping the pelican hook, the delivery station rigs a lizard line to the highline and belays to ensure proper fairlead of highline into trolley.

WARNING

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

- Retrieve the highline.

8.5 EMERGENCY BREAKAWAY PROCEDURE FOR PERSONNEL STREAM RIG

Emergency breakaway is an accelerated breakaway using the standard procedures in paragraph 8.4.6. The following procedures also apply:

- Retrieve personnel on the highline expeditiously.
- Clear the station of all nonessential personnel.
- Stop all transfer immediately.
- Slack the highline and tend.

5. Commence hauling in all hand-tended lines. (If hand-tended lines interfere with the breakaway, the lines should be cut.)
6. If unable to disconnect the rig, continue to pay out until all wire is free of the drum.



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.

7. Never cut a tensioned wire.

8.6 SAFETY PROCEDURES

Note

Safety of personnel is the primary consideration during transfer of personnel.

1. Use only the most experienced winch operators available.
2. Thoroughly inspect all rigging equipment, just prior to transfer.
3. The first lieutenant or ship's bos'n shall be present at the transfer station in use.
4. Personnel who are being transferred must wear an orange-colored, inherently buoyant, life jacket or auto inflatable utility life preserver (AIULP); a one-cell, pin-on type, white, water-tight flashlight, or a green chemical light; a

whistle; a dye marker; and a safety helmet with chin straps.

5. When the temperature of the water is 45 °F (7 °C) or below, personnel who are being transferred should wear immersion suits.
6. Instruct personnel on how to unhook the quick-release belt and get out of the chair, if the rig fails and the chair falls into the water.
7. When the chair is attached to the cargo drop reel, instruct personnel *not to pull on the brake release lanyard*.
8. When practicable, station a lifeguard ship astern of ships making personnel transfers. When no lifeguard ship or helicopter is available, each ship shall have a lifeboat and crew ready in all respects for rescue operations.

WARNING

- The station transferring personnel shall be the only station rigged while personnel are being transferred.
- Conduct personnel transfers at night only in an emergency.

8.7 TRANSFER OF PERSONNEL BY SYNTHETIC HIGHLINE

All surface ships are outfitted with a simple and compact synthetic highline rig. The procedures for transferring personnel with this rig, when only a fixed padeye for the highline or a pendant receiving station is available, are covered in Chapter 9.

CHAPTER 9

Personnel, Light Fleet Freight, and Mail Transfer by Synthetic Highline — Rigging and Operation

9.1 BASIC CONSIDERATIONS

Ships can exchange personnel, light fleet freight, and mail during a scheduled replenishment or as an independent operation on short notice at any time. An exchange during a scheduled replenishment requires careful planning to avoid interference (as much as possible) with work at other transfer stations and to prevent delay in completing the primary replenishment.

When two combatants are required to conduct an exchange of personnel, light fleet freight, or mail, the OTC shall designate the control and approach ships. The OTC shall also designate the delivery ship.

The rig for transfer of personnel in a transfer chair or Stokes litter is the synthetic highline. The equipment and procedures are described in paragraphs 9.2 through 9.6.

WARNING

The maximum safe load for transfer by synthetic highline is 600 lb (272 kg).

For transfer of personnel by STREAM rig, see Chapter 8. For transfer of personnel by helicopter, see paragraph 9.7 and NWP 3-04.1M (formerly NWP 42). For transfer of light fleet freight and mail, see paragraph 9.8.

9.2 TRANSFER OF PERSONNEL BY SYNTHETIC HIGHLINE

The synthetic highline, rigged for personnel transfer, is illustrated in Figure 9-1. See Figures 9-4 and 9-5 at the end of this chapter for equipment required at transfer stations.

9.2.1 Highline. The highline for personnel transfer is 4-inch (101.6 mm), double-braided, polyester line (MIL-R-24536), at least 350 feet (106.6 m) in length. A synthetic line thimble (NEWCO type) of appropriate size will be spliced into the delivery end of the highline with a 1-inch (25.4 mm) safety anchor shackle. The shackle is used to secure the highline to the receiving ship's attachment point.

WARNING

Only double-braided polyester line (MIL-R-24536) and the STREAM rig for transfer of personnel (see Chapter 8) may be used for transfer of personnel by highline.

9.2.2 Inhaul. The inhaul is a 3-inch (76.2 mm), plaited, polyester line (MIL-R-24537), at least 350 feet (106.6 m) in length. A 7/8-inch (22.2 mm) or 3/4-inch (19.0 mm) safety anchor shackle is dipped through an eye splice on the outboard end for attachment to the trolley block (see Figure 9-2).

9.2.3 Outhaul/Messenger. For ships that do not have a STAR messenger, the outhaul is made up as described in paragraph 2.3.5 without the 6-foot (1.8 m) 2-1/4-inch (57.2 mm) line, the pair of brummel hooks, and the 60-foot (19.2 m) 2-1/4-inch (57.2 mm) line. Make a 5-inch (12.7 cm) soft-eye splice in the 3-inch (76.2 mm) line for attachment to the trolley block (see Figure 9-2). Ships that have the STAR messenger will use the STAR messenger and will disconnect at the brummel hooks and not use the 60-foot (19.2 m) section.

9.2.4 Transfer Chair and Litter Protective Frame. Figure 9-2 shows the method of securing the transfer chair and litter protective frame to the trolley

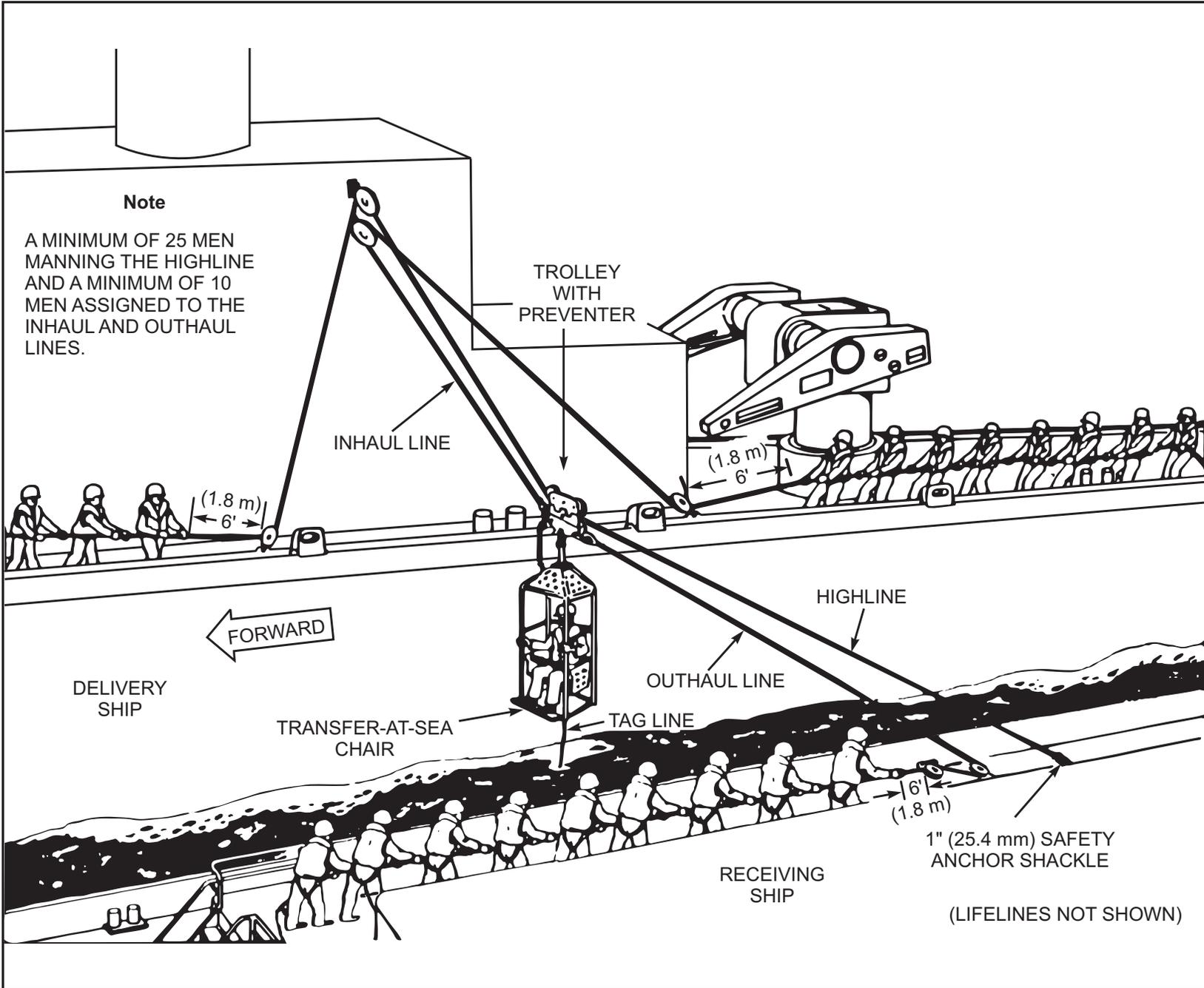


Figure 9-1. Personnel Transfer by Synthetic Highline

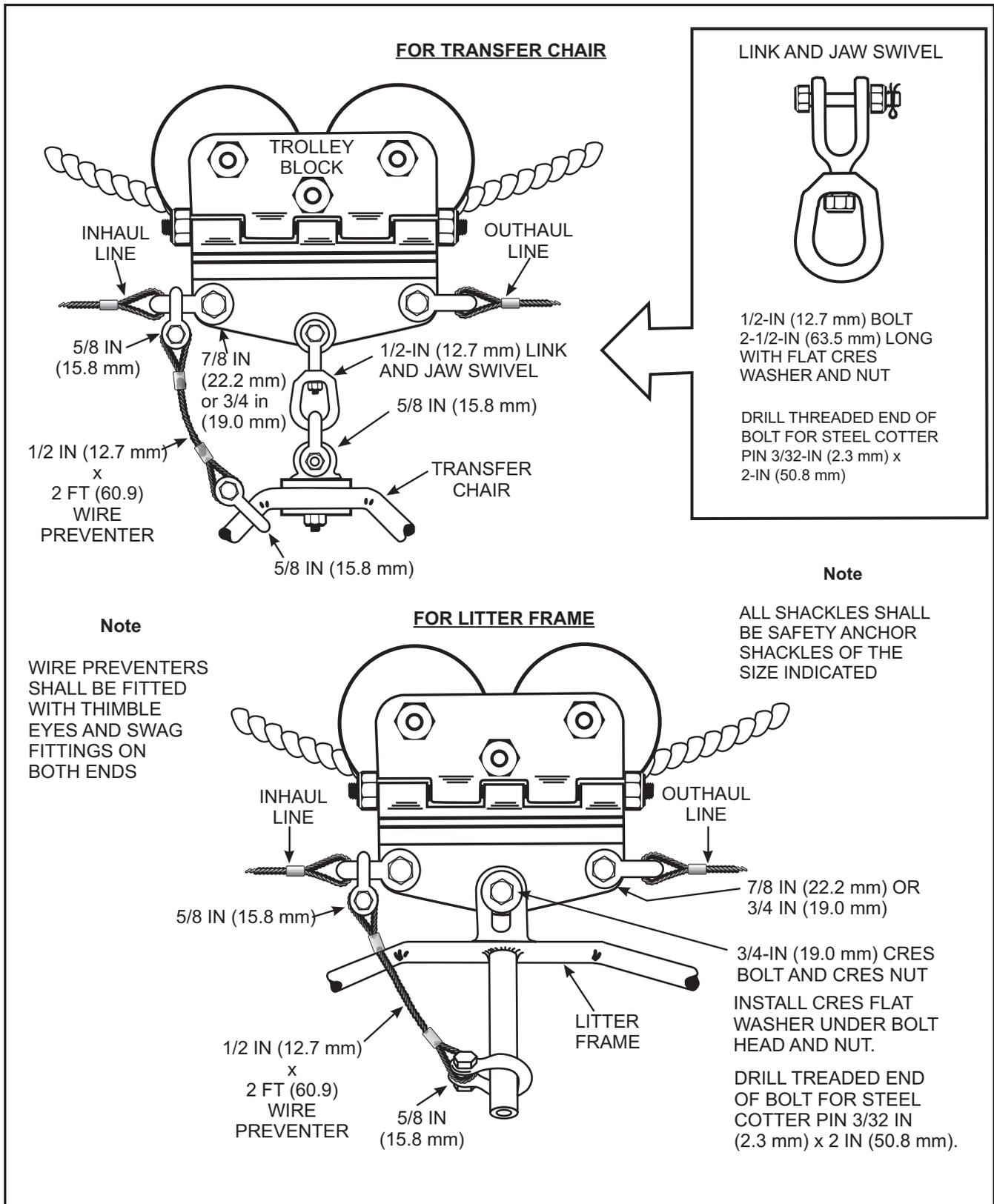


Figure 9-2. Rigging the Trolley for Personnel Transfer

block. A 1/2-inch (12.7 mm) wire preventer, 2 feet (60.9 cm) in length, is used for safety. Connect one end of the preventer to the inhaul shackle and the other end to the transfer chair or litter protective frame. Secure both ends with 5/8-inch (15.8 mm) safety anchor shackles. The wire preventer will ensure that the transfer chair or litter protective frame is not lost, if the primary attachment fails. Figure 9-3 shows the litter protective frame and flotation gear.

WARNING

The litter protective frame with flotation gear attached shall be connected to the trolley block, the preventer rigged, and the trolley flotation bag attached. Once these steps have been completed, the stretcher is brought under the trolley block and attached to the litter protective frame, using four flat iron shackles (Item E, Figure 9-3).

9.3 PREPARING SHIPS FOR TRANSFER

9.3.1 Ship Responsibilities. The ship that provides the highline is responsible for the condition of the equipment and fittings. In particular, the highline shall be inspected prior to each transfer for evidence of rot, broken inner strands, cuts, and other signs of weakened condition.

The receiving ship is responsible for notifying the delivery ship when it is ready to receive personnel.

Both ships shall ensure that all required working tools and safety equipment are on station, prior to transfer.

9.3.2 Personnel for Tending Lines. The ship that provides the highline shall assign a minimum of 25 personnel to the highline and a minimum of 10 personnel to the inhaul; the receiving ship shall assign a minimum of 10 personnel to the outhaul. Additional personnel must be available for use under adverse conditions or in an emergency.

9.3.3 Escorts and Assistance. Make specific arrangements for receiving personnel, including VIPs. Assign an officer or enlisted escort to greet arrivals, to escort arrivals away from the landing area, and to brief personnel who are about to depart. This courtesy will prevent embarrassment to passengers, who may be un-

familiar with the routine, and will also speed movements to and from the landing area.

Special care should be given to assist the sick and wounded.

9.4 TRANSFER PROCEDURES

The common procedures and equipment described in Chapter 2 apply to transfers by synthetic highline.

9.4.1 Rigging the Delivery Ship. Rig the transfer station on the delivery ship in accordance with the ship's plan. The delivery station:

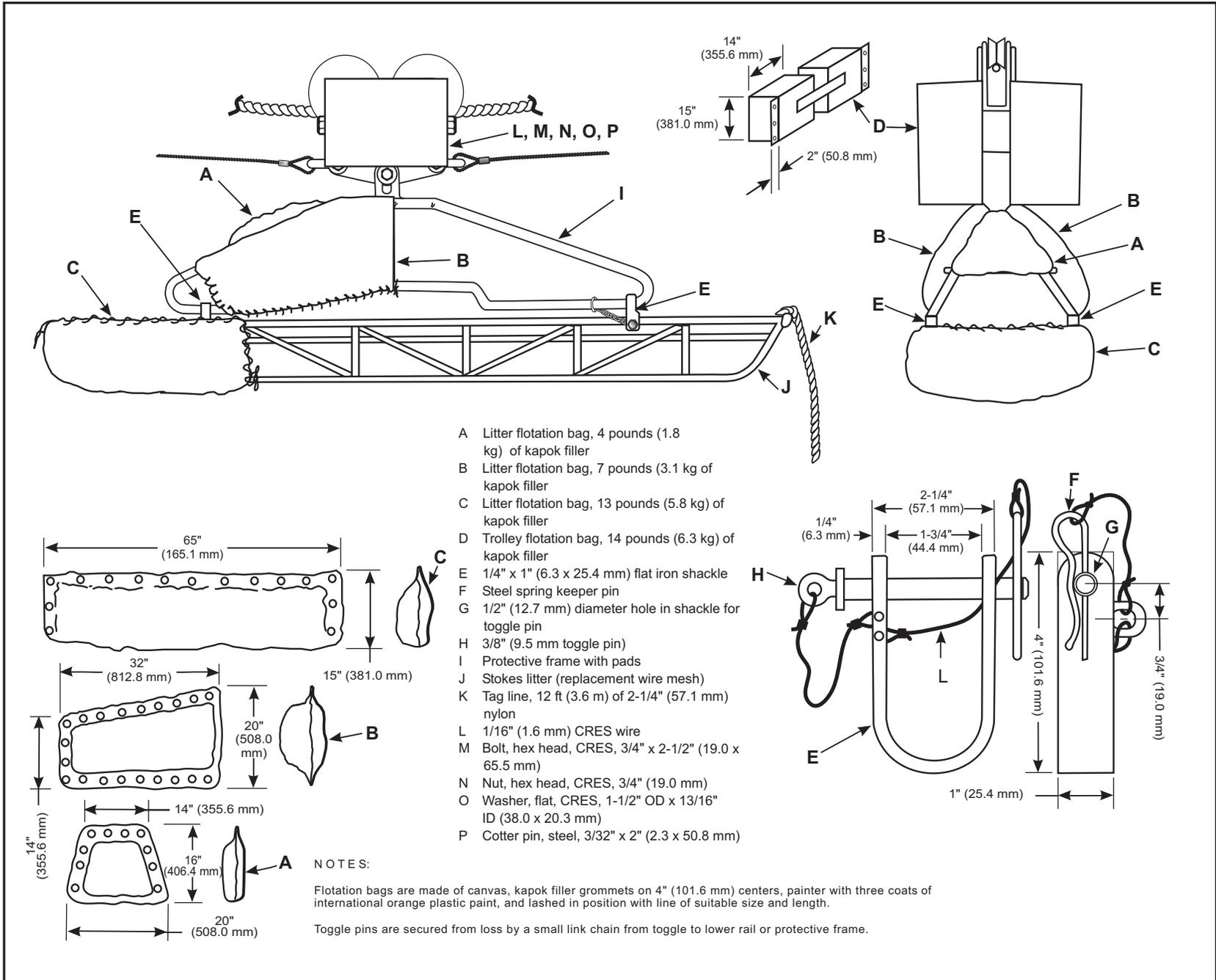
1. Reeves the highline through the trolley. (This is accomplished by removing one hinge bolt.)
2. Attaches the inhaul and outhaul/messenger to the trolley block. Use 7/8-inch (22.2 mm) or 3/4-inch (19.0 mm) safety anchor shackles.
3. Reeves the highline and inhaul through fairlead blocks.
4. Stops off the highline to the outhaul/messenger.
5. Attaches the station phone line and the lead line messenger for the phone/distance line to the outhaul/messenger.
6. Fakes down all lines, free for running, and forward of the rig, if practicable.
7. Ensures that a minimum of 25 personnel are assigned to the highline and a minimum of 10 personnel to the inhaul.

9.4.2 Rigging the Receiving Ship. Rig the transfer station on the receiving ship in accordance with the ship's plan. A padeye for the highline and a fairlead block for the outhaul are required. Once the highline is shackled to the attachment point and the stops are removed, the messenger becomes the outhaul.

A ship with a pendant receiving station, rigged like the one shown in Figure 7-12, shall remove the pelican hook at the deck padeye and substitute a sufficient number of 1-inch (25.4 mm) or larger shackles.

The receiving ship ensures that a minimum of 10 personnel are assigned for tending the outhaul, after it comes aboard.

Figure 9-3. Stokes Litter Rigged for Transfer



9.4.3 Passing the Rig. Pass and receive the following lines in accordance with the instructions in Chapter 2:

1. Bolo or gun line (paragraphs 2.3.4 through 2.3.4.4)
2. Phone/distance line (paragraphs 2.3.6 through 2.3.6.3)
3. Station phone line (paragraph 2.3.7)
4. Messenger (paragraph 2.3.5) for CLF ships; for ships not requiring the STAR messenger, see paragraph 9.2.3.

When the highline comes aboard, the receiving station shackles the 1-inch (25.4 mm) safety anchor shackle on the end of the highline to the attachment point, removes the stops, reeves the outhaul through the fairlead block, and tends the outhaul. The delivery station tends the highline and inhaul. Prior to attachment of the highline to the padeye, remove all twists of the messenger/ outhaul from around the highline.

WARNING

All lines shall be hand tended; power shall not be used for transfer of personnel. Line tenders shall be positioned inboard of the line and shall stay a minimum of 6 feet (1.8 m) from fairlead blocks.

9.4.4 Unrigging Procedures

1. Return the trolley to the delivery station.
2. The delivery station slacks the highline.
3. The receiving station slacks the outhaul and restops it to the highline.
4. The receiving station disconnects the highline and stops it off to the outhaul/messenger.
5. The delivery station retrieves the outhaul/messenger, highline, and station phone line.
6. The receiving station retrieves the phone/distance line.

9.5 EMERGENCY BREAKAWAY PROCEDURE

Emergency breakaway is an accelerated breakaway using the standard unrigging procedures in paragraph 9.4.4. Cut all lines, if the situation so dictates.

9.6 SAFETY PROCEDURES

Note

Safety of personnel is the primary consideration during transfer of personnel.

1. Personnel who are being transferred must wear an orange-colored, inherently buoyant, life jacket or auto inflatable utility life preserver (AIULP); a one-cell, pin-on type, white, water-tight flashlight, or a green chemical light; a whistle; a dye marker; and a safety helmet with chin straps.
2. When the temperature of the water is 45 °F (7 °C) or below, personnel who are being transferred should wear immersion suits.
3. Instruct personnel on how to unhook the quick-release belt and get out of the chair, if the rig fails and the chair falls into the water.
4. When practicable, station a lifeguard ship astern of ships making personnel transfers. When no lifeguard ship or helicopter is available, each ship shall have a lifeboat and crew ready in all respects for rescue operations.

WARNING

- The station transferring personnel shall be the only station rigged while personnel are being transferred.
- Conduct personnel transfers at night or during heavy weather only in an emergency.

9.7 TRANSFER OF PERSONNEL BY HELICOPTER

Transfer of personnel by helicopter is faster, in most cases, than transfer by synthetic highline.

Transfer personnel internally in the helicopter. When a landing area is not available, raise and lower personnel, using the helicopter's utility hoist, when the helicopter is positioned over the deck. Refer to NWP 3-04.1M (formerly NWP 42).

WARNING

These restrictions apply to transfers of personnel by helicopter:

1. The maximum safe capacity of the utility hoist is 600 lb (272 kg).
2. Never attach the cable from the utility hoist to the ship.

Night helicopter passenger flights to or from air capable ships shall be limited to situations of an operational necessity to properly certified ships. Transfer of passengers by hoist at night is prohibited, except in extreme emergency situations, and then only with the concurrence of the pilot in command.

The ship transferring passengers will originate and retain a manifest until the helicopter has delivered the passengers to the receiving ship. Outfit all passengers, including litter cases, in accordance with NWP 42. Brief passengers on the following items:

1. Use of rescue slings or seat.
2. Hazards, including avoidance of reaching for any support that might be a helicopter or hoist control lever.
3. Assistance that the passenger can expect the flight crew to provide him/her, when entering and departing from the helicopter.

9.8 TRANSFER OF LIGHT FLEET FREIGHT AND MAIL

Light fleet freight, mail, medical supplies, movies, and similar materials may be transferred by synthetic highline, light line, helicopter, or a STREAM or nontensioned rig (see Chapters 6 and 7). VERTREP is an ideal means for underway transfer of light fleet

freight, nonregistered mail, and movies, using the procedures in Chapter 10.

Light fleet freight and mail may be transferred by synthetic highline taken to power, if the receiving station's highline padeye is static tested for a minimum load of 30,000 lb (13,608 kg). When the highline padeye's test load is below the minimum, the highline shall be hand tended.

Note

During transfer of mail at night, attach a cluster of at least three blue chemical lights or a cluster of at least three one-cell, white, watertight flashlights to the bag.

9.8.1 Classified Material and Registered U.S. Mail. Properly safeguard these items during transfer using these procedures:

1. Obtain a weighted bag from the CMS custodian. The weighted bag will ensure sinking, if the bag is lost from the rig.
2. Attach the weighted bag to a self-mousing cargo hook.
3. Attach a wire preventer to the bag's straps, in a manner similar to that shown in Figure 9-2, to preclude loss of the bag.
4. Secure a seizing line to the opening of the bag, to prevent inadvertent loss of the contents during transfer.

9.8.2 Nonregistered U.S. Mail and Movies. Transfer these items in a flotation bag to preclude sinking. Use a wire preventer and a seizing line (see paragraph 9.8.1).

Helicopters normally carry these items internally; however, when fleet operational conditions dictate, the items may be carried externally when enclosed in triwalled containers.

9.8.3 Controlled Narcotics, Alcohol, Alcoholic Beverages, and Other Drugs and Chemicals. Transfer these items in the same manner as classified material and registered U.S. mail (see paragraph 9.8.1).

DELIVERY SHIP EQUIPMENT	CHAIR	LITTER	REMARKS
Block, Snatch, 12" (30.5 cm)	*	*	To fairlead 4" (101.6 mm) synthetic highline.
Block, Snatch, 10" (25.4 cm)	*	*	To fairlead 3" (76.2 mm) synthetic inhaul.
Bolo With Shot Line	2	2	See Note.
Bolt, 3/4" (19.0 mm); CRES With CRES Nut, Steel Cotter Pin, and Flat Washers	—	1	To secure litter protective frame to trolley (NAVSEA DWG 803-2555038).
Chair, Transfer-at-Sea	1	—	"S" type safety latch seat belt.
Flotation Bag, Litter (Set)	—	1	
Flotation Bag, Trolley	—	1	
Frame, Protective Litter	—	1	
Gun, Line-Throwing	1	1	See Note.
Highline, Synthetic	1	1	Synthetic line must be double-braided polyester (MIL-R-24536), 350' (106.6 m) long x 4" (101.6 mm).
Line, Inhaul, Synthetic	1	1	Plaited polyester (MIL-R-24537) or nylon approved for use, 350' (106.6 m) long x 3" (76.2 mm).
Line, Outhaul, Synthetic	1	1	Plaited polyester (MIL-R-24537) approved for use, made up in accordance with paragraph 9.2.3.
Line, Sta/Sta Phone	1	1	
Line, Tag, Synthetic	—	2	Nylon, 12' (3.6 m) long x 2-1/4" (57.1 mm).
Line, Tag, Synthetic	2	—	Nylon, 6' (1.8 m) long x 2-1/4" (57.1 mm).
Litter, Stokes	—	1	
Marker, Transfer Station or Light Box	1	1	
Messenger, B/B Phone/Distance Line	1	1	
Paddles, Signal (Set) or Wands (Set)	1	1	
Phone, Sound-Powered	3	3	

Figure 9-4. Personnel Synthetic Highline Rig Equipment for Delivery Ship — One Station (Sheet 1 of 2)

DELIVERY SHIP EQUIPMENT	CHAIR	LITTER	REMARKS
Pins, Steel Cotter	*	*	Sizes to suit safety shackles used.
Projectile, Gun Line With Shot Line	2	2	See Note.
Preventer; 2' (60.9 cm) Long x 1/2" (12.7 mm) Wire Rope	1	1	Secured between trolley and chair or litter protective frame.
Shackle, Safety Anchor, 5/8" (15.8 mm)	3	2	To secure chair or litter protective frame to preventer; to secure chair to swivel (link and jaw).
Shackle, Safety Anchor, 7/8" (22.2 mm) or 3/4" (19.0 mm)	2	2	To secure inhaul and outhaul to trolley.
Shackle, Safety Anchor; 1" (25.4 mm)	1	1	To secure highline at receiving ship.
Shackle, Flat Iron; 1/4" x 1" (6.3 mm x 25.4 mm) With 3/8" (9.5 mm) Toggle Pin and Keeper Pin	—	4	To secure litter to protective frame.
Shot Line Bag	1	1	See Note.
Swivel, Link and Jaw, 1/2" (12.7 mm)	1	—	A bolt nut and cotter pin shall be used to secure the jaw to the trolley (see Figure 9-2 inset).
Thimble, NEWCO Type	1	1	Appropriate size for synthetic highline.
Tools, UNREP Working and Repair (Set)	1	1	See paragraph 2.3.9.
Trolley, Synthetic Highline	1	1	
*Quantity as required.			
NOTE: See paragraph 2.3.4 for limitation on use to a CV, LHA, LPH, LHD, or other ship with aircraft on deck.			

Figure 9-4. Personnel Synthetic Highline Rig Equipment for Delivery Ship — One Station (Sheet 2 of 2)

RECEIVING SHIP EQUIPMENT	CHAIR	LITTER	REMARKS
Block, Snatch, 10" (25.4 cm)	*	*	To fairlead 3" (76.2 mm) synthetic outhaul.
Bolo With Shot Line	2	2	See Note.
Gun, Line-Throwing	1	1	See Note.
Line, B/B Phone/Distance	1	1	
Marker, Transfer Station or Light Box	1	1	
Paddles, Signal (Set) or Wands (Set)	1	1	
Phone, Sound-Powered	3	3	
Projectile, Gun Line With Shot Line	2	2	See Note.
Shot Line Bag	1	1	See Note.
Tools, UNREP Working and Repair (Set)	1	1	See paragraph 2.3.9.
*Quantity as required.			
NOTE: See paragraph 2.3.4 for limitation on use to a CV, LHA, LHD, LPH, or other ship with aircraft on deck.			

Figure 9-5. Personnel Synthetic Highline Rig Equipment for Receiving Ship — One Station

CHAPTER 10

Vertical Replenishment and USMC Helicopter External Load Operations

10.1 CONCEPT OF VERTICAL REPLENISHMENT

VERTREP provides a capability for augmenting and enhancing alongside replenishment. It also permits increased flexibility and considerable latitude in replenishment planning, particularly regarding time and location of the UNREP operation.

There are some specific advantages of VERTREP that should be considered in determining the method of UNREP, particularly:

1. Reduction in overall time required to replenish the supported forces or units
2. Reduction or elimination of time that screening ships are required to be off station
3. Reduction in personnel involved
4. Capability of replenishing units:
 - a. In a dispersed formation
 - b. Engaged in tasks that make it impossible for them to come alongside
 - c. In heavy weather conditions when alongside steaming is hazardous or impossible
 - d. On station in shallow water or at anchor.

While the VERTREP transfer rate is normally less than the CONREP transfer rate for a major fleet unit, VERTREP can be used to distinct advantage by eliminating the time for approach, hookup, and disconnect in an alongside transfer. This is particularly true during small-scale replenishments when less than approximately 75 short tons (68 metric tons) are to be transferred. VERTREP transfer rates of up to 180 short tons

(163.2 metric tons) per hour or 120 lifts per hour can be achieved by a CV, LHA, LHD, or LPH with two helicopters in use. Some small units cannot receive loads at this maximum rate because of small or partially obstructed VERTREP platforms. To minimize time alongside for small units, a combination of VERTREP and CONREP can be used.

Air Capable Ship Aviation Facilities Bulletin No. 1 specifies the various requirements for all platforms. For information on certification, refer to NAEC-ENG-7576, APP 2 SUPP 1, and type commander directives. For waiver criteria, refer to Chapter 3 of NWP 3-04.1M (formerly NWP 42) and OPNAVINST 3120.28.

10.2 VERTREP HELICOPTERS

Currently, the H-46 is the most widely used VERTREP helicopter. The H-46 can VERTREP cargo on its external cargo hook or by internal loading. The tandem rotor configuration of the H-46 allows maneuverability without the wind restrictions normally associated with tail rotor helicopters; thus, the ships may vary course and speed while undergoing VERTREP. UH-1 helicopters are equipped with external cargo hooks and have a weight-limited VERTREP capability. H-2 series helicopters have a limited VERTREP capability because of their configuration and operational limitations. Although H-3 series helicopters were not designed with a VERTREP capability, those that have been modified by the addition of an external hook have a limited VERTREP capability. H-60 series helicopters are equipped with external cargo hooks and have a VERTREP capability. CH-53 helicopters are equipped with external cargo hooks and are used by the USMC for vertical lifts and by the USN for VOD operations. Refer to NWP 3-04.1M (formerly NWP 42) or APP 2 for the general capabilities of the type of helicopter employed. USMC vertical-lift operations are described in paragraph 10.16.

10.2.1 VERTREP With Dissimilar Aircraft.

VERTREP involving dissimilar types of aircraft (i.e., one H-46 and one H-60) or dissimilar service aircraft (i.e., USN H-46 and USMC H-46) is inherently more hazardous in that a VERTREP evolution is in many respects a type of highly dynamic formation flight. Varying aircraft patterns and procedures lead to uncertainties and dangers in an evolution that depends on a smooth and predictable movement of aircraft. Therefore, if dissimilar types of aircraft or dissimilar service aircraft are to be used during a VERTREP evolution, a face-to-face operational prebrief should be conducted. Items to be briefed shall include, but not be limited to, VERTREP patterns, safety of flight items, and emergency procedures.

10.2.2 Factors Affecting VERTREP

10.2.2.1 Wind. For VERTREP, the helicopter must hover over both the delivery and receiving ships. More engine power is required to fly at extremely low air speeds (0 to 15 knots) and high air speeds (90 knots and above) than is required at medium air speeds. The difference between engine power required to hover without a load and the maximum engine power available is the excess power which can be used to carry cargo. A relative wind of 15 to 30 knots is considered ideal. The helicopter should take off, make approaches, and hover into the relative wind. A relative wind of 330° or 030° is optimum for VERTREP.

Other relative winds are acceptable under differing conditions. Under high wind conditions, sea state is usually severe enough to cause ships to pitch and roll excessively when headed into the seas. If these conditions exist, it is normally better to steam downsea to provide a steadier deck. A downsea course probably will be downwind, but the relative wind may still be suitable for VERTREP with the H-46, and cargo handling conditions for the crews on the exposed deck will be improved. However, the increased rotor downwash from the hovering helicopter — because of this downwind condition — will create additional hazards for both helicopter and deck crews in the form of high winds, flying debris, and salt spray. The pilot should be consulted when a downwind course is contemplated.

Note

Pilots conducting VERTREP operations shall be notified prior to any course change. VERTREP may continue at the discretion of the aircraft commander while the ship is in a turn.

10.2.2.2 Ship Stationing. See Figure 10-1 for typical ship stations for VERTREP. Examples of other VERTREP stations and situations are:

1. A carrier is on a downwind course between flight operations.
2. The receiving ship (for VERTREP) is approaching a control ship for CONREP.
3. The receiving ship (for VERTREP) is alongside a delivery ship for CONREP.
4. Destroyers are in lifeguard station or proceeding to and from screening stations.
5. The receiving ship is at anchor, lying-to offshore, or steaming offshore when involved in combat tasks.

Note

For night VERTREP the receiving ship should be abeam at a distance of 300 to 500 yards.

There will be times when VERTREP can be conducted well beyond visual range, depending on the following factors:

1. Adequate communications and navigation aids between ships and helicopters
2. Type and number of loads (internal and external)
3. Time required and time available versus operational priority of requirement
4. Whether aircraft NATOPS requirements for night VERTREP can be met.

Generally, the carrying of external loads for long distances — over 35 miles (56 km) for heavy, high density loads and over 25 miles (40 km) for light, low density loads — is not considered a standard VERTREP procedure, but rather a capability that should be reserved for high priority cargo that justifies the time involved.

Note

A light, low density load is defined as any load with a high drag-weight ratio: generally, any load weighing less than 500 lb (227 kg) and those loads that have exceptionally large sail areas. Included in this definition are such items as aircraft drop tanks or canopies, rotor blade containers, and empty missile containers, which have aerodynamic characteristics that require extremely slow air speeds for safe VERTREP transit.

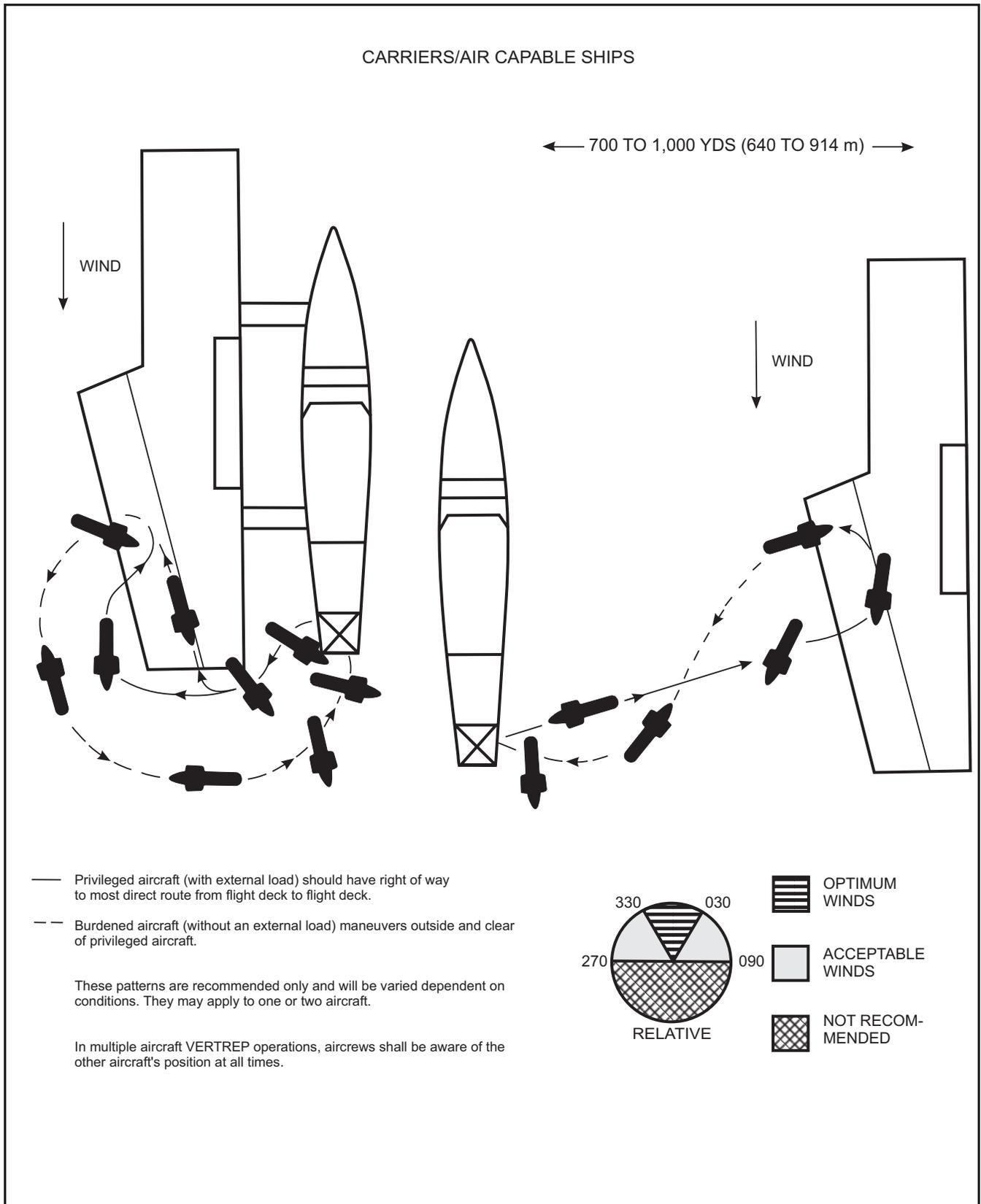


Figure 10-1. Typical Ship Stations and VERTREP Patterns (Sheet 1 of 2)

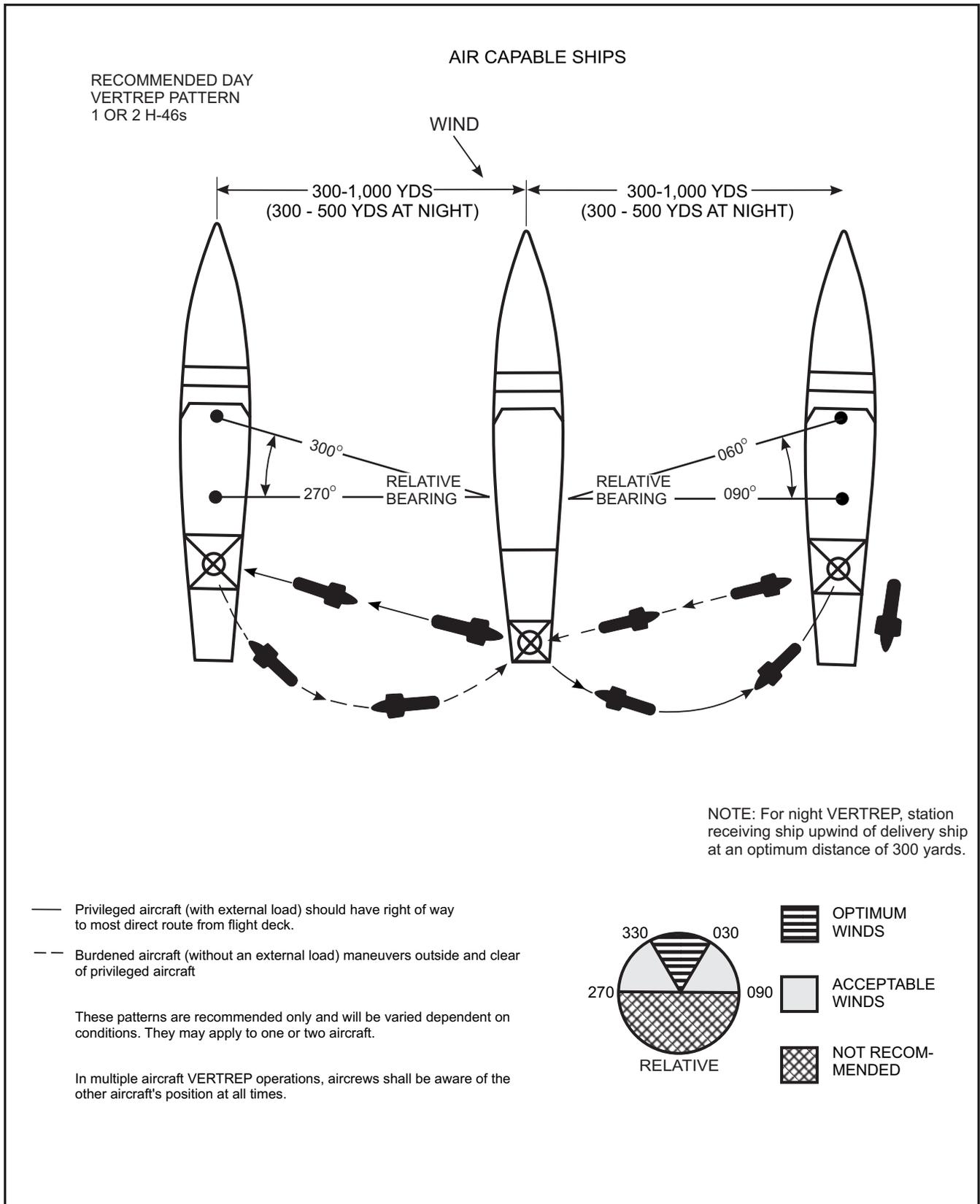


Figure 10-1. Typical Ship Stations and VERTREP Patterns (Sheet 2 of 2)

10.2.2.3 Ship-Produced Interference. It is more difficult to conduct VERTREP when either the delivery or receiving ship has another ship alongside that:

1. Creates turbulent air or vents hot stack gas over the helicopter pickup or drop area
2. Blocks off the wind in the pickup or drop area
3. Presents a physical obstruction to the desired flight pattern, necessitating a downwind approach or departure. Downwind approaches and departures with an external load should be avoided.

WARNING

Helicopters with an external load shall not overfly ships unless operational necessity so dictates.

10.2.2.4 Temperature and Atmospheric Pressure. These factors affect the lift capability of helicopters. Any increase in temperature or decrease in atmospheric pressure will decrease maximum lift capability. This loss in lift is a result of reduced engine performance and reduced aerodynamic performance of the rotor blades. Thus, a cold, dry day with high barometric pressure and a strong, steady, relative wind is best for VERTREP operations.

10.2.2.5 Helicopter Pilot Fatigue. OPNAVINST 3710.7 establishes guidelines for use by commanding officers in determining the maximum number of hours that pilots can fly during any given period. During day VERTREP, 6 to 8 hours are generally accepted as an effective limit of pilot endurance. During night VERTREP, the effective limit per pilot may be reduced to as few as 2 to 3 hours (see paragraph 10.11.1.2). Factors affecting pilot endurance include:

1. Deck pitch and roll
2. Weather conditions
3. Aircrew experience/currency
4. Number of hours without rest
5. Night operations and reduced visibility.

10.2.2.6 Helicopter Fuel Loading. A full fuel load adds substantial weight to the helicopter and thereby reduces the amount of cargo that can be lifted.

As fuel is expended, more cargo can be lifted. Factors to be considered in determining the fuel load are:

1. Distances to be flown
2. Amount of cargo to be transferred
3. Meteorological conditions.

When conditions are favorable for lifting heavy loads, more fuel generally can be carried.

10.2.2.7 Number of Helicopters Used. The number of helicopters used during a VERTREP operation will depend on:

1. Type and number of ships being replenished
2. Distance between ships
3. Number of helicopters available
4. Ability of the receiving ship to keep the cargo drop area(s) clear
5. Ability of the delivery ship to provide cargo at a sufficient rate
6. Administrative flights scheduled by the helicopter coordinator
7. Helicopter aircrew proficiency and training requirements.

10.3 HELICOPTER COORDINATOR

The replenishment group commander will designate a helicopter coordinator to control and coordinate all helicopters and VERTREP operations. Normally, the helicopter coordinator will be the senior commanding officer of the replenishment ship with VERTREP helicopter(s) embarked and participating in the operation.

The helicopter coordinator will make appropriate recommendations to the replenishment group commander concerning:

1. Course for optimum relative wind for helicopter operation
2. Delivery ship position in the formation to shorten the distance between transferring and receiving ships to enhance VERTREP effectiveness without embarrassing or hazarding other ships in formation

3. Coordination of helicopter administrative flights through the OTC.

The helicopter coordinator will be responsible for (1) the control of all passengers being transferred by helicopter and (2) the issuance of a manifest to the aircraft on all passengers so transferred. The helicopter coordinator will ensure that each transferring ship retains a copy of the passenger manifest for each flight departing the ship.

10.4 COMMUNICATIONS

10.4.1 Radio. Ships scheduled to receive material by VERTREP should maintain a continuous guard on the designated helicopter control circuit. The circuit should be activated and tested prior to VERTREP. Circuit discipline must be maintained at all times. The helicopter control circuit shall not be used for routine traffic between ships guarding this circuit.

Note

Since the helicopter pilot depends primarily on internal phone directions from the air crewman on all cargo pickups and drops, routine transmissions to the pilots should not be made during this maneuver. (In most helicopters, the copilot monitors all transmissions during delivery — the pilot's UHF receiver switch is turned off.) Transmissions will normally be made while the helicopter is traveling between ships.

10.4.2 Flag and Hand Signals. Flag and hand signals are in accordance with ATP 1, Vol. II, and NAVAIR 00-80T-113.

10.5 VERTREP EQUIPMENT

10.5.1 Pallets. Four-way pallets are platforms 40 inches (101.6 cm) by 48 inches (121.9 cm) by approximately 4 inches (10.2 cm) high, constructed of welded steel or hardwood, usually oak. They are designed to be lifted by a forklift truck from any side. Cargo is banded or strapped to pallets to provide a stable and transportable load. A nestable pallet made of tubular steel has an added advantage in that the empty pallets require less storage space (Figure 10-2).

10.5.2 Cargotainers. A cargotainer is a pallet with wire mesh sides that fold down for compact storage. The cargotainer is ideal for transferring loose and odd-shaped items (Figure 10-3).

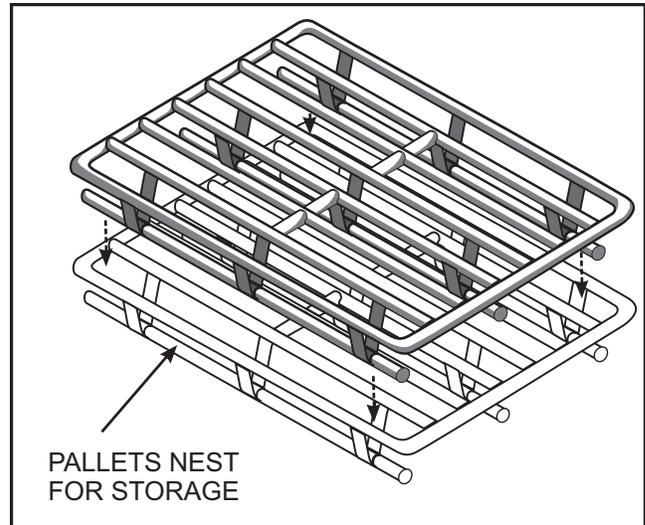


Figure 10-2. Nestable Tubular Steel Pallet

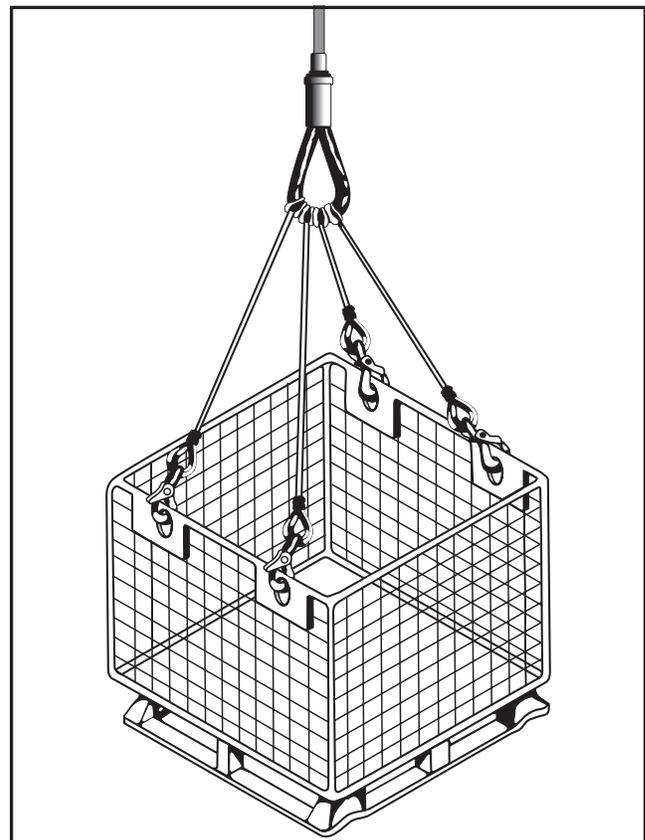


Figure 10-3. Hoisting Sling Hooked to Cargotainer (Four Attachment Points)

10.5.3 Forklift Trucks. Forklift trucks are used aboard UNREP ships to transport cargo to and from the staging area. They are similar to the ordinary commercial variety used for cargo handling ashore. Carriers or amphibious ships that normally carry forklift trucks are encouraged to use them to clear VERTREP cargo from the deck. Pallets are readily cleared by hoisting them from underneath. If this is not possible, an alternate method is to raise the forks and use them as an attachment point to suspend the load with the use of a Mk 91 Mod 0 adapter hook (Figure 10-4).



The capacity of the forklift truck decreases dramatically as the tines are raised and extended. Loss of control is possible if the weight of the load is not distributed properly.

Note

Refer to NAVSEA OP 4098 for approved types of equipment and their proper use.

10.5.4 Cargo Nets. The bulk of VERTREP cargo is transported in nylon cargo nets made of 1-1/2-inch (38.1 mm) nylon webbing (Figure 10-5). Overall size is 12 feet by 12 feet (3.6 m by 3.6 m) or 14 feet by 14 feet (4.2 m by 4.2 m). The Mk 16 Mod 0 cargo pallet, which consists of a net assembly bolted to a Mk 3 Mod 0 pallet, is used for transfer of loose containers and cargo (Figure 10-5). Oblong metal rings on each of the four corners are used to lift the net. Rough treatment, such as dragging across flight decks, causes extensive damage to nylon webbing, necessitates regular repair, and should be avoided.

10.5.5 Adjustable Pallet Sling. The adjustable pallet sling is a two-loop wire rope sling for lifting loaded pallets without using a cargo net (Figure 10-6). Lifting thimbles provide the attachment points for the hoisting sling used to carry the load by helicopter. There are four models of this sling, identified by color-coding, the difference being their size:

1. Mk 85 — red — for loads 13 to 31 inches (33.0 to 78.7 cm) high
2. Mk 86 — black — for loads 29 to 40 inches (73.6 to 101.6 cm) high
3. Mk 87 — green — for loads 36 to 50 inches (91.4 to 127.0 cm) high

4. Mk 100 — yellow — for loads 48 to 70 inches (121.9 to 177.8 cm) high.

10.5.6 Missile Containers and Dollies. Two methods of missile VERTREP are currently used — the choice is dictated by the strikedown method employed aboard the receiving ship. In the first method, missiles and boosters are carried in containers, such as the Mk 183, Mk 199, and Mk 200. Aboard the UNREP ship the containers can be transported by a forklift truck. Aboard receiving ships, a Mk 42 or Mk 45 hand truck is attached to each end of the container to move the load from the VERTREP area to the strikedown equipment for decanning. In the second method, missiles are transferred in the Mk 6 or Mk 30 missile dolly (Figure 10-7). The dolly can be transported by forklift truck, manhandled on casters wheels, or lifted by its sling. It is constructed of tubular steel and is provided with a deadman brake system, shock absorbers on each wheel, and fold-down side bumpers. The dolly provides mobility and shock protection during VERTREP of missiles and boosters.

10.5.7 Hoisting Sling Mk 105. This sling, called the multileg-pole pendant, is approved for all types of VERTREP loads up to 6,000 lb (2,721 kg). The Mk 105 consists of two parts: the pendant and the legs (Figure 10-8). The pendant, made of 1-1/8-inch (28.5 mm) diameter, double-braided nylon rope, is approximately 12 feet (3.6 m) in length. It has a silicone-impregnated eye at each end. The silicone impregnation allows the eye to slip off the helicopter's cargo hook when released and aids in removing the legs from the pendant. A 6 foot (1.8 m) plastic reach tube encases the upper portion of the pendant and provides the rigidity needed to place the upper eye over the helicopter's cargo hook. The legs are made of color-coded, 15/16-inch (23.8 mm), double-braided nylon with an open eye splice at one end and a positive-closing, self-locking, cargo hook at the other end. The regular leg (orange) is 6 feet (1.8 m) long and the long leg (green) is 10 feet (3.0 m) long. As many as six legs may be attached to the pendant's lower eye by means of choker hitches (Figure 10-8). The number of legs used is determined by the number of attachment points on the load. Four regular legs are furnished with each pendant at the time of issue. The safe working load for a single leg is 3,000 lb (1,360 kg). A benefit of using nylon rope is its ability to act as a shock absorber between the helicopter and the load. The pendant's stretch allows the pilot to slowly "take up" on the load, thereby reducing the g's applied to the load as the slack goes out of the pendant.

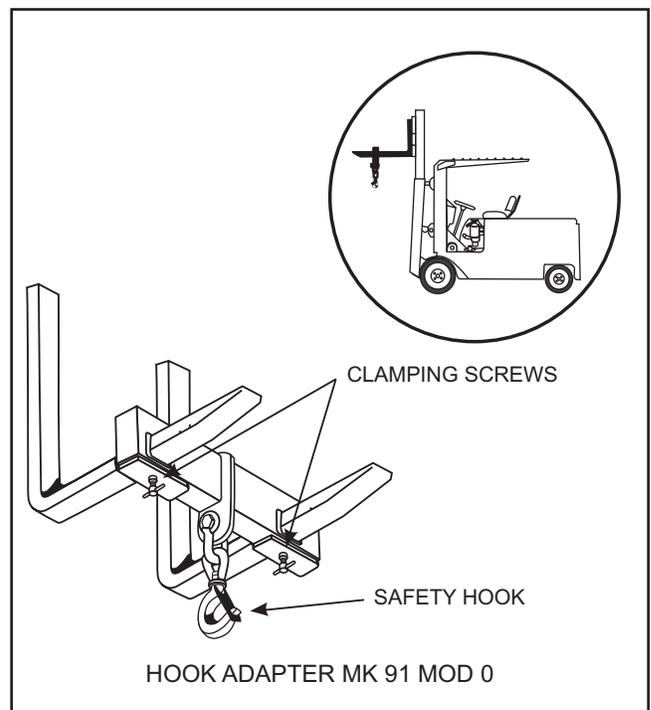
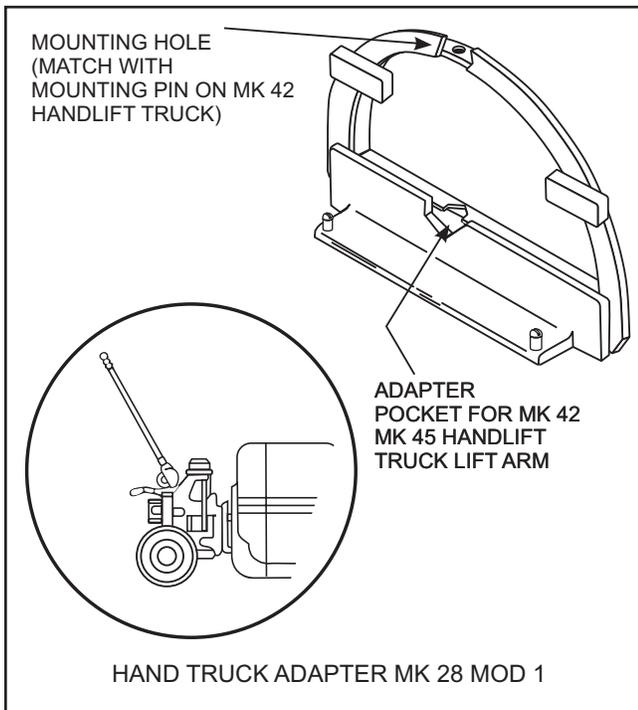
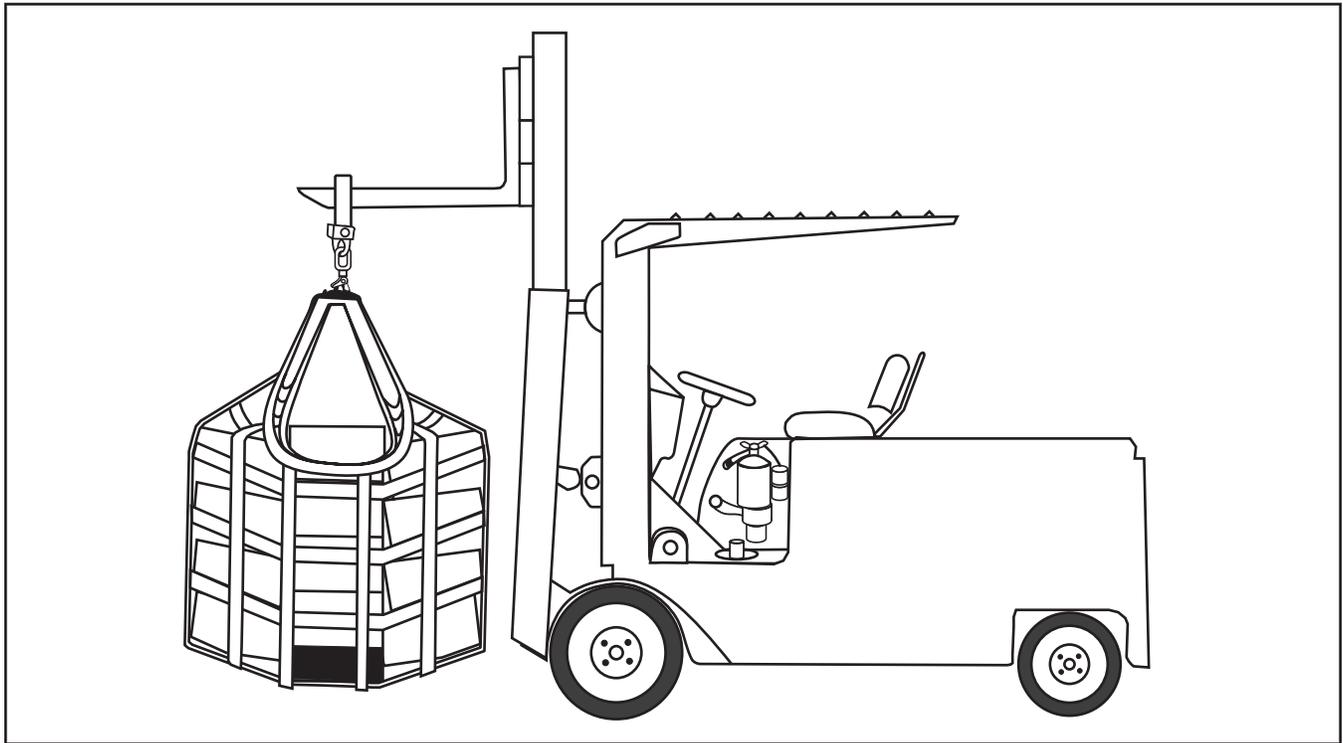


Figure 10-4. Netted Load Being Lifted From Top by Forklift Truck

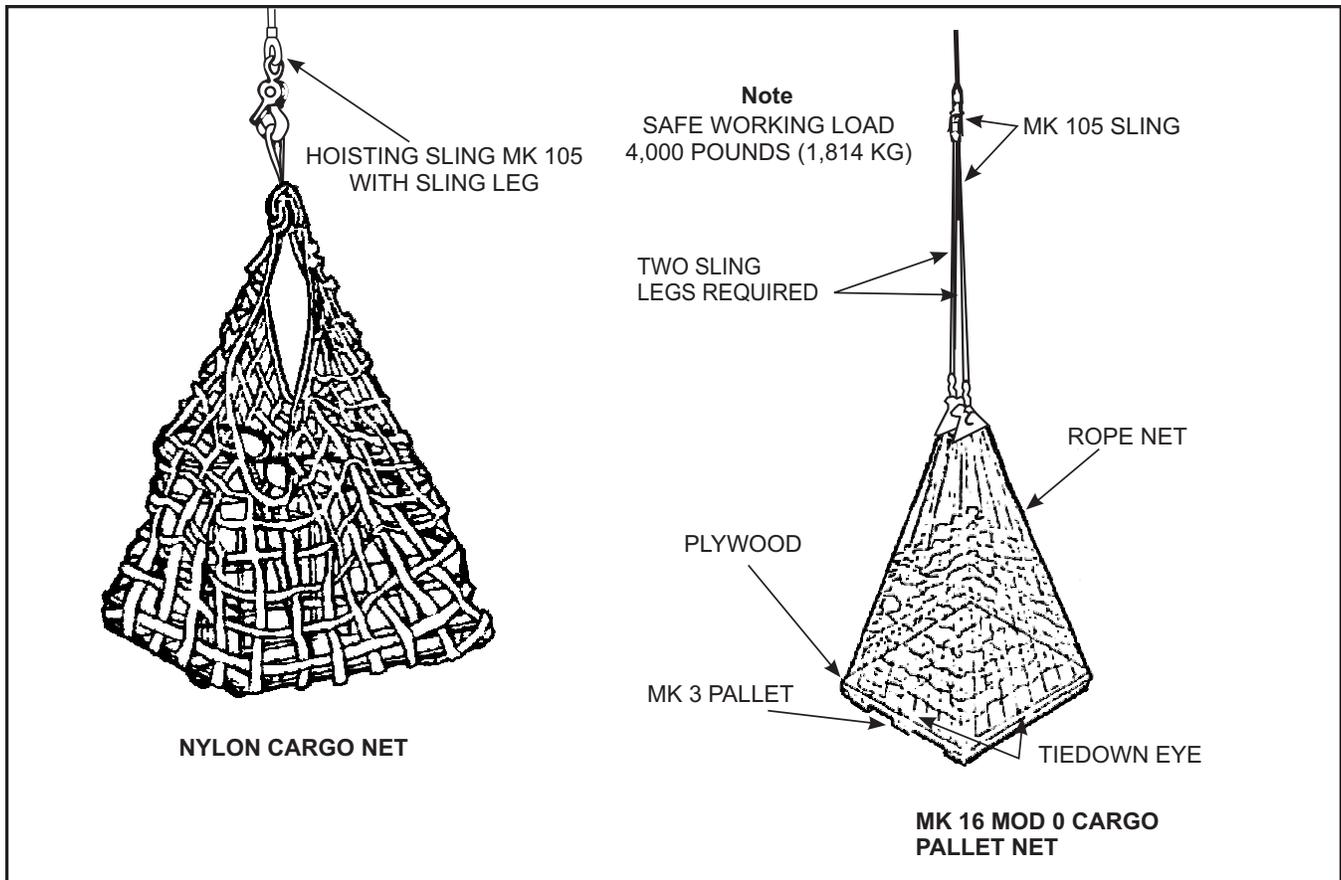


Figure 10-5. Nylon Cargo Net and Mk 16 Mod 0 Cargo Pallet Net

10.5.8 Hoisting Slings Mk 89, 90, and 91. These forerunners of the Mk 105 hoisting sling are still in use by the fleet and are identical in appearance to the multileg pendant, except that a safety hook is used instead of the lower eye. The slings are made of 1-inch (25.4 mm), double-braided nylon, have a 4,000 lb (1,814 kg) capacity, and come in 6, 13, and 20-foot (1.8, 3.9, and 6.0 m) lengths (Figure 10-9a).

10.5.9 Hoisting Sling Mk 92. This 20-foot (6.0 m) recovery pendant has an eye and a short, 1-foot (30.4 cm) reach tube on the upper end and a hook on the lower end. It is carried in the helicopter and lowered for picking up empty pallets, nets, and other VERTREP equipment at the end of a VERTREP to ships with Class 5 platforms. The safe working load is 4,000 lb (1,814 kg) (Figure 10-9b).

10.5.10 Hoisting Sling Mk 128 Mod 0. This sling comes in two parts, a pendant assembly and a leg assembly (two furnished with the unit). The pendant assembly has a spliced eye at each end and a stiffening tube to facilitate overhead attachment (Figure 10-10).

One eye attaches to the helicopter cargo hook. The other eye is for attachment of the leg assembly (Figure 10-11). The legs, color-coded green, have a spliced eye at one end and a hook at the other end. The legs are fastened to the eye of the pendant with a choker hitch. The entire assembly with one or more legs is rated at 4,000 lb (1,814 kg).

WARNING

Not all hoisting slings are compatible with all helicopters. Ensure compatibility prior to use. Do not alter a hoisting pendant to force a fit.

10.5.11 Pallet Trucks. The UNREP ship carries pallet trucks, also called pallet transporters or pallet jacks, for use by the receiving ship to clear pallets from the drop zone. When requested, the pallet trucks are normally flown to the receiving ship as the first load and returned after the last load has been cleared from the drop zone.

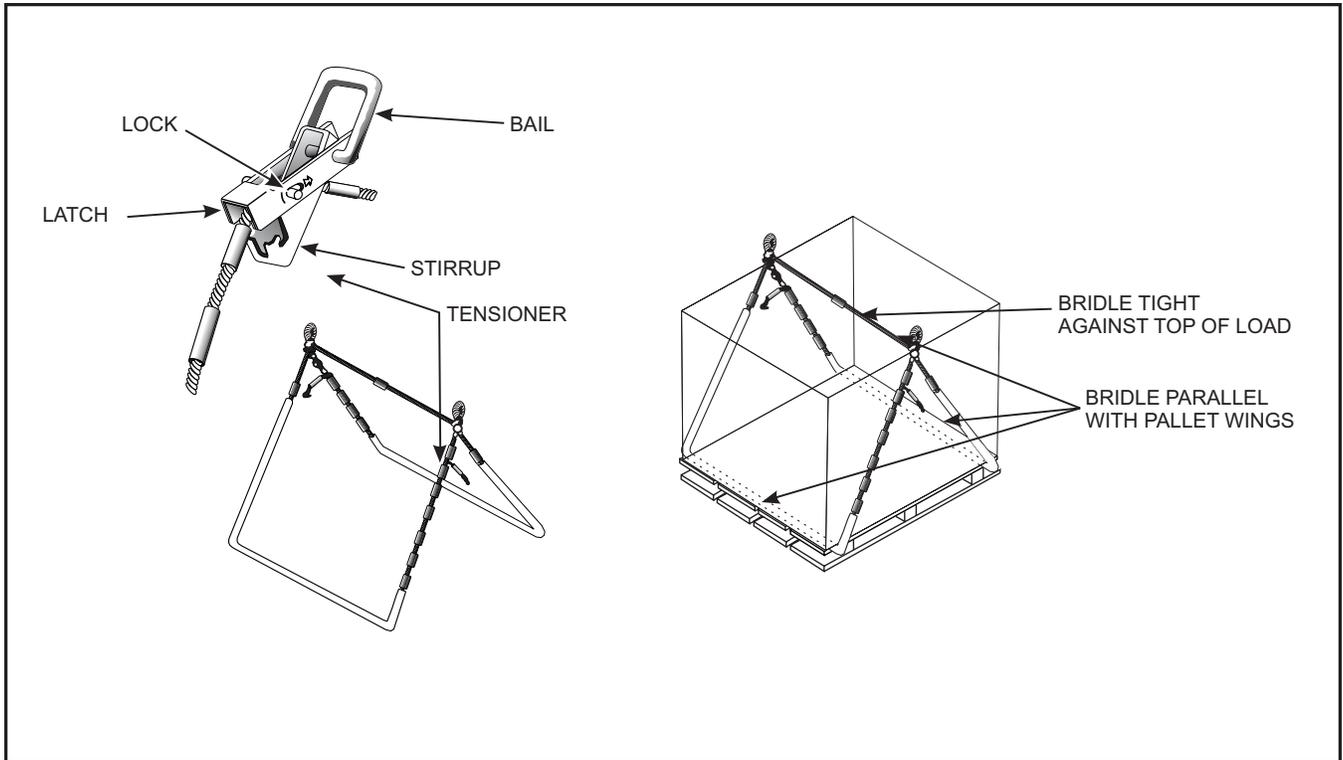


Figure 10-6. Adjustable Pallet Sling

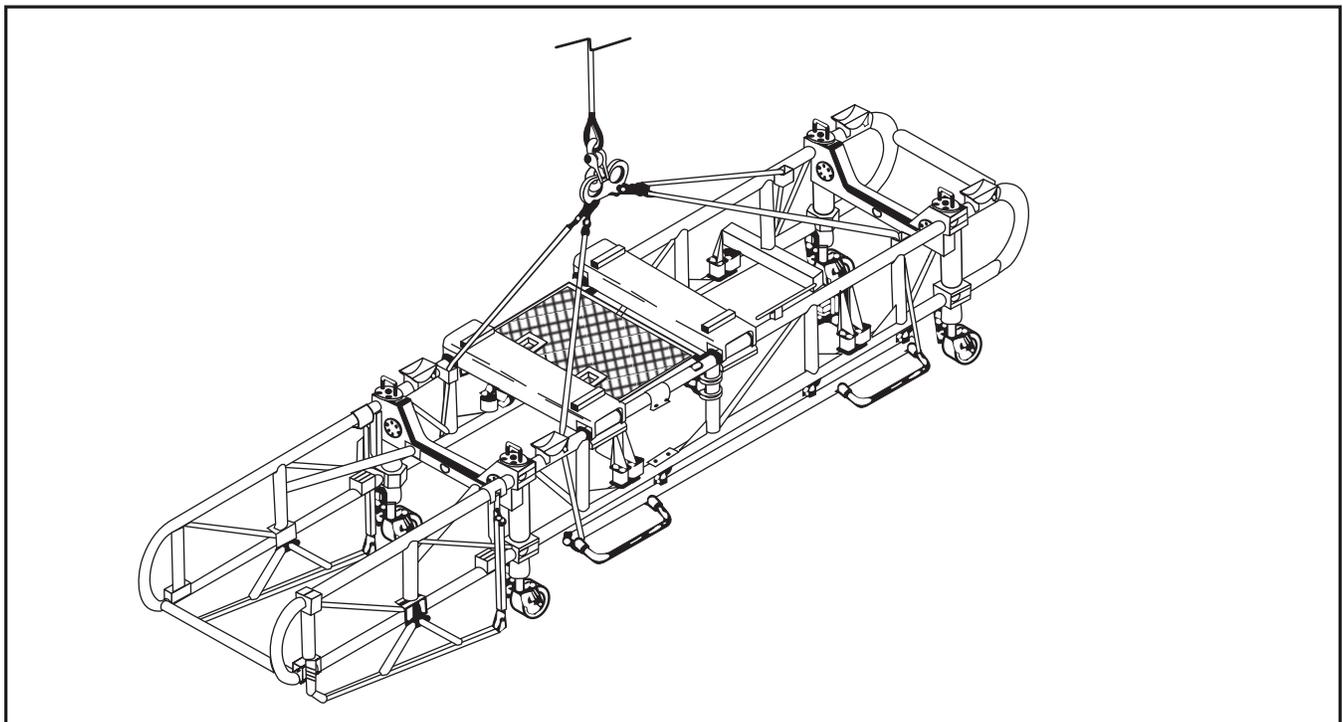


Figure 10-7. Hoisting Sling Hooked to Mk 6 Mod 3 Missile Dolly

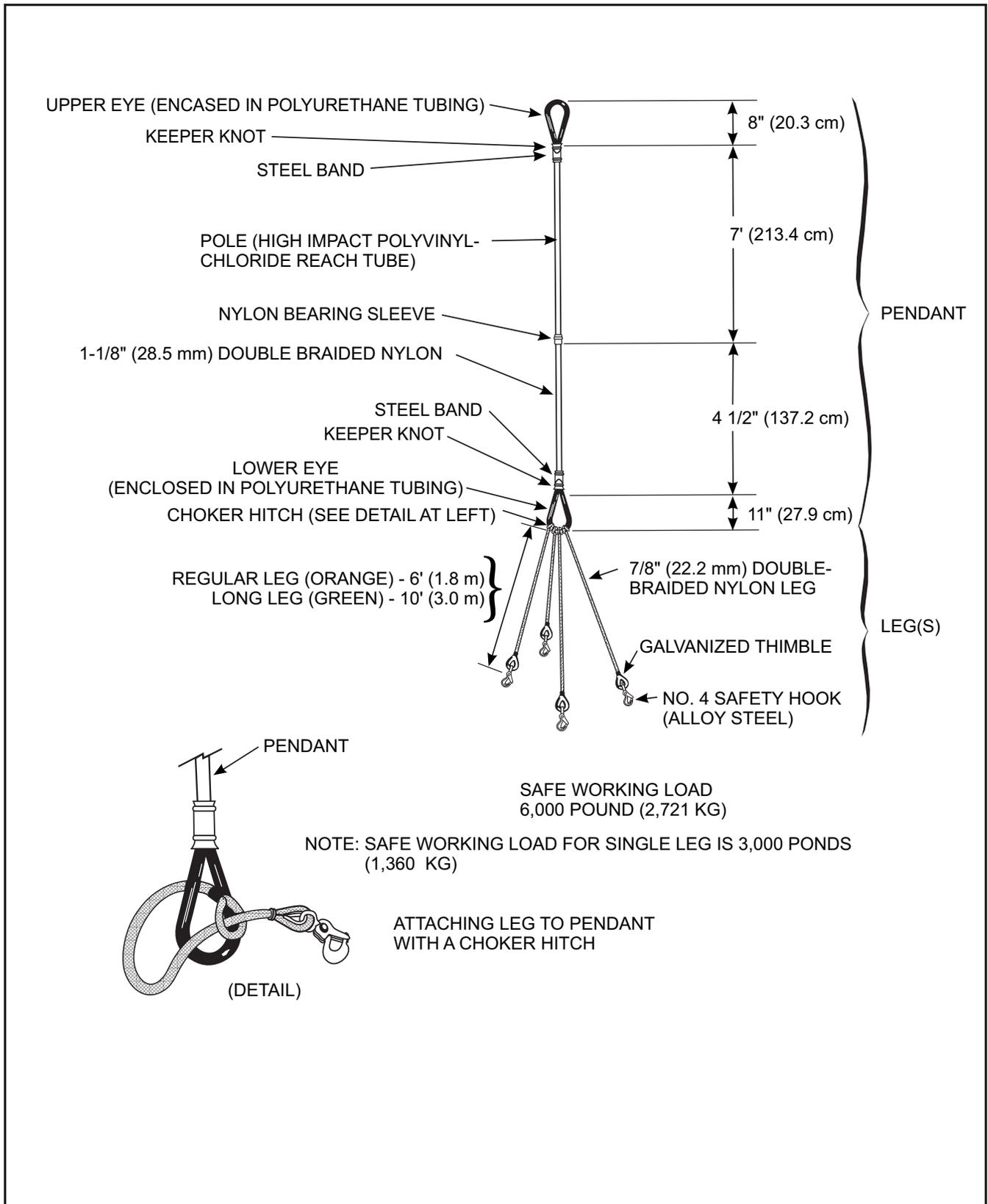


Figure 10-8. Mk 105 Hoisting Sling (Multileg-Pole Pendant)

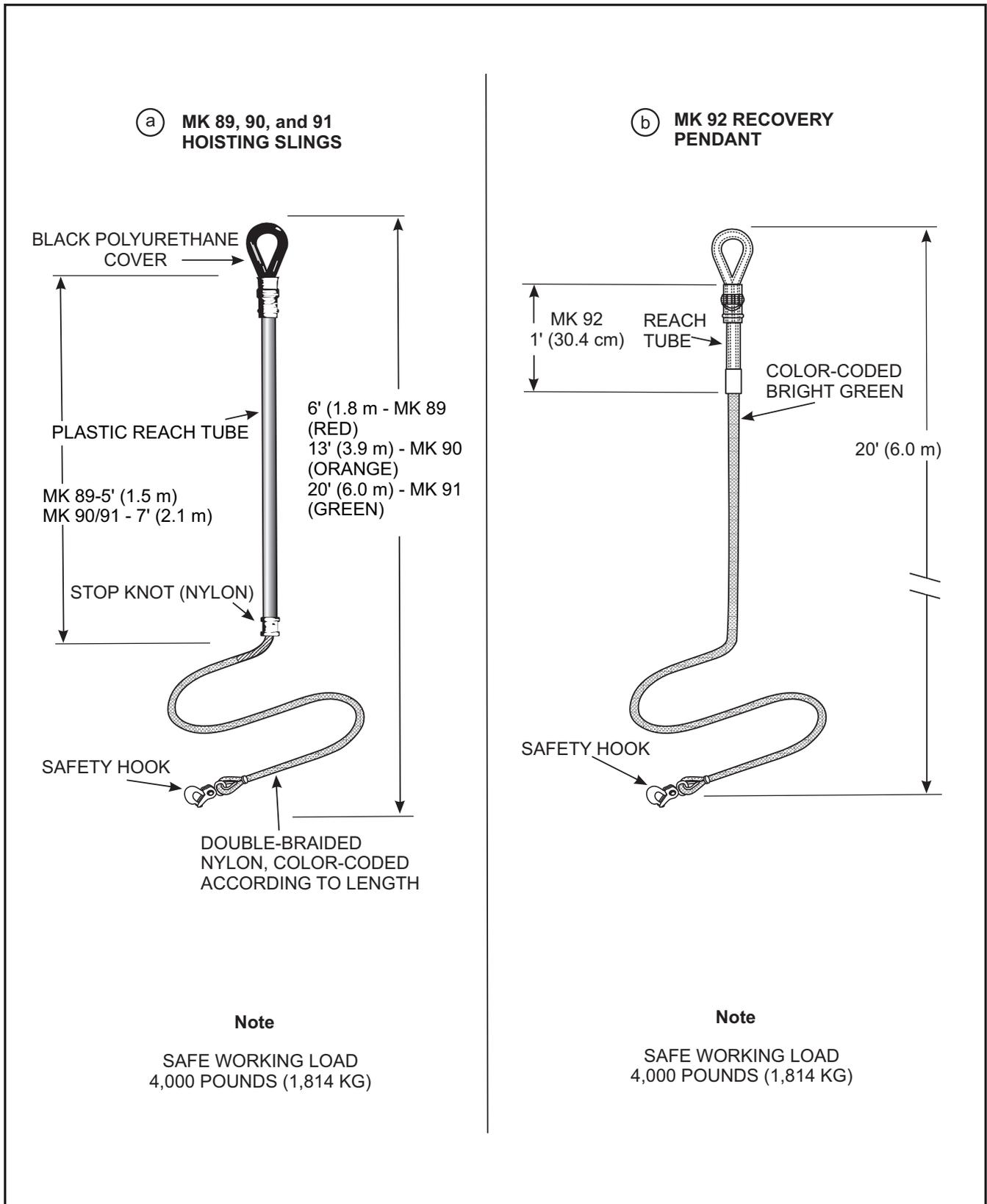


Figure 10-9. Hoisting Sling Mk 89, 90, and 91 (Single-Leg) and Recovery Pendant Mk 92

10.6 VERTREP PREPARATIONS

Plan a VERTREP operation several days before the actual flight operation. From 3 to 15 days before a scheduled VERTREP, distribute issue documents for customer ships to the cargo-hold captains. Hold a replenishment planning conference to develop a cargo breakout plan. From 1 to 3 days in advance of the scheduled delivery, begin breakout, strikeup, pallet assembly, and

prestaging. Stage as much cargo as possible near the VERTREP area before the actual operation begins.

WARNING

Remove all foreign object damage (FOD) material from the VERTREP area prior to flight operations (see Figure 10-12).

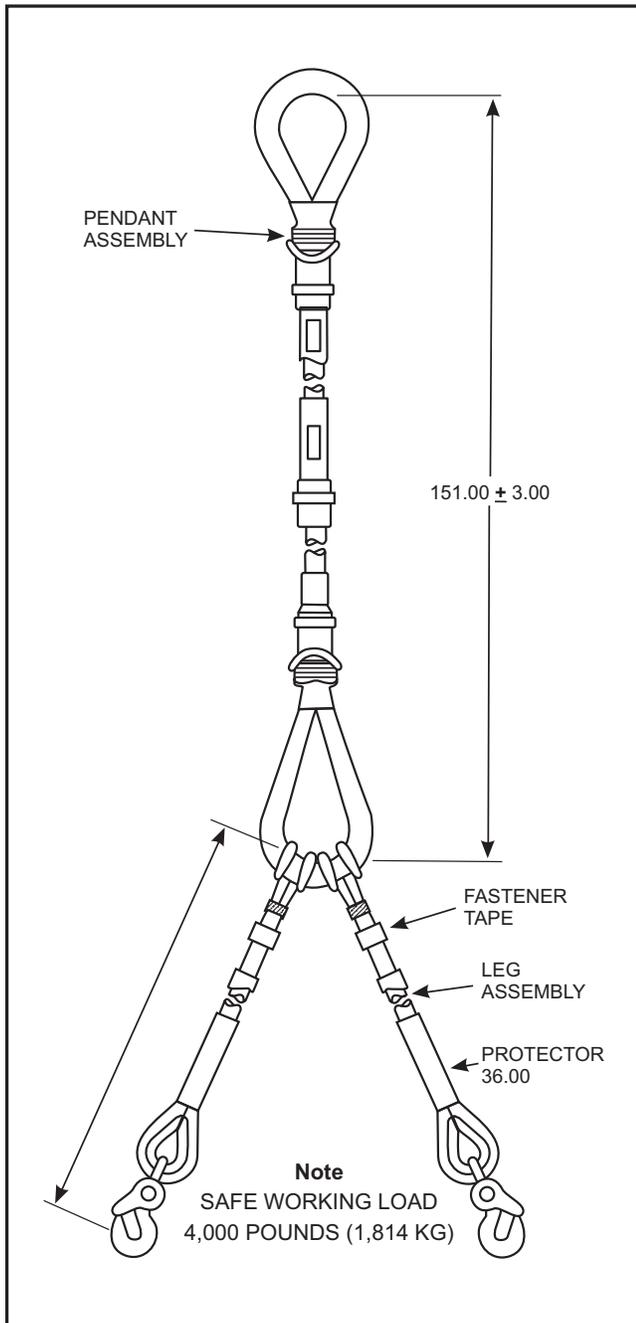


Figure 10-10. Pendant Assembly — Hoisting Sling Mk 128 Mod 0

10.6.1 Load Preparation. The primary concern when preparing loads is to provide a load that rides safely in flight and arrives at the receiving ship undamaged. VERTREP loads differ from CONREP loads in that they are subject to extremely high winds from rotor downwash during hover and during the flight between ships. The detailed procedures in NAVSEA S9750-AA-MMA-010 for preparing ordnance loads for VERTREP can also be used for preparing other types of loads of similar configuration.

10.6.2 Pallet Assembly

1. Loosely packed pallets are undesirable and dangerous. Stack small boxes and crates and strap them to the pallet to provide a stable and transportable load.

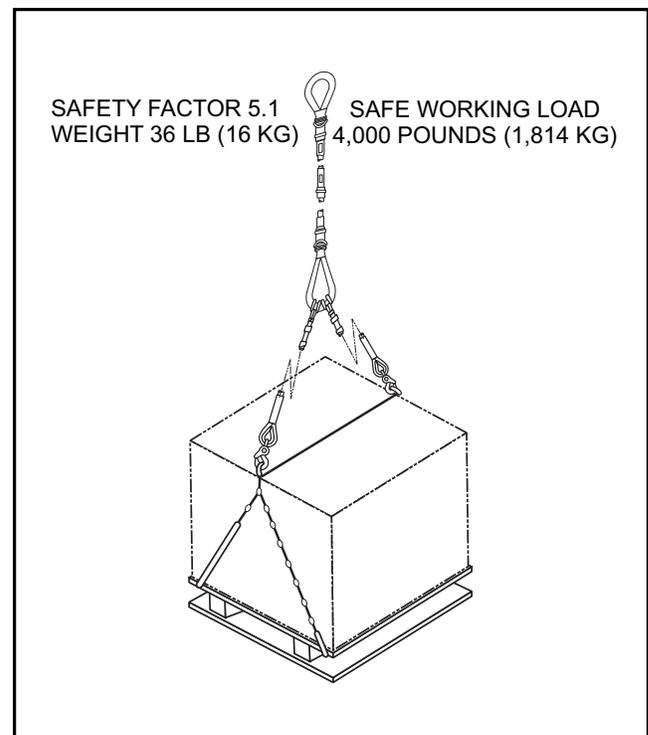


Figure 10-11. Hoisting Pallet With Hoisting Sling Mk 128 Mod 0 (Two Attachment Points)

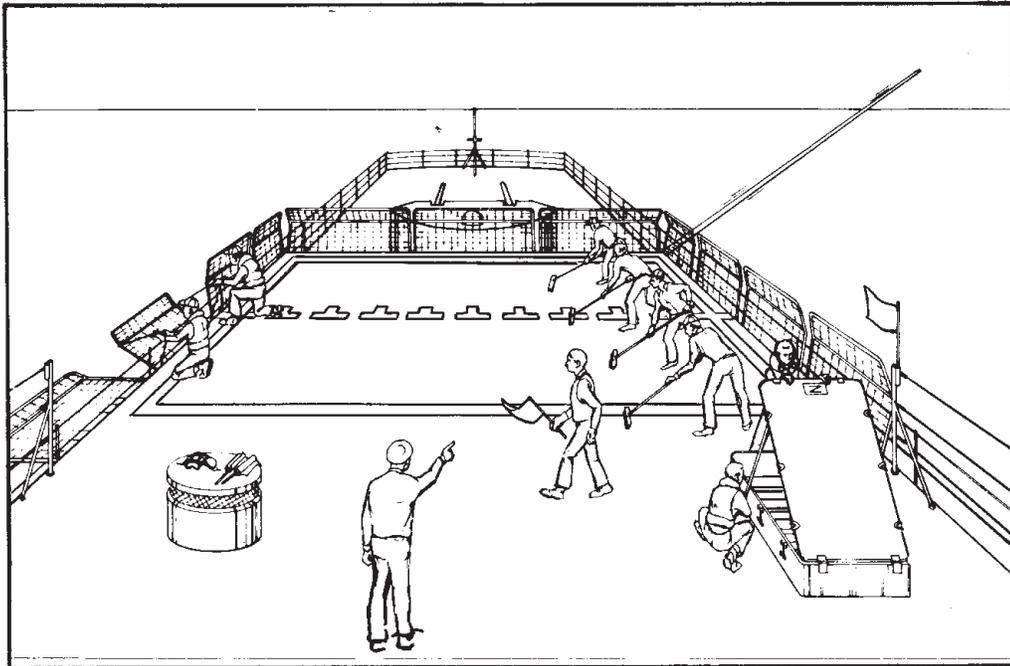


Figure 10-12. Preparation of the VERTREP Area

2. Interlace load layers whenever possible.
3. Tightly and adequately band pallet loads. Add nylon strapping to prevent a load shifting when the pallet is moved by forklift truck or while it is in flight.
4. Check for load integrity any cargo that was palletized at the naval ammunition depot or supply center. Reband as necessary.

10.6.3 Cargotainer Loading

1. Raise and lock the sides of the cargotainer — before or after — loading all cargo.
2. Secure light items near the top of the cargotainer. Use strapping or covers to keep them from being blown out during transfer.

10.6.4 Cargo Net Loading

10.6.4.1 Loose Cargo

1. Use nets without pallets for transferring awkward material that cannot be banded to a pallet. Ensure the material will not slip through the opening of the net.
2. Avoid extremely light loads. Because of the slow helicopter speed required for transfer, it is

possible that the load may blow up against the bottom of the helicopter or into the rotor blades.

3. Do not load small cartons on the bottom of the net, where they may be forced out of the openings in the net.
4. Cover or enclose lightweight or low density articles placed on top of the load, to keep them from blowing out of the net.

One method of safeguarding small items against loss in flight is to secure the corners of the net together by taking opposing corner rings and weaving them through at least two web straps in the webbing below the opposite rings. Figure 10-13 illustrates the steps to be used. Fasten the sling leg through all four corner rings. When the helicopter lifts the net, the weight of the load will cinch the net tight and prevent spillage of items over the sides of the net.

10.6.4.2 Palletized Cargo. The following procedure is the preferred method for loading palletized cargo in a net:

1. Band cargo to the pallet (if it is not already banded).
2. Lay the cargo net out on the deck and place the loaded pallet in the center of the net.

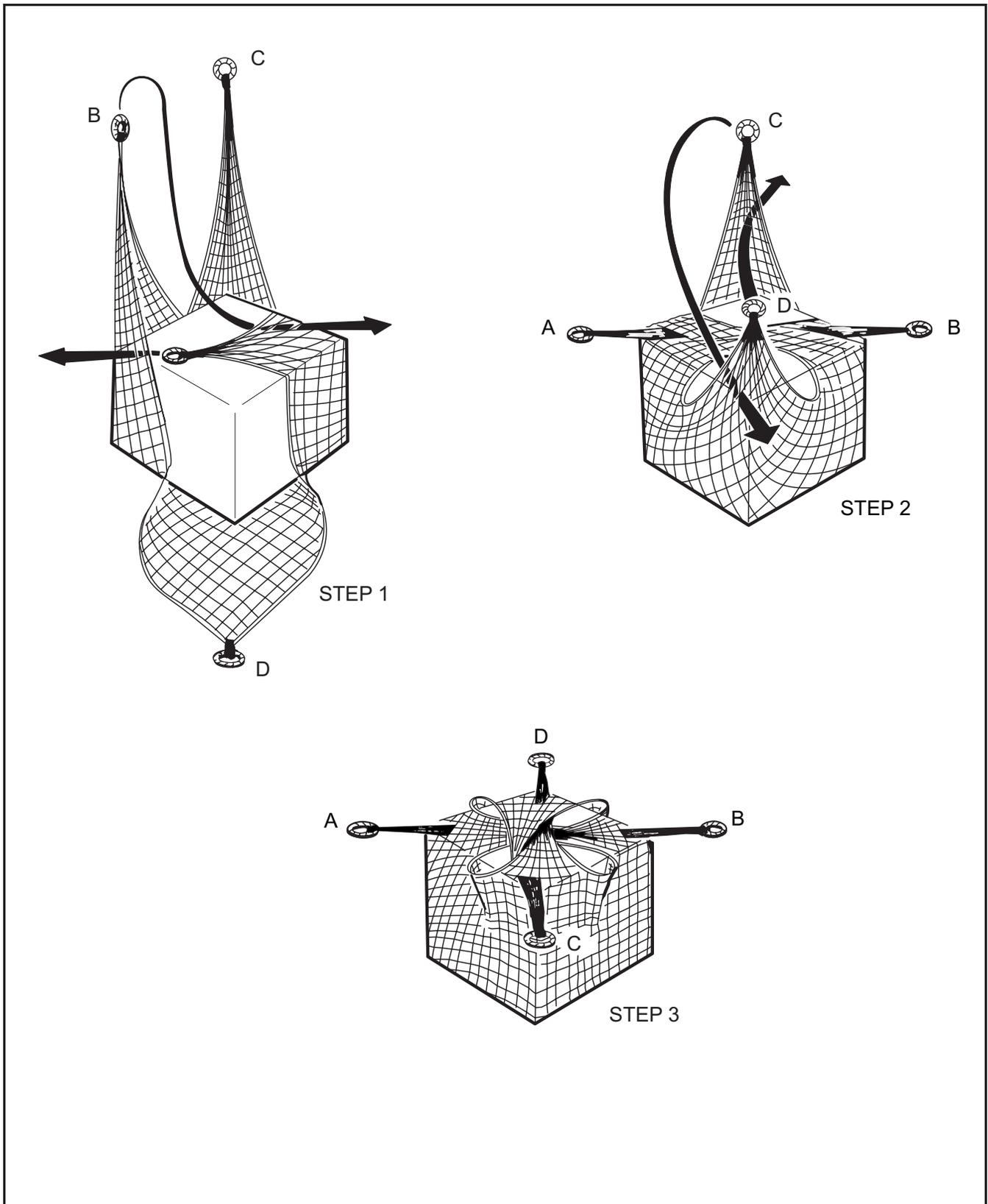


Figure 10-13. Securing Cargo Net With Loose Cargo

3. Draw the net up around the load and lay the corners of the net loosely on top of the load.
4. Secure the rings with a becket.
5. To move the pallet by forklift, carefully insert the forks through the net's webbing and hoist the pallet.

WARNING

Never place a netted load upon another pallet for movement by forklift. When the helicopter lifts the load, the loose pallet may become a missile hazard because of rotor wash. The pallet within the net is adequate for moving the load by forklift.

Note

An alternate (and sometimes preferred) method of moving a netted pallet is to use the forks as an overhead lifting device with the use of a Mk 91 Mod 0 adapter hook (see Figure 10-4).

10.6.5 Missile Dolly Loading. See NAVSEA OP 3192 or OP 3206 procedures for preparing bare missiles and loading them into the Mk 6 missile transfer dolly for VERTREP.

10.7 WEIGHT AND IDENTIFICATION OF LOADS

As each load is made up, mark the load with its weight in pounds (e.g., 500 LB) and any identification required by the customer. The method of marking depends on the procedure of the individual delivery ship. Use chalk, a felt-tipped pen, or a tag. Tags may be color-coded for easier identification. Marking of loads facilitates pairing of loads — the combining of light loads to provide the most efficient weight for helicopter lifting. Select the desired combination of loads that achieves the desired weight for each lift.

As many as four pallets may be carried per lift, depending on the size of the drop area, the ability of the receiving ship to clear the drop zone, and the fuel load of the helicopter. The average weight of a single or combined load (using an H-46 helicopter) is 3,000 lb (1,360 kg). Heavier loads may be carried under ideal weather and atmospheric conditions, depending on the helicopter's fuel load, and when cleared by the helicopter pilot. However, heavy

VERTREP lifts must not exceed the safe working load of the hoisting sling.



Paired loads should be approximately the same configuration to reduce the possibility of tipping the load on pickup or drop.

Note

VERTREP loads shall be color-coded when transfers are conducted under EMCON conditions.

10.8 ATTACHING SLINGS TO LOADS

10.8.1 Adjustable Pallet Slings. Palletized ordnance may be transferred without cargo nets using the adjustable pallet sling (Figure 10-14).

1. Select the proper sling according to the height of the load (see paragraph 10.5.5).
2. Pass each loop of the sling under the overhang made by the upper boards on the sides of the pallet.
3. Pass each basket leg of the sling under the wings on each side of the pallet.
4. Pull the ends of the sling legs containing the swage stops through the sling tensioners until the bridle is tight across the top of the load and slack is out of the sling.
5. Adjust the sling so that the lifting thimbles are centered and at an equal height up from the pallet.
6. Engage each tensioner over the nearest swage stop, lower the latch to the stirrup, and lock the tensioner.



The last swage stop on each sling leg is a safety bead and shall never be used.

10.8.2 Safety Hook Operation. The safety hook is the only working part of the hoisting sling. An explanation of its operation is needed before any descriptions of attaching hoisting slings are covered. See Figure 10-15.

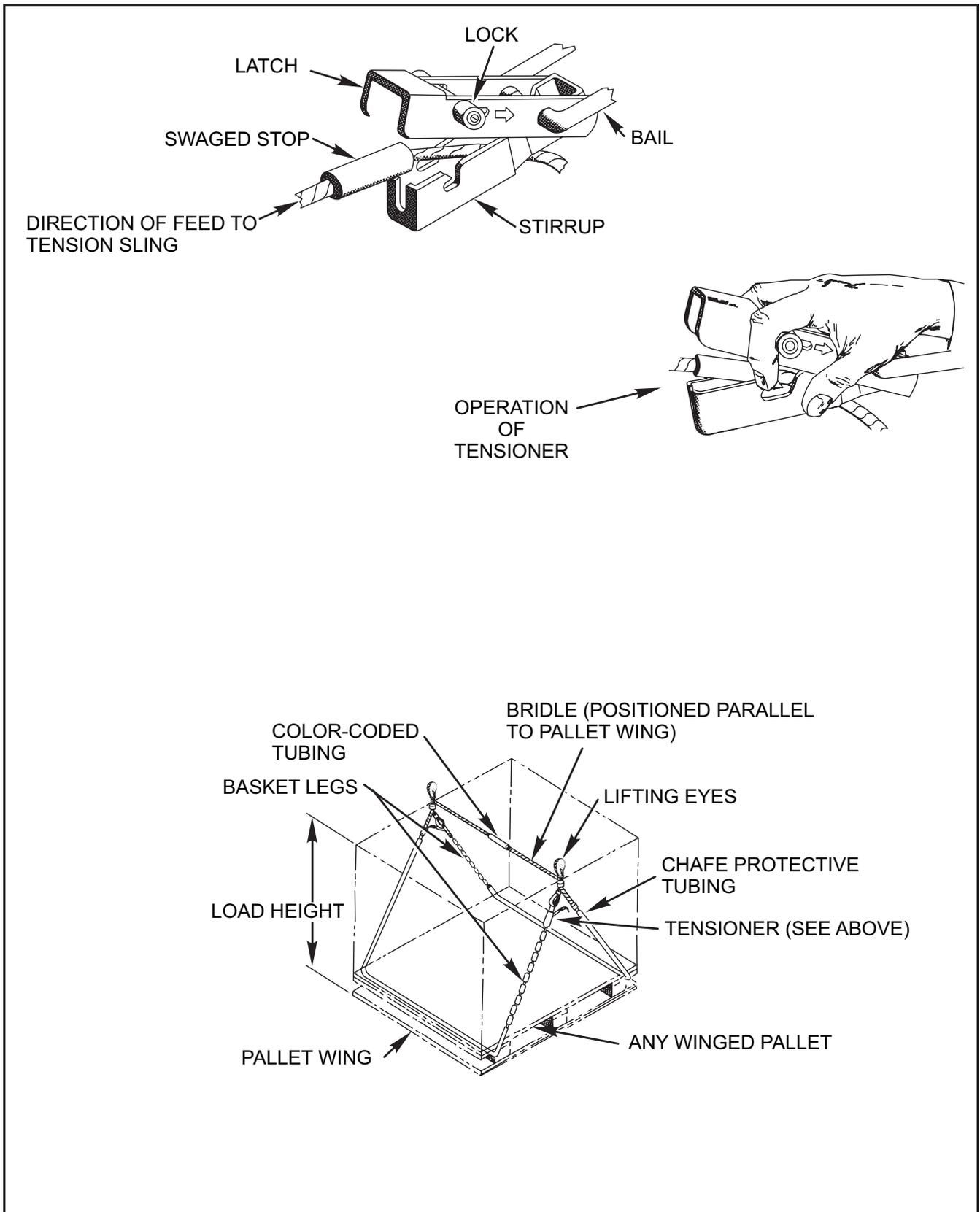


Figure 10-14. Adjustable Pallet Sling Mk 85, 86, 87, and 100

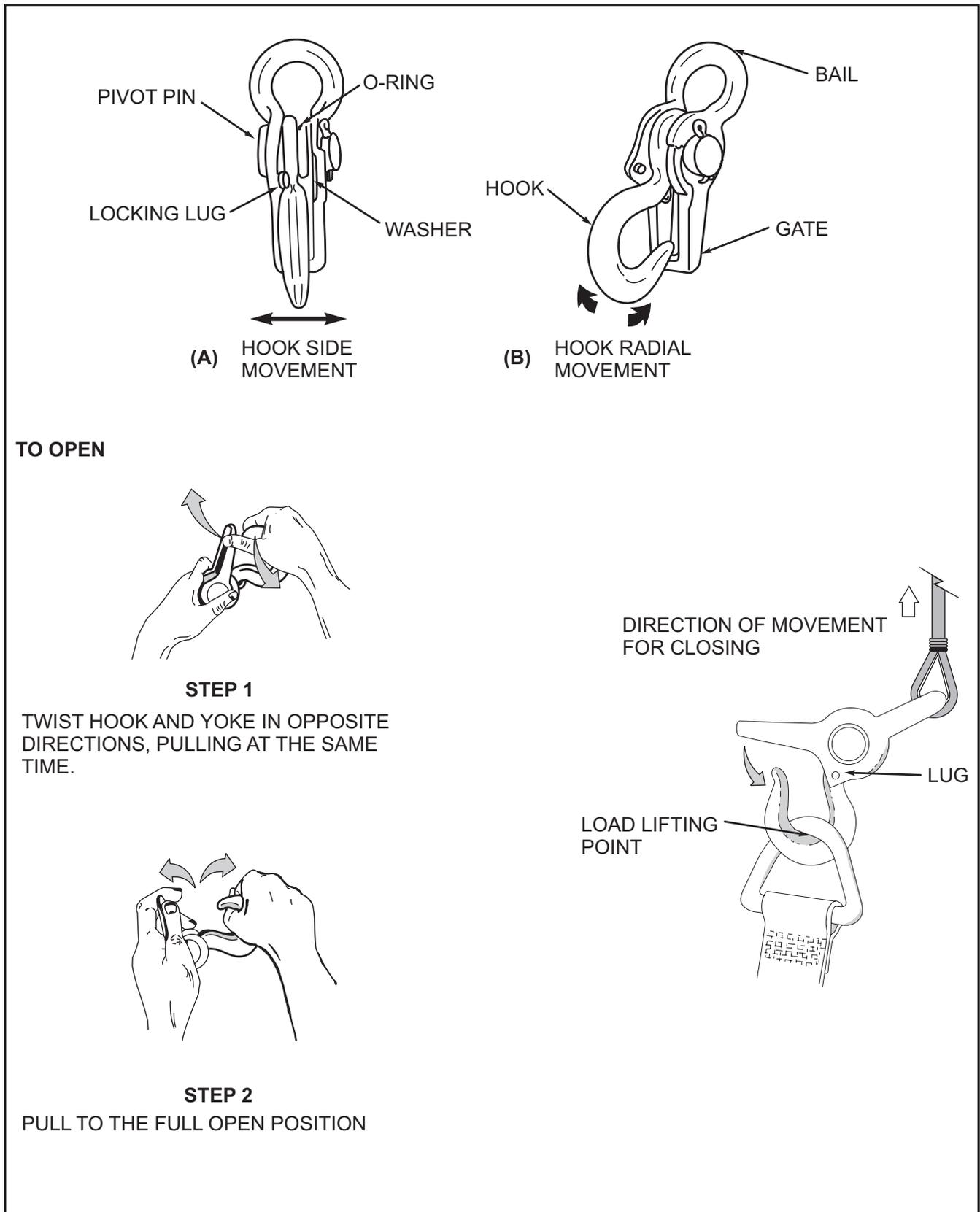


Figure 10-15. Operation of Safety Hook

1. **TO OPEN HOOK** — Grasp the hook in one hand and the yoke in the other hand so that the forefinger passes under the yoke. Hold the hook while twisting the yoke to the right and lifting it at the same time.
2. **TO CLOSE HOOK** — Force the yoke down over the hook.



Never thread the safety hook through all four of the cargo net's oblong metal rings and hook back onto the bight of the lifting sling or sling leg. This will cut the lifting sling or sling leg or damage the lifting sling or the sling leg's thimble and hook latching assembly. Attach the hook to the rings.

10.8.3 Hoisting Slings. For loads with a single lifting point, such as a cargo net or missile dolly, use a Mk 105 hoisting sling and one leg (attached by means of a choker hitch) or a Mk 89, 90, or 91 single-leg sling. To attach the sling, hook the safety hook on the sling leg to the ring(s).



The use of a single leg on the Mk 105 hoisting sling reduces the safe working load of the sling from 6,000 lb (2,721 kg) to 3,000 lb (1,360 kg).

Note

Lifting of more than one net with a single-leg hoisting sling is discouraged, since cargo damage may result. Do not use two or more single-leg hoisting slings to pair separate loads, when the Mk 105 hoisting sling is available.

For loads with two attachment points, such as a pallet with an adjustable pallet sling, attach two legs to the lower eye of the Mk 105 hoisting sling by means of a choker hitch; then hook the safety hooks on the legs to the lifting thimbles on the adjustable pallet sling — one leg to one thimble. An alternate hoisting sling for a load with two attachment points is the Mk 128 Mod 0. Attach it in the same manner as the Mk 105 sling. After the hooks are attached, secure the legs with the Velcro strap to ensure that the legs do not work under the load and tip it during pickup.

When using the Mk 105 hoisting sling to lift loads with two attachment points, ensure that both lifting legs are of equal length (the same color).

For loads with four attachment points, such as a cargotainer, use the Mk 105 hoisting sling with four legs (Figure 10-3). When pairing loads (from two to six lifting points), use the Mk 105 hoisting sling with a leg for each lifting point (Figure 10-16).



Attach only the number of legs needed to lift the load to the Mk 105 hoisting sling. Unnecessary legs shall be removed.

10.8.4 Special Procedures for Nonstandard Loads. Refer to NAVSEA S9750-AA-MMA-010 for attaching adapters to containers and rigging dollies for VERTREP. Large, bulky, or odd-shaped loads that cannot be carried on a pallet or in nets shall be provided with slings or lifting eyes for attaching a pendant.



The aircraft commander shall always be consulted as to the feasibility of transferring any nonstandard load.



When attaching a special load rigging, carefully inspect the selected attachment points on the load to ensure that they will withstand the loads applied when the object is lifted. What appears to be a convenient lifting eye or lifting point may be there for another purpose and not intended to lift the entire weight of the load.

10.8.5 Special Procedures for Missile Transfer to Class 5 Forward VERTREP Areas on FFG-7 Class Ships. Missile transfers to Class 5 (high hover) forward VERTREP areas of FFG-7 Class ships using the Mk 6 missile dolly require a high degree of coordination and optimum environmental conditions, since the configuration of the area presents unique hazards. Rotor downwash, combined with the relative wind over the deck, causes a swirling motion that causes the Mk 6 dolly to rotate and swing during the delivery. Cargo damage is likely when this instability is combined with

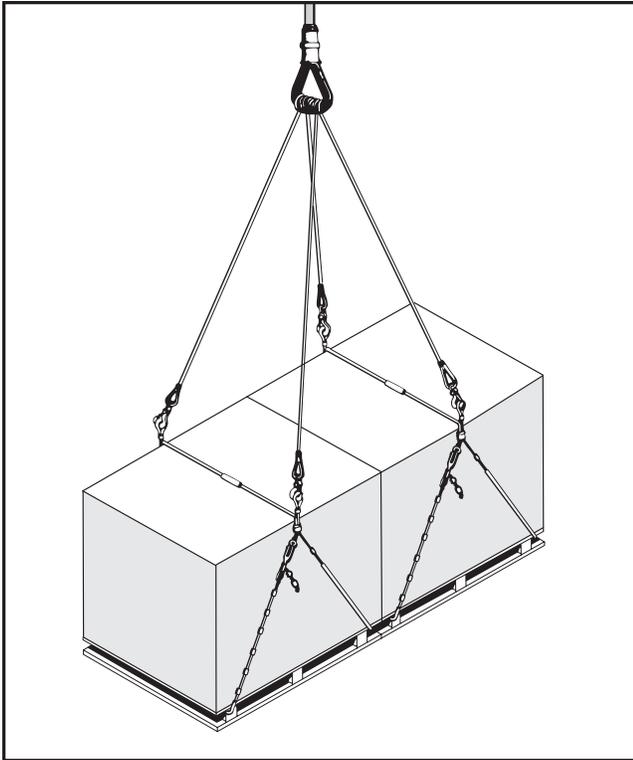


Figure 10-16. Hoisting Sling Mk 105 With Two-Pallet Load (Four Attachment Points)

restricted space, high seas, and/or a pitching or rolling deck. The following restrictions and procedures must be observed to ensure safe transfer of cargo:

1. Maximum ship's pitch of 3° and maximum ship's roll of 3°
2. Relative wind:
 - a. Optimum: 345° to 015° , 10 to 20 knots
 - b. Acceptable: 300° to 060° , 10 to 20 knots
 - c. Not recommended: 060° to 300°

Note

It may be desirable to sacrifice optimum winds for a stable deck. The aircraft commander should be consulted before any course is selected that would create a relative wind outside optimum parameters.

3. Delivery by VERTREP from an H-46 helicopter in accordance with the following procedures.

10.8.5.1 Rigging. To ensure stability of the Mk 6 missile dolly during delivery, a steadying line will be employed, tended by an air crewman on the aft ramp of the H-46. Standard Mk 105 or Mk 92 hoisting slings and four long legs (green) are to be used. Use of the Mk 105 is preferred for delivery of a loaded dolly, due to the greater pendulum effect associated with use of the Mk 92. Furthermore, use of the Mk 92 requires a higher hover, which reduces the pilot's visual cues. A steadying line made of 5/8-inch (15.8 mm) diameter, double-braided nylon line, 65 feet (110.8 m) long, with a swivel snap hook, is attached to the top of the forward end of the missile dolly. Both ends of the steadying line must be weighted (Figure 10-17).

10.8.5.2 Transfer Procedures

1. If feasible, transfer a pilot to the receiving ship prior to delivery of the first load for coordination and clarification of the transfer procedure.
2. Time permitting, make at least one practice delivery and retrograde pickup utilizing a missile training shape prior to the actual transfer.
3. Establish bridge-to-bridge communications to provide real-time feedback during the evolution.
4. During pickup over the delivery ship, pass the steadying line to the air crewman on the aft ramp prior to hooking up the missile load on the Mk 105 or Mk 92 hoisting sling.
5. The air crewman must maintain tension on the steadying line from pickup to drop to avoid rotation of the dolly and possible entanglement of the steadying line with the hoisting sling.
6. Position the LSE on the receiving ship on the 03 level to permit the greatest visibility.
7. Once the cargo is onboard the receiving ship, release the weighted bitter end of the steadying line from the aircraft and then release the Mk 105 sling from the cargo hook. In the case of the Mk 92 sling, the deck crew releases the load at the O-ring assembly above the dolly.

10.8.5.3 Returning Equipment. Retrograde pickup of the dolly must be accomplished utilizing the Mk 92 hoisting sling and the steadying line. The procedure is the reverse of delivery. The air crewman lowers both the steadying line and the Mk 92 from the H-46 for hookup by the deck crew.

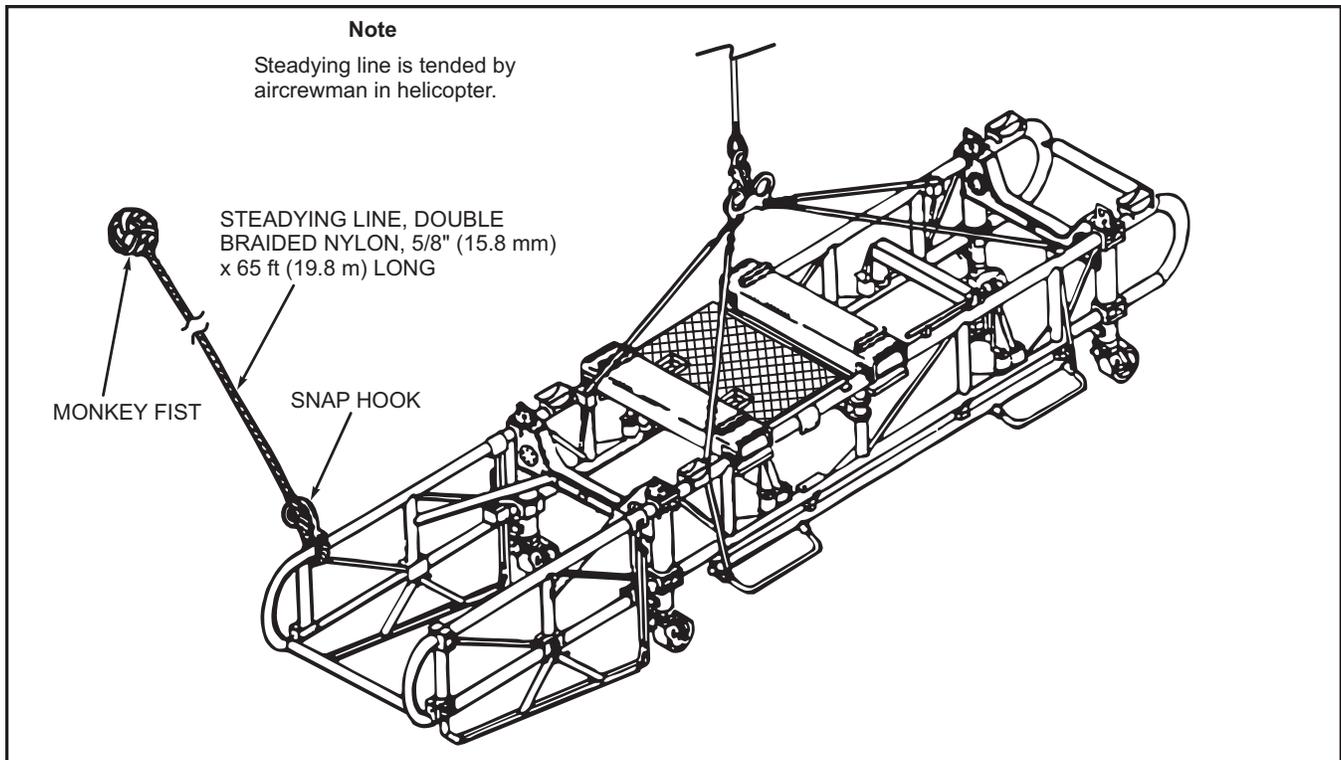


Figure 10-17. Rigging for Missile Transfer to a Class 5 VERTREP Area (FFG-7 Class Ship)

10.9 CARGO STAGING

Prior to actual flight operations, the maximum possible amount of cargo is staged on the flight deck (see Figure 10-18). Primary considerations in preparing and executing the flight deck cargo plan (staging) are outlined below.

CAUTION

A pre-evolution discussion of flight deck cargo staging requirements is essential. High velocity and/or gusty winds, combined with ship pitch and roll, may create a circumstance rendering a normal size landing area inadequate. Consideration must be given to clearing a larger than normal landing area for helicopters experiencing in-flight emergencies.

1. Sufficient clear space should be left on the deck to roll out the helicopter and to provide adequate clearance for takeoff and a landing area for possible emergency landings.
2. Complete staging of the flight deck after VERTREP has commenced is permissible, provided another

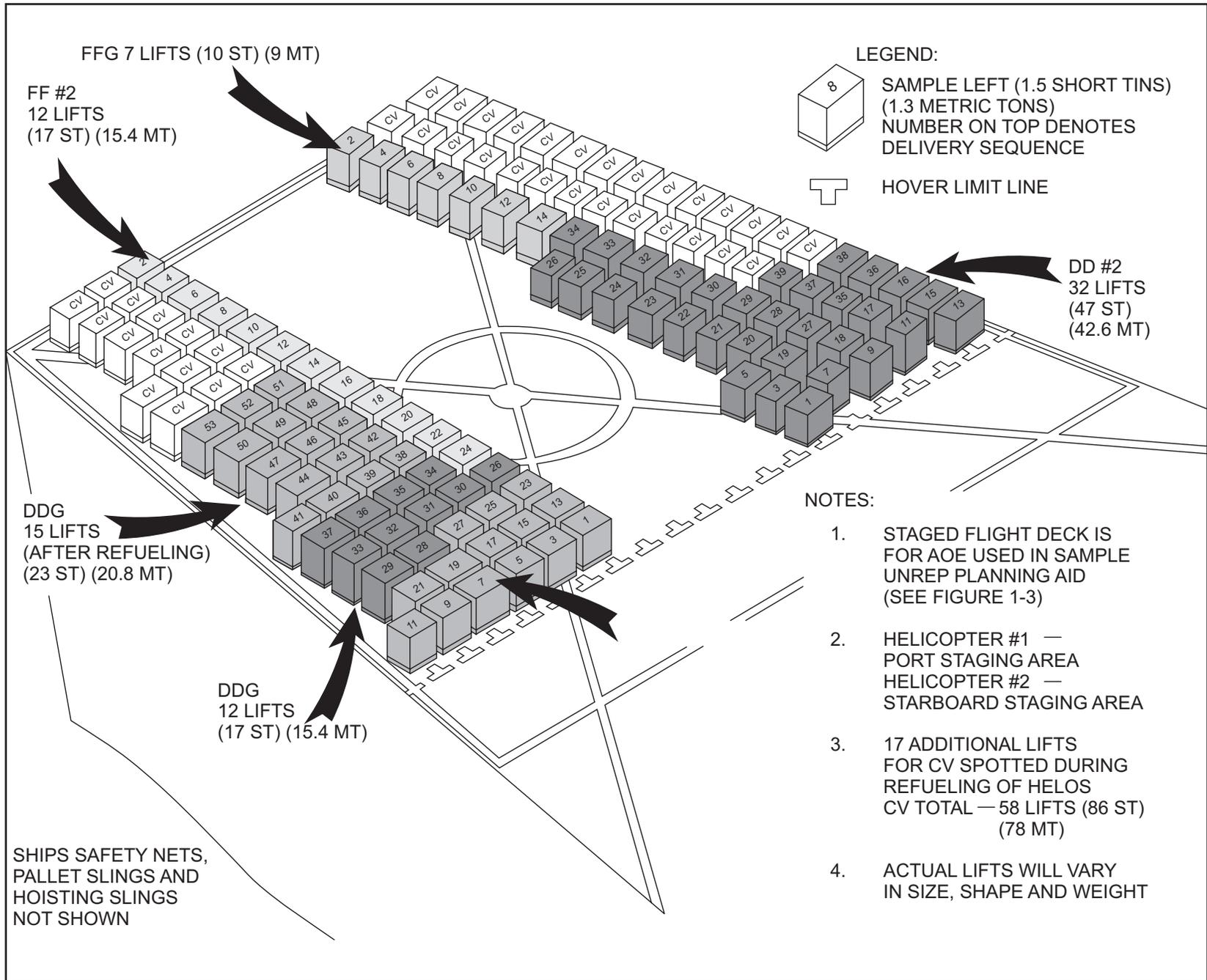
certified landing area is available that is satisfactory to the helicopter detachment officer in charge.

WARNING

During night VERTREP, the cargo staging plan shall provide for clear and unobstructed use of at least one landing lineup line, including its lights, whenever a certified ready deck is not available in the immediate area. The lights shall be visible through an arc of 15° on either side of the lineup line. (See Figure 10-19.)

3. All staged cargo must (1) be located within the hover area bounded by periphery lines and/or hover limit line(s) and (2) be accessible for pickup by the hovering helicopter.
4. Loads should be staged for each receiving ship and be accessible for pickup in the event of a change in schedule and during simultaneous multiship VERTREP operations.
5. Cargo for each receiving ship should be staged in a manner that will permit an orderly delivery sequence of like commodities to the receiving

Figure 10-18. Typical VERTREP Cargo Staging



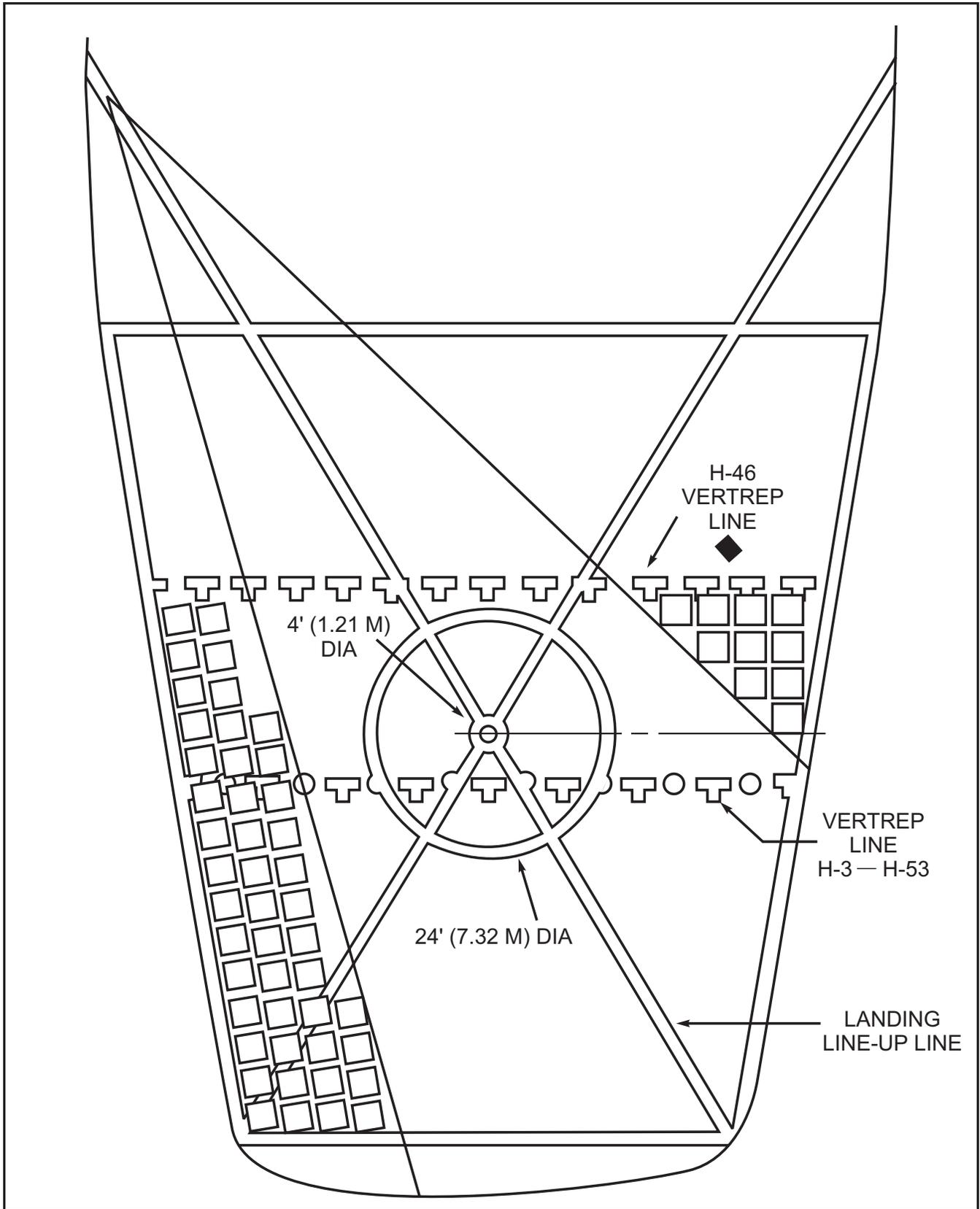


Figure 10-19. Typical Night VERTREP Cargo Prestaging Diagram (Single Landing Area Available)

ships. (Give consideration to timely strike up and delivery of freeze and chill cargo so that minimum exposure will result.) An orderly sequence of load receipt permits the receiving ship to strike down in one continuous cycle. It eliminates the slowdowns that result (1) from the constant shifting of personnel from one strikedown route to another and (2) the need to sort each load to determine if it can be struck down immediately or left to accumulate topside, awaiting the later shifting of strikedown routes. Greater efficiency on the receiving ship results in reduced VERTREP time and thereby reduces workload for all ships in the operation.

6. Sufficient room shall be left for the hookup man to move about and always have an escape route available. He should remain forward or inboard of the load during hookup.
7. Load height will be such that the hookup man can accomplish his tasks without climbing on the loads. He shall stay on the deck at all times.
8. Sufficient room must be left between loads to reduce the possibility of a load snagging or tipping adjacent loads during pickup.
9. Tarpaulins used to cover VERTREP loads on the flight deck during flight operations shall be secured to the deck. Cargo nets shall be placed over them, and secured to the deck. This ensures that tarpaulins will not blow up and become entangled in the rotors.
10. VERTREP lifts weighing 500 lb (227 kg) or less and lifts with a large sail area are highly susceptible to being displaced by rotor downwash. Items that fall into this category include aircraft drop tanks and canopies, rotor blade containers, and empty missile containers. Hence, special care should be given to placement and handling. Light loads are best spotted in the center of the deck, preferably inboard of other loads, to minimize the possibility of rotor downwash blowing them over the side.

WARNING

All FOD material shall be removed from the VERTREP area prior to flight operations.

10.10 LOAD TRANSFER PROCEDURES

10.10.1 Internal Loads. Internal loads are usually far more time-consuming than external loads and, therefore, should normally be avoided, except for transfers at great distances where a landing area is provided for off-loading. For transfer of personnel by helicopter, see paragraph 9.7 and NWP 3-04.1M (formerly NWP 42).

Note

When making up pallets for internal transfer, ensure that wooden pallets are intact and not missing pieces that would keep them from rolling smoothly into the helicopter. Pallets must be standard 42 inch X 48 inch (106.7 cm X 121.9 cm) size in order to allow pallets to roll on the aircraft's internal cargo rollers.

10.10.2 Load Pickup. Before operations start, provide pilots and crewmen with the name, type of ship, hull number, location in the formation, frequencies, and tactical voice call of all receiving ships. As each load is picked up, display information — consisting of the destination and weight of each load — on a chalkboard from a position clearly visible to the pilot.

Note

An alternate method is to write the weight of the load with chalk on the side of the upper eye of the Mk 105 sling, where it can be easily seen by the air crewman during hookup.

As the helicopter approaches the UNREP ship, its approach is announced over the deck-edge speakers. All personnel clear the landing and pickup zone, except the hookup man, who takes position forward or inboard of the load and holds the pendant up to signal the location of the load to the pilot. Guided by signals from the LSE, the pilot maneuvers the helicopter to hover over the load.

An air crewman, viewing the deck through the helicopter's open cargo hook access hatch, advises the pilot via the helicopter's internal communications system as to the helicopter's exact position over the load. As the helicopter hovers over the load, the hookup man hands the pendant to the air crewman positioned in the open cargo access hatch and then clears the area, moving toward the LSE. The air crewman then slips the pendant over the helicopter hook, and ensures that the load is secure and ready for lifting.

WARNING

In the case of the CH-53E, the hand-held static discharge wand and 20,000 to 30,000 volt insulated gloves shall be used to prevent personnel injury. Contact between the cargo hook and grounding hook shall be maintained continuously because the CH-53E rotor system can recharge to its full static potential within 1 second. This will require a second deck crew member to aid the hookup man during hookup.

Note

This method ensures positive hookup of the pendant and eliminates the unnecessary and unsafe chasing of the helicopter by the hookup man.

In alternate methods, the hookup man either holds the pendant up while the air crewman in the open cargo access hatch guides the pendant onto the helicopter's hook, or the hookup man raises the pendant and slips the eye over the helicopter's hook. The hookup man then clears the area, moving toward the LSE.

WARNING

The hookup man shall never stand on the load or between the load being picked up and another load.

The air crewman then gives pickup and liftoff directions to the pilot to clear the load from the pickup area.

Note

The air crewman is the primary director of the helicopter once it is in a hover over the pickup or drop area for placement of the load. The LSE shall also continue giving directions in case of internal communications failure or other emergencies of which the pilot or air crewman is unaware. Radio transmissions to aircraft hovering over the VERTREP zone are distracting to the pilot and should be of an urgent nature only.

10.10.3 Maintaining Contact. When helicopters operate between ships within visual range, both the launching and receiving ships shall maintain visual contact with the helicopter until it has landed or has

completed its mission. When the helicopter is dispatched to more than one ship to make pickups or deliveries, responsibility for maintaining visual contact rests with both the last ship from which the helicopter departed and the next succeeding receiving ship. When possible, radar contact on all helicopters will be maintained by the launching and receiving ships. Under conditions of low visibility, positive control is mandatory. Parent ships must be aware of the location of their helicopters at all times. When conducting VERTREP beyond visual range of the parent ship, CIC shall be responsible for providing voice communications and vectors to the helicopters over the entire route as specified in NWP 3-04.1M (formerly NWP 42).

10.10.4 Fueling Helicopters. During extended VERTREP, it may become necessary to refuel the helicopter several times. The VERTREP control officer shall always be aware of the helicopter's fuel state by determining endurance prior to takeoff or on arrival from another ship. Multi-helicopter VERTREP can be continued with minimum interruption when one helicopter refuels at another ship and the remaining helicopter(s) continues to VERTREP from the UNREP ship. Hot refueling is the most expeditious method of continuing operations. Hot refueling may be accomplished with the permission of the commanding officer or his duly authorized representative, usually the VERTREP control officer. In all cases, aircraft NATOPS hot refueling procedures shall be followed.

CAUTION

Do not use FAS hose or fittings to fuel helicopters. FAS hose and fittings may not meet aviation fueling standards.

10.10.5 Load Delivery. During the approach to the receiving ship, the LSE and the air crewman guide the pilot to the drop zone. This enables the pilot to fly so that he/she can see and avoid any obstructions. If a load spotter is used, he/she will be positioned on the intended spot for the incoming load. Once acknowledged by the air crewman, he/she shall clear the drop zone. Once over the drop zone, the pilot follows the LSE's advisory signals and the air crewman's directions for positioning the load over the cargo landing spot. The pilot relies on the air crewman's directions for precisely spotting and then lowering the load. The air crewman informs the pilot as soon as the load is on deck. The LSE signals the pilot when the pendant slackens. The air crewman releases the cargo hook and informs the pilot.

WARNING

Personnel shall not enter the drop zone nor attempt to steady the load while the helicopter is over the ship. The load spotter shall be clear of the drop zone before the load passes over the deck edge.

CAUTION

Premature release of the load before there is slack in the sling legs can cause the pole pendant to damage the load or cause personnel injury.

10.10.6 Clearing the Drop Zone. As soon as the helicopter departs, assigned personnel release the pendant hook(s), open the net, and cut any banding or strapping on the load.

CAUTION

Never cut nets.

Cargo handlers, who have been standing by, clear of the drop zone, move in, pick up a portion of the cargo, and leave the drop zone. The last ones remove the pendant, empty pallet, and all loose debris from the drop zone to a staging area. There they stack the pallets and fold the nets for later return to the UNREP ship. Remove debris from the drop zone to a staging area and retain it there until dumping of trash is authorized.

WARNING

Personnel clearing stores must take extra precautions to remove banding, paper, and other debris from the drop zone — prior to the next helicopter's approach — to preclude injury to personnel or damage to helicopter engines and rotor blades.

Note

A loaded helicopter shall not be waved off solely because the drop zone has not been completely cleared of the previous load. If space is available for additional drops, temporarily secure the load being worked: pull the net up over the load and thread a hoisting sling leg or safety hook through the net's

rings or corners. All personnel shall then clear the area while the next load is being deposited.

If the UNREP ship furnishes pallet jacks, it will deliver most of the loads using adjustable pallet slings instead of nets. This facilitates inserting the forks of the pallet jack into the pallet and pumping up the pallet, clear of the deck, for expeditious removal from the drop zone. Netted pallets can be moved with two pallet jacks; however, cargo handlers should be prepared to break down the load by hand if the net under the pallet interferes with operation of the pallet jack.

10.10.7 Returning VERTREP Equipment and Retrograde. As pallets, nets, triwalls, cargotainers, and hoisting slings accumulate on the receiving ship, cargo handlers assemble them into loads for return to the UNREP ship. In addition to taking up much-needed space on the receiving ship, pallets are needed back on the UNREP ship for making up new loads for delivery to the next ship on the VERTREP schedule. Retrograde shall be returned at the request of the delivery ship. If the UNREP ship furnished pallet jacks, make up return loads consisting of cargotainers or pallets clear of the drop zone and move them to the drop zone intact when ready for return. Since netted pallets are difficult to move with pallet jacks, it is best to assemble them in a load on the drop zone in between deliveries. (See Figure 10-19.)

Note

If the helicopter starts an approach before the return load is completely assembled in the drop zone, pull the net up over the load and temporarily secure it by threading a hoisting sling's leg or a safety hook through the net's rings or corners. All personnel then clear the area to await the helicopter's departure.

10.10.8 Preparation for Return**10.10.8.1 Pallets.** (See Figure 10-20.)

1. Stack pallets to make up a load between 16 inches and 68 inches (40.6 cm and 172.7 cm) high. From 4 to 14 wooden pallets or 6 or more Mk 3 metal pallets may be stacked to make up a load.
2. Secure the load with the appropriate size pallet sling.
3. Attach a hoisting sling (two attachment points) to the load.

WARNING

When making up return loads of nestable tubular steel pallets, a minimum of 6 pallets must be used.

Note

Three loads of pallets may be returned in the same lift, if there is sufficient clearance to lift the load clear of the pickup area. In this case, attach the hoisting sling (six attachment points) after the loads are spotted on the VERTREP platform.

10.10.8.2 Nets and Pallets. (See Figure 10-20.)

1. Spread one net on the VERTREP platform, centered on the VERTREP lineup line or behind the hover limit line.
2. Stack 4 or more wooden pallets or 6 or more nestable pallets in the center of the net.
3. Place folded nets on top of the pallets.
4. Pull the bottom net up around the entire load and secure the rings or corners with a becket.
5. Attach a hoisting sling (one attachment point).

10.10.8.3 Cargotainers. Return cargotainers by folding them and placing them inside one cargotainer; place extra straps and slings inside the one cargotainer; but save one sling (four attachment points) to connect the load to the helicopter's hook.

10.10.8.4 Hoisting Slings. Return hoisting slings by threading the slings on the flexible leg of one sling and hooking the leg back upon itself. (This is the only time a sling leg is hooked to itself in this manner.) A minimum of 10 to 12 slings can be returned in this way, as shown in Figure 10-21.

CAUTION

No additional cargo shall be attached to the sling legs.

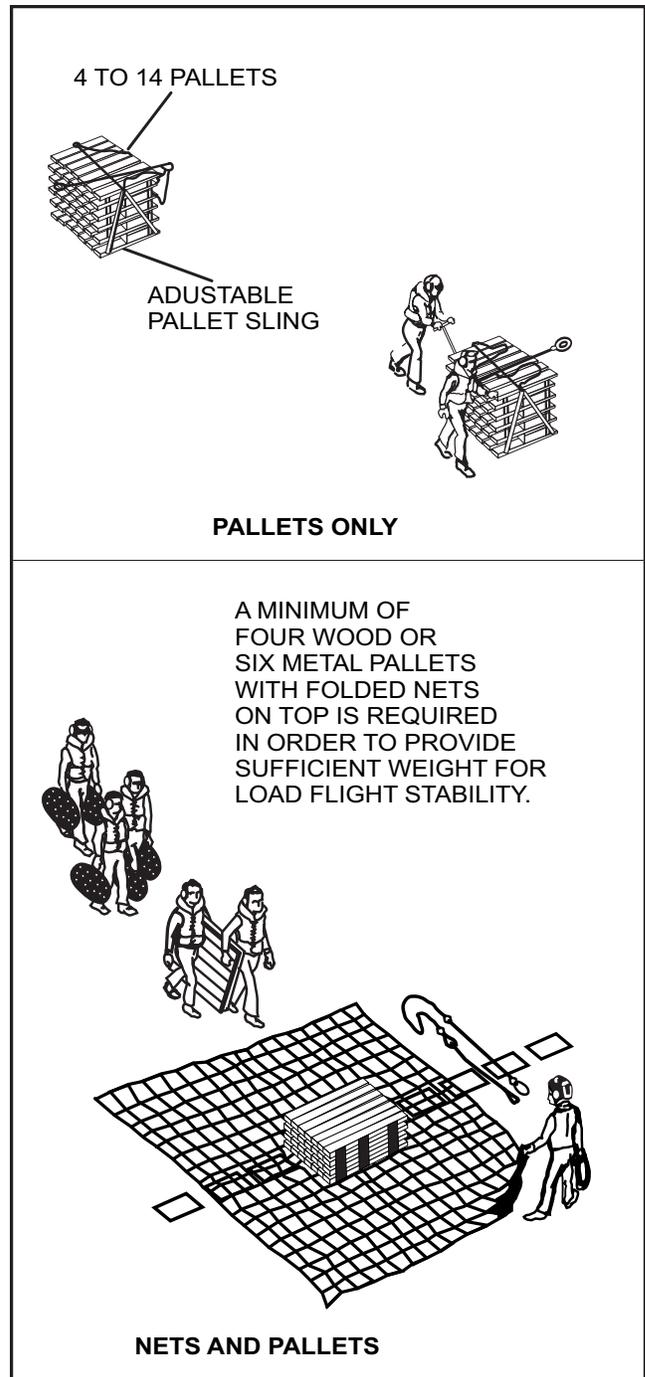


Figure 10-20. Preparation of Nets and Pallets for Return to UNREP Ship

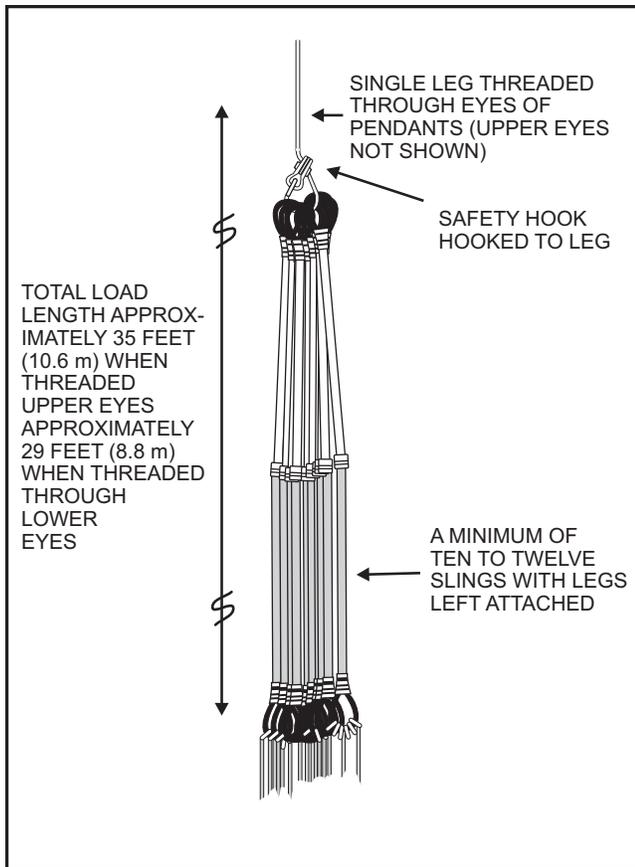


Figure 10-21. Mk 105 Slings Being Returned to UNREP Ship

10.10.8.5 Retrograde From a Class 5 VERTREP Platform. For returns from Class 5 VERTREP platforms, the helicopter will provide a recovery pendant (Mk 92 hoisting sling) at the time of pickup. Make up return loads in the same manner as above, but do not attach the hoisting sling. On loads with two, four, or six attachment points, attach the required number of legs to the load. On a load with a single attachment point (nets and pallets), make up in the same manner as a cargo net (Figure 10-5). On a load of slings, use only one sling leg.

10.10.9 Staging and Pickup of Loads for Return. Any retrograde cargo should be prepared in the same manner as described for the UNREP ship. When the VERTREP platform is of sufficient size to accommodate several loads, place the return load as close to the lineup line as possible on the side of the platform away from the helicopter's approach. This will leave sufficient room for the helicopter to deposit the next incoming load on the approach side of the platform and then move forward over the return load.

WARNING

The hookup man shall stay clear of the VERTREP platform until the incoming load is on deck and the pendant clear of the load.

As the helicopter moves over the return load, the LSE signals the hookup man to pick up the hoisting sling, hand the pendant to the air crewman positioned in the open cargo access hatch or place it over the helicopter's hook, and clear the area.

On ships with Class 5 VERTREP platforms, there is insufficient rotor clearance to allow the helicopter to hover low enough to pick up the load in the normal manner. On such ships, the helicopter hovers at a higher altitude and the air crewman stationed in the open cargo access hatch (1) hooks the eye of a recovery pendant (Mk 92 hoisting sling) to the helicopter's cargo hook and then (2) lowers the leg of the recovery pendant down to the cargo load on deck. The hookup man then goes to the load, attaches the safety hook on the pendant to the load, and clears the area.

WARNING

Load preparation of retrograde cargo and VERTREP equipment for return to the UNREP ship is as important as proper load makeup by the UNREP ship. Danger to the helicopter or loss of part or all of the load can result if the cargo is not properly secured or if prescribed methods are not followed.

VERTREP equipment may be returned internally, if the receiving ship has a landing platform. Normally this is time-consuming and is not desired unless the distance is greater than 25 miles (46.3 km) or the equipment is so light that it will be dangerous to carry it externally.

WARNING

Do not, under any circumstances, hook an empty net to the helicopter without at least 4 wooden or 6 metal pallets or an equivalent weight in the net. To do so would endanger the helicopter by allowing the net to blow into the helicopter's rotors. In questionable cases consult the aircraft commander.

10.11 NIGHT VERTREP

Ships that are certified Level I or II or are operating under a waiver (see OPNAVINST 3120.28) may conduct VERTREP at night. In night VERTREP, the speed of the operation is reduced because of reduced visibility. Night VERTREP is carried out in the same manner as day VERTREP, subject to the limitations set forth in NWP 3-04.1M (formerly NWP 42), OPNAVINST 3710.7, and the appropriate NATOPS flight manual. The final decision on conducting a night VERTREP to a certified ship is the aircraft commander's responsibility. One or more of the following conditions must exist prior to conducting VERTREP at night:

1. A natural horizon is present.
2. The ships are alongside in CONREP position.
3. The drop/pickup zone of the ship to be worked is clearly visible from the cockpit when over the drop/pickup zone of the delivery/receiving ship.

10.11.1 Factors Affecting Night VERTREP

10.11.1.1 Helicopter Limitations. Since night flying is essentially instrument flying, the helicopter shall be capable of instrument flight.

10.11.1.2 Pilot/Crew Fatigue. Depth perception and visual reference at night for a pilot are greatly reduced. Pilot/crew fatigue is greatly increased because of the need for extra care and the constant transition from visual flight to instrument flight. Pilots should be consulted with regard to night endurance based on the current conditions. The generally accepted limit of pilot endurance during night VERTREP may be as few as 2 to 3 hours.

10.11.1.3 Weather/Sea State. Adverse weather conditions further reduce night VERTREP capabilities.

10.11.1.4 Ship's Lighting. Ships certified for night VERTREP shall display lights in accordance with Air Capable Ship Aviation Facilities Bulletin No. 1. As a minimum, the ship shall display the following lights:

1. The drop area shall be outlined with a sufficient number of red perimeter lights to clearly define the area for the pilot.
2. Obstruction(s) in the vicinity of the drop area should be illuminated.
3. Red floodlights are focused on the flight deck at a point forward of the cargo drop area.

4. A blue stern light, where provided, shall be displayed in place of the standard white light.
5. Ships shall be ready at all times to adjust the intensity of all lights in the flight deck area and shall do so when directed by the aircraft commander.
6. Ship's red and/or white forward rigging lights and contour lights should be turned on at the aircraft commander's request to facilitate depth perception.

WARNING

Under no circumstances shall flash pictures of the helicopter be taken, since the flash temporarily blinds the pilots.

Note

The pilot may use red or white landing lights to make a safe approach.

10.11.2 Night VERTREP Procedures. Essentially the same procedures are used for night VERTREP as during the day. However, night cargo pickup and delivery require increased care and precision. A wider flight pattern is necessary under low visibility conditions. Delivery rates, therefore, are lower than during daylight hours.

10.11.2.1 Coordination. The OTC is responsible for:

1. Directing all ships in the formation to show aircraft obstruction lights
2. Employing a course and speed that will minimize deck motion and keep ship's stack gases away from the helicopter in the VERTREP area.

10.11.2.2 Signaling and Communications

1. The LSE shall use amber wands for helicopter direction signals.
2. The LSE shall use the landing signal light kit (battery powered).
3. A green flashlight or chemical light will be secured to the hookup man's/load spotter's helmet to aid the air crewman in determining the pickup point. The light should be attached so as to be visible when the crewman looks up at the helicopter.

4. Chalkboard information concerning receiving ship identification, bearing and distance, load weight, and so forth, may be transmitted by radio.
5. Radio communications to airborne helicopters should be minimized to avoid interrupting essential aircrew ICS communications necessary for smooth and safe operations.
6. Positive communications should be maintained between the LSE, HCO, and FDO.

10.12 SAFETY

Safety is the primary consideration in all VERTREP operations. Commanding officers should obtain the advice of the officer in charge of the helicopter detachment on board in all matters relating to the safety of the helicopter transfer. If helicopters are airborne, he/she should ask advice from the senior naval aviator if operating conditions appear marginal.

A helicopter should be landed at the request of the aircraft commander anytime the aircraft commander believes that safety is endangered either by his/her own fatigue or by other operational factors. The following precautions must be meticulously observed:

1. ***All personnel except the LSE and the hookup man (when required) shall clear the landing or drop area during a delivery, takeoff, or landing.***
2. Flight deck personnel shall wear life jackets, helmets with chin strap, goggles, safety shoes, and ear protection. Loose articles of clothing should not be worn. Ball caps, rags, or other loose articles shall be removed from pockets.
3. All personnel in the vicinity of the helicopter shall remove their hats while the rotors are turning.
4. All personnel at the pickup or delivery area shall be trained to take cover immediately on command of the officer (or petty officer) in charge.
5. Personnel working near the helicopter shall be instructed to observe the aircraft carefully for any sign of malfunction such as smoke, oil, hydraulic leaks, and so forth, and immediately report any such condition(s) to the helicopter pilot, VERTREP officer, or HCO in the tower if the helicopter is airborne.
6. Ships participating in VERTREP operations shall have a firefighting detail stationed at the transferring or receiving area. Personnel assigned to the helicopter crash/firefighting crew shall be properly clothed and shall not be assigned to any other duties, such as cargo handling.
7. Personnel shall be instructed concerning the shrapnel effect caused when rotor blades strike a solid object. ***Spectators must be kept clear of the pickup or delivery area while VERTREP is in progress.***
8. Personnel working as cargo handlers in the vicinity of helicopters shall wear ear and eye protection devices and safety shoes.
9. All removable objects that might be damaged by swinging loads should be removed from the area.
10. The flight deck drop zone shall be cleared of all objects that can be blown around by rotor wash or ingested into jet intakes.
11. Ships shall not dump trash and garbage during VERTREP operations.
12. All hatches and covers near the drop zone shall be closed.
13. Ships shall be careful not to blow tubes during VERTREP operations.
14. ***Cargo handlers shall not attempt to steady a load or rush to the load before the helicopter has left the drop zone.***
15. To minimize the danger to personnel and equipment during wet, rough weather, all staging areas, drop zones, and paths leading thereto shall have non-skid deck surfaces.
16. To minimize FOD hazard to the helicopter, cardboard boxes (excluding triwall containers) or other lightweight material shall not be returned to the delivery ship.
17. Ensure that the rescue boat is fully prepared, and that the boat crew is detailed and available at short notice for launch.
18. Concurrent VERTREP and CONREP operations from AE-26 Class ships using stations 9 and 10 are extremely hazardous due to the proximity of these stations to the flight deck and conflict with fire party stationing and rig crews.
19. During VERTREP operations and cargo handling, the OOD shall notify the flight deck crews of any anticipated ship movements.

WARNING

Rotor downwash created by the CH-53E helicopter is greater than that produced by any other fleet helicopter. Potential downwash hazard may extend as much as 300 feet from the CH-53E. Under zero wind conditions, maximum average velocities occur at 49 feet (15 m) from the rotor center (1.25 X rotor radius) and can vary from 50 to 95 knots, depending on aircraft gross weight. This downwash is sufficient to blow aircraft chocks, tiedown chains, and tow bars about the deck or overboard, and cause possible injury or death to personnel. The presence of high relative winds may increase the hazardous effects of turbulence from rotor downwash to personnel and equipment not secured to withstand these wind velocities.

10.13 EMERGENCY PROCEDURES

Emergency landing occurs when the helicopter has major difficulties and must land immediately. Only those personnel essential for a safe and rapid recovery should be present on the flight deck. Emergency procedures will be carried out in accordance with the appropriate NATOPS flight manual.

10.14 SUBMARINE VERTREP

VERTREP may be conducted on submarines during day VFR conditions and then only as operational commitments dictate. Since submarines do not have standard VERTREP deck markings, the drop zone shall be agreed upon and briefed between the VERTREP control officer and the pilot prior to commencement of the evolution. The final decision as to the feasibility and safety of the operation rests with the pilot in command.

10.15 VERTICAL ONBOARD DELIVERY

VOD with the CH-53E helicopter significantly enhances the air logistics capability of the fleet and supplements the H-46 helicopter and C-2 aircraft with logistics and utility services previously not available with those aircraft.

10.15.1 CH-53E Helicopter. The CH-53E is a day-night, all-weather aircraft capable of landing aboard all aircraft carriers and numerous amphibious, MSC, and fleet support ships. It normally seats 35 but can carry up to 52 passengers with centerline seats installed. An external cargo load of up to 36,000 lb (16,330 kg) may be

carried using either a single-point or dual-point suspension system. Normal flight radius of action with internal cargo or passengers is 50 nm.

10.15.2 Preparations for VOD Services. Request VOD services as far in advance as possible through COMNAVAIRLANT, COMNAVAIRPAC, COMFAIRMED, or COMFAIRWESTPAC as appropriate. Specific procedures are promulgated in separate instructions. Standard airlift procedures and format are contained in OPNAVINST 4631.2. Liaison with VOD aircraft squadrons is recommended prior to requesting services.

Due to the limited availability of low-speed tanker aircraft, inflight refueling shall not normally be used to extend the radius of action for logistic missions except in an emergency.

10.15.3 VOD Operations. Supported ships shall provide load requirements, position and intended movement, overhead data, and communications plan by message to the supporting squadron and naval air station with information to all concerned. For extended operations, ship beach detachments should be assigned at the attended air station to:

1. Process and handle incoming and outgoing U.S. mail, courier mail, passengers, and cargo
2. Maintain liaison with the VOD aircrew to inform them of planned shore-to-ship passenger, mail, and cargo load requirements.

To ensure that unauthorized personnel are not transported, passengers must be manifested prior to every flight per OPNAVINST 4630.25 (DOD Regulation 4515.13).

All flights shall be conducted under positive radar coverage to the maximum extent possible. Consideration should be given to using approach control or ship's radar, airborne early warning radar, and accompanying ship's radar.

Though the CH-53E is not certified for overwater rescue missions, it is an excellent search platform utilizing its Omega navigation system, tacan, and long endurance time. The CH-53E is limited with only one UHF radio, but it can act as on-scene commander for any search and rescue effort or conduct an active search and provide a raft for survivors.

10.15.4 Internal Cargo Transport. Internal cargo will normally be banded on standard 40-inch (101.6 cm) X 48-inch (121.9 cm) pallets with a load height not to exceed

60 inches (152.4 cm). The roller conveyors limit pallet weight to 2,200 lb (998 kg); a maximum of seven pallets can be carried simultaneously. Cabin width is 90 inches (228.6 cm) and cabin height varies between 73 inches (185.4 cm) and 77 inches (195.6 cm). These limits are for general planning only. For detailed guidance, consult the crew chief, CH-53E NATOPS manual, or loading manual.

It will normally require 20 to 30 minutes to fully off-load or on-load a CH-53E with properly palletized cargo or other large items of cargo. Cargo consisting of small pieces, such as mail, will take longer due to added manpower and handling requirements.

Due to limited tail boom clearance, a low-profile, 4- to 6-ton forklift is required when loading pallets and heavy or oversized items. The recommended vehicle is: Truck, lift, fork, diesel, shipboard, low silhouette, solid rubber tires, 6,000 lb (13,227.6 kg), 92-inch (233.7 cm) lift, Model Number 60-DALS-2.

At no time shall the aircraft be configured to preclude safe emergency egress by the passengers and crew.

10.15.4.1 Hazardous Cargo. Hazardous cargo must be prepared, briefed, and shipped per NAVSUP 505.

10.15.4.2 Liquid Oxygen Carts. Liquid oxygen carts are extremely dangerous to carry in helicopters. They will not be carried unless directed by type commanders or higher authority, and only when required due to operational necessity.

10.15.5 External Cargo Transport. Due to its external lift capability and single-point and dual-point suspension systems, the CH-53E is the most capable helicopter for carrying heavy external loads over long distances. External heavy lift operations with the CH-53E produce unique safety hazards of high static electric shock and rotor downwash. For all external cargo operations, ground hookup and deck crews will be thoroughly briefed on these hazards.

10.15.5.1 Special Handling Equipment. To reduce the static electric shock hazard, use shock resistant rubber gloves, ASTM-D-120-84A, Type I, Class III, and use only the grounding wand.

10.15.5.2 External Cargo Handling Procedures. External VERTREP safety procedures must be observed. CH-53E external VERTREP operations also require the following specific precautions:

1. External cargo loads should weigh over 2,000 lb (907 kg). If loads are under 5,000 lb (2,268 kg)

and transfer is not limited by range, consider using an H-46 helicopter.

2. Load positions on deck should be aft of the VERTREP tee-ball line for single-point loads and at least an additional 5 feet (1.5 m) aft for clearance for dual-point loads.
3. Class 5 VERTREP ship decks may require additional pendants from the helicopter to allow sufficient rotor clearance for pickup or drop. Prior planning is required.
4. Dual-point lift operations shall be performed only with the approved 7-foot 6-inch (2.3 m) dual-point pendant and swivel-hook assembly.
5. Loads shall never be hooked to only one of the dual-point hooks, nor will one or both of the dual-point hooks be used in conjunction with the single-point hook.
6. For dual-point cargo lifts, the load's cG should be as equally balanced as possible and shall never exceed a maximum of 60 percent on either hook. A practice dead lift by crane using dynameters on the sling legs should be done on all special loads to determine that proper rigging, cG, and flight stability requirements will be met.
7. Ensure that special lifting equipment and attaching points are certified for use with helicopters. Dockside lifting equipment is not recommended for external cargo operations.
8. Additional information may be found in the CH-53E NATOPS manual.

10.15.6 Aircraft Recovery. Because of its dual-point suspension system, the CH-53E is the primary aircraft recovery helicopter. Aircraft recovery operations require extensive planning, coordination, and preparation.

10.15.7 Safety. Several unique hazards are associated with the CH-53E helicopter. These should be thoroughly reviewed and briefed to all flight deck crew members to any VOD operation.

Safety procedures unique to CH-53E operations and not previously mentioned include:

1. Recommended action for a ground crew member who is inadvertently engulfed in high velocity downwash is to drop to the deck in a sitting or prone position.

2. After landing, the air crewman in the helicopter will install auxiliary fuel tank safety pins prior to chock and chainmen positioning chocks or attaching chains to the main landing gear.
3. During movement of the aircraft on deck, the brakerider should be a qualified APP operator. APP operation pressurizes the utility hydraulic system for more positive braking. A fully fueled aircraft weighs approximately 54,000 lb (24,494 kg) and a tow tractor alone may be unable to control its movements on wet or slick decks in moderate to heavy sea states.
4. Some helicopters are susceptible to electromagnetic interference (e.g., transmissions, radar, etc.). It may be necessary to de-energize this equipment during CH-53E operations.
5. Visibility from the CH-53E's cockpit is not as good as that from most other helicopters. The LSE should be alert to this fact and attempt to maintain eye-to-eye contact with the pilot at the controls at all times.

10.16 USMC HELICOPTER EXTERNAL LOAD OPERATIONS

10.16.1 Concept of Operations. USMC helicopter external load operations in support of the landing force commander's scheme of maneuver entail the ship-to-shore movement of Marine equipment and supplies during an amphibious operation. The goal of these operations is to safely deliver USMC cargo and equipment by the most expeditious means that support the tactical scenario ashore.

With the increase in USMC organic equipment that can only be transported by helicopter by external means, ship-to-shore movement of these items has become more important and requires additional emphasis. Advanced planning and close coordination between the ship's company and embarked personnel are critical to mission success and personnel safety.

The CH-53 is the primary helicopter for external transport of USMC cargo and equipment. It is equipped with a single-point external cargo hook pendant. The CH-53E is also equipped with a dual-point external cargo hook system. The CH-46 is equipped with a single-point external hook. It has a secondary mission to transport USMC cargo and equipment externally. The UH-1N is equipped with an external cargo hook, but it is not normally employed in USMC helicopter external load operations because of its weight-lifting

limitations. OH 5-3A, The Helicopter External Cargo Loading Manual, stipulates the helicopters that are suitable for carrying each load.

10.16.2 Combat Cargo Officer. The designated CCO is responsible for the safe and efficient conduct of the HELT during USMC helicopter external load operations. He will act as the liaison between the embarked unit and ship's personnel and will supervise the HELT during sending (hookup) and receiving operations.

The CCO shall ensure that all loads of USMC cargo and equipment are rigged in accordance with OH 5-3A. The procedures therein provide detailed instructions for each item certified for airlift by USMC helicopter external load operations.

The CCO is also responsible for ensuring that each HELT is trained to perform its duties safely and proficiently. OH 5-3A and qualified helicopter support team personnel from the combat service support element or the landing support battalion of the force service support group provide excellent sources for procedures and expertise. The CCO will also ensure that HELT members are properly outfitted with flight deck gear and thoroughly familiarized with shipboard procedures.

10.16.3 Helicopter External Load Team. The HELT is organized as a hookup team or as a receiving team.

1. The hookup team is responsible for the preparation, rigging, and hookup of the load. It consists of a team leader, who serves as supervisor and safety observer, a static discharge man, a hookup man, and sufficient legmen to handle the sling legs. A The LSE serves as an outside director but is not part of the hookup team.
2. The receiving team consists of a team leader, a static discharge man, and a hookup man familiar with manual release procedures. Chockmen may be required for a wheeled load.

10.16.3.1 Team Member Responsibilities

1. The team leader is responsible for overall coordination of the team, individual equipment, and safety procedures. He/she will take a position where he/she can best observe and direct the team.
2. The static discharge man affixes the grounding cable of the static discharge grounding wand to a deck padeye or designated grounding receptacle. He/she positions himself/herself on or near the load in a stable position where he/she can

best make and maintain contact with the aircraft's cargo hook until hookup or manual release is complete. He/she ensures that the aircraft is properly grounded at all times during cargo hookup and emergency manual release procedures. Upon completion of hookup, he/she exits the load area with the static discharge grounding wand and moves to the team's rally position. The static discharge man must be thoroughly familiar with the effects of static electricity on personnel.

3. The hookup man positions himself/herself on or near the load in a stable position where he/she can best attach the sling or apex of the net to the aircraft's cargo hook. He/she ensures that the cargo sling or apex of the net are properly hooked up to the cargo hook and that the cargo hook is in the closed and locked position. Upon completion of hookup, he/she exits the load area and moves to the team's rally position.
4. Legmen are employed when there is either insufficient time for the use of tape to hold the sling legs in position or the configuration of the load is such that legmen are required to prevent the sling legs from catching on the load and thus preventing safe lifting of the load. Legmen position themselves on or near the load and ensure that sling legs are clear of obstructions. They hold the sling legs until the aircraft has lifted sufficiently to apply tension to the sling, thereby removing all slack from each sling leg. They then exit the load area and move to the team's rally position, ready to return to the hookup point on the team leader's signal.

10.16.3.2 Composition of the Helicopter External Load Team.

Composition of the HELT is according to type of load.

1. Netted loads:
 - a. One team leader
 - b. One static discharge man
 - c. One hookup man
 - d. Legmen — up to two.
2. Single-point equipment loads:
 - a. One team leader
 - b. One static discharge man

- c. One hookup man
- d. Legmen — one per sling leg.

3. Dual-point equipment loads:

- a. One team leader
- b. Two static discharge men — one per hook
- c. Two hookup men — one per hook
- d. Legmen — one per sling leg.

10.16.3.3 General Rigging Instructions. Prepare the load to be airlifted by following the instructions for each item as listed in OH 5-3A. This handbook provides information for the rigging and hookup of vehicles, equipment, and cargo for external lift. Modifications and additions to these rigging instructions are promulgated by Headquarters, U.S. Marine Corps.

10.16.4 Landing Signal Enlisted. While not a member of the HELT, the LSE must be integrated into HELT procedures. The CCO will ensure that the LSE is familiar with the planned operation and with HELT procedures.

WARNING

If legmen are used, the aircraft shall be held in a hover after slack is removed from the sling to allow HELT personnel to exit the lift area. At no time shall a load be lifted with personnel in the lift area.

10.16.5 Equipment and Support

10.16.5.1 Personal Protective Equipment. Each member of the HELT needs a complete issue of protective equipment. To provide for the safety of personnel during helicopter external load operations, personnel shall wear full flight deck personal protective equipment in accordance with NWP 3-04.1M (formerly NWP 42) or the LPH/LHA/LHD NATOPS Manual.

1. Military-approved combat, flight, or safety boots will be worn during external load operations. They are required to have rubber heels and soles during shipboard external load operations.
2. Lineman gloves of 20 kilovoltampere (20 kVA) are required to be worn by personnel using the static discharge grounding wand, hooking up a load, and manually releasing a load.

10.16.5.2 Communications. Communications should be used during helicopter external load operations and will be discussed during planning. As a minimum, the team leader and CCO representative should be on the flight deck radio net.

10.16.5.3 Static Discharge Grounding Wand.

The static discharge grounding wand is designed to protect the user from static electric shock during helicopter external load operations. Medium- and heavy-lift helicopters can produce a severe or fatal shock if not grounded when touched. The stored charge of static electricity of any helicopter increases with helicopter weight and low humidity.

The static discharge grounding wand consists of a hollowed rod with a grounding cable and clamp attached to one end and a hook attached to the other end. Lineman 20 kVA gloves will be worn for additional protection. The cable clamp is attached to a padeye on the deck of the ship or designated grounding receptacle.

WARNING

- Proper grounding is essential to effectively discharge static electricity. Attachment of the cable clamp to the cargo load is not sufficient. To ground the cargo hook, the clamp must be attached to a designated grounding receptacle or to a deck padeye.
- Do not hold the grounding cable or the “no hold” section of the wand during grounding. Because of the rapid buildup of static electricity, continuous contact must be made between the wand and the cargo hook.
- A hole in the lineman’s gloves, regardless of size, could leave a part of the hands unprotected from static electric shock, which may result in severe injury or death to ground crew personnel.

10.16.6 Coordination and Training. An important factor in preparing for shipboard external load operations is having thoroughly trained personnel. During shipboard operations, designated ship’s personnel are responsible for the supervision and control of all external lift operations. On amphibious aviation assault ships and air-capable ships, selected embarked Marine personnel are assigned to assist the ship’s CCO and

flight deck officer FDO during external lift operations of Marine cargo, equipment, and vehicles.

1. As loads of Marine equipment are generally different from standard Navy VERTREP loads, they require different hookup procedures and use of personnel specifically trained in those procedures.
2. During planning for shipboard external lift operations, the supported unit and transporting unit should review NWP 3-04.1M (formerly NWP 42) and OH 5-3A.
3. A liaison meeting shall be conducted with the embarked Marine unit and appropriate ship’s representatives prior to the operation. This meeting is to review the loading plan, load characteristics, rigging procedures, and HELT composition.
4. Personnel participating in shipboard external lift operations must be thoroughly trained in safe operating procedures.

10.16.6.1 Training. The responsibility for having trained personnel, familiar with external lift procedures for their equipment, lies with the unit being transported. The CCO, as the representative of the ship’s commanding officer, must be thoroughly familiar with and trained in external loading procedures. Marines formally trained in helicopter external load operations shall be used to the maximum extent possible. As there is a limited number of formally trained personnel to support multideck external lift operations, locally trained personnel will be used as part of the ship’s platoon. All HELT personnel in the ship’s platoon must be thoroughly familiar with the training objectives listed below:

1. Knowledge and recognition of lifting devices (e.g., slings, nets, bars, etc.)
2. Familiarity with general hookup procedures (see OH 5-3A)
3. Knowledge of safety hazards
4. Familiarity with the unit’s equipment that is routinely lifted by helicopter
5. Knowledge of each team member’s tasks
6. Knowledge of operation and maintenance of slings and other lifting devices
7. Familiarity with the helicopter’s hookup systems

8. Knowledge of shipboard operations
9. Knowledge of approved rigging procedures for external loads.

The landing support detachment of the combat service support element within a MAGTF has the expertise to assist in training to meet the objectives listed above. The landing support battalion of the force service support group is also capable of providing training to meet these objectives.

10.16.6.2 Night Operations. Because of the increased difficulty involved in conducting external load operations during darkness, extensive training and detailed planning become increasingly important. Certain problems will exist at night that do not occur during daylight operations. Common difficulties include increased time required for hookup, a tendency for the helicopter to drift during hover, and the lack of depth perception for aircrew and HELT personnel. Short duration chemical lights attached to the top of the load can assist the aircrew in identifying the load; likewise, chemical lights attached to the pendant hook will aid HELT personnel in the hookup operation.

10.16.7 Safety. Shipboard helicopter external load operations require more preparedness and alertness from personnel than operations ashore because of the increased hazards. Some of the major hazards to keep in mind include:

1. Confined helicopter operating area
2. Pitching and rolling decks
3. Wet and slippery decks
4. Turbulent winds due to ship's movement and superstructure
5. Potential of being struck by the helicopter.

10.16.7.1 Static Electricity. In flight, a helicopter generates and stores a charge of static electricity. When the helicopter lands, this charge is grounded out. However, in flight, the charge remains stored unless a path is provided for it to be grounded. The CH-53E is the helicopter that generates the greatest amount of static electricity — up to 200,000 volts on a dry, hot day. The buildup of static electricity in all helicopters must be neutralized prior to touching the aircraft's cargo hook, even if insulated lineman gloves are worn.

WARNING

Buildup of static electricity in the helicopter's cargo hook must be grounded before attempting hookup with a sling. Contact of the static discharge grounding wand with the cargo hook must be maintained continuously until hookup is complete. Static electricity is dangerous and can cause serious injury or death.

10.16.7.2 Rotor Downwash. Ground and deck crew members must be aware of the effects of downwash from helicopters, especially the CH-53E. Excessive downwash can cause difficulty for personnel in walking or standing and its force can move unsecured material. Because the CH-53E provides the greatest amount of downwash, ground and deck crew members who encounter high velocity downwash should drop to the deck in a sitting or prone position.

WARNING

The greatest downwash velocity occurs from 60 to 70 feet (18.3 to 21.3 m) from the cargo hook. The CH-53E can generate downwash greater than 120 knots. Before conduct of external load operations, ground and deck crews must be briefed on the downwash potential of the helicopter and safety considerations. Personnel who encounter high velocity downwash should drop to the deck in a sitting or prone position.

10.16.7.3 Additional Hazards. The hazards found in working under a hovering helicopter are not always apparent. In addition to static electricity and rotor downwash, other hazards to consider and avoid include:

1. Flying debris and FOD.
2. Tangling of cargo slings. This may also cause fasteners to disengage, thus increasing the potential of dropping the load.
3. Objects that protrude from loads or the aircraft.
4. Top-heavy or unbalanced loads. Load weight should be verified and the hookup points checked for proper distribution of cG.

5. Personnel being caught between the sling and the aircraft.
6. Tripping over the static discharge grounding wand's grounding cable.

All HELT personnel have the responsibility to abort an operation if unsafe conditions are present that would injure personnel or cause a safety or flight hazard.

10.17 REFERENCES

ATP 1, Volume II, Allied Maritime Tactical Signal and Maneuvering Book

ATP 16, Replenishment at Sea

NAEC-ENG-7576, Shipboard Aviation Facilities Resume

NAVAIR 00-25-513, Ground/Air Emergency Code

NAVAIR 00-80T-133, Aircraft Signal Book

NAVAIR, Air Capable Ship Aviation Facilities Bulletin No. 1

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

NAVSEA OP 3192, Missile Transfer Dolly Mk 6 Mod 1, 2, 3, and 4

NAVSEA OP 3206, Handling and Stowage of Naval Ordnance Aboard Ammunition Ships, Volumes I, II, and III

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

NAVSEA OP 4098, Handling Ammunition, Explosives, and Hazardous Materials With Industrial Material Handling Equipment (MHE)

NAVSEA S9570-AA-MMA-010, Underway Replenishment Ordnance Handling Equipment and Transfer Units

NWP 3-04.1M (formerly NWP 42), Shipboard Helicopter Operating Procedures

OH 5-3A, The Helicopter External Cargo Loading Manual

OPNAVINST 3120.28, Certification of Aviation Facilities in Naval Ships Operating Aircraft

OPNAVINST 3710.7 NATOPS Manual, General Flight and Operating Instructions

OPNAVINST 3750.6, Aircraft Accident Reporting Procedures

OPNAVINST 5100.19A, Navy Safety Precautions for Forces Afloat

APPENDIX A

Reports

A.1 REPLENISHMENT MISHAP/INCIDENT REPORTING

Reports of replenishment mishaps and incidents provide the Chief of Naval Operations (CNO) with detailed information necessary to conduct a comprehensive safety program. Complete reporting is essential. Facts discovered — but not reported — do not prevent accidents. The collective use of reports provides information (1) that can be used for modification and changes in design criteria, personnel planning, operations planning, and other staff actions and (2) that may otherwise be obscure to an individual investigating a single accident. Reports and recommendations must be prepared with the thought that personnel at numerous levels will review them, evaluate their contents, and take appropriate action. The following reports relate the replenishment mishaps/incidents:

1. Urgent Change Recommendations
2. Forces Afloat Mishap
3. Safetygram
4. PMS Feedback
5. Hazardous Defective Material
6. OPREP-3 (OPNAVINST 3100.6 series).

A.2 URGENT CHANGE RECOMMENDATIONS

The form for submitting urgent change recommendations of vital importance, including items of safety, is provided in the Preface.

A.3 FORCES AFLOAT MISHAP REPORTING

Detailed information for reporting mishaps and near mishaps as well as reporting material property damage (MPD) and criteria for submitting personnel injury/death (PID) reports is contained in OPNAVINST 5102.1.

A.4 SAFETYGRAM REPORT

Safetygram reports provide Navy personnel with an informal means of reporting the hazardous material conditions or practices they have observed during a replenishment operation. A person who observes a hazardous material condition or practice, or who has an accident prevention suggestion, may describe it on a safetygram form and submit the form to the Naval Safety Center. The Safetygram (OPNAV Form 5102/4) (see Figure A-1) can be ordered from Naval Publications and Forms Center. The form is to be filled out in triplicate (copies are provided) and the original is to be submitted to Naval Safety Center, Naval Air Station, Norfolk VA 23511.

The purpose of the safetygram is to provide an informal method of reporting hazard-related suggestions or comments to the Naval Safety Center. It shall not be used as a substitute for other required reports.

A.5 PMS FEEDBACK REPORT

The PMS Feedback Report (OPNAV Form 4790/7B) is also an effective tool for reporting replenishment accident-related information via the type commander. Instructions for preparing this form are contained on the reverse side of the green “Originator” copy. When reporting safety-related information, make sure that the “Safety Precautions” block is checked.

A.6 HAZARDOUS DEFECTIVE MATERIAL REPORT

The reporting of defective material obtained through the supply system is of prime importance, especially when the use of this material could endanger personnel. NAVSUPINST 4440.120 outlines procedures and assigns responsibilities for the reporting of defective material. It applies to all ships and stations. Commanding officers, ships’ safety officers, and department heads should make all personnel aware of these responsibilities and of the reporting criteria outlined in NAVSUPINST 4440.120. Proper reporting of defective material may save a life.

SAFETYGRAM

(Mark X in appropriate box to indicate type of Command)

Surface Ship

Submarine

Diving/Salvage

Aviation

Shore

Command, Ship, or Ship Class

Date:

References:

Plan No/Tech Manual/etc.

STATE: What, where, why; how it can be prevented or corrected.

SAMPLE

ORIGINAL

SIGNATURE (NOT REQUIRED)

Instructions: (1) Send original to Commander NAVSAFECEN, and copies as appropriate. Retain file copy. (2) May use pencil longhand; attach additional sheets as necessary. (3) If classified information included, follow appropriate marking and mailing.

OPNAV 5102/4 (Rev. 8-78) S/N 0107-LF-061-0226 (Replaces NAVSAFECEN 5101-1, 5101/2 and 5101/3 which may be utilized to deplete existing stocks.)

Figure A-1. Safetygram

APPENDIX B

Ram Tensioner Procedures

B.1 SAFETY PROCEDURES

1. Air leaking into the fluid past defective accumulator piston seals or overfilling with fluid will cause ejection of an A model (fourth or fifth letter of model number) ram tensioner if a highline or span wire parts under tension. Repeated over-extension of an overfilled or leaking ram into the stops of an A or B model ram will also cause failure.
2. Regular use of the manual bleed valve, as specified under operating instructions, is mandatory. Operate the bleed valve only when the ram is fully extended, and open the valve slowly to a maximum of one turn. The fluid in the sight glass should be a clear stream. As a precaution against sight glass rupture, do not stand directly in front of the sight glass. Always pump fluid from reservoir back to ram tensioner after a bleed valve check. Reservoir should be maintained half full.
3. Use only phosphate ester hydraulic fluid conforming with MIL-H-19457C Addendum 1 or D. This fluid is the latest nonneurotoxic fire resistant ram tensioner operating fluid, also known by the Stauffer Chemical Company trade name Fyrquel 220MLT (NSN for 55 gallon drum — 9G-9150-01-113-2047; NSN for 5 gallon drum — 9G-9150-01-113-2046).
4. Fluid made to MIL-H-19457C Addendum 1 or D is safe to use when handled properly. Follow the following safety precautions:
 - a. Avoid inhalation, ingestion, and skin and eye contact. If exposed, remove contaminated clothing. Immediately wash exposed skin with soap and water and rinse eyes for 15 minutes with water. Seek medical aid. Launder contaminated clothing immediately using oily clothing method.
 - b. Keep food, smoking material, and drink away from areas where fluid is being handled or stored.
 - c. Wash hands thoroughly with soap and water immediately after handling fluid. Discard any contaminated food, smoking materials, or drink.
 - d. Respiratory and eye protection is required in the area of leaks which result in a fine mist or spray in the air.
 - e. Wear protective clothing in keeping with the work task. Stock numbers of appropriate protective clothing are listed in NAVSEAINST 5100.13.
 - f. Follow safety precautions of NAVSEAINST 5100.13 when handling or cleaning up spills of phosphate ester fluids.
5. All ram tensioners and all spaces where phosphate ester fluids are stored shall have the following warning posted in a conspicuous place:

WARNING

Some ram tensioners may still contain fluid made to MIL-H-19457B, sometimes called Cellulube 220A or Fyrquel 220PM. This fluid contains triortho-cresyl-phosphate, which can be absorbed into the body through the skin and may affect certain nerve functions. This older, more hazardous fluid may be identified by its green color, and should be changed to the nonneurotoxic fluid at the first opportunity. Fluid made to MIL-H-19457C is blue in color.

WARNING

Contains phosphate ester fluid. Avoid direct skin contact. Follow safety precautions of NAVSEAINST 5100.13 when handling. Use MIL-H-19457C Addendum 1 or D fluid only.

B.2 OPERATING PROCEDURES

Figure B-1 shows the ram tensioner installation. The safe load capacities for STREAM rigs for transfer of solid cargo and missiles are given in Figure B-2. Most receiving ships with STREAM stations have attachment points static tested to 50,000 lb (22,675 kg). These ships can accept all of the STREAM rigs at maximum available highline tensioning; consequently, they can use line B in Figure B-2 to determine rig capacity. Receiving ships with STREAM stations that have attachment points static tested to less than 50,000 lb (22,675 kg) must use line A of Figure B-2.

B.2.1 Pre-Operational Procedures

1. Ensure that the highline or spanwire winch is ready to operate.

CAUTION

The following precautions must be taken before charging the ram:

1. Ensure that the end of the wire is secure.
2. Remove all slack from the highline.
2. Secure the end of the highline or span wire to a padeye that was previously tested to a minimum of 36,000 pounds (16,326 kg).
3. Ensure that the ram has been charged with proper fluid (see item 3 of paragraph B.1) and that a minimum of 2-1/2 gallons (9.5 L) of fluid (half full) remains in the hand pump reservoir. Ensure that the air flask bank is at operating pressure with the ram shutoff valve closed. See Figures 6-1 and 3-17 for correct pressure.
4. Close the air dump valve and slowly open the ram shutoff valve to pressurize the ram. This valve must remain fully open during ram operation. A partially closed valve may cause relief valve to lift.

5. Operate the winch to pay out the highline or span wire, and allow the ram to extend fully until the wire becomes slack.
6. To clear the bleed line, slowly open the manual bleed valve one-half turn, and observe the flow indicator for a minimum of 10 seconds or until clear fluid only shows in the sight glass. If air continues to bleed in excess of 1 minute, the ram tensioner unit should be considered questionable and a leakage test (paragraph B.3) should be conducted before further use.
7. The ram, when free of air and properly charged with fluid, should extend to the charged position (i.e., 12 feet 6 inches (381 cm) for the 80-foot (24.3 m) capacity model and 14 feet (441 cm) for the 120-foot (36.6 m) capacity model). (Figures following the letter in the model number show the total take-up capacity.) Adjust to charged position by bleeding excess fluid or adding fluid with the hand pump. No further bleeding or addition of fluid should be done while the ram is in operation. The most convenient way to measure extension is to attach a tape measure to the top sheave assembly and measure the difference before and after extension to a convenient fixed point on the base.
8. In cold weather, a temperature below 20 °F (-6.7 °C) will cause sluggish action of a ram tensioner when first activated. Slowly stroking the unit 10 strokes, starting with partial strokes, will warm the fluid and correct any sluggishness.
9. Verify that the ram position indicator at the winch control position is functioning and correctly indicates the ram position. Verify that limit alarms, where provided, function correctly.
10. The highline or span wire is now ready for passing to the receiving ship. The ram should remain extended while passing the rig.

B.2.2 Operating Procedures

1. The function of the ram tensioner is to take up and pay out the highline or span wire rapidly as required to compensate for relative ship motion without constant paying out and hauling in of the winch. After the ships have steadied on course and ship motion is not extreme, the ram should be allowed to ride in the mid-range without unnecessary use of the winch.
2. The ratio of tension in the highline or span wire to air pressure is 10 to 1 — that is, 15,000 pounds of

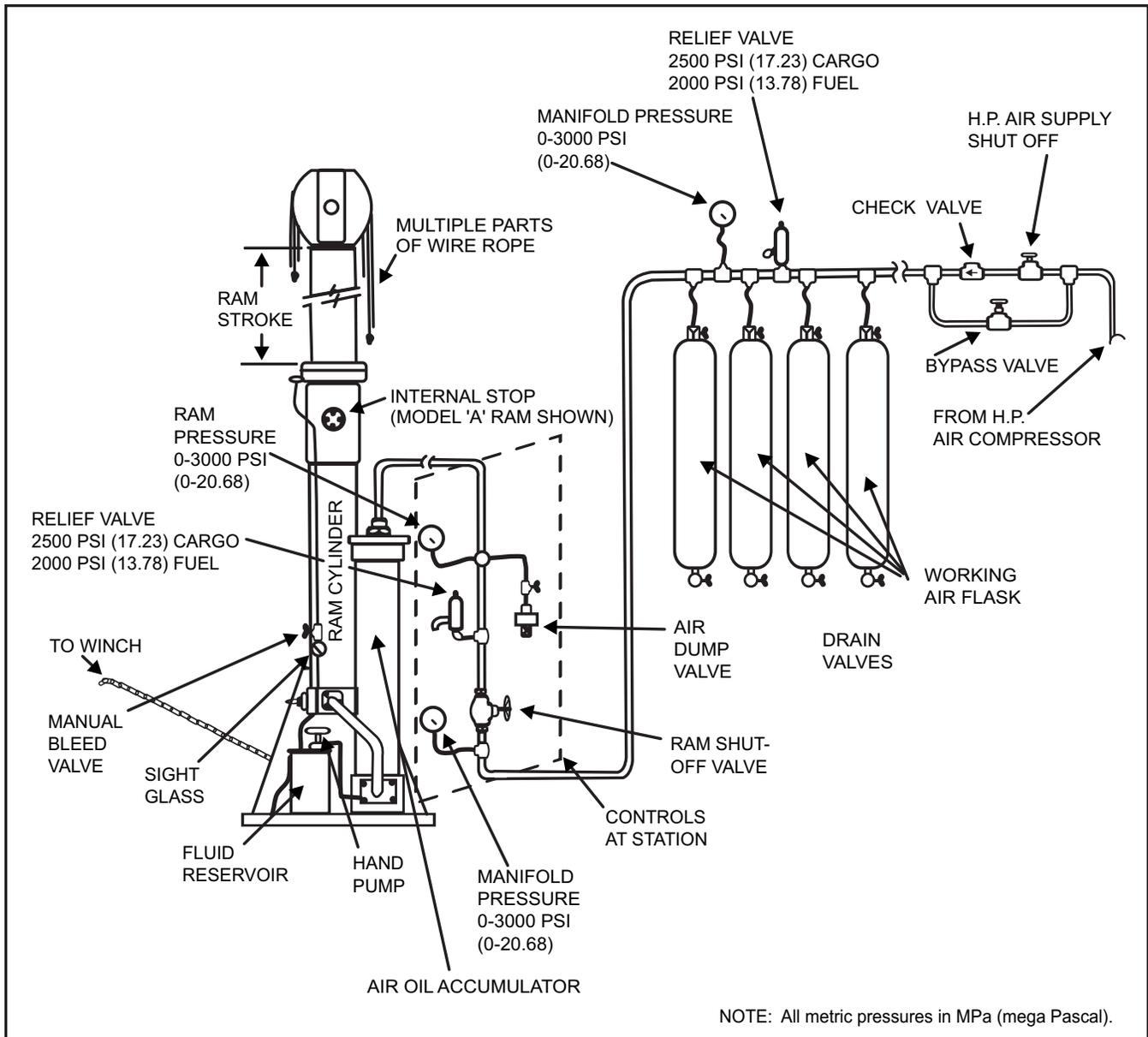


Figure B-1. Ram Tensioner Installation (High Pressure Air Piping Circuit May Vary)

tension to 1,500 psi air. (There is no easy-to-remember ratio in the metric system, but corresponding values are 6,803 kg to 10,342 kPa.) Maximum operating air pressure can be increased up to but not exceeding the rated line pull of the winch, as determined from the winch nameplate or technical manual. Maximum pressure is the air pressure multiplied by 10 (64.6 metric) with the ram fully retracted. The ram air pressure will vary up to 400 psi (2,758 kPa) between the extended and retracted positions, and when observing air pressure in the extended position, allowance must be made for the increase in pressure in the

retracted position. Greater ship separations will require higher tensions. Older ships with receiving stations rated less than 50,000 pounds (22,675 kg) test will require a reduction in tension. See Figure 6-1 for the amount of reduction. Low spanwire tension may make the mating of the fueling probe into the probe receiver difficult. Air pressure is reduced by bleeding air using the air dump valve or flask blow-down valve. Air pressure may be boosted by supplying air from other stations. Avoid unnecessary air pressure reductions that may overwork air compressors.

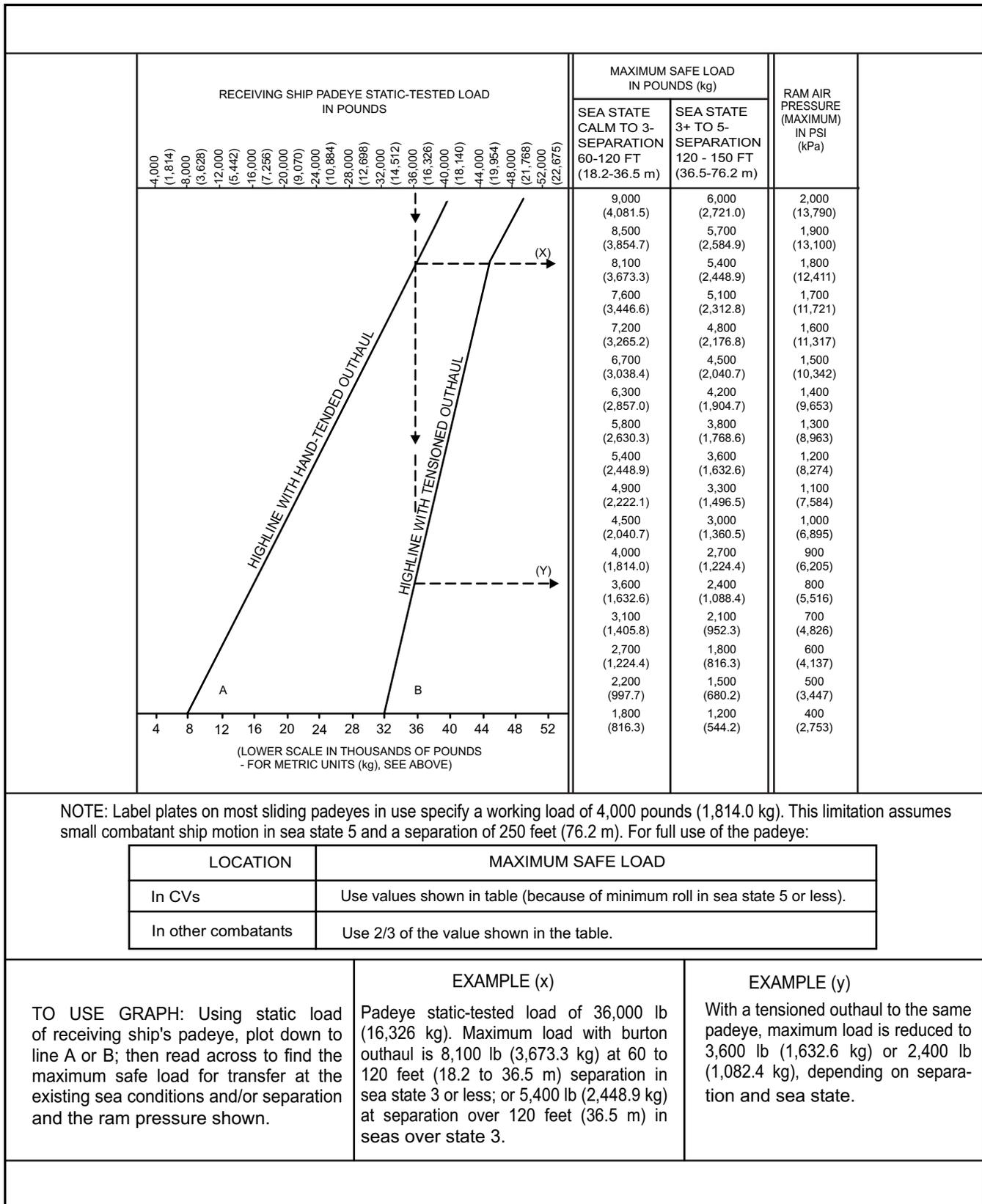


Figure B-2. Ram Tensioner Air Pressure for Missile/Cargo STREAM Stations

3. The high-pressure air system should be operated and inspected in accordance with the instructions in NAVSHIPS Technical Manual, Chapter 551, Compressed Air Plants and Systems. Drain valves on the air flask must be operated at regular intervals to prevent accumulation of excess moisture in the air system.

B.2.3 Post-Operational Procedures

1. After retrieving the rig again, secure the end of the highline or span wire to the padeye.
2. With the ram shutoff valve still open, operate the winch to fully retract the ram. Close the ram shutoff valve, and open the air dump valve. This procedure forces air back into the air flask to conserve high-pressure air. Leaving the air dump valve open ensures that the ram will not extend during periods of disuse if the ram shutoff valve should leak.
3. Slack the highline or spanwire, and note any extension of the ram. Any extension beyond the fully retracted position with the ram shutoff valves secured, indicates that there has been air leakage past accumulator piston seals during use. Do not attempt to bleed air with the ram in the retracted position. If an extension is observed, the ram tensioner unit should be considered questionable and a leakage test (paragraph B.3) should be conducted before further use.

B.3 LEAKAGE TEST

Activate the ram as provided in paragraph B.2.1, steps 1 through 7.

1. Static Test — Allow the ram to remain pressurized, in extended (charged) position, and with

the wire slack for 60 minutes. Any additional extension of the ram beyond the charged position during this period or any indication of air when the manual bleed valve is opened for 10 seconds indicates a defective ram accumulator piston seal.

2. Dynamic Test — Operate the winch to stroke the ram from the extended (charged) to the retracted position for 10 cycles. Again allow the ram to extend. Slack the wire and leave the ram extended for 60 minutes. Extension of the ram beyond the charged position indicates a defective ram accumulator piston seal.
3. A defective ram may be due to worn seals on the accumulator piston or scored accumulator walls. Refer to the technical manual for corrective action.

B.4 STANDARDIZATION

For standardization, and to allow heavy-lift operations described in paragraph 6.17, ram tensioner and air flask air relief valves at solid cargo stations shall be set at 2,500 psi (17,237 kPa). Ram tensioner and air flask air relief valves at liquid cargo (FAS) stations shall be set at 2,000 psi (13,790 kPa). Ships with a reserve air bank shall set the reserve air bank relief valve at 3,500 psi (24,132 kPa).

B.5 REFERENCES

NAVSEA Instruction 5100.13

NAVSHIPS Technical Manual

Hydraulic Ram Tensioners, Operation and Maintenance Manual — NAVSHIPS 0978.036-7010 (covers 80 and 120 foot (24.4 and 36.6 m) Models A and B).

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 chemical light wand holders or colored wands on flashlights at night. The standard hand signals used during replenishment operations are illustrated in Figure C-1. (See paragraph 2.4.5.3.)

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.

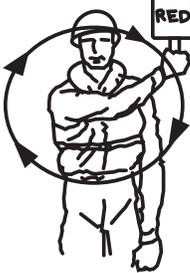
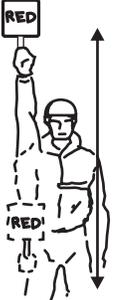
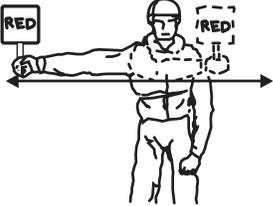
STANDARD PROCEDURES (Paralleled by S/P phone)	
SIGNAL	REMARKS
<p>1.</p>  <p>HEAVE AROUND</p>	<p>Signalman moves <u>red</u> signal device in a continuous complete circle in front of body, and keeps the proper color visible to the other station at all times. The other station answers with the "Slack off" signal</p>
<p>2.</p>  <p>SLACK OFF</p>	<p>Signalman moves <u>red</u> signal device vertically in front of body. The other station shall slack off the appropriate line, wire, or hose and answer with the "Heave around" signal.</p>
<p>3.</p>  <p>AVAST</p>	<p>Signalman moves <u>red</u> signal device horizontally in front of body, and keeps the proper color visible to the other station at all times. The other station shall <u>stop</u> heaving around or slacking off as appropriate, and tend all lines.</p>
<p>4.</p>  <p>TEST S/P PHONE LINE</p>	<p>Signalman raises <u>two green</u> signal devices overhead to form a "steeple." Phone talkers shall "Test your phones/phone line."</p>

Figure C-1. Alongside Hand Signals (Sheet 1 of 7)

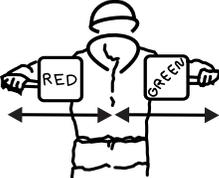
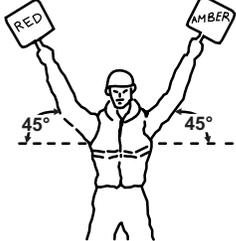
STANDARD PROCEDURES (Paralleled by S/P phone)	
SIGNAL	REMARKS
<p>5.</p>  <p>REPLACE S/P PHONE LINE</p>	<p>Signalman moves <u>two green</u> signal devices vertically in front of body. Phone talkers and line handlers shall "Replace your phone line."</p>
<p>6.</p>  <p>HOOKED-UP or CONNECTED</p>	<p>Signalman, with <u>red</u> signal device in right hand and <u>green</u> signal device in left hand, touches devices moving horizontally in front of body at shoulder height when the receiving station has "hooked up" the pelican hook. The signal shall be repeated by the receiving station until acknowledged by the delivery station. This signal is repeated when the fuel hose is "connected" or the traveling SURF/STAR is "connected" at the receiving station.</p>
<p>7.</p>  <p>TENSION</p>	<p>Signalman holds <u>red</u> signal device in right hand and <u>amber</u> signal device in left hand with arms extended overhead to form a "V." This signal, initiated by receiving station, means "I am ready for tensioning." When initiated by the delivery station, signal means "I am tensioning," and the delivery station will tension the appropriate wire. Both signalmen will maintain the signal until the delivery station stops the signal. This signal is repeated when the receiving station is ready for tension on the outhaul; if not ready for tension, the "Avast" signal is used.</p>
<p>8.</p>  <p>START PUMPING or COMMENCE TRANSFER</p>	<p>Signalman moves <u>green</u> signal device in a continuous complete circle in front of body, and keeps the proper color visible to the other station at all times. This signal, executed by either station 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 station, begin transfer and commence signaling with <u>red</u> paddle. If not ready to commence operation, the "Avast" signal is used.</p>

Figure C-1. Alongside Hand Signals (Sheet 2 of 7)

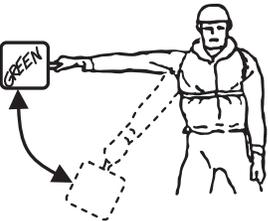
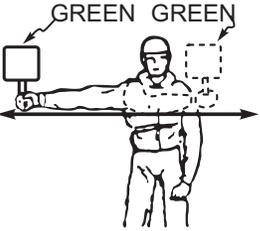
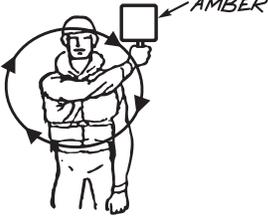
STANDARD PROCEDURES (Paralleled by S/P phone)	
SIGNAL	REMARKS
<p>9.</p>  <p>DESIRE INCREASE IN PUMPING PRESSURE</p>	<p>Signalman on the receiving ship moves a <u>green</u> signal device in a continuous circle overhead to indicate to the delivering ship that an increase in pumping pressure is desired.</p>
<p>10.</p>  <p>DESIRE DECREASE IN PUMPING PRESSURE</p>	<p>Signalman on the receiving ship moves <u>green</u> signal in an arc on his right side from shoulder to knee level to indicate to the delivery ship that a decrease in pumping pressure is desired.</p>
<p>11.</p>  <p>STOP PUMPING or CEASE TRANSFER</p>	<p>Signalman moves <u>green</u> signal device horizontally in front of body. This signal, executed by either station, indicates "Stop pumping" or "Cease transfer" and is used only to signal the completion of the pumping/transfer operation. As soon as the signal is repeated by the other station, the signalmen shift to <u>amber</u> or <u>red</u> signal devices as appropriate.</p>
<p>12.</p>  <p>START BLOW THROUGH</p>	<p>Delivery station signalman moves <u>amber</u> signal device in a circle in front of body. The signal, meaning "Start blow through now," is repeated until the receiving station acknowledges with a "Blow through" signal, indicating that it is ready to commence blow through (fueling-at-sea use only).</p>

Figure C-1. Alongside Hand Signals (Sheet 3 of 7)

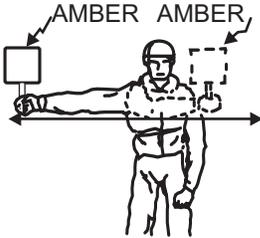
STANDARD PROCEDURES (Paralleled by S/P phone)	
SIGNAL	REMARKS
<p>13.</p>  <p>STOP BLOW THROUGH</p>	<p>Signalman moves <u>amber</u> signal device horizontally in front of body, and keeps the proper color visible to the other station at all times. The signal, given by the receiving station to indicate "Stop blow through," is acknowledged by the "Stop blow through" signal from the delivery station, indicating that it has stopped the blow through (fueling-at-sea use only).</p>
<p>14.</p>  <p>REPLENISHMENT COMPLETED AT THIS STATION. COMMENCE UNRIGGING.</p>	<p>Signalman holds <u>red</u> signal device in right hand and <u>green</u> one in left hand. He crosses both hands and arms over each other overhead.</p>
<p>15.</p>  <p>DETENSION</p>	<p>Signalman, with <u>red</u> signal device in right hand and <u>amber</u> signal device in left hand, arms extended vertically overhead, 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."</p>
	<p>Cargo Station:</p> <ol style="list-style-type: none"> 1. Delivery ship — detension outhaul 2. Receiving ship — disconnect STAR/SURF
	<p>Fuel Station:</p> <ol style="list-style-type: none"> 1. Delivery ship — haul in slack on retriever 2. Receiving ship — disconnect fuel fitting
<p>Cargo and Fuel Stations:</p> <ol style="list-style-type: none"> 1. Retrieve hose or STAR/SURF 2. Detention highline or spanwire 	

Figure C-1. Alongside Hand Signals (Sheet 4 of 7)

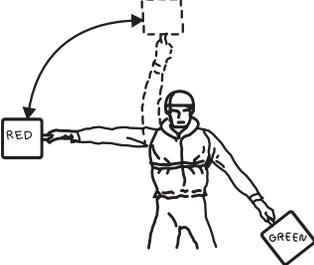
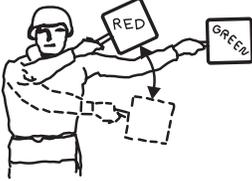
STANDARD PROCEDURES (Paralleled by S/P phone)	
SIGNAL	REMARKS
<p>16.</p>  <p>PELICAN HOOK TO BE TRIPPED</p>	<p>Signalman, with <u>red</u> signal device in right hand, makes chopping motion with right hand from overhead to shoulder height. In left hand, he holds <u>green</u> signal device steady at 45° angle from body. Signal, given by delivery ship, indicates "I am ready, trip pelican hook." If receiving ship is not ready, the "Avast" signal is given until such times as ship is ready.</p>
<p>17.</p>  <p>TRIP PELICAN HOOK</p>	<p>Signalman holds <u>red</u> signal device in right hand and <u>green</u> 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.</p>

Figure C-1. Alongside Hand Signals (Sheet 5 of 7)

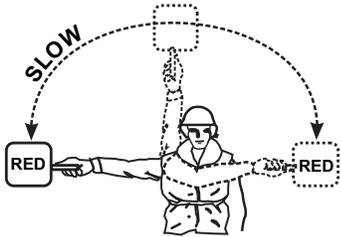
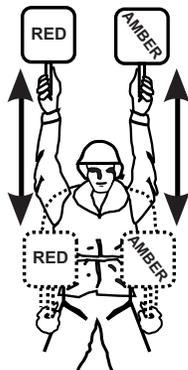
EMERGENCY BREAKAWAY (Paralleled by S/P phone)	
SIGNAL	REMARKS
1. FIVE SHORT BLASTS OF THE SHIP'S WHISTLE	<u>EMERGENCY BREAKAWAY</u> . The delivery ship or the receiving ship may initiate an emergency breakaway. Once initiated, the delivery ship assumes control. The following signals shall be used for normal or emergency breakaway.
2.  PREPARE FOR EMERGENCY BREAKAWAY	Signalman of delivery ship waves <u>red</u> signal device in a semicircular arc overhead, meaning "Prepare for breakaway." Other ship acknowledges by repeating the signal, meaning "Understood, I am preparing for breakaway."
	Cargo Station: 1. Delivery Ship — retrieve load
	Fuel Station: 1. Delivery ship — stop pumping and secure valves
3.  DETENSION	Cargo and Fuel stations: 1. Clear station of all nonessential personnel
	Cargo Station: 1. Delivery ship — detension outhaul 2. Receiving ship — disconnect STAR/SURF
	Fuel Station: 1. Delivery ship — haul in slack on retriever 2. Receiving ship — disconnect fuel fitting
Cargo and Fuel Stations	1. Retrieve hose or STAR/SURF 2. Detention highline or spanwire

Figure C-1. Alongside Hand Signals (Sheet 6 of 7)

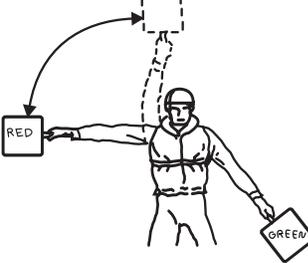
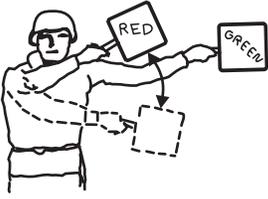
EMERGENCY BREAKAWAY (Paralleled by S/P phone)	
SIGNAL	REMARKS
<p>4.</p>  <p>PELICAN HOOK TO BE TRIPPED</p>	<p>Signalman, with <u>red</u> signal device in right hand, makes chopping motion with right hand from overhead to shoulder height. In left hand, he holds <u>green</u> signal device steady at 45° angle from body. Signal, given by delivery ship, indicates "I am ready, trip pelican hook." If receiving ship is not ready, the "Avast" signal is given until such times as ship is ready.</p>
<p>5.</p>  <p>TRIP PELICAN HOOK</p>	<p>Signalman holds <u>red</u> signal device in right hand and <u>green</u> 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.</p>

Figure C-1. Alongside Hand Signals (Sheet 7 of 7)

APPENDIX D

Replenishment Checklists

The checklists contained in this appendix are to be used only as a guide. Ships should promulgate replenishment checklists that will reflect the individual ship's requirements.

Note

For VERTREP checklist, refer to NWP 3-04.1M (formerly NWP 42).

REPLENISHMENT CHECKLIST

Deck Department

1. Receive and review all station checkoff lists. _____
2. Check each station to see that it is properly rigged for the method of transfer. _____
3. Check the distance line for proper length and markings. _____
4. Ensure that any required handling equipment is in place, operating, and manned. _____
5. See that any required carriers are on station (such as, cargo nets, skip boxes, transfer-at-sea chair, or transfer bags). _____
6. Start, warm up, and test winches. _____
7. Ensure that the brake is set on the cargo boom's topping lift winch and the winch pawl is engaged. If winch is not equipped with a pawl, attach a preventer stopper to the topping lift wire (as appropriate). _____
8. Rig the proper station markers. _____
9. Have two bolos and one line-throwing gun ready for use at each station to be used. Test line-throwing gun and examine firing pin. Have extra projectiles and shot lines on hand. _____
10. Prepare and test sound-powered phones. _____
11. Have all personnel on station in prescribed uniform with life jackets, hard hats, and other special clothing as required. _____
12. Rig in movable equipment and fittings that project over the engaged side and are not required during the replenishment (that is, lifeboats and sea painter). _____
13. Test lifeboat engines. Ready lifeboat for lowering. _____
14. Have movies, fleet freight, and mail ready for immediate transfer. _____
15. Have all specified rigs ready for use. _____
16. In freezing weather, have sand available for use on icy areas. Whenever practicable remove ice from working areas prior to replenishment. _____
17. Have repair tools on station and ready for use. _____
18. Make readiness report to OOD. _____

Remarks:

REPLENISHMENT CHECKLIST

Engineering Department

- 1. Light off additional boilers, as necessary. _____
- 2. Put generators on the line, as required. _____
- 3. Warm up all deck machinery. _____
- 4. Maintain fire-main pressure at 100 psi (689.4 kPa). _____
- 5. Lead out and inspect necessary firefighting equipment. _____
- 6. Check all sound-powered phones and circuits that will be used, both intership and intraship. _____
- 7. Warm steam cargo pumps. Test all pumps, including electrical. Recirculate oil (AO). _____
- 8. Make readiness report to OOD. _____
- 9. Set restricted maneuvering conditions, when directed. _____

Remarks:

REPLENISHMENT CHECKLIST

Supply Officer

- 1. Receive or send requisitions, ration items in short supply, and prepare hatch check sheets. _____
- 2. Conduct prereplenishment conference to disseminate information to checker, hatch officers, and leading petty officers. _____
- 3. Prestage number of net loads at each transfer station. _____
- 4. Predesignate deck space that will be used for transfer, and label the space accordingly. _____
- 5. Man replenishment-at-sea detail when called away. Man phone talker stations, status boards, and supervisor stations. _____
- 6. Furnish checkers for cargo transferred/received at each station. _____
- 7. Prepare cargo scheduled for transfer. _____
- 8. Record water cuts, ullage gauges, and temperature of tanks before and after. _____
- 9. Make readiness report to OOD. _____

Remarks:

REPLENISHMENT CHECKLIST

Night Replenishment Station # _____

(Petty officer in charge of station will complete this checklist in addition to the station checklist required for day replenishment.)

- 1. Have at least two shot-line projectiles on hand illuminated with orange chemical light for each ship expected alongside. _____
- 2. Test batteries and bulbs in all flashlights. _____
- 3. Have station marker light box properly prepared. Show correct commodity for transfer. _____
- 4. Have obstructions, fittings, and attachment points marked with red chemical lights or one-cell red flashlights. _____
- 5. Have appropriate chemical light wand holders or colored wands on flashlights available for hand signals. _____
- 6. Mark each messenger line with canvas tags. _____
- 7. Rig distance line illumination. _____
- 8. Rig lifeline illumination. _____
- 9. Illuminate working station lighting. _____
- 10. Ensure approach and station lights have been tested. _____

Remarks: Refer to paragraph 2.5 for night lighting requirements.

REPLENISHMENT CHECKLIST

POL Cargo Officer

- 1. Ensure that ullage ports and hatch covers are closed but not dogged. Vent valves should be open and flame screen in place. _____
- 2. Line up cargo system (line up for each replenishment should be in writing). _____
- 3. Man all cargo discharge stations, drop lines, and pump rooms with qualified personnel. _____
- 4. Test cargo pumps. _____
- 5. Test explosimeter. _____
- 6. Provide inert gas for blowdown (if applicable). _____
- 7. Have pressure gauges at all discharge stations. _____
- 8. Ensure that drip pans, sawdust, sand (if needed), and rags are available. _____
- 9. Ensure that there is 100 psi (689.4 kPa) pressure on the fire main and that fire-fighting equipment is available. _____
- 10. Ensure that safety precaution checklist for loading and discharging liquid cargoes has been completed, signed by the cargo officer, and approved by the commanding officer. _____
- 11. Ensure that steam smothering is cut in up to the tank manifolds (if applicable). _____
- 12. Ensure that a green chemical light or one-cell white flashlight, a whistle, and a dye marker are attached to each life jacket in use. _____
- 13. Make readiness report to OOD. _____

Remarks:

REPLENISHMENT CHECKLIST

Fueling Station # _____

(For night replenishment, include supplemental checklist.)

1. Ensure that open wire and whips are free of kinks and are spooled on the drums with no riding turns. _____
2. Check pelican hook for ease of operation and presence of cotter pin. _____
3. Check end fitting (that is, eye splices and spanwire weak link). _____
4. Start, warm up, and test winches. _____
5. Conduct pre-operation check-out of ram tensioner. _____
6. Check topping lift brakes and wire stopper. _____
7. Rig station marker. _____
8. Ensure that only properly tested hoses are used in rig. _____
9. Conduct pre-operation inspection of probe. For double-probe delivery, verify all teflon inserts are installed in probe runners. For double-probe receivers, verify all spacers are installed between receivers. Verify centerline to centerline distance is 19 inches (48.3 cm) between upper and lower probes and upper and lower receivers. _____
10. Check quick-release coupling for ease of operation and for condition of three actuating pawls inside the coupling. _____
11. Tighten 4-inch hose cap hand-tight. _____
12. Place hose rig in position, fitted on outboard end with appropriate fitting for ship to be refueled. _____
13. Attach STAR messenger to trolley carriage, and fake messenger down on deck for running. Connect messenger return line to messenger return line pendant, and fake down for running. _____
14. Ensure that inboard saddle whip is led to a cleat on deck and is faked down free for running when applicable. _____
15. Ensure that saddle whips and retrieving lines are clear for running and are led to winches. _____
16. Fake down phone line, and test phone. _____
17. Have signal paddles available. _____
18. Have required station tools available. _____

19. Have line-throwing gun and one bolo at each station to be used. Test line-throwing gun and examine firing pin. Have extra projectiles and shot lines on hand.

20. Have spare shackles, seizing wire, and small stuff for lashing available.

21. Ensure that a green chemical light or one-cell white flashlight, a whistle, and a dye marker are attached to each life jacket in use.

22. Make readiness report to first lieutenant.

Remarks:

REPLENISHMENT CHECKLIST

STREAM Station # _____

(For night replenishment, include supplemental checklist.)

- 1. Ensure that wires are free of kinks and are spooled on the drum with no riding turns. Additionally, ensure that winch clutches are engaged and that clutch engaging levers are secured in place with toggle pins. _____
- 2. Test winches and sliding block in accordance with approved SQT procedures. _____
- 3. Ensure that trolley, cargo drop reel, cargo hook, messenger-rigged STAR, traveling SURF, and STREAM manila or Burton outhaul are properly rigged. _____
- 4. Ensure that inhaul is in tension mode. _____
- 5. Check pelican hook for ease of operation and presence of cotter pin. _____
- 6. Ensure that the STAR messenger is faked down for running and properly attached to the rig. _____
- 7. Have line-throwing gun and one bolo at each station to be used. Test line-throwing gun and examine firing pin. Have extra projectiles and shot lines on hand. _____
- 8. Rig station marker. _____
- 9. Have signal paddles available. _____
- 10. Fake down phone line, and test phone. _____
- 11. Have required station tools available. _____
- 12. Have cargo nets, net shorteners, skip box, and transfer bag available, as required. _____
- 13. Muster personnel assigned. _____
- 14. Ensure that a green chemical light or one-cell white flashlight, a whistle, and a dye marker are attached to each life jacket in use. _____
- 15. Make readiness report to first lieutenant. _____

Remarks:

REPLENISHMENT CHECKLIST

Burton Station # _____

(For night replenishment, include supplemental checklist.)

- 1. Ensure that whip is free of kinks and is spooled on the drum with no riding turns. _____
- 2. Check operation of cargo hook. _____
- 3. Have all swivels free and well lubricated. _____
- 4. Have all shackles properly secured. _____
- 5. Fake messengers down for running. _____
- 6. Have line-throwing gun and one bolo at each station to be used. Test line-throwing gun and examine firing pin. Have extra projectiles and shot lines on hand. _____
- 7. Rig station marker. _____
- 8. Have signal paddles available. _____
- 9. Fake down phone line, and test phone. _____
- 10. Test all winches. _____
- 11. Have bulwark gripper available. _____
- 12. Have required station tools available. _____
- 13. Have cargo nets, net shorteners, skip box and transfer bag available, as required. _____
- 14. Muster personnel assigned. _____
- 15. Ensure that a green chemical light or one-cell white flashlight, a whistle, and a dye marker are attached to each life jacket in use. _____
- 16. Make readiness report to first lieutenant. _____

Remarks:

REPLENISHMENT CHECKLIST

Fuel Receiving Station # _____

(For night replenishment, include supplemental checklist.)

- 1. Ensure correct fuel fitting is rigged and inspected for proper operation. _____
- 2. Ensure correct cotter pin is used for pelican hook. _____
- 3. Have jiggers, riding lines, remating lines, short straps, long straps, and easing-out lines available (if applicable). _____
- 4. Install fairlead blocks required in accordance with ship's drawings and seize properly. _____
- 5. Inspect probe seals and retainer ring for visible damage. Inspect seating flags for proper operation. _____
- 6. Test and operate gypsy heads (if applicable). _____
- 7. Fake down phone and distance line and test (if applicable). _____
- 8. Visually inspect all attachment points, cleats, and associated fittings for visible damage. _____
- 9. Have required information, pumping pressures, amount of cargo needed, and standby times available. _____
- 10. Rig station marker. _____
- 11. Have signal paddles available. _____
- 12. Have required station tools available. _____
- 13. Muster personnel assigned. _____
- 14. Ensure that a green chemical light or one-cell white flashlight, a whistle, and a dye marker are attached to each life jacket in use. _____
- 15. Make readiness report to the First Lieutenant. _____

Remarks:

REPLENISHMENT CHECKLIST

Cargo Receiving Station # _____

(For night replenishment, include supplemental checklist.)

- 1. Ensure long links, sliding padeyes, kingposts, and pendants are properly rigged, tested, and inspected. _____
- 2. Install fairlead blocks required in accordance with ship's drawings and seize properly. _____
- 3. Have required lines and small stuff available for lashings, etc. _____
- 4. Test and operate gypsy heads (if applicable). _____
- 5. Remove portable lifelines, hand rails, and portable davits and rig temporary lifelines (if applicable). _____
- 6. Have working parties, pallet jacks, or fork trucks available. _____
- 7. Fake down phone and distance line and test (if applicable). _____
- 8. Visually inspect all attachment points, cleats, and associated fittings for visible damage. _____
- 9. Have information required for incoming cargo and plans for its removal from rig station. _____
- 10. Rig station marker. _____
- 11. Have signal paddles available. _____
- 12. Have required station tools available. _____
- 13. Muster personnel assigned. _____
- 14. Ensure that a green chemical light or one-cell white flashlight, a whistle, and a dye marker are attached to each life jacket in use. _____
- 15. Make readiness report to the First Lieutenant. _____

Remarks:

REPLENISHMENT CHECKLIST

Synthetic Highline Station

(For night replenishment, include supplemental checklist.)

- 1. Inspect the highline to ensure that it is in good condition (free from weak spots, chafed spots, and dry rot). _____
- 2. Ensure the highline eye splice and shackle are in good condition. _____
- 3. Ensure that the trolley block is properly installed. _____
- 4. Ensure that all blocks are free and have a proper fairlead. _____
- 5. Ensure that inhaul and outhaul are free from weak spots, chafed spots, and dry rot. _____
- 6. Fake messenger down for running. _____
- 7. Have line-throwing gun and one bolo at each station to be used. Test line-throwing gun and examine firing pin. Have extra projectiles and shot lines on hand. _____
- 8. Rig station marker. _____
- 9. Have signal paddles available. _____
- 10. Fake down phone line, and test phone. _____
- 11. Have required station tools available. _____
- 12. Inspect all safety devices on personnel transfer chair, safety release, and wire preventer. Have shackle available to shackle chair to the trolley block. _____
- 13. Inspect Stokes litter for restraining strap, flotation gear, and wire preventer. _____
- 14. Have transfer bag available (when transferring movies there will be flotation gear on the transfer bag). _____
- 15. Ensure that sufficient manpower is available for personnel transfers. Hold a safety lecture. _____
- 16. Ensure that a green chemical light or one-cell white flashlight, a whistle, and a dye marker are attached to each life jacket in use. _____
- 17. Make readiness report to the first lieutenant. _____

Remarks:

REPLENISHMENT CHECKLIST

Bridge

1. Ensure rudder operational PMS check has been conducted within 48 hours of UNREP. _____
2. Notify EOOW of expected approach speed and speed requirement upon completion. Verify plant lineup for evolution. _____
3. Cargo and personnel manifest available on bridge (if applicable). _____
4. Fuel type and quantity requirement posted on bridge. _____
5. As applicable: Set the replenishment detail. _____
6. Post name, rank, lineal number of all commanding officers and the name, hull number, voice call of all ships on status board. _____
7. Test bullhorn and place in vicinity of captain’s chair. _____
8. Ensure sound-powered circuits and engineering “E” call sound power circuits are tested and set up. _____
9. Take assigned waiting station as directed by OTC. _____
10. PQS qualified master helmsman at the helm. Helm safety supervisor on station. _____
11. Determine replenishment order. _____
12. Set HERO condition, if applicable. _____
13. Receive manned and ready reports from main control, cargo control, after steering, bridge, replenishment stations and departmental reports. Set restricted maneuvering conditions, when directed. _____
14. ROMEO at dip, ready to go alongside (300 to 500 yards (274 to 457 m)). (Flashing light at night.) _____
15. ROMEO at close-up, commencing approach. Haul up day shapes (at night turn on task and contour lights, signal ROMEO by shielded directional signal lamps or Nancy). _____
16. Pass the word over the IMC: “On the (name of ship); stand by for shot line(s), (port/starboard side, fwd, aft, midships, all stations); all hands topside take cover.” _____
17. When first messenger is in hand, haul down ROMEO. Put smoking lamp out while refueling or handling of ammunition. _____
18. Fifteen minutes prior to disengaging, receiving ship only, PREP at the dip. _____

19. Replenishment complete, last station disengaging, PREP close up.

20. When last line is clear, haul down PREP. _____

21. When clear (200 to 300 yards (182 to 274 m)) of delivery ship, haul down day shapes (switch to normal running lights at night). _____

Remarks:

APPENDIX E

Standard Operating Procedures for MSC-Controlled Tankers Assigned to Extended Fleet Operations

E.1 BACKGROUND

At any one time, 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 and fleet directives provide guidance for these exercises.

Middle East contingency operations 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 used over an extended period to shuttle fuel from shore depots to 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, 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. 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 m³/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 CLF for extended operations, a message will be sent to COMSC WASHINGTON DC; information to CNO WASHINGTON DC; 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 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 5-32 and 5-33 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 Figure 5-32 or 5-33)
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 Chapter 5 of This Publication. Thorough familiarization with Chapter 5 of this manual is mandatory whenever a Navy unit is scheduled for underway replenishment with an MSC tanker (MSC tankers hold NWP 4-01.41 (formerly NWP 14-2), which contains pertinent extracts from this publication). As a matter of routine, the briefing team will review Chapter 5 with the master and cognizant ship's officers and personnel.

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 operational control 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's 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, MERCOS 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 (Mbbbls)
3. Amount of each product remaining (Mbbbls)
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 (Mbbbls), 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 crew members 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 tankers controlled by MSC are equipped with 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 torn-tape interface at MSC headquarters. This is the ship's primary communications system, as described in NTP-10; secondary communication guard arrangements may be made using HF SITOR, Coast Guard or commercial stations, or MERCASAT.

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 backup 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 Automated Merchant Vessel Reporting (AMVER) system 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 as directed by the task group 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. 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 callup 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 4-01.4, Underway Replenishment

NWP 4-01.41, 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 F

Training Aids and Courses

F.1 PROBE FUELING SYSTEM

Two audio/visual training programs have been developed to support shipboard training. They are available on a loan basis from type commanders and/or fleet training aids libraries.

1. Program I: Single Probe Fueling-at-Sea System, No. 12-7200038.1SS - Part 1, Introduction (12 min/35 slides) and Part 2, Operation (21 min/73 slides)
2. Program II: Single Probe Fueling-at-Sea System, No. 12-7200038.2SS - Fueling Probe Maintenance (27 min/73 slides).
2. VERTREP Safety Precautions, No. W-UNREP-7300002-SS (31 min/90 slides)
3. VERTREP Load Preparation Series:
 - a. Program I: General Cargo and Ordnance Load Handling Equipment, No. W-UNREP-730003.1-SS (13 min/40 slides)
 - b. Program II: General Cargo and Ordnance Load Assembly, No. W-UNREP-730003.2-SS (16 min/60 slides)
 - c. Program III: Hoisting Sling Attachment, No. W-UNREP-730003.3-SS (10 min/25 slides)
 - d. Program IV: VERTREP Equipment Return Procedures, No. W-UNREP-730003.4-SS (12 min/37 slides)

F.2 STREAM RIGS

Three audio/visual training programs have been developed to support shipboard training. They are available on a temporary loan basis from fleet training aids libraries.

1. Program I: STREAM Equipment and Rigs, No. W-UNREP-7300007-SS (21 min/50 slides)
2. Program II: Rigging With the Traveling SURF (includes STAR), No. W-UNREP-7300008-SS (23 min/91 slides)
3. Program IV: Rigging With Burton Outhaul Rigs, No. W-UNREP-7300010-SS (20 min/68 slides).
4. VERTREP Helicopter Control Signals, No. W-UNREP-730004-SS (23 min/62 slides)
5. VERTREP Planning Aboard Receiving Ships, No. W-UNREP-730005-SS (14 min/49 slides)
6. Sending and Receiving Missiles by VERTREP, No. W-UNREP-730006-SS (20 min/66 slides).

F.3 VERTREP

Nine audio/visual training programs have been developed to support shipboard training on VERTREP. They are available on a temporary loan basis from fleet training aids libraries.

1. An Introduction to VERTREP, No. W-UNREP-7300001-SS (23 min/80 slides)

F.4 TRAINING COURSES

1. CNET K-060-0025, STREAM Operator
2. CNET K-690-0077, Fueling Probe and Cargo Drop Reel Maintenance
3. CNET K-690-0068, Forklift Truck Operator
4. CNET K-690-0082, Shipboard Elevator Maintenance
5. CNET K-060-2119, UNREP Simulator.

APPENDIX G

Replenishment Rig Operating Signals

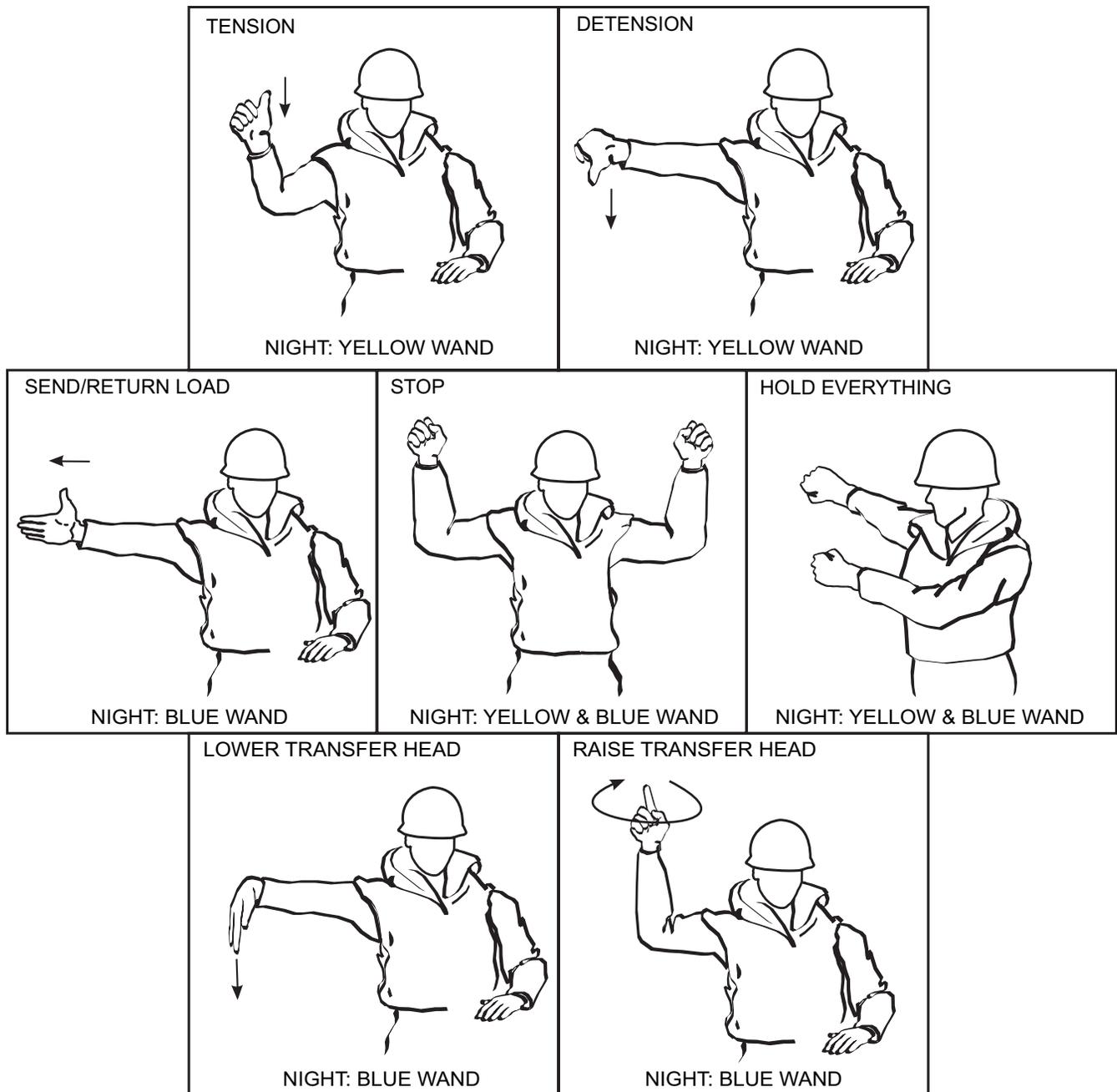


Figure G-1. Standard Hand Signals From Rig Captain to Winch Operator for Solid Cargo Delivery Station

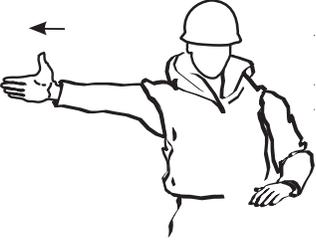
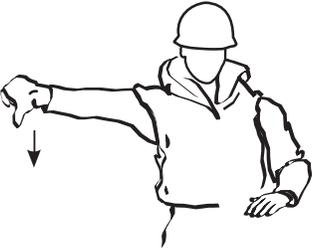
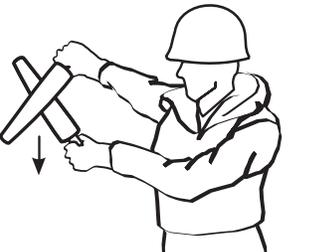
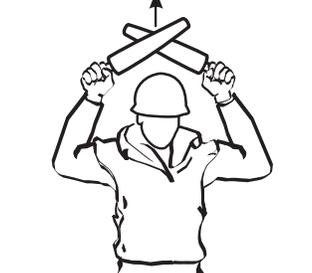
<p>SEND SPANWIRE</p>  <p>NIGHT: YELLOW WAND</p>	<p>STOP SPANWIRE</p>  <p>NIGHT: YELLOW WAND OFF</p>	<p>TENSION SPANWIRE</p>  <p>NIGHT: YELLOW WAND</p>	<p>DETENSION SPANWIRE</p>  <p>NIGHT: YELLOW WAND</p>
<p>PAYOUT NO. 1 SADDLE</p>  <p>NIGHT: BLUE WAND</p>	<p>HAUL IN NO. 1 SADDLE</p>  <p>NIGHT: BLUE WAND</p>	<p>PAYOUT NO. 2 SADDLE</p>  <p>NIGHT: YELLOW WAND</p>	<p>HAUL IN NO. 2 SADDLE</p>  <p>NIGHT: YELLOW WAND</p>
<p>PAYOUT NO. 3 SADDLE</p>  <p>DAY</p>	<p>HAUL IN NO. 3 SADDLE</p>  <p>DAY</p>	<p>PAYOUT NO. 3 SADDLE</p>  <p>NIGHT: YELLOW & BLUE WAND</p>	<p>HAUL IN NO. 3 SADDLE</p>  <p>NIGHT: YELLOW & BLUE WAND</p>
<p>STOP/HOLD</p>  <p>NIGHT: YELLOW & BLUE WAND</p>			

Figure G-2. Standard Hand Signals From Rig Captain to Winch Operator for Fuel Delivery Station

APPENDIX H

Metric Weights and Measures

The International System of Units (SI) is a modern version of the metric system established by international agreement. The units of metric measurement used in NWP 4-01.4 are:

1. The meter (m), centimeter (cm), and millimeter (mm) — for length.
2. The kilogram (kg) and the metric ton (t) — for weight.
3. The cubic meter (m³) — for volume.

In addition, two SI units are used:

1. The Pascal (Pa) — for pressure
2. The watt (W) — for power.

All metric and SI units are written with lower case letters, except for those named after a person. Periods are never used. Figure H-1 provides a table of metric units. Figure H-2 provides a table for converting non-metric units into metric units. Nautical mile, knot, and time remain the same under the metric system.

WEIGHT

10 milligrams (mg)	= 1 centigram (cg)
10 centigrams	= 1 decigram (dg) or 100 mg
10 decigrams	= 1 gram (g) or 1,000 mg
10 grams	= 1 dekagram (dkg)
10 dekagrams	= 1 hectogram (hg) or 100 g
10 hectograms	= 1 kilograms (kg) or 1,000 g
1,000 kilograms	= 1 metric ton (t)

LENGTH

10 millimeters (mm)	= 1 centimeter (cm)
10 centimeters	= 1 decimeter (dm)
10 decimeters	= 1 meter (m) or 1,000 mm
10 meters	= 1 dekameter (dkm)
10 dekameters	= 1 hectometer (hm)
10 hectometers	= 1 kilometer (km)

VOLUME

10 milliliters (ml)	= 1 centiliter (cl)
10 centiliters	= 1 decliter (dl)
10 deciliters	= 1 liter (l) or approx. 1,000 cm ³
10 liters	= 1 dekaliter (dkl)
10 dekaliters	= 1 hectoliter (hl)
10 hectoliters	= 1 kiloliter (kl) or 1,000 l
1 kiloliter	= 1 cubic meter (m ³)

TEMPERATURE

Unit	—	°Celsius (C) (formerly centigrade)
0 °C	—	Freezing point of water

Figure H-1. Table of Metric Units

LENGTH

inches	x 25.4	= mm
inches	x 2.54	= cm
feet	x .3048	= m
yards	x .9144	= m
statute miles	x 1.609	= km
nautical miles	x 1.852	= km

WEIGHT

ounces	x 28.349	= g
pounds	x .4535	= kg
short tons	x .907	= t (metric)
long tons	x 1.016	= t (metric)

VOLUME (Liquid)

quarts	x .9463	= l
gallons	x 3.785	= l
barrels (42 gal.)	x .15899	= m ³

TEMPERATURE

°Fahrenheit (F) – $32 \times 5 \div 9 =$ °Celsius (C)

PRESSURE

pounds per square inch (psi) x 6.894757 = kPa (kiloPascal)

POWER

horsepower (H.P.) x 746. = W (watt)

Figure H-2. Nonmetric to Metric Conversion Table

APPENDIX I

Winch Malfunctions

I.1 BIRDCAGING

Wire rope is not spooling properly on winch drum; or winch drum is rotating to pay out, but wire rope is not moving.

I.2 INTERNAL MALFUNCTION

Unusual noise is coming from winch gearbox or hydraulic transmission and there is excessive leakage of hydraulic fluid or lubricating oil. Check temperature and pressure gauges.

I.3 RUNAWAY WINCH

Winch operator has lost control of winch. Wire rope is paying out at a fast rate and losing tension during transfer operation. Highline or spanwire winch's ram tensioner is extended to upper limit of travel and rig is sagging close to the water.



Releasing the hydraulic brake under tension may cause damage to the hydraulic transmission.

Note

If a runaway-winch condition occurs, the winch watcher will immediately apply the winch's manual brake until the winch is returned to normal control. The manual brake will be released only as required to prevent a tightline condition.

I.4 TIGHTLINE CONDITION

There is excessive tension on wire rope, usually caused by malfunction of hydraulic brake.

Note

It is difficult for the winch watcher to detect a tightline condition. The winch watcher will usually be informed of the condition by the rig captain or winch operator. When informed of a tightline condition, the winch watcher will immediately pull the hydraulic brake's manual release handle to release the brake. The manual release handle will be held long enough to get a catenary in the wire rope, but the wire rope must not touch the water.

I.5 ABNORMAL OPERATION

Any indication that, by experience, the winch watcher recognizes as a malfunction or as a situation that is leading to a malfunction.

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 polyethylene 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 Catcher. The pig catcher, 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, that catches the pig and prevents it from entering the receiving ship’s fuel system. The catcher 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 catcher 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 Drawing 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 that 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. This inspection must be performed prior to sending the astern FAS hose to the receiving ship.

1. Ensure that pig catcher (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).
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.

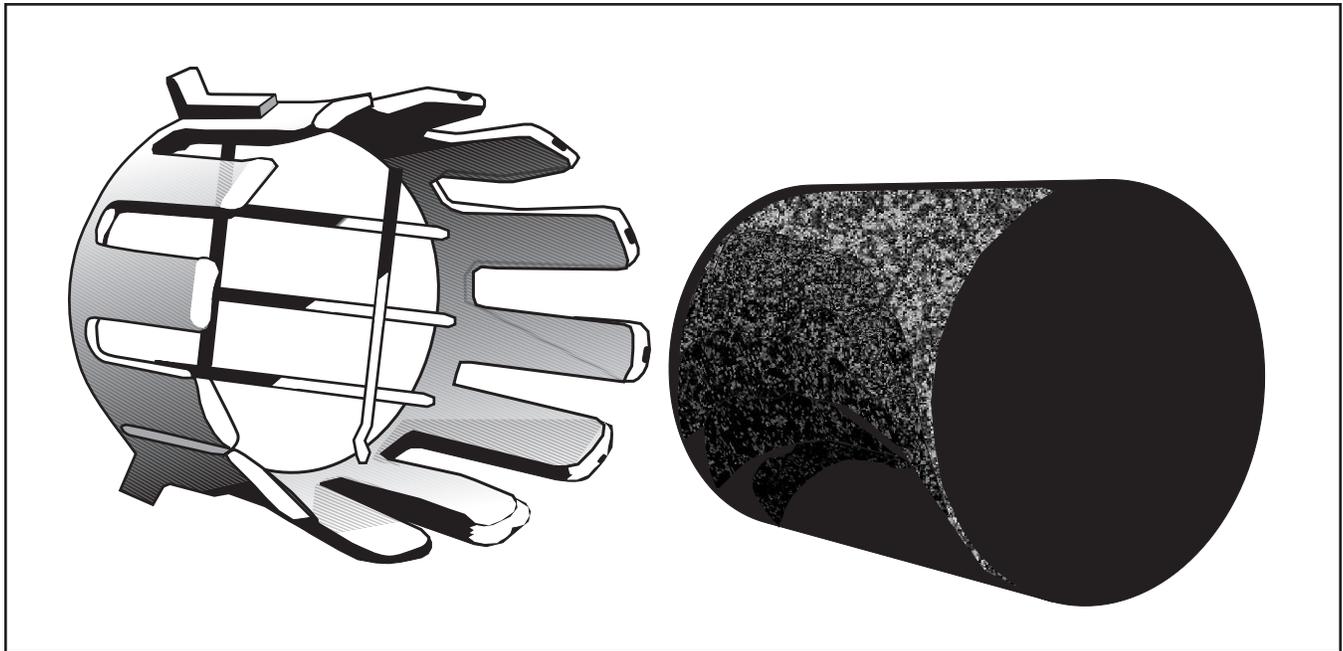


Figure J-1. Pig Catcher (Left) and Pig (Right)

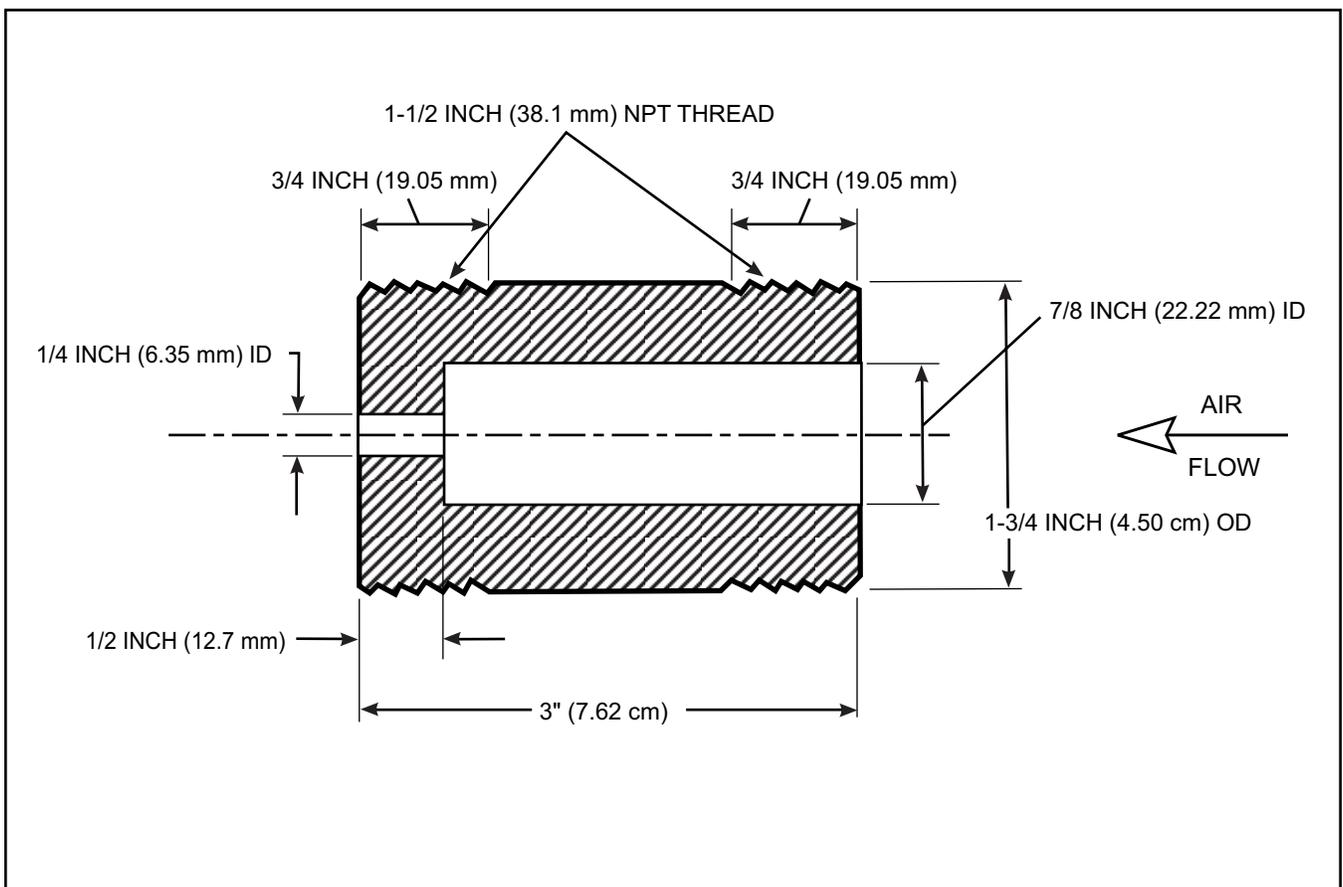
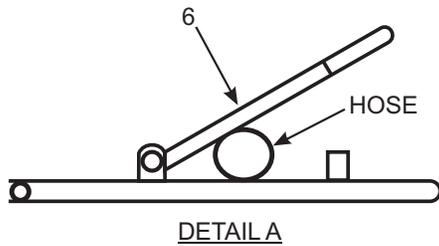


Figure J-2. Orifice for Blowdown Air Line



PARTS LIST	
PART NO.	DESCRIPTION
1	FUEL SHUTOFF VALVE
2	QUICK CLOSING FUEL VALVE
3	BLOWDOWN SUPPLY GAUGE
4	BLOWDOWN SHUTOFF VALVE
5	PIG
6	HOSE CRIMPER
7	QUICK DISCONNECT COUPLING
8	DUMP VALVE
9	HOSE PRESSURE GAUGE
10	DRIP PAN
11	ORIFICE

INSERT PIG
SUFFICIENTLY TO
CLEAR FACE OF
HOSE COUPLING (APPROX 2")

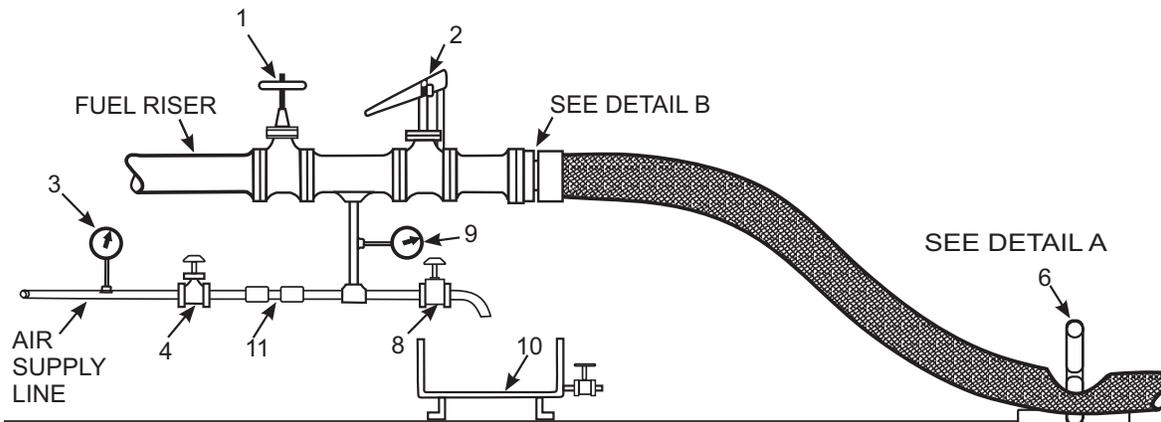
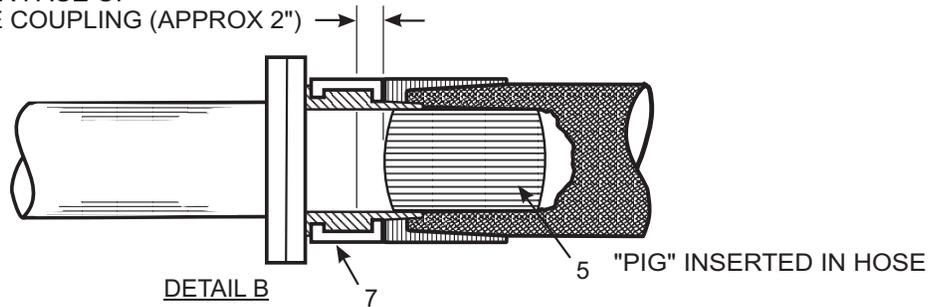


Figure J-3. Astern Refueling Station — Delivery Ship

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)

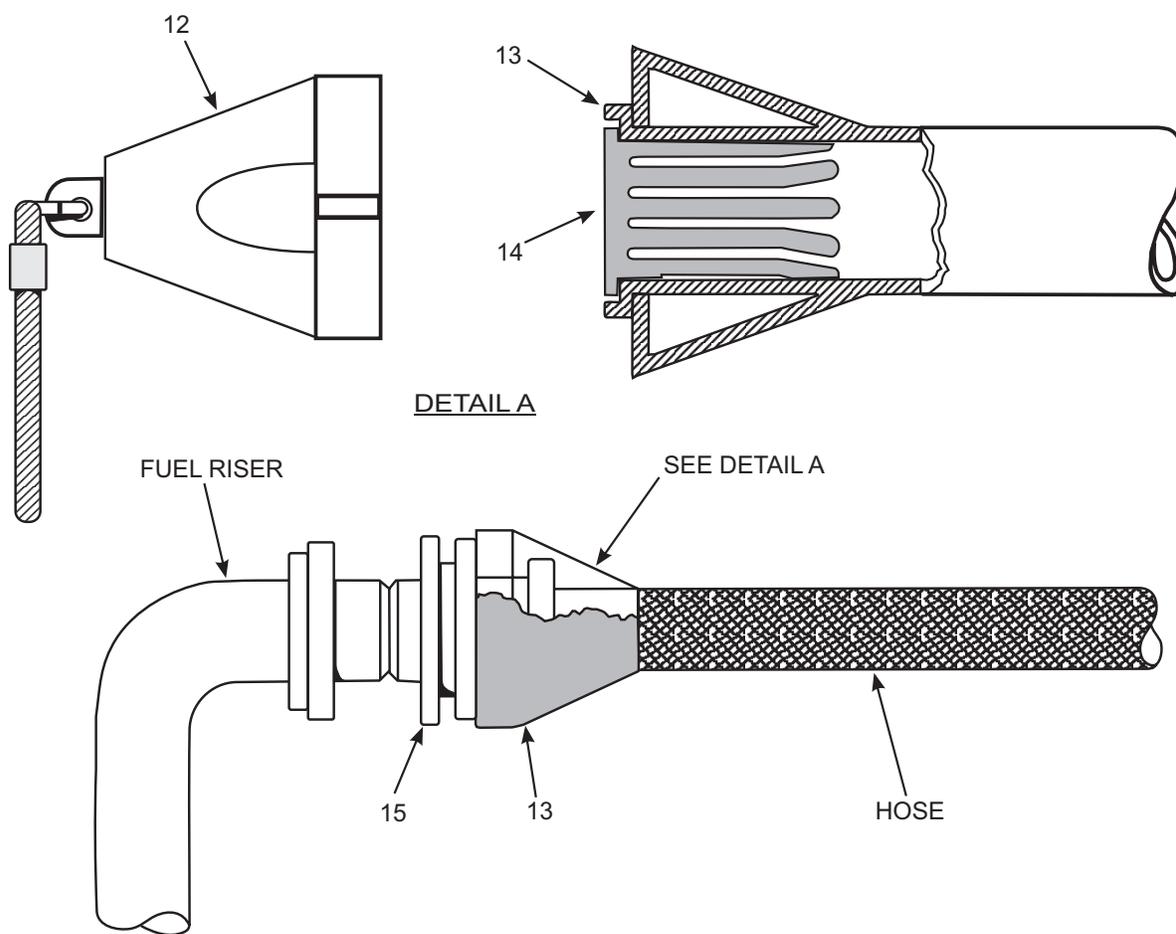


Figure J-4. Astern Refueling Station — Receiving Ship

3. 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 catcher (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 catcher 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 catcher (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."



The astern FAS hose may contain up to 1,200 gal (4,542 L) of fuel that 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 catcher (14) from the end of hose.
2. Remove pig (5) from pig catcher (14) and dispose of pig.
3. Replace pig catcher (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 catcher 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 catcher, 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 breakdown 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 that 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 that should give re-

liable 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. Part numbers refer to Figures J-3 and J-4.

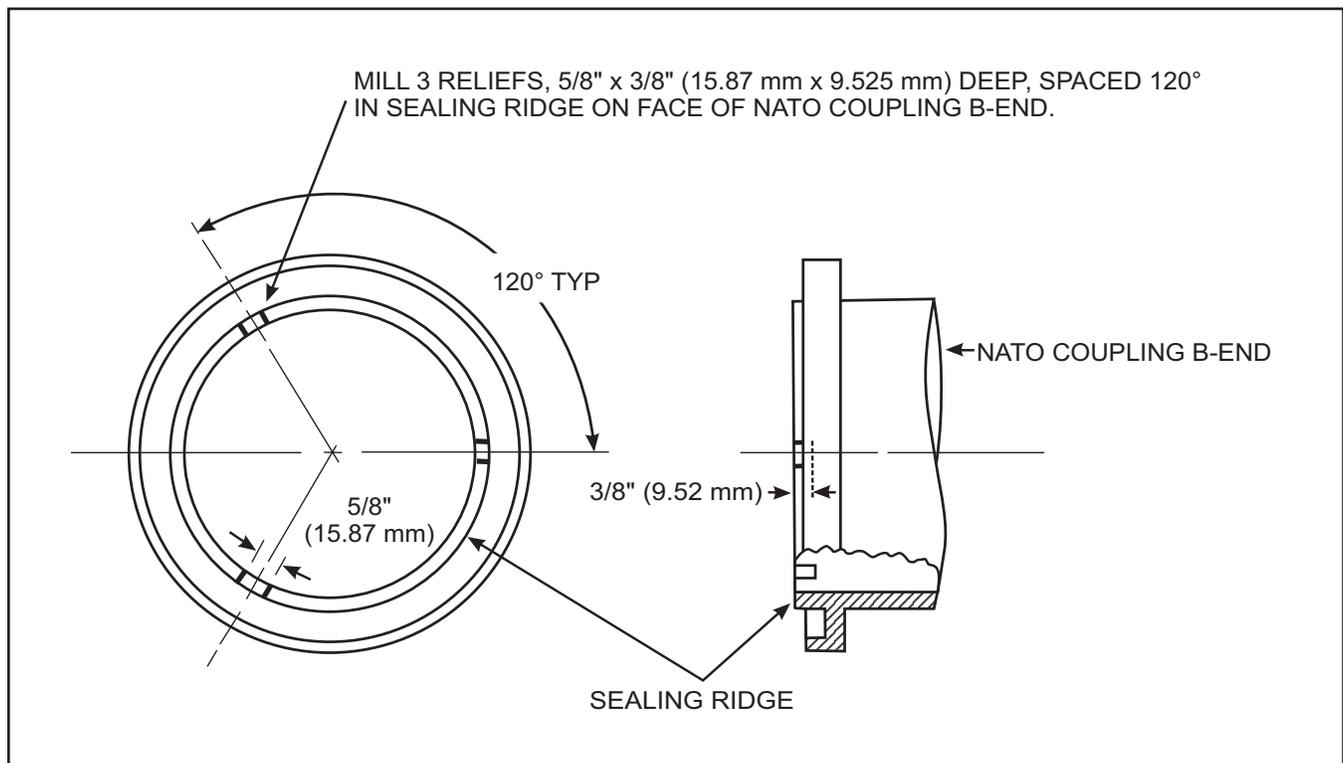


Figure J-5. Modification to NATO Coupling

**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 (6.35 mm) ORIFICE IN THE AIR SUPPLY LINES 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. Instrument Placard

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 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 catcher (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.

APPENDIX K

Station-Keeping Aid

K.1 PURPOSE

The station-keeping aid for underway replenishment provides a reference to help the receiving ship maintain alignment of her stations with the delivery ship's stations. The station-keeping aid is adjusted for an approximate ship separation of 150 feet (46 m). It has a 3 foot (0.9 m) X 3 foot (0.9 m) solid orange background and a white, triangle-shaped pointer that divides the background in half vertically. The conning officer on the receiving ship reads the aid as shown in Figure K-1. For night replenishment, red and blue chemical lights are installed.

K.2 OPERATING INSTRUCTIONS

1. DELIVERY SHIP: Secure the station-keeping aid in the rotating stand. If making a night replenishment, install red and blue chemical lights (see Figure K-1).
2. DELIVERY SHIP: Prior to the receiving ship making her approach, rotate the station-keeping

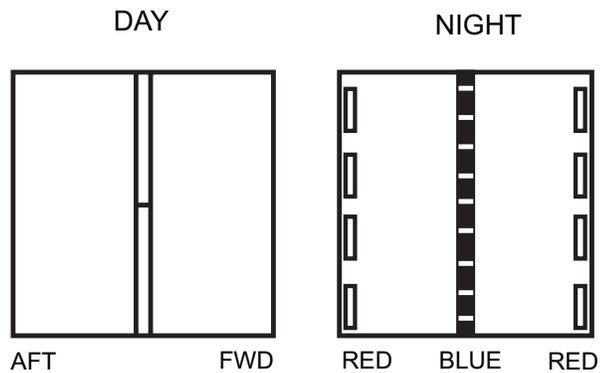
aid so it is pointing as shown in the table mounted on the rotating stand for the ship coming alongside.

3. RECEIVING SHIP: Take station so that the arrow on the station-keeping aid shows as a straight line (white line against orange background) (vertical blue line between two vertical red lines at night).
4. RECEIVING SHIP: If an alternate position is desired, take up the new position and request the delivery ship to align the aid visually to your bridge.
5. DELIVERY SHIP: Realign aid to suit position desired by receiving ship.

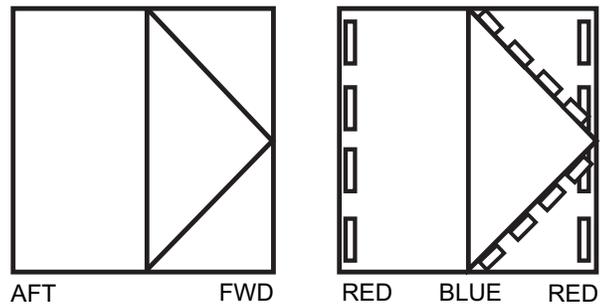
K.3 DELIVERY SHIP DIAGRAMS

Information on station-keeping aids on all CLF ships and all ships' diagrams/outlines can be found in the UNREP Station Capabilities Handbook, S9571-A1-HBK-010.

WHEN RECEIVING SHIP IS IN THE BEST POSITION, THE CONNING OFFICER SEES A STRAIGHT VERTICAL WHITE LINE IN THE CENTER OF THE ORANGE BACKGROUND. AT NIGHT HE SEES A BLUE LINE BETWEEN TWO RED LINES.



IF RECEIVING SHIP DROPS TOO FAR AFT, THE CONNING OFFICER SEES A WHITE ARROW POINTING FOWARD (A BLUE ARROW AT NIGHT). THIS IS THE DIRECTION THAT THE SHIP SHOULD MOVE TO IMPROVE STATION KEEPING. IF THE ARROW TOUCHES THE EDGE OF THE BACKGROUND AS SHOWN, THE RECEIVING SHIP'S POSITION IS ABOUT 30 DEGREES OFF STATION.



IF RECEIVING SHIP DROPS TOO FAR FOWARD, THE CONNING OFFICER SEES A WHITE ARROW POINTING AFT (A BLUE ARROW AT NIGHT). THIS IS THE DIRECTION THAT THE SHIP SHOULD MOVE TO IMPROVE STATION KEEPING. IF THE ARROW TOUCHES THE EDGE OF THE BACKGROUND AS SHOWN, THE RECEIVING SHIP'S POSITION IS ABOUT 30 DEGREES OFF STATION.

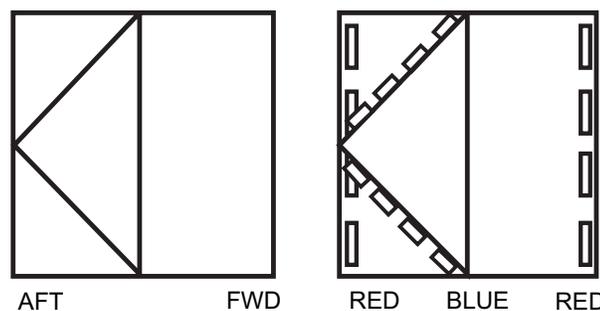


Figure K-1. Station-Keeping Aid

APPENDIX L

Potable Water Transfer

L.1 POTABLE WATER TRANSFER

Transfer of potable water during UNREP operations requires special preparations and operating procedures to prevent contamination of the potable water.

L.1.1 Hose Preparation and Disinfection. New hoses must be prepared and disinfected before they are used to transfer potable water. Previously prepared hoses that are known or suspected to be contaminated must be re-disinfected before they are used to transfer potable water. Hoses can be contaminated by careless handling, by improperly storing them without end caps or plugs, by immersing them in harbor water or seawater (without end caps or plugs), or by using them to transfer seawater, boiler feedwater, or water from an unapproved source.

WARNING

Potable water hose *must only* be used to transfer potable water. If a potable water hose is used to transfer a nonwater product (fuel, lube oil, oily waste, etc.), it cannot be decontaminated and *may not* be used to transfer potable water.

1. Prepare new hoses that are to be used for potable water transfer by painting the outside of the end coupling, caps, and plugs dark blue (avoiding any threads). Also label the hose every 10 feet (3 m) "POTABLE WATER ONLY." Prepare hoses that have been contaminated by touching up the fitting paint and hose labels.
2. Flush hose thoroughly with potable water.
3. Disinfect hose by filling it completely with a solution containing at least 100 PPM of free available chlorine (FAC). Leave solution in hose for at least 2 minutes. Prepare solution per NAVSEA Technical Manual, Chapter 533, Potable Water Systems, or NAVMED P-5010-6,

Manual of Naval Preventive Medicine, Chapter 6, Water Supply Afloat.

4. Drain hose.
5. Immerse the hose end couplings, plugs, and caps in a solution containing at least 100 PPM FAC. Leave fitting in solution at least 2 minutes.
6. Drain fittings.
7. Cap or plug (as appropriate) hose free ends before stowing hose.

L.1.2 Hose Stowage Precautions. Potable water hoses require special stowage precautions to prevent hose contamination.

1. Cap or plug (as appropriate) potable water hose free ends when hose is not in use.
2. Stow potable water hose only in designated potable water hose lockers.
3. Potable water hose stowage lockers must be ratproof, be provided with a lock, and be elevated at least 18 inches (.45 m) off the deck if they are located on weather decks or sponsons.
4. Lock potable water hose stowage lockers when not removing or stowing hose.

L.1.3 Hose Handling. Potable water hoses require special handling precautions to prevent hose contamination.

1. Do not remove potable water hose from stowage locker except to inspect it or use it.
2. Ensure both free ends of a potable water hose are capped or plugged (as appropriate) before moving the hose.

WARNING

Potable water hose that has been stored with either end uncapped or unplugged is contaminated. *Do not* use hose to transfer potable water until it has been disinfected.

3. When moving hose, do not drag it along the deck.
4. Do not immerse hose or end fittings in water, except in disinfecting solution to disinfect them.
5. Do not install potable water hose on a rig until just before the UNREP operation.
6. Do not remove hose end caps or plugs while hose is hanging on an UNREP rig.

L.1.4 Potable Water Operation. Potable water hose and risers require special operating procedures during an UNREP to prevent water contamination.

1. Delivery station must ensure that the leading delivery hose cap is securely in place before sending the hose.
2. Both stations remove the hose end cap or end plug (as appropriate) once the receiving station receives the hose.
3. Both stations immerse the hose end caps or plugs in a solution containing at least 100 PPM FAC. Leave fittings in solution for at least 2 minutes.
4. Both stations remove riser caps and thoroughly swab the potable water riser exterior and riser interior (back to the valve closure) with a solution containing at least 100 PPM FAC.
5. Delivery station connects potable water hose to potable water riser.
6. Receiving station aims potable water hose overboard. Delivery station pumps potable water to flush hose for 15 to 30 seconds.
7. Receiving station connects potable water hose to potable water riser.

8. Both stations open potable water riser valves and transfer water.
9. Delivery station may blow down or back suction potable water hose once pumping has ceased.
10. Both stations secure potable water riser valves once transfer and blowdown or back suction is complete.
11. Both stations remove hose caps or plugs from solution and cap or plug hose ends (as appropriate).
12. Both stations thoroughly swab the potable water riser caps, interior and exterior, and install caps on risers.
13. Delivery station retrieves hose.
14. Delivery station removes potable water hose from UNREP rig and stows it in the potable water hose locker. Do not leave potable water hose on a fuel delivery rig after an UNREP except during a day when potable water will be delivered from that station to more than one ship.

WARNING

Do not leave potable water hose on an UNREP rig during freezing weather. Water remaining in hose will freeze and could damage hose.

CAUTION

Leaving hose on a rig longer than a day will contaminate the hose and require disinfecting the hose.

L.2 REFERENCES

NAVSEA Technical Manual 533, Potable Water Systems

NAVMED P-5010-6, Manual of Naval Preventive Medicine

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