FM 55-50-1 (TEST)

DEPARTMENT OF THE ARMY FIELD MANUAL

Chapters 2 thru 5, S/S Aug 72, 29/1 55-51

TRANSPORTATION AMPHIBIAN OPERATIONS

HEADQUARTERS, DEPARTMENT OF THE ARMY
MARCH 1967

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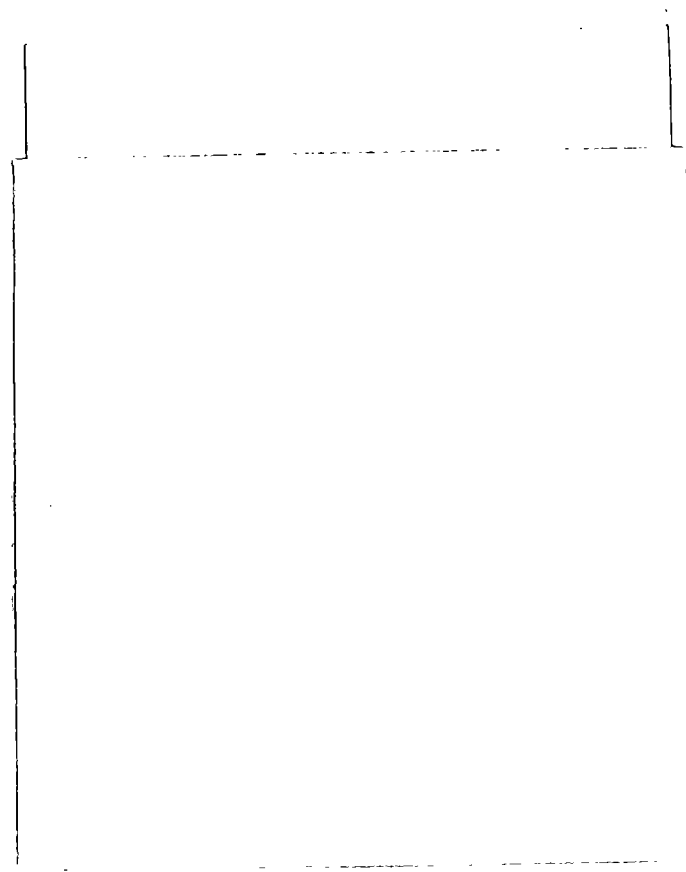

FOREWORD

This manual provides interim guidance to commanders, staff officers, and other personnel concerned with amphibian operations support under the TASTA–70 concept of organization and operation. This information can be utilized to facilitate reorganization under the TASTA concept. Firm information on the organizational structure and composition of units will be as contained in TOEs when published. Although the basic TASTA–70 study has been approved by Department of the Army, detailed doctrine contained in this test field manual is under continuing development and review.

Readers are encouraged to submit comments and recommendations for changes that will improve the clarity, accuracy, and completeness of the manual. Comments should be constructive in nature and reasons should be provided for each recommendation to insure understanding and to provide a valid basis for evaluation. Each comment should be keyed to a specific page, paragraph, and line of the text. Comments should be forwarded directly to the Commanding Officer, U.S. Army Combat Developments Command Transportation Agency. An information copy of recommendations that propose changes to approved Army doctrine may be sent, through command channels, to the Commanding General, U.S. Army Combat Developments Command, Fort Belvoir, Virginia 22060, to facilitate review and evaluation.

FIELD MANUAL
No. 55–50–1 (TEST)

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., *27 March 1967*

TRANSPORTATION AMPHIBIAN OPERATIONS

CHAPTER 1
INTRODUCTION

1. Purpose and Scope

a. The manual is published as a planning and operational guide for unit commanders, staff officers, and other personnel associated with the organization and employment of the following units:

(1) Transportation light amphibian company (TOE 55–138).
(2) Transportation medium amphibian company (TOE 55–139).
(3) Transportation heavy amphibian platoon (team FK, TOE 55–500).
(4) Transportation lighterage direct support company (TOE 55–158).

b. The manual describes the organization, mission, assignment, capabilities, task equipment, concept of employment, and operational techniques of these units in both logistical and tactical beach operations.

c. The doctrine presented herein is applicable to general, limited, and cold war.

2. Training

ATP 55–111 will be used as a guide in training units covered by this field manual. Training tests for these units will be conducted in accordance with procedures set forth in ATT 55–111.

3. Command Relationship

a. Transportation amphibian units are designed primarily to provide, operate, and support equipment used in transporting cargo and personnel in logistical ship-to-shore shore-to-shore operations in the communications zone.

b. The command element in the communications zone is the theater army support command (TASCOM), which provides an integrated support system for one or more field armies. Its operational area extends from the ocean terminals of the theater to the rear boundary of the field army, thereby providing the necessary link between the combat force and its source of manpower and materiel replenishment in the continental United States. The TASCOM is organized into six commands: five of these are mission commands, which operate on a perpendicular axis from the water's edge forward to the field army area, and the sixth is an area support command. Details of TASCOM operations are contained in FM 54–8 (TEST).

c. The transportation command is one of the five mission commands of the TASCOM. It has the necessary movement control, motor transport, terminal service, lighterage, rail, and aviation units to provide an integrated transportation system capable of supporting the TASCOM mission. The transportation command receives personnel replacements and supplies at shipside, air terminals, or rear area depots and delivers them as far forward as possible toward the combat zone with minimum unloading, reprocessing, rehandling, or transshipping at intermediate points. The operational functions of the transportation command are detailed in FM 55–6–1 (TEST).

d. Depending on the size and complexity of the theater, the senior terminal headquarters under the transportation command will be either a terminal group (TOE 55–112) or a terminal brigade (TOE 55–111). The group provides command, planning, supervision, and coordination of the operations of up to six terminal battalions—a force normally sufficient to support one field army. In divided theaters or in large theaters requiring two or more groups, a brigade will be assigned to provide an intermediate level of command, thereby becoming the terminal "mission" headquarters for the theater. In each case, the group and brigade functions are essentially the same, and their internal organization reflects this similarity.

e. The terminal battalion (TOE 55–116) is the basic operating element in the terminal

structure and provides direct command, control, and operational supervision over amphibian units, as well as boat units and the terminal service companies charged with handling the cargo at the beach and on the ships as well as transportation truck companies and certain other nontransportation units which may be attached to the terminal battalion to meet specialized mission requirements. A complete description of theater terminal operations is contained in FM 55–55–1 (TEST). Boat unit operations are described in FM 55–58.

CHAPTER 2

TRANSPORTATION LIGHT AMPHIBIAN COMPANY

4. General

The transportation light amphibian company (TOE 55–138) is equipped with 35 LARC–5's (lighter, amphibious, resupply, cargo), a 35-foot, aluminum-hulled, diesel-powered amphibian with a 5-ton carrying capacity. This lighter is designed to operate at maximum speeds of 10 miles per hour (8.7 knots) in the water and 30 miles per hour on land. It is designed to transport cargo through the beach between ships lying offshore and discharge areas located short distances inland. Cargo may be loaded into and unloaded from the lighter by using cranes, ship's gear, conveyor belts, troughs, A-frames, wreckers, or forklift trucks. Detailed operating instructions for this amphibian are contained in TM 55–510 and TM 55–1930–205–10.

5. Mission

The mission of the light amphibian company is to provide lighterage for the movement of general cargo between ship and shore or from shore to shore in logistical beach operations or in support of amphibious operations.

6. Assignment

This unit is normally assigned to a theater army support command and attached to a terminal battalion or terminal group for operational control. It may also be attached to a shore party organization to provide combat service support in an amphibious operation.

7. Capabilities

a. A full-strength light amphibian company is capable of transporting approximately 1,000 tons of general cargo per day in around-the-clock operations. As explained in chapter 8, however, the productivity of the light amphibian company is directly related to the discharge rates of the terminal service company working the ship, and the amount of cargo delivered ashore will vary significantly as the hatch rates change. For long-range planning purposes, the average figure given above should be used for determining the number of amphibian companies required or for estimating tonnage productivity in sustained operations. In planning for specific operations, consideration must also be given to weather and sea conditions which may affect total productivity as explained in chapter 7.

b. Because of the configuration of the cargo well, the LARC–5 is not normally considered as a personnel carrier except in emergency situations and when sea and surf conditions are relatively light. For planning purposes, however, the LARC–5 is capable of carrying approximately 20 men each.

c. The light amphibian company is designed to provide personnel and equipment to support vessel loading and discharge in continuous around-the-clock operations, and it may be broken down by platoon or section for detached service on a mission basis. When so employed, the daily tonnage capabilities of the platoons and sections are approximately 500 and 250 short tons each, respectively.

d. The company is equipped and manned to provide communications, control, and organizational maintenance support for platoons and sections operating on detached service.

8. Organization

The light amphibian company is composed of a company headquarters, a maintenance section, and two amphibian platoons of two sections each as shown in figure 1.

a. Company Headquarters. In addition to the normal command, administration, mess, and supply functions, the company headquarters provides the personnel to operate the lighter control center—the hub of the company's operation. The company commander is the director of operations and the special am-

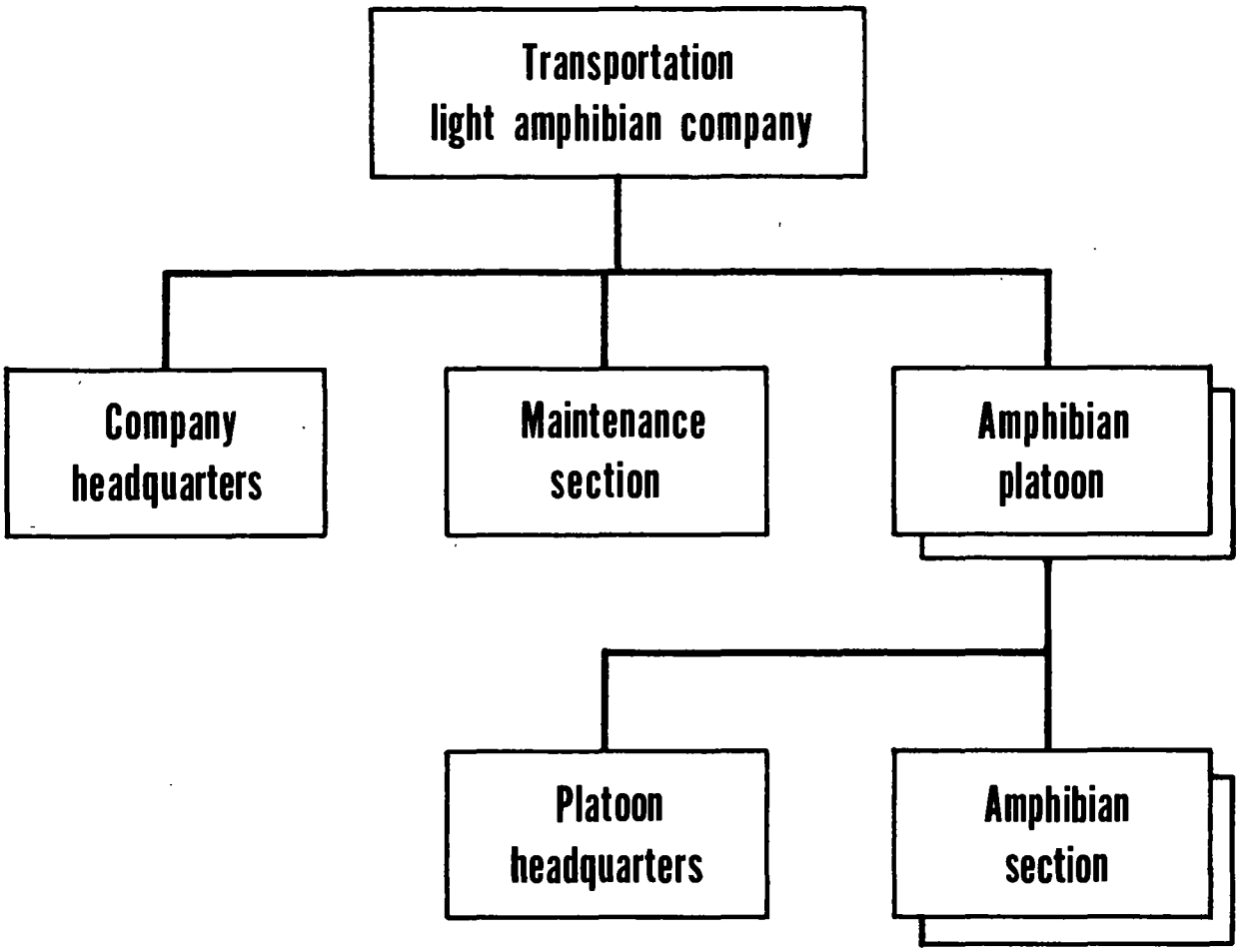

Figure 1. Light amphibian company organization.

phibian adviser to the command to which the unit is attached. The lighter control center is operated by a lighter control center officer, a lighter control center sergeant, an assistant lighter control center sergeant, and two dispatches. The lighter control center also operates the unit's net control station, receiving reports and transmitting instructions to the amphibian platoons on a 24-hour basis.

b. Maintenance Section. A warrant officer is in charge of the maintenance section and is responsible for organizational maintenance for all equipment organic to the unit. In addition, he is responsible for lighter and vehicle recovery and for maintenance quality and production control. The maintenance officer is assisted by a maintenance supervisor and an assistant maintenance supervisor, who allocate and supervise the work of the various maintenance specialists assigned to the section. One LARC–5 with crew is assigned to the maintenance section to provide contact maintenance and recovery service.

c. Amphibian Platoons. The amphibian platoons are equipped with 17 task LARC–5's each—eight in each section and one in platoon headquarters. Each platoon headquarters is made up of a platoon leader, a platoon sergeant, an assistant platoon sergeant, and a two-shift crew for the headquarters LARC–5. The assignment of one LARC–5 in each platoon headquarters is an organizational expedient to permit equal strength in each amphibian section. These lighters must be employed as task craft in order for the unit to accomplish its

mission and must not be used as administrative or command craft. A four-man crew is assigned to each lighter—an operator and a crewman for each shift. Section leaders and assistant section leaders are provided for two-shift control of each section.

CHAPTER 3

TRANSPORTATION MEDIUM AMPHIBIAN COMPANY

9. General

The transportation medium amphibian company (TOE 55–139) is equipped with 25 LARC–15's (lighter, amphibious, resupply, cargo), a 45-foot, aluminum-hulled, diesel-powered amphibian with a 15-ton carrying capacity. This lighter is designed to operate at maximum speeds of 9 miles per hour in the water and 20 miles per hour on land. It is designed to transport general cargo and small vehicles through the beach between ships anchored offshore and discharge areas short distances inland. Cargo may be loaded into and unloaded from the LARC–15 by using cranes, ship's gear, conveyor belts, or forklift trucks, and vehicles may be driven into or out of the cargo well through the bow ramp. Operating instructions for this lighter are contained in TM 55–510 and TM 55–1930–206–10.

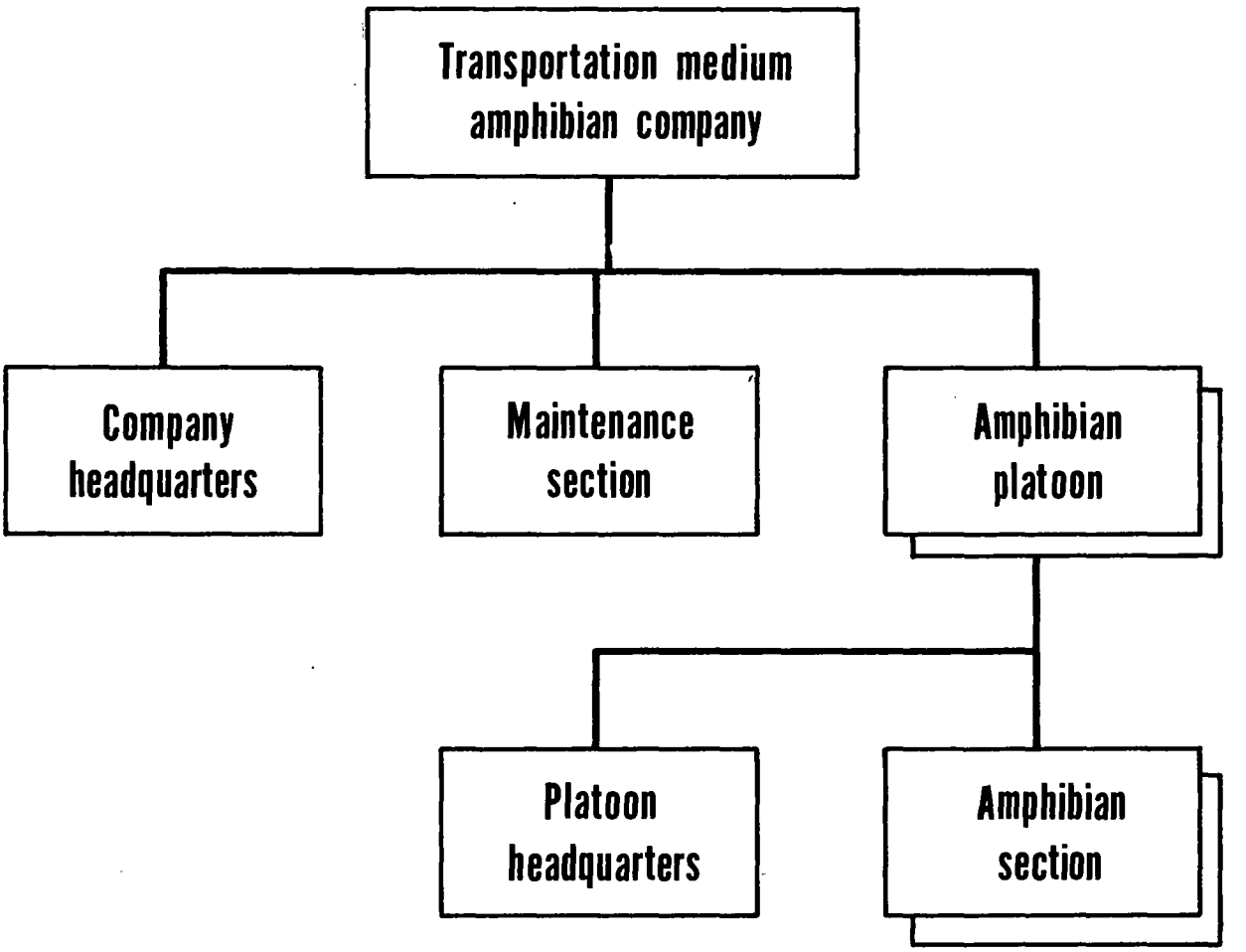

Figure 2. Medium amphibian company organization.

10. Mission

The mission of the medium amphibian company is to provide lighterage for the movement of general cargo and small vehicles between ship and shore or from shore to shore in logistical beach operations or in support of amphibious operations.

11. Assignment

Like the light amphibian company, this unit is normally assigned to a theater army support command and attached to a terminal battalion or a terminal group for operational control. It may also be attached to a shore party organization to provide combat service support during an amphibious operation.

12. Capabilities

A full-strength medium amphibian company is capable of transporting approximately 1,000 short tons of general cargo and small vehicles per day in sustained around-the-clock operations. The productivity of this unit is also influenced by discharge rates, weather, and sea conditions as explained in paragraph 7.

13. Organization

(fig. 2)

The organizational structure of the medium amphibian company is essentially the same as that described in paragraph 8, except that the platoons in this unit are equipped with 12 LARC–15's each—6 in each section—and one amphibian is assigned to the maintenance section.

CHAPTER 4

TRANSPORTATION HEAVY AMPHIBIAN PLATOON

14. General

a. The transportation heavy amphibian platoon (team FK, TOE 55–500) is equipped with four LARC–60's (lighter, amphibious, resupply, cargo), a steel-hulled, diesel-powered amphibian 62 feet 6 inches long and 26 feet 7 inches wide. In land operation, each of the craft's four wheels is driven by a 165-horsepower diesel engine at a maximum speed of 15 miles per hour. When waterborne, the LARC–60 is propelled by two propellers, each driven by two of the engines mounted in bank on a single shaft, and attains a loaded speed of 7 knots.

b. The LARC–60 is a specialized piece of equipment designed to transport vehicles and other heavy, outsized items between ship and shore. It has a normal cargo capacity of 60 short tons and an emergency overload capacity of 100 short tons. Cargo may be loaded into and unloaded from the lighter by using cranes, ship's gear, or forklift trucks. In addition, vehicles may be driven into or out of the cargo well through the bow ramp.

c. Because of its large size, the LARC–60 is capable of negotiating surf far in excess of that which can be traversed by smaller craft. In spite of this size and weight, however, this lighter can move easily over soft sand because its large tires—9 feet in diameter—reduce ground pressure sufficiently to enable the vehicle to retain its mobility over extremely soft surfaces.

d. The LARC–60 also has certain limitations which serve to restrict its employment. It cannot be operated satisfactorily in deep mud, and it requires a path 30 feet wide for operation on land. Movement inland should be limited to the distance necessary to clear the beach and normally should not exceed ½ mile. Because of its height (19 feet, 5 inches), the LARC–60 is difficult to load and discharge with the mobile cranes in the terminal service company. As expedients, a loading dock can be improvised or the lighter can be driven into a dugout or revetment to provide easier access to the cargo compartment.

15. Mission

The mission of the heavy amphibian platoon is to provide lighterage for the movement of vehicles and heavy equipment between ship and shore in logistical beach operations and in support of amphibious operations.

16. Assignment

The platoon is normally assigned to a theater army support command and attached to a transportation terminal battalion, terminal group, or amphibian company for operational control.

17. Capabilities

Depending on discharge rates, weather, and sea conditions, a full-strength heavy amphibian platoon is capable of transporting approximately 450 short tons of vehicles and heavy equipment per day in around-the-clock operations. Although not designed to carry general cargo, the platoon's capability when so employed is approximately 225 short tons per day. In a maximum one-time lift, the four LARC–60's can transport a total of 500 combat-equipped troops.

18. Organization

a. The heavy amphibian platoon has no internal organizational breakout, but is normally separated into an operations section and a maintenance section when employed independently. The organizational maintenance personnel authorized may augment the maintenance section of the amphibian company to which the platoon is normally attached during operations.

b. The platoon commander also serves as the LARC–60 technical adviser for the organization to which the platoon is attached. In addi-

tion to a maintenance officer, he is assisted by two operations officers—one for each shift.

c. The maintenance officer is assisted by a chief marine engineman to insure complete technical supervision on a two-shift basis. Other enlisted men are provided to perform the actual organizational maintenance services.

d. The operations officers directly supervise the platoon's operations on a two-shift, 20-hour basis, and each may command a two-lighter section if the platoon is required to operate on separate, but adjacent, beaches.

e. Each LARC–60 is authorized a crew of eight men—four for each shift. A crew chief is responsible for each amphibian and serves as operator on one shift. He is assisted by an engineman and two crewmen. An amphibian operator is second in command of each LARC–60 and is in charge of the second shift, which also has an engineman and two crewmen.

f. No clerical personnel are authorized, and even when employed independently, the heavy amphibian platoon must be attached to another organization for administrative and logistical support of all types.

CHAPTER 5

TRANSPORTATION LIGHTERAGE DIRECT SUPPORT COMPANY

19. Mission

The mission of the lighterage direct support company (TOE 55–158) is to provide direct support maintenance and to receive, store, and issue all repair parts required for organizational and direct support maintenance of transportation amphibians and landing craft.

20. Assignment

This unit is normally assigned to a theater army support command and attached to a transportation terminal battalion or group for operational supervision.

21. Capabilities

a. At full strength, the lighterage direct support company has the following capabilities:

(1) Providing 10,000 man-hours per month of direct support maintenance for amphibians and landing craft and their components in around-the-clock operations, or the equivalent of from four to five amphibian or landing craft units. This capability is based on the following monthly direct support maintenance requirements per individual craft:

(*a*) LARC–5: 60 man-hours.
(*b*) LARC–15: 95 man-hours.
(*c*) LARC–60: 160 man-hours.
(*d*) LCM–8: 115 man-hours.
(*e*) LCU: 175 man-hours.

(2) Providing 1,000 man-hours per month for inspection, test, adjustment, minor repair, and replacement of radio and radar equipment.

(3) Receiving, storing, and issuing approximately 6,000 line items of repair parts for amphibians and landing craft supported by the company and receiving, storing, and issuing organizational repair parts required by the supported units.

b. In addition, the lighterage direct support company furnishes contact teams for on-site repair of disabled amphibians and landing craft and provides technical assistance to supported units.

22. Organization

This unit is composed of a company headquarters, a shop office, two shop platoons, a service and equipment platoon, and a supply platoon as shown in figure 3.

a. The company headquarters provides the personnel for command, administration, communications, mess, unit supply, and other functions normally performed by a headquarters.

b. The shop office exercises production and quality control over the maintenance and repair activities of the unit. The shop officer is primarily concerned with programing the unit's maintenance capability and is responsible for assigning priorities and maintaining a system for controlling work backlogs in the shop.

c. The shop platoons, consisting of a platoon headquarters and two shop sections each, comprise the principal repair and maintenance elements of the unit. The shop platoon leaders are responsible for intrashop coordination of the shop sections and provide firm control over workloads and materiel. Along with the repair control sergeant in the shop office, they conduct initial inspections on amphibians and landing craft, parts, and assemblies being processed into the maintenance shop and list discrepancies to determine the work to be accomplished and the parts required.

d. The service and equipment platoon consists of a platoon headquarters and two service sections. It furnishes personnel to organize contact teams for on-site repair of disabled amphibians and landing craft and provides maintenance personnel for the unit's organic vehicles and engineer equipment. In addition, the service sections can provide direct support detachments to accompany lighterage units on

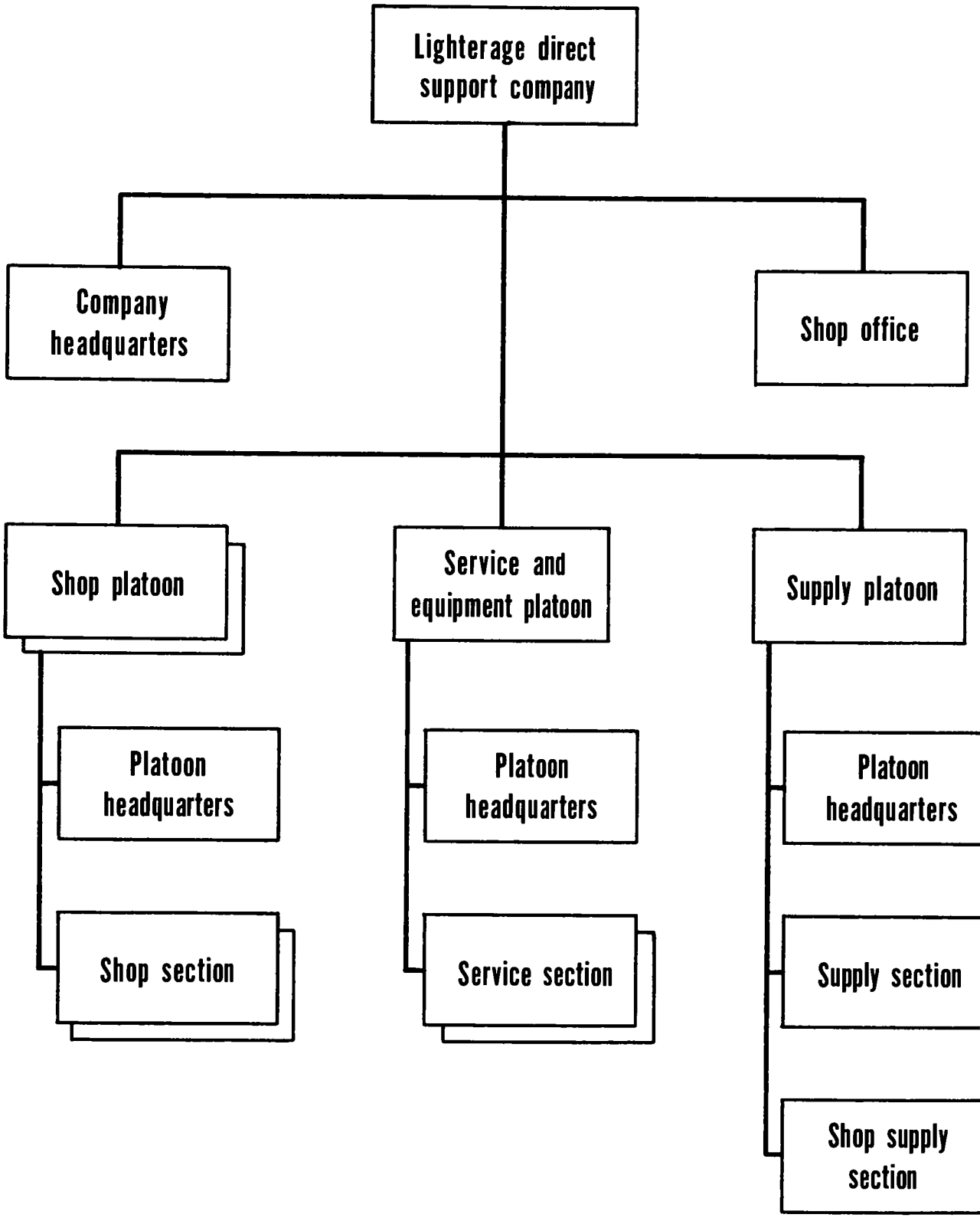

Figure 3. Lighterage direct support company organization.

special missions in remote areas for short periods. The radio and radar repairmen required to support this portion of the company's mission are also assigned to this platoon.

e. The supply platoon is responsible for receiving supply requirements from the shop platoons and supported units and, in turn, taking action through further supply requests to the supporting supply source. The platoon maintains records to reflect the number of items required, on hand, due in, and due out. The supply officer directs requisitioning and issuance of and accounting for supply items used by the shop platoons in accomplishing their direct support mission. He has the same responsibilities for those repair parts and supplies used by supported lighterage companies in their organizational maintenance functions. The platoon is made up of a supply section and a shop supply section.

(1) The supply section is responsible for receiving, storing, unpacking, packing, locating, and issuing repair parts and supply items required for organizational maintenance of landing craft and amphibians. The section also prepares for shipment and ships to supported units components required for organizational maintenance.

(2) The shop supply section is responsible for requisitioning, receiving, storing, and issuing the repair parts, supplies, and materiel required in the performance of the unit's direct support mission. The section maintains its own stock level and provides the unit's maintenance personnel with mission support repair parts and supplies. When stocks require replenishment, this section requisitions on the supply platoon headquarters.

CHAPTER 6
EMPLOYMENT

23. General

Although transportation amphibian companies provide support to forces conducting amphibious operations (ch 11), they are normally employed in logistics over-the-shore (LOTS) operations at dispersed beach sites (ch 10).

24. Logistics Over-the-Shore Operations

A LOTS operation is a routine transshipment of troops, supplies, and equipment over the shore to inland modes of transportation. These operations may be conducted from ship to shore or from shore to shore. LOTS operations may be instituted to supplement or increase tonnage capabilities of an existing terminal, to replace the tonnage capacity of a terminal made untenable by enemy action, to relieve congested lines of communication, or to reduce the land transportation required to support combat forces. They may be conducted jointly in support of other Department of Defense agencies for resupply missions or following an amphibious assault in support of a landing force, and unilaterally in support of landed forces (air, airborne, or amphibious) to provide alternate terminal facilities or to establish terminal support where commercial facilities do not exist.

25. Amphibious Operations

An amphibious operation is an attack launched from the sea by naval and landing forces involving a landing on a hostile shore to gain a lodgement area from which to carry out further combat operations ashore, to obtain an advanced air or naval base area, or to deny the use of the seized positions to the enemy. A tactical withdrawal of troops from land involving Navy ships may also be termed an amphibious operation.

26. Operational Environment

a. The terminal group, or terminal brigade in a large theater, will have its headquarters located in the communications zone rear area as nearly as possible in a central position relative to the main line of communication and terminal operating areas. Because of the close working relationships which the transportation command has with the supply and maintenance command and with the movement control center, it is desirable that these activities be colocated or within easy traveling distance of each other.

b. Water terminal operations in the COMMZ rear area will not normally be subject to organized ground attack. However, because of the probable depth of the theater, the sparse military population in the COMMZ, and the dispersed character of the operations, there is considerable likelihood of guerrilla attack and subversive activity. In addition, ships at discharge berths will be subject to air attack and, under certain circumstances, as when discharging off an open coastline, to attack by submarine. Guerrilla activities will have to be combatted by perimeter defense of the operating areas. Main supply routes and other important terrain will be patrolled by military police of the area support command. Guerrilla activity in the area which does not directly involve perimeter defense may be combatted by area military police or other organic units, or by combat troops if the degree of activity exceeds the capability of the area support command. Sabotage will be countered by internal security measures, underwater demolition attacks by harbor patrols, submarine attack by the use of harbor barriers and naval patrols, and air/missile attack by dispersion, warning systems, and active air defense.

c. In dispersed terminal operations, all terminal units, operating equipment, cargo, and facilities are separated as widely as operational efficiency permits. Troops, materials, establishments, and activities are spread over a wide area to avoid offering the enemy a concentrated

target. Discharge operations are scheduled so as to offer the enemy a remunerative target as seldom as possible and for as short a time as possible.

d. Dispersion greatly increases the requirements for all forms of protection and should therefore be kept to a minimum consistent with the commander's estimate of the threat from area destruction weapons. Normally, the direct line distance between ships and between ships and major shoreside activities or built-up areas should be at least 1 nautical mile. To avoid creating targets for large, long-range nuclear weapons, not more than two ships should be handled simultaneously at one beach terminal, and these should be kept at least 1 nautical mile apart. The distance between each two-ship operation should be 5 nautical miles or more.

e. Further information on rear area security will be found in FM 19–45–1 (TEST).

27. Concept of Employment

a. Approximately 95 percent of theater daily resupply requirements will arrive by surface transport. At least 60 percent of this tonnage will consist of dry cargo, and the remainder will be bulk POL. Some 65 percent by weight of theater dry cargo will be unitized on pallets or in containers of various sizes. Most of the remainder will consist of vehicles and other large bulky items which can be considered as unitized loads in themselves. Ships will be loaded in the continental United States in a manner which will permit discharge with their own cargo gear to the maximum extent practicable.

b. Upwards of 40 percent of all cargo entering the theater by surface means will be delivered through dispersed beach terminals. Each of these two-ship terminals will be under the direct operational supervision of a terminal battalion and will be manned by two terminal service companies and an appropriate number of amphibian and boat components. In addition, a truck company may be attached for intraterminal transportation and clearance assistance, and a terminal transfer company may be required to aid in clearing cargo backlogs in the discharge areas. Harbor craft teams and maintenance detachments or companies may also be attached as required. Ships will be anchored up to 5 miles offshore, and amphibians will transport cargo through the beach to multiple discharge points located as close behind the beach as practicable.

c. The functions of a number of these beach terminals, dispersed along a maximum of 150 miles of shoreline, will be coordinated by a terminal group or brigade. In those cases where beach operations are isolated, a lighterage direct support company or elements thereof may be attached directly to the terminal battalion. General support maintenance is provided by the floating craft general support company (TOE 55–157) as described in FM 29–22 and FM 54–5–1 (TEST) and in paragraph 78 of this manual.

d. Command relationships for amphibian units in amphibious operations are explained in chapter 11.

CHAPTER 7

SITE SELECTION

28. Beach Reconnaissance

a. The initial step in planning for beach operations is the selection of a beach site. Selection of the general operational area is made by the terminal group or brigade headquarters in coordination with the Navy and the Military Sea Transportation Service. Locations of the exact sites are then determined by a beach reconnaissance party made up of representatives of the terminal group, the commander and the operations officer of the terminal battalion that will operate the site, and the commanders of the terminal service, boat, and amphibian companies involved. During the reconnaissance, the terminal battalion commander selects and assigns company areas and frontages, indicates areas of defense responsibilities, and tentatively organizes the area of operations. The amphibian unit commanders are expected to provide advice and recommendations on the factors and conditions affecting the employment of their units, and these recommendations will have a direct bearing on the final choice of the exact operational sites.

b. When CBR operations are suspected, the beach reconnaissance party conducts radiological monitoring and survey and chemical agent detection activities to determine the possible contamination of the prospective beach sites. Areas found to be hazardous are posted with contamiantion markers. For further details see FM 21–40.

29. Beach Characteristics

In selecting a specific area for beach operations, the amphibian unit commander is particularly interested in the following physical characteristics, which are discussed in detail in FM 55–58:

a. Length and width of beach.

b. Depth of water close inshore.

c. Beach gradient at various stages of the tide.

d. Composition of the beach.

e. Surf conditions—distance from the shore at which breakers form, average height of breakers from crest to trough, average distance between crests, types of breakers, number of lines of breakers, period of breakers, the width of the surf zone, and the angle at which the surf strikes the shore.

f. Currents—location, type, direction, and speed of offshore and inshore currents; dangerous sea conditions such as rips and undertows.

g. Tidal range and period—duration and variation of high and low water, effect of tides on the beach width, and obstacles.

h. Reefs—width of reefs; length, slope, height, or depth below water at various tidal stages; nature of reef surface; effect of reef on surf and tide conditions; presence of channels, including location, depth, width, and possibilities for improvement; distance offshore of barrier reefs; depth, nature of bottom, and landward slopes of lagoons.

i. Sandbars: distance offshore, width, length, consistency, slope seaward and landward, depth below water at various tidal stages, and inshore water, including depth and nature of bottom.

j. Rocks and shoals—location, extent, size, and height above or depth below water at various tidal stages.

k. Seaweed—location, extent, and type (such as kelp, rockweed, sea lettuce).

30. Selection Criteria

a. Because cargo is unloaded some distance beyond the waterline when amphibians are employed, the length and depth of the beach are not as restrictive as they would be for full-scale landing craft operations. The beach area, however, must be large enough to provide the dispersion and security required by the tactical

situation, and it must provide sufficient space for separate entrance and exit points at the waterline.

b. The selection of a beach area for the amphibians depends to a great extent on its trafficability and the availability of exit routes behind the beach. The trafficability of the beach is gaged according to its steepness and the moisture content of the sand. The steeper the beach, the poorer its trafficability, and the greater the moisture content, the better the trafficability, except where the sand is so highly saturated that it becomes "quick." Although the off-road mobility of the LARC's is excellent, deep heavy sand, marsh, and a steep beach can substantially increase turnaround time, and the beach with the firmest available surface and lowest gradient should be selected.

c. Exit routes should provide the same degree of trafficability and should tie in as closely as possible with road nets to the discharge areas. Exit routes for the amphibians should provide the following minimum road widths:

(1) LARC–5—12 feet for one-way traffic and 25 feet for two-way traffic.
(2) LARC–15—16 feet for one-way traffic and 35 feet for two-way traffic.
(3) LARC–60—30 feet for one-way traffic and 65 feet for two-way traffic, although it is recommended that LARC–60 operations be confined to one-way routes whenever possible.

d. In all cases, consideration should be given to the use of pierced steel or pierced aluminum planking to improve both the beach area and the exit routes.

e. Consideration must also be given to the effects of the general sea conditions on lighter operations. Rough seas disrupt turnaround schedules by increasing loading time at shipside and reducing the speed of the craft in the water. This, plus the fact that each craft must carry smaller loads, seriously reduces the amount of tonnage that can be delivered ashore. Although the lighters are capable of negotiating surf heights up to 10 feet, it can be assumed for planning purposes that tonnage capabilities will be reduced 50 percent by the following wave heights:

(1) LARC–5—over 3 feet.
(2) LARC–15—over 4 feet.
(3) LARC–60—over 5 feet.

f. Except in extreme emergencies, operations should be suspended when sea and surf exceed heights of 5 feet for the LARC–5, 6 feet for the LARC–15, and 7 feet for the LARC–60.

g. The angle at which waves break in relation to the general shoreline contour imposes a number of complications for the operator. Waves breaking at other than right angles to the contour of the shore generate currents which travel parallel to the shoreline in the direction of the wave and which may reach speeds of 3 or 4 knots. These currents may cause lighters to broach to and swamp, both when entering and leaving the water.

h. The location of reefs, bars, rock outcroppings, and manmade obstructions at various stages of the tide must be determined during the selection of the operational area. Although amphibians are capable of crossing most reefs without difficulty, the hazards of hull punctures and the severity of the surf breaking on the reefs must be considered. It should also be noted that tides and currents may cause sandbars and underwater depressions to shift periodically, and plans should provide for frequent checks of the water approaches to insure that the locations of these obstacles are known at all times during operations.

31. Discharge Areas

a. Although the amphibian company commander does not make the final decision as to the location of inland discharge points, the capabilities of his equipment are an important factor in this selection. Discharge areas will be located within the limits imposed by required dispersion factors and will be based primarily on the capabilities of the terminal service companies working the area, the availability of discharge equipment, existing road and rail nets, and the availability of clearance transportation. The number of discharge points within the discharge area will also be influenced by the number of amphibians to be employed. The amphibian company commander should recommend that discharge points be located as close behind the beach as practicable, preferably not more than 6 miles for the LARC–5, 3 miles for the LARC–15, and ½ mile for the LARC–60.

b. The discharge area should provide a network of all-weather roads sufficient to handle the expected flow of traffic. Normally, the traffic pattern should be established for one-way traffic on all roads, but if two-way traffic is necessary, the pattern must include the minimum road widths given in paragraph 30*c*. Turning radius and gradeability of the amphibians must be evaluated against the choice of routes, and consideration must be given to cover and concealment, provisions for alternate routes, and defensibility of the area.

32. Maintenance Areas

a. The organizational maintenance area should be located as near as possible to the bivouac area, which in turn should be as close to the operating area as the situation permits. This grouping of functional areas simplifies defensive problems and reduces time losses for messing, maintenance servicing, and shift changes.

b. The maintenance area must be large enough to permit the installation of all required maintenance facilities. In general, the terrain should provide sufficient hardstand for parking and working areas, it should have good drainage in all types of weather, it should be accessible by good all-weather roads, and it should provide adequate cover and concealment. Under 24-hour maintenance operations, it may be necessary at times to work on disabled craft in blackout conditions, and consideration must also be given to this eventuality.

c. In addition to the main organizational maintenance area, plans should be made to provide beach maintenance points for lubrication services and correction by maintenance section personnel of minor problems noted by the operators. These points should be located as close as possible to the control center and should be of sufficient size to accommodate standby craft.

CHAPTER 8
OPERATIONAL PLANNING

33. General

a. Employment of lighters in beach operations must be planned to achieve a balanced operation in which the turnaround time of the lighters (para 34) matches as closely as possible the unloading and loading cycle of the terminal service units involved. Balance cannot be maintained unless the craft are unloaded at the discharge points at least as fast as they are loaded at shipside. Every effort must be made to insure that there are enough lighters available to accept and deliver all the cargo that the terminal service personnel are capable of handling. Undue delays at the loading and unloading points must be held to an absolute minimum, and the operation should be set up so that a lighter is along-side a hatch being worked each time the cargo hook is ready to lower a draft. This can be done by having one or more craft on standby at shipside while one is being loaded and others are being dispatched from the beach at intervals equal to the loading time at the hatch.

b. Information obtained from actual operating experience should be used in planning for lighter employment in beach operations, but when these data are not available, factors noted in this manual, FM 101–10–1, and FM 55–15 may be substituted therefor.

34. Turnaround Time

a. Turnaround time is the basic factor in determining lighterage capabilities and requirements. It is used to ascertain the number of craft required for a specific operation or the amount of tonnage that can be delivered by a given number of craft. Turnaround time is the total elapsed time that a single lighter takes to make a complete round trip from the discharge point to shipside and back to the discharge point. The elements involved are average speed in the water and on land, distances to be traveled, loading time, unloading time, and predictable delays.

b. An estimate of turnaround time must be worked out for each new operational site and mission and for each change in any of the elements given above. Speeds will be affected by sea and terrain conditions, and the average loads to be carried will alter loading and unloading times. In addition, any change in the water and/or land distances to be traveled will require a new turnaround time computation. As an example, an average delivery capability of 1,000 short tons of general cargo per 20-hour day for the light amphibian company is based on the following average factors:

Water distance (one-way)	2 miles
Land distance (one-way)	1 mile
Water speed	8 mph
Land speed	20 mph
Average load per craft	2.5 tons
Loading time	12 minutes (12 tons per hour)*
Unloading time	7 minutes (24 tons per hour)
Total daily time	20 minutes

c. Average turnaround time is computed by using the following formula:

$$TT = \frac{WD \times 60}{WS} + \frac{LD \times 60}{LS} + LT + ULT + D$$

where

TT = turnaround time in minutes
WD = water distance (round trip)
WS = water speed (mph)
LD = land distance (round trip)
LS = land speed (mph)
LT = loading time in minutes
ULT = unloading time in minutes
D = delays in minutes

d. Using this formula and the factors noted in *b* above, the average turnaround time of one LARC–5 under these conditions would be computed as follows:

$$TT = \frac{WD \times 60}{\text{WS}} + \frac{LD \times 60}{\text{LS}} + LT + ULT + D$$

* Based on the terminal service company's average general cargo discharge of 1,200 tons per day.

$$= \frac{4 \times 60}{8} + \frac{2 \times 60}{20} + 12 + 7 + 20$$
$$= 30 + 6 + 12 + 7 + 20$$
$$= 75 \text{ minutes}$$

e. The figures shown above are based on general planning forecasts for over-the-beach operations, but lighters are most efficiently employed when the following conditions obtain:

(1) An unloading time not greater than the loading time, but preferably one-half the latter.

(2) A land traveltime not greater than the water traveltime.

f. The delay factor shown in the example in *b* above includes predicted lost time at shipside and in transit (10 min) and at the beach control point and the discharge area (10 min). Whenever possible, actual loading and unloading times and known delays should be used in computing turnaround time. However, additional delays can be avoided by the establishment of multiple discharge points in sufficient numbers to accommodate the number of amphibians being employed. The location of these points will also be influenced by the number of ships and the number of hatches being worked.

35. Lighter Requirements

a. Once an average turnaround time is established, the number of lighters required to deliver an assigned daily tonnage can be computed by using the following formula:

$$L = \frac{T}{W \times \frac{M}{TT}}$$

where

L = lighters
T = tonnage assigned
W = average load in tons
M = operational time in minutes
TT = turnaround time

b. Assuming a 20-hour operational day (1,200 minutes) and an average load per trip of 2.5 tons, the number of amphibians required to deliver 1,000 short tons would be computed as follows:

$$L = \frac{T}{W \times \frac{M}{TT}}$$
$$= \frac{1,000}{2.5 \times \frac{1,200}{75}}$$
$$= \frac{1,000}{2.5 \times 16}$$
$$= \frac{1,000}{40}$$
$$= 25$$

c. This computation shows that under specified conditions each amphibian will make 16 trips and deliver a total of 40 short tons ashore in 20 hours, producing a requirement for 25 craft to handle 1,000 tons in a single day. This solution, however, provides the requirement for *operational* craft only, with no allowances made for preventive maintenance services or deadlined craft. For sustained operations, plans should be based on an average availability of only 75 percent of assigned amphibians. Therefore, the 25 craft indicated by the above must be considered as only 75 percent of the task LARC's required for continuous operations. The requirement for task craft in this situation can be determined by dividing 25 by .75. Thus, 34 amphibians would be required to sustain an average delivery rate of 1,000 short tons per day over extended periods.

d. Operational craft requirements for specific missions can be computed according to the number of hatches to be worked. This method is also based on turnaround time, but includes computation of the "most restrictive factor" among loading, unloading, or delay times. This formula is expressed as follows:

$$L = H \times \frac{TT}{R}$$

where

L = lighters required
H = hatches to be worked
TT = turnaround time
R = most restrictive factor (LT, ULT, or D, whichever is greatest in turnaround time formula given in paragraph 34*c*)

e. Using the turnaround time computed in paragraph 34 and the most restrictive factor from the same formula (delays = 20 minutes), the number of LARC's required to work three hatches, as an example, would be computed as follows:

$$L = H \times \frac{TT}{R}$$
$$= 3 \times \frac{75}{20}$$
$$= 3 \times 3.75$$
$$= 12$$

f. This solution shows that 4 lighters would be required to work 1 hatch under the conditions specified and that 12 LARC's would be required to keep 3 hatches busy. By relating this solution to the data obtained in *c* above, it will be seen that these 12 LARC's will discharge 480 short tons per day (12 × 40 STON's per LARC per day) from 3 hatches and that the 25 operational craft in the lighter amphibian company are capable of working 6 hatches simultaneously under these conditions (25 divided by 4).

g. As noted in *b* above, however, this formula indicates the requirement for operational craft only, and the resultant figure must be divided by .75 to determine the number of task lighters that must be available for continuous operations (12 divided by .75 = 16).

36. Tonnage Capabilities

a. In some cases, it will be necessary to forecast the amount of tonnage that can be delivered by the available craft over a specified period of time under existing conditions. As noted in paragraph 34, turnaround time can be used as a basis for this forecast.

b. Tonnage capabilities are computed by using the following formula:

$$T = \frac{M \times W \times L}{TT}$$

where

T = tonnage capability
M = minutes per operational day
W = weight per lighter
L = number of lighters
TT = turnaround time

CHAPTER 9
UNIT MOVEMENT PLANING

37. General

a. The unit commander must prepare and keep current plans for the loading of all equipment and personnel for any type of nontactical move (AR 220–10). Plans should provide for the following types of movement:

(1) Overland movement in organic equipment.
(2) Overland movement by rail.
(3) Oversea movement by landing ship and conventional transport.

b. The commander should insure that the following information is available in the company files:

(1) Weight, square, and cube of all amphibians and wheeled vehicles.
(2) Material required for packing and crating equipment.
(3) Packing lists for all crates and boxes.
(4) Weight and cube of all crates and boxes.
(5) Material required for blocking, bracing, and lashing vehicles for movement by rail.
(6) Stowage plan for each lighter and vehicle, showing the specific crates and boxes to be carried in each.
(7) Vehicle assignment list for all personnel, indicating the lighter or vehicle in which each individual or organizational element will be transported.
(8) A list of the numbers and types of watercraft required in addition to the organic lighters for movement by water, including stowage plans and equipment and/or personnel assignments for each.

c. The information listed in *b* above must be kept current. Plans should be made not only for all personnel and equipment authorized by TOE, but also for the minimum essential equipment (MEE) shown in AR 220–10. Much of this information may also be used in planning a tactical movement, although space and tonnage limitations may require rearrangement of stowage plans or revision of packing lists.

38. Ocean Transport

Although amphibians can be transported overseas in naval transport vessels and conventional cargo ships (TB 55–1930–203–12/1), LSD's (landing ship, dock), LST's (landing ship, tank), and LPD's (amphibious transport, dock) are more suitable because they provide the following advantages:

a. Rapid Embarkation and Debarkation. LARC's can embark or debark under their own power through the LST ramps and can be floated into and out of the well deck of the LSD's and LPD's. When conventional ships are used, the lighters must be loaded by cranes and unloaded either by cranes or davits.

b. Accessibility During Transit. Maintenance services and inspections en route can be performed more thoroughly and with less difficulty in the larger, sheltered area provided by the landing ships.

c. Ease of Control. Control problems are lessened by the rapid discharge and the shorter run to the beach provided by the shallow-draft landing ships.

d. Greater Load Capacity. Characteristics and capacities of individual landing ships of the same type or class vary to a considerable degree, and load plans should be based on characteristics pamphlets for the specific ship involved. However, by using average capacities for each type of ship, the following loads may be used for general planning purposes:

(1) LSD—30 LARC–5's or 20 LARC–15's or 5 LARC–60's.
(2) LST—25 LARC–5's or 15 LARC–15's. (One LARC–60 may be deck-loaded on an LST and side-launched in the objective area.)

(3) LPD—15 LARC–5's, or 10 LARC–15's, or 3 LARC–60's.

39. Preparation of Unit Equipment

a. General. Equipment to be carried on cargo vessels must be prepared so that it is protected from handling and weather damage and can be easily managed during loading and unloading. Instructions for preparing supplies, equipment, and vehicles are usually contained in standing operating procedures or in appropriate technical publications.

b. Vehicles and Mobile Equipment.

(1) If possible, all vehicles and trailers should be loaded with unit equipment or other supplies. This reduces the amount of cargo handling required on the beach. Loads must not extend beyond the maximum height or width of the vehicle in stripped condition. Fuel tanks should be three-fourths full to permit expansion and allow for splashing during transit. Vehicles should carry a reserve of fuel in 5-gallon cans and suitable amounts of engine oil, as well as individual combat rations for the drivers.

(2) Bows are removed from the tops of loaded vehicles and stowed in each vehicle, with the canvas top securely crosslashed over the load. This precaution protects cargo from the weather and prevents loss of contents if the vehicle is tilted during loading or unloading.

(3) Vehicles and other motorized equipment must be waterproofed before loading. Waterproofing procedure is described in detail in TM 9–238.

(4) Drivers and assistants are normally embarked in the same vessels as their vehicles so that they may service the equipment en route.

(5) Vehicles and equipment carried on the exposed decks of vessels must have headlights, windshields, windows, rearview mirrors, reflectors, and similar reflecting surfaces covered.

(6) Mobile generators should carry prefabricated lighting standards that can be erected quickly when illumination is required.

(7) All equipment is serviced before loading so as to be in the best possible mechanical condition. An adequate supply of repair parts must be provided.

c. Unit Impedimenta.

(1) All unit equipment must be covered or sealed to protect it from the elements. Any material that might be damaged in handling should be crated or packaged. However, packing and crating should not appreciably increase the weight and size of items. For specific instructions pertaining to crating, packing, waterproofing, and application of preservatives, see TM 38–230 and SB 38–100.

(2) Where practicable, boxes and crates should not exceed dimensions of 36 by 18 by 18 inches nor a weight of 40 pounds. Sizes and weights in excess of these add to difficulties when individual boxes must be handled over the beach. For ease in handling, stowage, and identification, general cargo, including the smaller items or organizational equipment and supply, will be unitized in tri-wall CONEX inserts or on 40- by 48-inch wooden pallets. Pallets are described in TM 55–513.

d. Stowage Responsibility. All stowage of cargo must be approved by the master of the vessel because he is solely responsible for the vessel and all cargo and personnel aboard it. When cargo is transported, lifted, or loaded by personnel not under his control, his responsibility for the cargo commences when it is safely stowed on board and accepted by him.

e. Marking Equipment.

(1) Detailed information concerning marking is contained in AR 220–10, AR 725–50, AR 746–5, and TB 746–93–1. When the unit is combat loaded, all material must be marked to indicate its unloading priority number and the hatch and level at which it is to be stowed. For example, on a U.S. Naval Ship, 13 3/2P means that the

item has priority 13 for unloading and is stowed in hatch No. 3 on the second platform. On a merchant ship, an item with the same priority and stowed in approximately the same relative location would be marked 13 3/LTD to indicate hatch No. 3 at the lower 'tween deck level. These priority and location markings are placed on top of each item and on both sides of it. Vehicles are marked with 9- to 12-inch numbers and letters on the top of the hood and on both sides of the cab. If the construction of a particular type of vehicle precludes marking in this manner, the vehicle will be marked conspicuously on the top and on both sides. Markings are made with white crayon or other waterproof material. Identifying marks should be placed on all items that will be needed promptly upon landing.

(2) In order to reduce pilferage, the outside packing list of packages containing such items as narcotics, maps, currency, and watches will contain a minimum of information.

(3) It is particularly important that any equipment that has been partially disassembled for loading be marked so that it can be loaded and landed as a unit to facilitate reassembly.

40. Loading Plans

a. Loading plans are based on the priority in which equipment and supplies will be needed upon landing, and priority is based on an analysis of the operation plan. When the farshore priority has been determined, the commander of the amphibian unit submits a loading priority list to the headquarters responsible for conducting the movement. The commander is responsible for having his troops, equipment, and supplies available for loading when and where the higher headquarters specifies.

b. As a guide to subordinate units, the higher headquarters may issue standing operating procedures for packing, crating, and marking of supplies and equipment; preparation of vehicles for embarkation; and pallet-loading procedures.

CHAPTER 10
LOGISTICS OVER-THE-SHORE OPERATIONS

41. General

As previously pointed out, the operations of the amphibian companies must be responsive to the needs of the terminal service units handling the cargo at shipside and in the discharge areas. In order to maintain the balance necessary for a smooth and continual flow of cargo over the beach, the amphibian unit commander must be constantly aware of the status and location of all his craft so that platoons, sections, and individual lighters can be relocated or assigned new or additional missions as rapidly as possible. This flexibility of operation requires a responsive, closely monitored control system—the most important element in an efficient ship-to-shore operation. Control is maintained primarily by means of radio communications and is exercised through the lighter control center and various control points located as required on the beach, at shipside, and in the discharge areas.

42. Communications

a. The amphibian unit commander establishes and maintains communication with all lighters and control points by employing the following signal equipment:

(1) Public address set AN/PIQ–1. These sets can best be used in control of lighters upon their close approach to and when alongside the vessels being discharged.

(2) Radio set AN/VRC–46, mounted in each ¼-ton truck and in each lighter.

(3) Radio set AN/VRC–47, to be used in overall net and traffic control.

(4) Signal lamp equipment SE–11. This equipment can be effectively employed to indicate the initial beach entrance point when embarking lighters into a landing ship and in lighter control at the vessel being worked.

(5) Telephone set TA–312/PT and switchboard SB–993/GT or SB–22/PT. The telephones and the switchboard afford the unit an adequate internal communications net to all shore-based areas, centers, and control points.

b. All personnel normally required to use radio equipment should be trained in radiotelephone operating and authenticating procedures. Consideration must be given to the number of radios operating on the company frequency, and strict radio discipline must be enforced and maintained by the net control station. Radio control and dispatch of lighters while en route should be in clear, concise, standard terminology, and transmissions from the lighter crews should be restricted to acknowledgement of orders and emergency or distress traffic.

c. The operating crews must also be familiar with the international Morse code, transmitted either by flashing light or sound; the recognition and meaning of singly flown International Code flags; and the hand semaphore used for short-range visual signaling.

43. Control System

a. Once a site has been selected, the amphibian company commander determines the layout of his operational area in accordance with the guidelines in chapter 7, establishes and locates his control system, and makes his operational plan.

b. The extent of the control system will depend on the size of the operational area, the dispersion required, and the ship-to-shore distances to be traveled. The discussion in this portion of the manual pertains equally to the light and medium amphibian companies, and the principals and techniques are generally applicable also to the heavy amphibian platoon. In most cases it can be assumed that one or more heavy platoons will be attached to or working with the light and medium companies.

c. In average situations, and particularly when working two ships simultaneously, best

results will be obtained by decentralizing operations to platoon level. This approach reduces communication problems and simplifies overall control. The greater the dispersion, the more important this decentralization becomes.

d. Although all the control points discussed in this chapter will not always be required, a complete description is included for illustrative purposes. Under decentralized platoon operation and maximum dispersion, a typical control system would include the lighter control center, a shipboard control point on each ship being worked, a discharge control point, and one beach control point for each platoon.

44. Lighter Control Center

a. The lighter control center (LCC) controls and coordinates overall company operations and should be located at or near company headquarters and as close as possible to the discharge areas. (LCC is not an authorized abbreviation for lighter control center. It is valid only within this manual).

b. The lighter control center determines lighter requirements for specific missions, establishes initial lighter dispatch, controls routing, maintains operational records, and formulates plans for future employment in accordance with predicted and assigned operational requirements. Under two-shift, around-the-clock operation, a suggested method of manning the LCC with key personnel is shown below (additional clerks, messengers, and other personnel may be employed as required and available):

(1) First shift—company commander, LCC sergeant, dispatcher.

(2) Second shift—LCC officer, assistant LCC sergeant, dispatcher.

c. The LCC maintains radio contact with the beach control points, the maintenance and standby area, higher headquarters (command net), and adjacent and operationally allied units. Contact with the discharge area is normally maintained by telephone. The LCC should not make direct radio contact with individual lighters or with the shipboard control points except in emergency situations.

d. At the beginning of each day's operation and/or at each shift changeover, the LCC determines lighter requirements based on information obtained from the platoon leaders and from the commanders of the terminal service companies working the ships. These requirements are checked against lighter availability data supplied by the maintenance officer.

e. The dispatcher then prepares a copy of DA Form 2400 (Equipment Utilization Record (TM 38–750)), for each lighter to be dispatched. This form serves as a dispatch ticket and a daily operational log. The amphibian operators pick up the authenticated forms at the LCC and report to the platoon leader for further instructions. At the end of each shift, the completed forms are returned to the LCC, where they become a part of the unit operational records.

45. Beach Control Points

a. The beach control points should be located as nearly as possible in line with the ship and the beach exit road to the discharge area to insure the shortest possible water distance and rapid entry of the lighters into the clearance road net. Since all amphibians going to and returning from the ship report to this control point, it should be positioned between the water entrance and exit points.

b. Personnel to man and operate the beach control points are drawn from the command and supervisory positions available within the operating platoons. Communication is maintained by radio to the lighters and the shipboard control point and by radio and telephone to all shore-based company activities. Messenger service may be employed to alleviate any initial or temporary communications shortcomings.

c. Personnel manning the beach control points have the following responsibilities:

(1) Dispatching and controlling the operations of the amphibians employed.

(2) Issuing final instructions to the operators as to the hatch and side of the ship at which they will work and relating any special information or instructions that will promote safe and efficient operation.

(3) Coordinating amphibian discharge with the terminal service company

representatives at the control point, with the shipboard control point, and with the discharge areas.

(4) Regulating the flow of available amphibians in accordance with vessel requirements and discharge and clearance capabilities.

(5) Checking the amphibians for damage each time they arrive at the beach and insuring that the craft are operated properly and that the cargo is properly secured aboard.

(6) Maintaining a lighter control board to record arrival and departure of each craft at the beach, current status of all amphibians in operation, and type and weight of all cargo delivered ashore by each.

(7) Keeping the LCC informed on the progress of the operation, amphibian status and availability, and any operational problems encountered.

d. Platoon operations are normally directed principally from the beach control point. This point should neither duplicate nor supplant the function of the lighter control center. Its purpose is to contribute to an effective overall accomplishment of the unit mission as an intermediate control point in the line of travel from the vessel to the discharge area. Information received from the other company control points and activity areas, together with on-site observations, is the basis for actions by the officer in charge or the noncommissioned officer in charge. If warranted, an immediate report will be made to the LCC, delineating conditions and discrepancies and the corrective action taken.

46. Shipboard Control Point

a. Although the mission of moving the cargo from the vessel to the discharge area is assigned to the amphibian company commander, the responsibility for unloading the ship remains with the terminal service company commander. These mutually-supporting responsibilities require close coordination between the principles, particularly at the loading and unloading ends of the turnaround cycle. The basic function of the shipboard control point is to insure that unloading delays are not due to nonavailability of lighters under the hook and that lighters in excess of immediate requirements are not dispatched to the ship.

b. At the beginning of the operation, the NCO who will man the shipboard control point proceeds to the vessel with the mooring detail in the first lighter dispatched to the ship. The shipboard control NCO then contacts the terminal service company ship platoon leader to determine which hatches are to be worked, which moorings should be port and which should be starboard, the type of cargo to be removed from each hold, and the time unloading can begin.

c. The above information is relayed by radio through the beach control point to the LCC. Based on this report and the information received from other sources, the initial dispatch of lighters is ordered. Radio contact between the ship and beach control points will normally be accomplished by use of the radio in any one of the lighters alongside the ship at any given time. Communications and control equipment taken to the ship at the time of initial boarding by the shipboard control NCO should include a public address set, signal lamp equipment, and binoculars.

d. Other duties of the shipboard control point NCO are—

(1) Supervision of the rigging of lighter mooring lines (TM 55–510).

(2) Control and spotting of lighters when alongside or upon their close approach to the vessel.

(3) Close coordination with the terminal service OIC or NCOIC as to contemplated actions that may delay or expedite the ship discharge and affect lighter requirements at the vessel. Examples of such actions are—

(*a*) Respotting booms, opening hatches, and going from one level to another in the hold.

(*b*) Changing rig for making heavy lifts or for removing another type of cargo.

(*c*) Removal of tonnage.

(*d*) Stevedore shift changes.

(4) Insuring that drafts are not swung over the side and lowered onto the lighter in a manner that unnecessarily

endangers either the lighter or the crew.

(5) Determination of the amount of cargo to be carried each trip, its proper stowage aboard the lighter, and the measures to be taken to properly secure it in the cargo compartment. This will require a careful evaluation of sea and surf conditions between the vessel and the beach.

(6) Visual and radio monitoring of lighter overwater movement.

e. The LCC must be kept informed as to the progress of the operation at the ship. It must be recognized that changes in lighter requirements must be anticipated and that an increase or reduction in lighter flow is not always immediately evident at the vessel. This requirement and the need to accomplish the mission with a minimum exposure of the lighter and crew to unsafe practices and hazardous conditions make it necessary that the individual manning the shipboard point also be familiar with stevedoring techniques.

47. Discharge Control Point

a. A section leader is normally stationed in the discharge area during the operation to provide technical advice and assistance to insure the most effective unloading and turnaround of the amphibians. If an unfavorable situation exists or develops that cannot be corrected through coordination with the terminal service representative, the LCC should be immediately notified by telephone so that corrective action can be taken.

b. Other duties of the discharge control point NCO include—

(1) Supervision of the operating crews to insure adherence to safe driving and cargo unloading practices in the discharge area.

(2) Insuring that lighters are unloaded as rapidly as possible in order to prevent lighter backlogs and congestion at the beach and discharge areas.

(3) Arranging for return of cargo nets, slings, and pallets to the vessel. Each lighter should return at least as many as brought ashore to prevent accumulation in the discharge area.

48. Utilization Records

In addition to the standard operational records required by TM 38–750, the LCC may find it useful to consolidate daily operational data extracted from DA Form 2400 into a rough log. Reproduced locally, this log will provide information which will enable the unit commander to check on the day-to-day efficiency of his unit and to spot operational difficulties as they occur. In addition, the log will provide a basis for subsequent employment plans and for additional reports and records that may be required by higher headquarters. A properly maintained log would include information such as number of trips per lighter, tons per trip, total trips per day, total tons per day, traveltime, loading and unloading time, and total hours of operation.

49. Lighter Control Board

a. The lighter control board (fig. 4) is normally maintained at the beach control point. Its purpose is to show the current location of each lighter and the time of its departure or arrival at a particular destination. The "Time to Standby" column shows that certain lighters are available for dispatch and indicates the time each was placed in this category. The "Trip Number" column serves to record a running total of the number of completed trips during the shift. Five columns headed "Time to Discharge Point(s)" provide space to enter the time a lighter left the vessel destined for any of five discharge points.

b. When ships are being loaded over the beach by the lighterage company, the board is kept in the same manner, except that the word "Discharge" is lined out and the word "Loading" is entered in its place.

50. Lighter Status Board

a. A lighter status board should be maintained in the LCC to assist the unit commander in determining the location and operational status of all of his lighters at any time. A board similar to that shown in figure 5 will furnish all the necessary information at a glance. Each lighter is assigned a control number. A disk having this number will be placed in the appropriate column on the board to indicate the status of the equipment.

TRANSPORTATION COMPANY (LIGHT AMPHIBIAN)
LIGHTER CONTROL BOARD

			Time to ship (s)		Time to discharge point (s)					
Lighter number	Time to standby	Trip number	(Name or number)	(Name or number)	1	2	3	4	5	Time to maintenance
1	1020	2	0820			0915				
2										
3										
4										
5										
6										
7										
8										
9										
10										
30										
31										
32										
33										
34										

Figure 4. Sample lighter control board (light amphibian company).

TRANSPORTATION COMPANY (LIGHT AMPHIBIAN)

LIGHTER STATUS BOARD

MAINTENANCE

Lubrication intervals						Deadline		Evac
W	2W	M	Q	S	A	+48	−48	
6	7	31						
11	20							
14								
23								

VEHICLES AND ROLLING EQUIPMENT

Trk, ¼-T	○	○	○	○			
Trk, 2½-T	○	○	○	○			
Trk, fuel	○	○	○				
Trac, 5-T	○						
Wkr, 5-T	○						
Tlr, ¼-T	○	○	○	○			
Tlr, L&S	○						
Tlr, 1½-T	○						
Tlr, water	○						
Van, 12-T	○						
Trans, liq	○	○	○	○			

IN OPERATION

1st Plat	1	3	4	5				
	10	12	15	16				
2nd Plat	19	21	22	26				
	27	28	30	32	33			
ATTACHED								

AVAILABLE FOR OPERATION

1st Plat	2	8	9					
	13	17						
2nd Plat	18	24	25					
	29	34						
ATTACHED								

Figure 5. Sample lighter status board (light amphibian company).

b. Blocks of control numbers should be assigned to each platoon to aid in rapid identification of both the lighter and its parent element. In the light amphibian company, as an example, control numbers 1 through 17 should be assigned to the LARC–5's in the first platoon and numbers 18–34 to those in the second platoon. Number 35 in this case would be assigned to the maintenance platoon LARC. The administrative vehicles in the unit may also be assigned control numbers and shown on the status board if desired. Control numbers should be painted on the lighters in acocrdance with AR 746–5.

c. It will be noted under the "Maintenance" portion of the status board that lighters are indicated in two deadline categories: lighters deadlined for less than 48 hours and those deadlined for a longer period. Lighters requiring parts that have been requisitioned and are expected shortly and lighters that are not immediately releasable for any other reason are represented in the — 48 column. If it is estimated that extensive repair is required or repair parts are not immediately available, or if the lighter has been deadlined continuously for a period in excess of 48 hours, the disk representing it is moved into the + 48 column. When it is necessary to release a lighter for maintenance at a higher echelon than that normally available to the unit, it is carried in the "Evacuated" column until such time as it is returned to the unit or replaced. Task lighters that are operational will be carried either as "In Operation" or "Available for Operation" on the board. When available but not committed (dispatched), lighters will normally be located in the standby area where the operating crews will perform preventive maintenance inspections and services.

51. Cargo Loading and Discharge Considerations

a. Loading cargo into an amphibian from a vessel anchored in the stream is a difficult and dangerous operation. The shipboard control point NCO must take into account the conditions under which the unloading is being conducted and must constantly supervise the lighter crews at shipside to guard against any unnecessary compromise of safety precautions. If, in his opinion, it is dangerous to continue the discharge operation, he must immediately notify the LCC through the beach control point. The unit commander or LCC officer will then decide whether to continue or suspend operations until conditions improve and will make his recommendations accordingly to the terminal battalion commander.

b. The ship discharge rate is influenced by the following factors:

(1) Type of cargo to be unloaded (mobile, unitized, or loose).
(2) Characteristics of the cargo ship.
(3) Handling gear available.
(4) Experience of the cargo handling personnel on the ship and ashore.
(5) Weather conditions.
(6) Distance of cargo ships from the beach.
(7) Beach characteristics.
(8) Distance of discharge points from the beach.
(9) Enemy air, ground, and naval action.

c. Unless unusual wind or tidal currents exist, the ship is normally anchored bow to either the wind or current, depending upon which is stronger. If all hatches are being worked, lighters must receive cargo over both side of the ship. For example, the cargo from No. 1 hold may be discharged over the starboard side and that from No. 2 over the port side, etc. However, sea and weather conditions at the anchorage may frequently be such that cargo discharge over the windward side of the ship may be impracticable. When this situation occurs, all lighters must necessarily moor and receive cargo at the lee side of the vessel. Lighter operators are instructed by beach control personnel or by the shipboard control point NCO as to the number of the hatch and the side of the vessel at which they should moor. Detailed procedures for coming alongside, mooring, and clearing shipside are contained in TM 55–510.

d. Drafts of nonunitized small items of cargo are usually handled in cargo nets which are unhooked and left in the craft. Empty nets are returned to the ship each time the lighter comes alongside for another load.

52. Use of Jumpers

The minimum crew requirement for the LARC–5 and LARC–15 in normal land operations and shiploading operations is two men as provided in TOE 55–138 and 55–139. However, because of the configuration of the cargo well and the fact that the operator must remain at the controls the entire time the lighter is alongside, a third crewman is required to assist in placement of cargo drafts aboard the LARC in ship discharge operations. This third crewman is also required in ship loading operations when sea swells reach a height of 3 feet. Since the third man is reqiured only when the lighter is actually under the hook, or approximately 15 percent of each operational cycle, it is not considered economical to assign the additional crewmember full time. Therefore, a "jumper" system must be employed in which the third man boards the lighter when it is dispatched to shipside and debarks when it returns to the beach. For safety reasons, it is best to transfer the jumper from an inbound to an outbound LARC at the beach rather than at shipside or an intermediate point. Except for the time spent on the lighter while it is moving from the beach to the ship and back, the jumper is aboard the lighter only when actually needed; that is, during unloading operations at shipside. Because his total time aboard the lighter normally comprises only a little more than 50 percent of the operational cycle, an average of two jumpers can support three lighters. Unless otherwise employed, crewmen from lighters in maintenance or on standby can be used as jumpers for the operational lighters. If additional jumpers are required, they can be drawn from the shore platoon of the terminal service company working the ship.

53. Documentation

a. All cargo moving through water terminals is documented in accordance with DOD 4500.32–R (Military Standard Transportation and Movement Procedures (MILSTAMP)). The basic document for cargo movements under these procedures is DD Form 1384 (Transportation Control and Movement Document (TCMD)), which is used as a dock receipt, a cargo delivery receipt, an accountable document during temporary holding, and a record of all cargo handled. (TCMD is not an authorized abbreviation. It is valid only within this manual.)

b. Although cargo documentation is a function of the terminal service company, the amphibian unit commander must insure that all cargo received at the ship is properly accounted for until it is unloaded at the discharge point. This is accomplished by having the lighter operator receive copies of the TCMD covering the contents of his load at shipside. The number of copies furnished will depend upon command requirements for each particular discharge operation.

c. The amphibian operator retains one copy of the TCMD until he returns to the beach control point for redispatch, all other copies having been delivered with the cargo to the terminal service shore checker at the discharge point. This copy is initialed by the shore checker to signify receipt of the cargo. Before surrendering the initialed copy at the beach control point, the lighter operator enters the cargo weight on his equipment utilization record.

54. Beach Area Security

a. The commander of the terminal is responsible for the local defense of his portion of the beach area. Commanders of all units have their normal responsibility for the security of men and equipment. Each unit of the terminal is assigned a mission in the defense system. Emergency assembly areas are designated, and an alert warning system is established. An overlay of the beach defense is circulated to all units in the area.

b. General security measures taken by amphibian units within their bivouac areas include—

(1) Dispersing all vehicles, equipment, and personnel.
(2) Posting guards, patrols, and sentries.
(3) Constructing foxholes, slit trenches, and dugouts.
(4) Designating specific defense positions for all personnel and conducting alert drills to insure that personnel are familiar with their duties in an emergency.
(5) Organizing definite defense groups un-

der leaders specifically designated in a published defense plan.

(6) Organizing communication systems to be used during defense operations.

(7) Constructing suitable obstacles to the advance of attacking forces.

(8) Planning for integrated fields of fire.

c. In an emergency all members of the amphibian unit, including crews, may have to occupy defense positions. Accordingly, weapons must be kept handy at all times and frequently checked to insure that they are in serviceable condition.

d. Defense plans are forwarded to the next higher headquarters for approval and coordination with the overall defense plan of the beach area.

e. Normal passive and active security measures to protect the beach in the event of air attack are established and coordinated by the responsible terminal unit. These measures consist mainly of concealment, dispersion, early warning, and weapons firing (app C). Shelters are provided for personnel, a system of alert warning signals is set up, and installations are camouflaged.

f. Miximum use is made of supporting Army aviation to assist in surveillance of the beach area.

g. Security and defense measures to be taken during conditions of CBR (chemical, biological, and radiological) operations are outlined in FM 21–40 and FM 3–12.

CHAPTER 11

AMPHIBIOUS OPERATIONS

55. Concept of Employment

a. When employed in amphibious operations, transportation amphibian companies are initially attached to and train with the engineer amphibious unit providing shore party support to the landing force (FM 5–144). When the shore party is dissolved upon termination of the amphibious operation, the transportation amphibian units are attached to a terminal battalion or terminal group for participation in subsequent LOTS operations.

b. Because of their slow water speed and lack of armor protection, wheeled amphibians are not normally employed in the early assault waves (scheduled movements), but are preloaded with priority supplies and held in the transport area as on-call elements. They may debark from transport vessels and lie to at designated control points as floating dumps, or may remain aboard landing ships until ordered ashore by the control officer at the request of the shore party commander.

c. Although amphibians may be employed to deliver artillery pieces during an amphibious operation, they should not be used as prime movers for this equipment. Immediately upon delivery of the artillery piece to its designated unloading point, the amphibian should be released so that maximum use can be made of its ship-to-shore cargo-carrying capabilities.

d. Although a significant number of combat-equipped troops can be transported comfortably in the LARC–60 under most sea conditions, the configuration of the cargo well of the LARC–5 and LARC–15, the dangers involved in loading alongside ship, the difficulty of debarking ashore (from the LARC–5), and the lack of adequate weather protection during transit severely restrict the practicability of these lighters as personnel carriers. Consequently, movement of troops and casualties should be planned primarily for the LARC–60 and for the other amphibians only for short distances in emergency situations and when sea and surf conditions are relatively light.

56. Planning

a. Planning for operational employment and coordinated training with shore party elements begins immediately upon receipt of the initial directive assigning an amphibian unit to the landing force. Liaison is established between the amphibian unit and the engineer amphibious unit to which it is attached. During the planning phase, the transportation amphibian commander makes detailed plans corresponding with those of the other elements of the shore party and/or landing force. These plans should provide for—

(1) Shore-based and afloat training.
(2) Missions and operational assignments.
(3) Organization for embarkation and landing.
(4) Ship-to-shore movement procedures.
(5) Subsequent employment after accomplishment of primary mission.
(6) Supply and maintenance.

b. The unit commander takes into consideration those factors cited in chapter 7 when selecting or providing advice to the shore party commander on the selection of specific beaches and/or beach areas for the employment of his craft.

c. During the planning phase, the amphibian unit requires extensive individual training as well as training with other elements of the landing force in amphibious techniques to insure efficient execution of its support mission. Continual practice in the mechanics of attaining coordination is necessary during training to achieve virtually automatic execution during the operation.

d. Detailed discussions of amphibious techniques and the functions and responsibilities of

personnel, units, and services are contained in FM 31–11 and FM 31–12.

57. Embarkation

a. Amphibians are transported to the objective area aboard landing ships and/or assault ships. Types and numbers of lighters to be carried by each ship of the transport group are determined and designated through coordination between representatives of the landing force and the appropriate naval transport echelon.

b. Before the arrival of assault shipping, amphibian unit commanders, troop commanders, naval commanders, and the shore party commanders concerned prepare detailed landing and embarkation plans for the lighters based on the overall tactical plan and scheme of maneuver ashore. Details of embarkation planning are contained in FM 60–30.

c. The senior amphibian unit representative to be embarked on each ship, together with the commanding officer of troops and the ship's combat cargo officer, arrange for the following:

(1) Assignment of billets.
(2) Assignment of crews, relief crews, and maintenance teams.
(3) Assignment of working parties.
(4) Storage of fuel, lubricants, and maintenance material to insure availability en route and during the initial stages of the assault.
(5) Organization of security details.
(6) Messing procedures.
(7) Stowage of weapons and ammunition.

d. All supplies and repair equipment must be prepared for loading before the assault shipping arrives in the embarkation area. A final inspection must be made to insure that all craft and equipment are in proper condition and ready for the operation. Amphibians should be completely serviced, with fuel tanks and water cans filled, accessories in place, and radio and navigation equipment waterproofed. This inspection should also include an examination of the cargo loaded aboard each craft to insure that it is securely lashed and adequately protected.

e. Amphibian units should be ready to begin loading immediately upon the arrival of ships in the embarkation area. If ships are to be loaded offshore, the embarkation area should be so organized that amphibians and boats use different beach areas. Lighters to be embarked aboard each ship are grouped together and escorted by naval guide boats to the assigned ships.

f. The amphibians must be loaded aboard assault shipping in a manner that will permit debarkation in the proper order when they arrive in the objective area. The loading sequence is the responsibility of the officer in charge of the craft assigned to each ship.

g. Amphibians are driven directly aboard landing ships and loaded aboard conventional vessels by ship's gear or shore-based cranes either from the water or the pier. Procedures for loading amphibians aboard landing ships are described in TM 55–510.

58. Movement

a. Because of security requirements, only senior commanders are informed of the details of the assault before embarkation. Therefore, during the approach to the objective, amphibian unit personnel and other embarked troops must be instructed in the details of the operation. This instruction must be of sufficient scope and detail to insure complete understanding by each individual of the nature of his duties and responsibilities and his part in the overall plan of the landing force. Instruction should include the information normally imparted to amphibious assault troops in addition to the following:

(1) Detailed procedure for debarkation and movement to the beach.
(2) Location of all key personnel during various stages of the operation and the authorized methods and procedures for communication.
(3) Condition of beaches, inland terrain, and exit routes; location of obstacles, including CBR contaminated areas; and sea and weather conditions in the objective area.
(4) Mission details, including the mission and objectives of the units to be supported.
(5) Location of maintenance and supply facilities afloat and ashore.

b. When assault units are embarked aboard

the same ship as the supporting amphibian unit, it is advisable for the commanders to discuss their respective plans and requirements in detail during the movement to the objective area.

c. Briefing should be continuous until the actual assault operation begins. Late information received during the movement phase should be disseminated to all personnel. Valuable information can be obtained from air and submarine photographs, underwater demolition team reports, reconnaissance reports, and last-minute weather data.

d. Throughout the movement the amphibians must be constantly inspected and serviced according to a predetermined schedule. This inspection and servicing should include—

(1) Prestarting checks and, if permitted by the ship's commanding officer, engine running inspections.
(2) Batteries.
(3) Controls and linkage, including hydraulic systems.
(4) Tires and hull.
(5) Vehicle and cargo lashings.
(6) Fire estinguishers, life preservers, and other on-board equipment.

e. On the day preceding the landing, the above services should also include topping off of fuel tanks, oil reservoirs, cooling systems, and spare fuel and water cans.

59. Operations

a. As noted previously, amphibian units normally do not land with the initial assault waves. These elements, however, must be debarked and deployed in a timely manner so that they can sustain the assault forces by facilitating the landing and forward movement of supplies and supporting equipment.

b. The assault elements land initially with only a portion of their supporting units, equipment, and supplies. The remainder must be unloaded, brought to the beach, and forwarded as rapidly as possible to the using unit on a predetermined schedule.

c. In amphibious operations, ship-to-shore movement is under Navy control exercised by naval control officers aboard Navy control ships. Off-beach movement control is a responsibility of the shore party and is carried out through attached naval beach parties. Available ship-to-shore means of all types are used to accomplish rapid buildup of combat power ashore without congestion on the beach.

d. During the period immediately following the landing of the initial waves, the lighters designated as floating dumps and on-call elements are debarked and stationed at designated control points. The amphibian unit commander remains waterborne throughout this period, assisting naval control officers in dispatching and routing his craft and coordinating maintenance and supply activities for his unit.

e. When dispatched ashore by the naval control officer, the amphibians report to the proper shore party representative at the designated beach and are routed to their inland destination. After the cargo is unloaded, the amphibians report to assigned assembly areas where they are routed to the proper beach exit point and from thence to a specific ship for reloading. Unit craft continue to function in this manner throughout the initial and general unloading periods until released by the primary control officer or the shore party commander, at which time they revert to the control of their parent organization (terminal battalion or group).

f. When the general unloading period begins, the amphibian unit commander normally moves ashore, along with his control elements, to facilitate coordination with the shore party commander and with the staff of the terminal battalion being phased ashore. Once ashore, he establishes his company command post and sets up a shore-based control system. This system is established and operated as described in chapter 10, but within the limits imposed by Navy and shore party systems.

g. In addition, unit standby and maintenance areas are located, and unit maintenance craft actively support naval recovery craft in providing assistance to disabled amphibians.

60. Beach Markers

a. During the process of beach organization, debarkation points for various categories of supply and equipment are selected on each beach where they best support the tactical plan. Beach markers and debarkation point markers are erected by shore party personnel as soon

as possible after the initial assault of an amphibious operation has been made.

b. Beach markers are large pieces of cloth secured to points and held aloft as shown in figure 6. Beaches under attack are given a color designation such as Red Beach or Green Beach, and beach markers are constructed in corresponding colors. The center of a beach is marked by a large square of cloth with the color facing seaward. The left flank of the beach, as seen from the sea, is denoted by a horizontal rectangle of the same color, and the right flank is marked by a vertical rectangle, also of the same color. Lights of corresponding colors are used during night operations as shown in figure 6.

c. Debarkation point markers are set up to indicate to the amphibian crews where various types of cargo are to be unloaded (fig. 6). Markers showing supply symbols are placed near the beach exit road that leads to the particular transfer or discharge point.

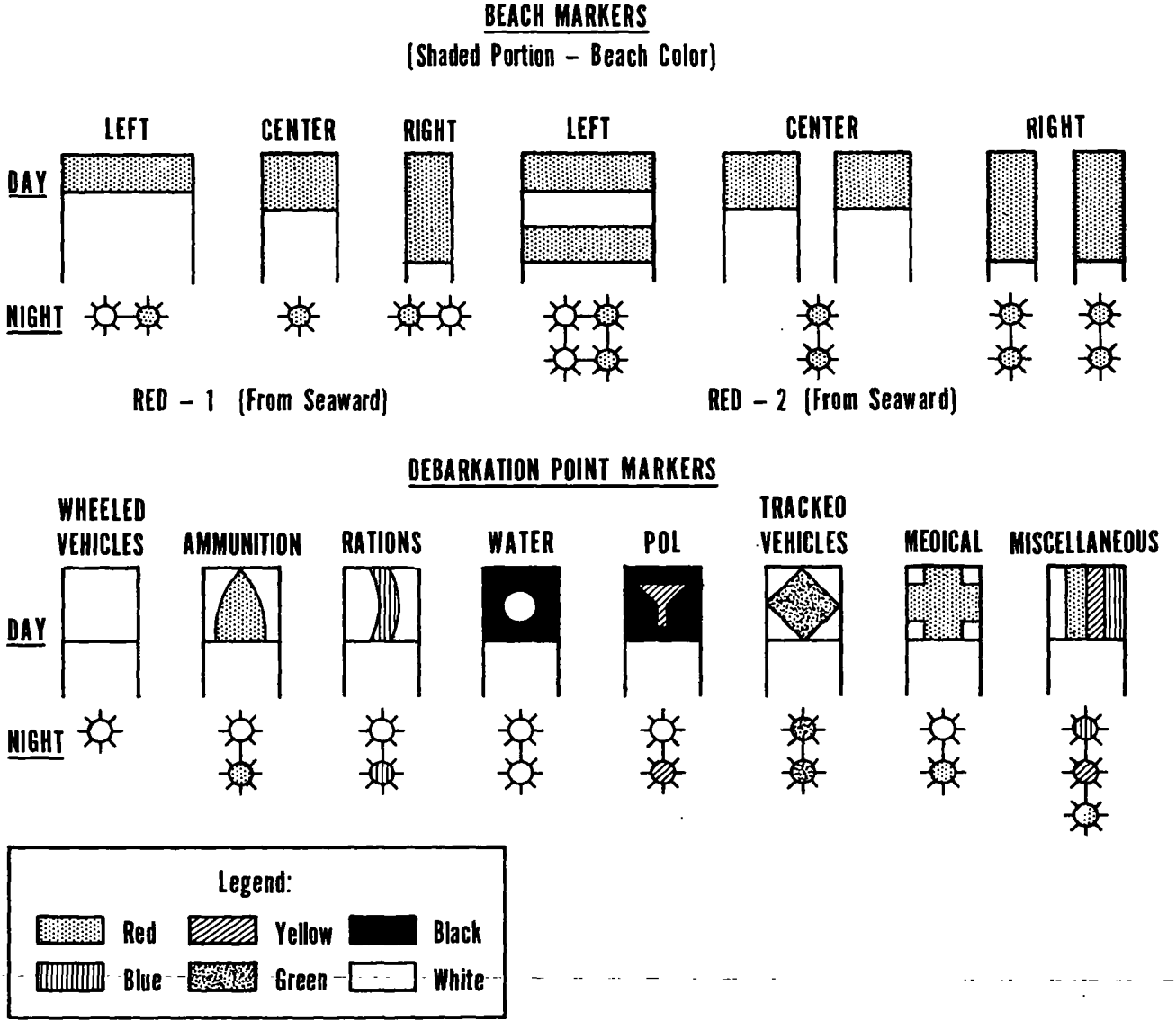

Figure 6. Beach and debarkation point markers.

61. Hydrographic Markings
(fig. 7)

Hydrographic markings have been developed for use in beach operations in areas not otherwise suitably marked. The shore party commander is responsible for determining the necessity for an installing hydrographic markings. They have no relation to the aids to navigation maintained by the Coast Guard. (See TM 55–501 and FM 55–15 for a description of navigational aids and the U.S. buoyage system). During the day, a pennant with alternate red and black vertical stripes is fastened to a buoy or stake to show the location of rocks, shoals, or submerged obstacles. The pennant is replaced at night by a white light over a red light, both blinking. Hydrographic markings for channels consist of the following:

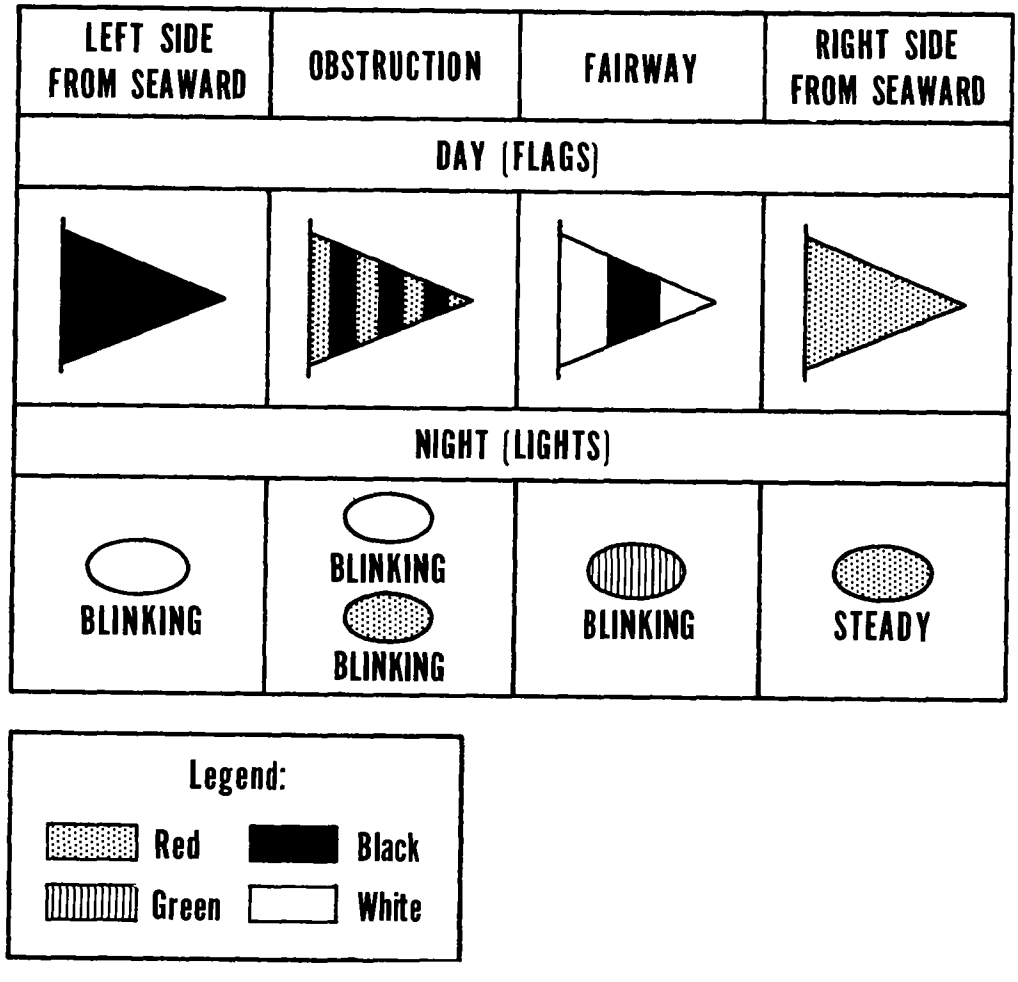

Figure 7. Hydrographic markings for beach operations.

a. A red pennant by day and a steady red light at night mark the starboard side of the channel for craft coming from seaward.

b. A black pennant by day and a blinking white light by night mark the port side.

c. A black and white vertically striped pennant by day and a blinking green light at night mark the fairway.

62. Ranges

Two lights or markers located some distance apart and visible usually in one direction only are known as range lights or range markers. They are located in tandem in line with the center of the channel or the center of the beach, and when the operator positions his craft so

that the range markers appear one over the other the craft will be on the axis of the channel or on the proper heading to arrive at a designated point on the beach. Characteristics of established ranges are indicated on the charts for the particular area. When ranges are constructed especially for beach operations, an explanation of their purpose and use is provided to amphibian operators in advance. Ranges should be used only after careful examination of the charts or complete instructions from the amphibian company commander. It is particularly important to determine the distance that a range line can be safely followed. The shore party commander is responsible for establishing and installing ranges.

63. Communications

a. The physical conditions obtaining in amphibious operations require almost complete dependence upon radio communications during the initial landings and the initial unloading period. However, the large number of radios available in landing force craft and vehicles and with the combat elements require strict radio discipline. Because of this complexity, wire communications should be established between shore installations as early as possible.

b. During the initial phases of the operation, control of the amphibians afloat is exercised by the naval control system, and ashore by the shore party control system, and communications between elements of the amphibian unit and company headquarters are virtually nonexistent. However, initial intracompany communications must be ready to function as soon as the unit control system is established ashore. This net and the control procedures, which operate essentially as described in chapter 10, must be provided for during the planning phase.

64. Maintenance Support

a. During the actual conduct of the amphibious operation, amphibian maintenance support will be provided only by unit maintenance sections and direct support teams. Direct support and general support companies will not be phased in until the situation ashore is completely stabilized.

b. Every effort must be made to establish organizational and direct support maintenance personnel and equipment ashore as soon as practicable so that the delivery of supporting personnel and supplies will not be seriously impaired by an insufficient number of operational amphibians.

c. During the early phases of the operation, floating contact maintenance teams and salvage craft should be provided to aid disabled amphibians in transit between the shore and the assault convoy. These teams are made up of personnel from both the organizational maintenance sections and the direct support teams detached from the lighterage direct support company. Preoperational plans must include designation of amphibians, landing craft, and/or small harbor craft to provide floating bases for these parties.

CHAPTER 12

SHORE-TO-SHORE OPERATIONS

65. General

a. In addition to their role in amphibious operations and in ship-to-shore LOTS operations, amphibian units may also be required to support combat forces conducting shore-to-shore assaults and to ferry cargo across or along rivers and between islands in routine resupply operations.

b. Except for the fact that shipping is not involved, the operational techniques for amphibian units in both tactical and logistical shore-to-shore operations are identical to those described in chapters 10 and 11. However, because of the nature of the terrain and the differences in control requirements, some basic planning considerations for shore-to-shore operations, and particularly for river crossings, are covered in this chapter. Further details on river crossings and other shore-to-shore operations are contained in FM 31–60 and FM 5–144.

c. Although in a tactical shore-to-shore operation the amphibian unit commander does not have the final choice in the selection of a landing site, he should advise the tactical commander of his requirements as to specific areas and should indicate any adverse conditions that would directly affect the operational efficiency of his unit. In a shore-to-shore LOTS operation, there is normally sufficient time to make the necessary preparations at the site to insure the success of the mission. In general, the site selection factors described in chapter 7 must be considered in evaluating areas for shore-to-shore operations. However, in river crossing operations, crossing sites must be located downstream from bridge sites to reduce the possibility of floating bridge damage by disabled amphibians and debris.

66. Control

a. In average situations, amphibian units in shore-to-shore LOTS operations normally require the following control points:

(1) Lighter control center (LCC).
(2) Loading area control point.
(3) Near-shore beach control point.
(4) Far-shore beach control point.
(5) Discharge control point.

b. These points will operate in the same manner and fulfill the same functions as outlined in paragraphs 41 through 54, with the loading area control point replacing the shipboard control point and a beach control point being added on the far shore. In some cases, however, it may be expedient to move the LCC closer to the waterline and eliminate the beach control point on the near shore.

67. Assembly Areas

Whenever possible, the supported unit commander should consult the amphibian company commander before designating assembly areas to be used in a shore-to-shore operation. Among the desirable characteristics of an assembly area are the following:

a. As near as practicable to the crossing site.

b. Easy entrance from the rear and good exits to the crossing site.

c. Sufficiently large to permit dispersion of lighters and to provide adequate loading area.

d. Defiladed to the degree necessary to permit assembly and maneuver without enemy observation.

e. Terrain firm enough to permit the passage of amphibians without the use of excessive power and its accompanying noise.

68. Riverbanks

a. Planning for river crossings differs from ship-to-shore planning in that the characteristics of two beaches must be taken into consideration. The slope of each bank must not be more than 40 percent (40 feet of rise for each 100 feet of forward horizontal movement), and

preferably less. In addition, the slope should be gradual without an abrupt dropoff at the water's edge. During operations, the amphibians should use multiple routes into and out of the water to avoid the formation of deep ruts that would cause the craft to "belly" down. Earthmoving equipment may be used to decrease the slope of high banks and to level off entrances and exits.

b. Consideration must also be given to the type and consistency of the soil at the crossing sites. The LARC–5 and LARC–15 are excellent cross-country vehicles, and soil consistency will present a major problem only to the LARC–60. Soils with a clap base and marshy, swampy areas must be avoided. When hard-packed sand entrances and exits are not available in the operational area, pierced steel planking, brush, netting, etc., may be used to increase traction. Earthmoving equipment may be used to improve the trafficability of the entrance and exit routes at the crossing site.

69. River Bottom

A sandy shoreline with a gradual slope; clear, deep water; and a clean river bottom provide ideal conditions for a crossing site, but these conditions are not often encountered in the field. Mud is the most difficult terrain to cross in an amphibian, and this is the type of soil usually found in and around rivers. Shallow rivers with a soft bottom are particularly difficult for these craft. If the river is too shallow to float the amphibian, the wheels will sink into the muddy bottom and immobilize the craft, increasing the danger of capsizing in swift currents. A shallow river with a bottom made up of large rocks presents similar problems for the amphibians. These conditions can sometimes be remedied by using underwater bridges constructed of sandbags.

70. River Currents

a. Operation in rivers with swift currents (more than 4 miles per hour) requires highly skilled and experienced operators. When exceptionally swift currents are encountered, it may be possible to rig a cable from one bank to another to assist the amphibians in crossing. The operator attaches a mooring pendant to the cable to keep the craft from drifting out of control and adjusts his rudder angle and engine speed to hold the craft on its proper heading during the crossing.

b. When it is impossible to make a cable crossing, amphibians should be backed into the stream so that the rudder and propeller will enter the water at the earliest possible time and give the operator maximum control of his craft. The aproach also causes the stern to float first so that it will swing around and head the bow into the current as the craft becomes waterborne.

71. Obstacles

It is unlikely that obstacles will be encountered in the center of the river, but banks may be mined with conventional antitank, antipersonnel, or chemical mines, and antiamphibious mines may be laid below the high waterline. Early reconnaissance by the tactical unit should disclose the location of minefields in the area of operations so that they can be removed or avoided during crossing. Personnel of the amphibian unit must be trained to be on the lookout for mines and to mark and report their location. Naval mines probably will not be encountered in river crossing operations unless the river is of sufficient depth for navigation by seagoing vessels. However, crewmen must be on the alert for floating mines of the type used for bridge destruction.

CHAPTER 13

CONVOY OPERATIONS

72. Water Convoys

a. Although amphibians are normally transported to their operating area by ship, situations may develop in which a company or a platoon is required to proceed under its own power to another beach discharge site. Depending upon the distance to be traveled, an escort craft or control boat may be assigned to accompany the convoy and to provide navigation and piloting assistance as necessary.

b. Of major importance in a movement of this type is the availability of sheltered waters (safe havens) along the proposed route. The tactical situation will determine whether harbors, lagoons, or beaches may be used for rest and maintenance halts. Safe havens not more than 4 hours traveltime apart should be chosen, provided anticipated enemy activity and the coastal terrain are favorable.

c. Generally, amphibians in convoy will be controlled by radio from the escort or control craft. To keep transmissions to a minimum, it is usually not necessary that each amphibian operator acknowledge instructions. Receipt of maneuver orders will be evidenced by the fact that each operator assumes and maintains the correct station in relation to other lighters in the formation and in accordance with the orders transmitted.

d. The formation employed will vary according to the situation and will depend upon such factors as—

(1) Anticipated enemy activity.
(2) Weather.
(3) Time of day (daylight or darkness).
(4) Sea conditions.
(5) State of training.

e. There are three basic reasons for convoy formations.

(1) To keep order, control, and contact.
(2) To provide immediate assistance to a disabled craft when required.
(3) To present an unattractive target.

f. A recommended amphibian formation is

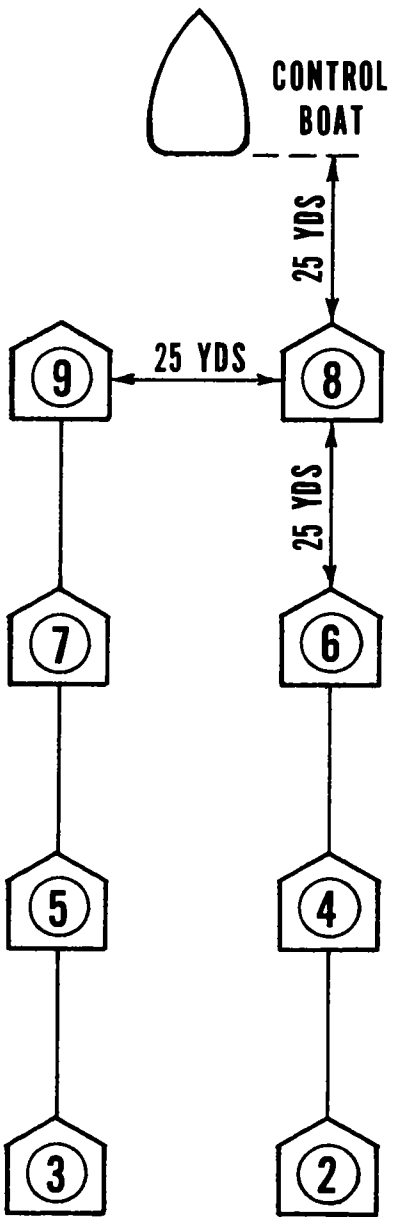

Figure 8. LARC–5 section in closed V-formation.

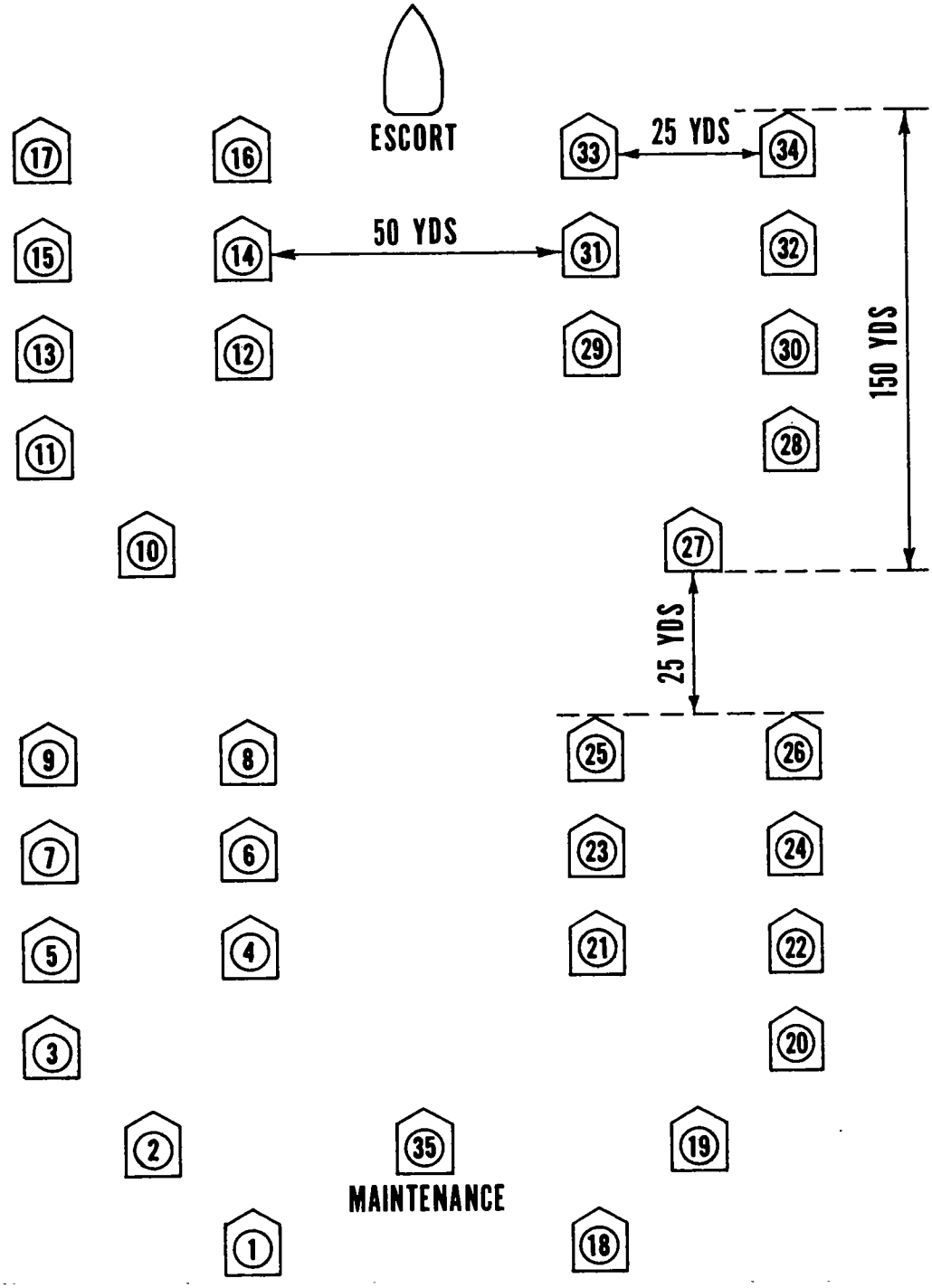

Figure 9. Light amphibian company in inverted closed V-formation.

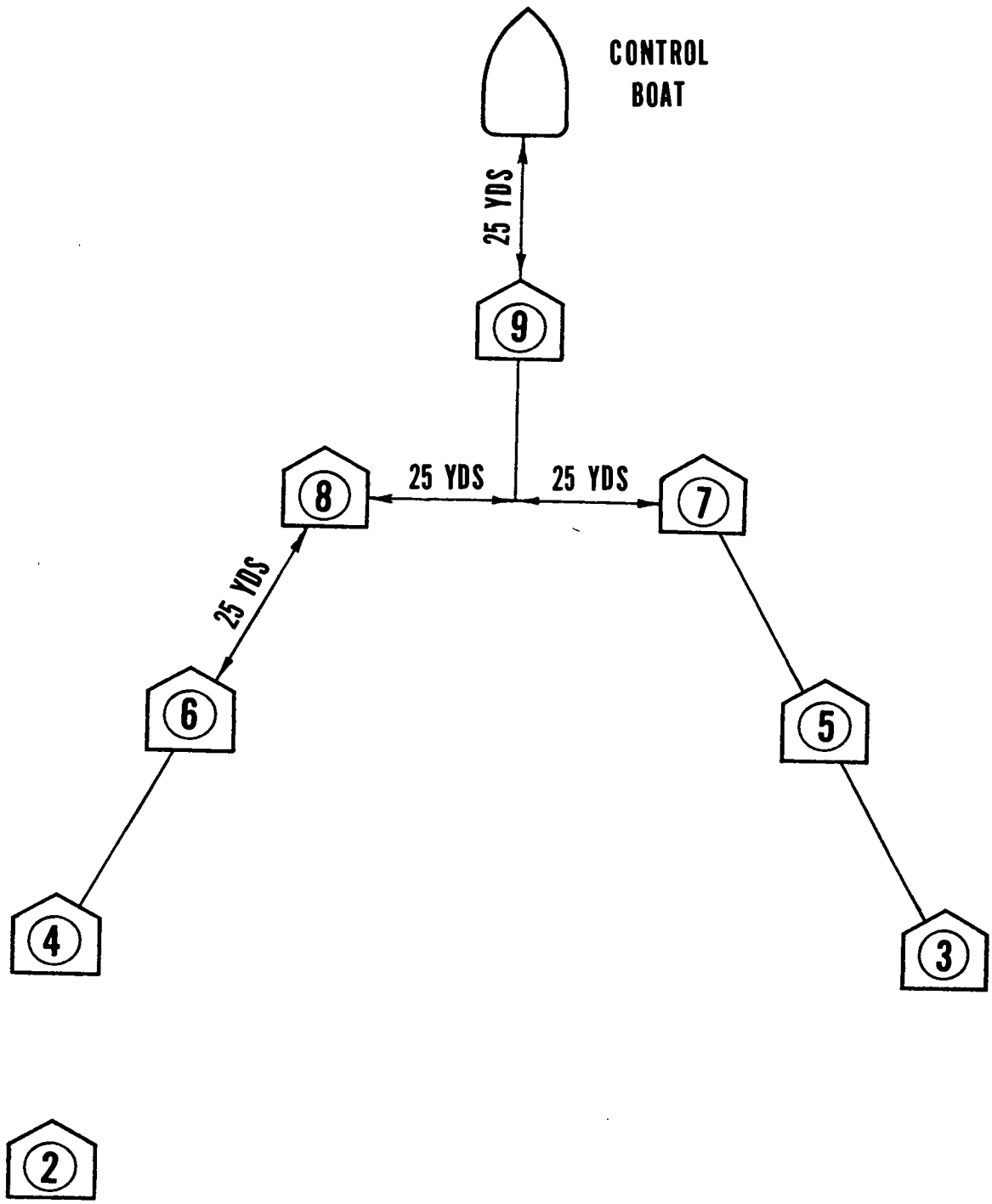

Figure 10. LARC–5 section in open V-formation.

inverted closed V consisting of not more than eight craft as shown in figure 8 for a LARC–5 section. Four of these groupings would be arranged as shown in figure 9 if an entire light amphibian company were engaged in the movement.

g. The unit commander may find it expedient to close or lengthen the distance between individual amphibians and sections, or it may be necessary to assume an entirely different formation according to the conditions encountered or anticipated. Other standard formations are line abreast (craft in line at least 25 yards apart) for small groups and an open V as shown in figure 10. If LARC–60's are to be displaced separately, it is recommended that they move in a closed V as shown in figure 11.

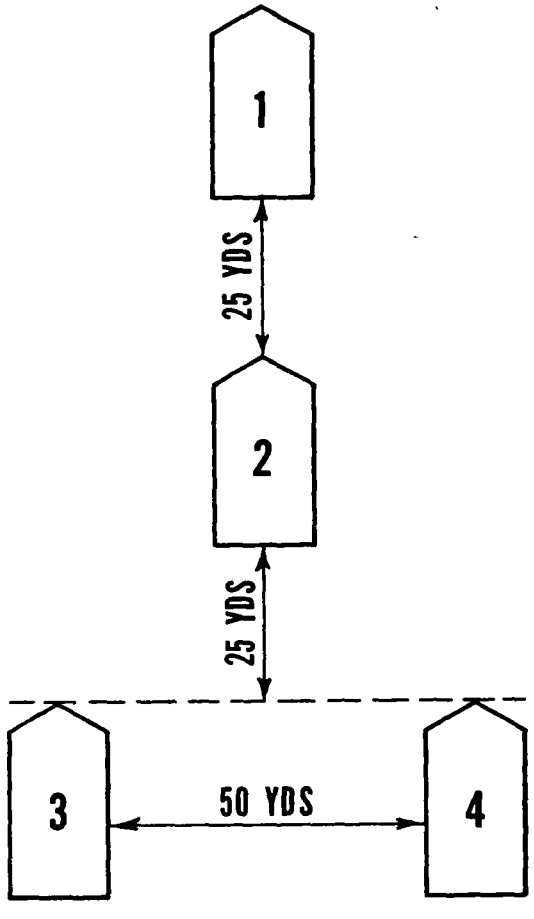

Figure 11. Heavy amphibian platoon in closed V-formation.

h. Since station keeping (maintaining direction and distance in relation to other craft) is the key to efficient convoy movement, it is imperative that operators be afforded ample opportunity to practice these formations under conditions similar to those expected along possible or typical convoy routes.

73. Road Convoys

a. Road convoys are formed to move the amphibian unit's craft and vehicles from one point to another via a land route. Some of the more important factors to be considered in planning and conducting a road movement are provided in this paragraph. Detailed information on road convoy operations is considered in FM 55–35–1 (TEST).

b. The movement of amphibians over roads will often conflict with existing traffic patterns. Generally, on-the-ground coordination with area military police will facilitate selection of the best routes, yield up-to-the-minute reports on route conditions, and provide traffic control and escort assistance as may be required. Escort and other special considerations for road movement are covered in FM 19–25.

c. The company commander is the convoy commander and is responsible for its actions during movement. He issues the orders to initiate the march and insures that instructions contained in standing operating procedures and march orders are compiled with during the preparation for and conduct of the march. Orders initiating the movement of a convoy consist of warning orders, which are issued to alert the unit, and march orders, which actually initiate and outline the procedure for the move.

d. Advance planning for the movement is based on both map and personal reconnaissance of the route and the employment of an advance party.

e. Depending upon the mission and existing conditions, the movement may be conducted by controlled convoy (closed or open column) or be infiltration (FM 55–35)–1 (TEST)).

f. Defensive measures against air, artillery, and guerrilla attack, and measures for radiological monitoring and survey and chemical agent detection must be planned for when moving in an area subject to enemy action.

g. Commanders and equipment operators

must have available and be familiar with both road and strip maps covering the area through which the movement is conducted.

h. Timetables and march graphs must be prepared before the move an usually accompany the march order from higher headquarters.

i. Traffic aids (road markers and road guides) must be provided for in advance and positioned along the route before the move is started.

j. Halts are scheduled before departure for both scheduled preventive maintenance and for relief of troops.

k. Both radio communications and visual signals are employed to control the convoy.

l. Mission, route, road conditions, defensive measures, etc., should be outlined to convoy personnel before the march is started.

CHAPTER 14

MAINTENANCE OPERATIONS

74. General

a. Amphibian maintenance operations are assigned and performed at specific levels of command, based on the primary mission, characteristics, and mobility of the level involved. Maintenance categories for amphibians are described in AR 750–1, AR 750–5, and AR 750–16 and are provided as follows:

(1) Organizational maintenance—performed by using unit maintenance section.

(2) Direct support maintenance—normally assigned at battalion or group level.

(3) General support maintenance—normally assigned at group level.

(4) Depot maintenance—performed by commercial or available military facilities.

b. Since they are employed in the same general operational area, all three types of Army floating craft—amphibians, landing craft, and harbor craft—are provided with general support maintenance by the same organization: the transportation floating craft general support company organized under TOE 55–157.

c. In addition to the lighterage direct support company (ch 5), amphibians may also be provided with direct support by team HC, TOE 55–500. This team also furnishes direct support to landing craft and harbor craft units and may be attached to units organized under TOE 55–157 and TOE 55–158 to provide increased support capability when required.

d. In addition to fulfilling the maintenance functions assigned by the appropriate maintenance allocation charts, each support unit provides backup for the next lower level unit by handling overflow work which would normally fall within the responsibility of the latter, but which cannot be completed because of time restrictions.

e. The principle of performing maintenance at the lowest possible level consistent with the personnel, skill, tools, repair parts, and time available also applies to amphibians, and lower level units may be authorized to perform higher level maintenance tasks by the unit assigned primary responsibility for those functions when required by operational conditions.

f. The maintenance system must remain flexible to prevent overflows as much as possible and to provide procedures and facilities for absorbing these excesses when they do occur so that they will not continue to pile up and create a bottleneck.

g. A responsive maintenance system is maintained by close liaison between the operating units and the maintenance support units. In order to provide a firm basis for support planning and to insure sufficient amphibian availability, maintenance unit commanders must be informed of all actual and anticipated operational changes. In addition, there must be a constant exchange of capability information between maintenance support units.

h. Repairs are accomplished under the inspect and repair only as necessary (IROAN) principle at all maintenance levels. General support maintenance is accomplished to permit return of an item to the supply system in accordance with maintenance standards established for each item of equipment. For general planning purposes, it can be assumed that approximately 50 percent of all theater amphibian maintenance will be accomplished at organizational level, 30 percent at direct support level, and 20 percent at general level. Under average circumstances, the maintenance time ratio for amphibians will be approximately 1 hour of maintenance for every 3 hours of operation. This ratio, along with the 50-percent organizational figure given above, includes normal daily preventive maintenance service before, during, and after operation.

i. Technical assistance may be requested by supported units at any time, but should be provided on a regular basis without request to insure more effective and efficient user maintenance and to reduce demands on the supporting unit and thereby increase its mission efficiency. Technical assistance consists of furnishing instruction and technical guidance to supported units by providing information on new maintenance and supply techniques and procedures and new publications and by providing guidance in implementing maintenance directives and orders.

75. Staff Supervision

a. A marine engineer technician (warrant officer) on the terminal battalion staff is responsible for staff supervision of organizational and direct support maintenance for the amphibians and other marine equipment in the attached companies. He is additionally responsible for staff supervision of general support maintenance if this function is assigned at battalion level. This officer supervises correct recording of maintenance activities within the battalion in accordance with existing directives and conducts periodic inspections as necessary. He prepares reports of inspections, disseminates technical information, and provides technical maintenance assistance when required.

b. A marine maintenance officer is provided on the staff of the terminal group and terminal brigade to exercise staff supervision over general support maintenance functions for the command. The commanders of the assigned general support units also act as special advisers on floating craft maintenance to the marine maintenance officer and to the terminal group and brigade commander.

76. Organizational Maintenance

a. Organizational maintenance consists of that maintenance normally authorized for, performed by, and the responsibility of a using organization on equipment in its possession. It includes functions and repairs that are within the capabilities of authorized personnel, skills, tools, and test equipment. Maintenance exceeding the authorized scope may be performed when specifically permitted by the next higher maintenance support commander.

b. With the exception of the LARC–60, which has an engineman assigned on each crew, operator maintenance of amphibians is largely limited to proper operation and periodic in-service checks to detect incipient defects (TB 55–1900–202–12/1). Therefore, the bulk of the organizational maintenance workload falls to the unit maintenance section, which is responsible for and capable of performing all the organizational maintenance functions indicated in the maintenance allocation chart published for each type of craft.

c. Amphibian unit capabilities are based on an average availability of 75 percent of the assigned craft. A constantly supervised operator and organizational maintenance effort is required to sustain this rate. When maintenance at this level is neglected, the deadline rate will become so high that the unit mission cannot be accomplished, and the increased load on the supporting maintenance units will eventually affect the mission performance of other lighterage units by depriving them of normally required support.

d. Maintenance inspection, schedules, and performance will be established and conducted in accordance with applicable technical manuals. If scheduled maintenance is performed regularly and properly, the percentage of craft down because of equipment or mechanical failure should seldom exceed the 25-percent rate. When the deadline rate exceeds this figure appreciably or for abnormal periods of time, the commander should make every effort to insure that operation of the amphibians is not abusive or improper and that the regular maintenance services are not being performed in a perfunctory manner.

e. A listing of organizational maintenance repair parts and special tools is contained in the –20P-series of technical manuals published for each amphibian. These manuals list allowances of repair parts that are authorized to be maintained in the unit. The levels prescribed cannot be exceeded unless proper authority is obtained. If the company commander determines through experience that certain components suffer a higher mortality rate than the stock level will support, this information must be brought to

the attention of higher command level for authority to initiate remedial action. It must be kept in mind that an excess of spare parts contributes appreciably to the weight of the unit and creates storage and accountability problems. Of greater importance, the parts thus removed from supply channels are being denied to units having an immediate need for them.

77. Direct Support Maintenance

a. Direct support maintenance is that maintenance normally authorized and performed by designated maintenance activities in direct support of using organizations. This category encompasses the repair of end items of unserviceable assemblies on a return-to-user basis.

b. Maintenance floats of selected end items and components are provided to the lighterage direct support company for direct exchange to supported units for unserviceable repairable items. Maintenance float items are issued to direct support units in the same priority as that assigned to the supported units for initial issue of the item. Unserviceable repairable items exchanged for maintenance float items are programed for immediate repair and return to maintenance float. Maintenance float items will normally not be used to replace items which have been lost, destroyed, or determined to be uneconomically repairable by direct support and general support maintenance activities.

c. The lighterage direct support company normally is attached to the terminal battalion and is located in the rear of a beach complex where amphibians and landing craft are being employed in logistical beach operations. When required, contact teams are organized and sent to a unit for on-site repair of disabled craft. Detachments may be organized from the service and equipment platoon direct support for amphibian units dispatched to remote areas on special missions. After the missions are completed, the detachments are returned to the parent unit. When so employed, these detachments are dependent upon the supported unit for mess and other administrative support, although they remain under the operational control of the parent unit. The HC team in TOE 55–500 may be used in this role, in addition to augmenting the capability of the direct support company.

d. The direct support company also stores and issues all marine-peculiar repair parts required for direct support and organizational maintenance of the supported lighterage companies. The supply officer directs requisitioning, receipt, storage, issue, and accounting for supplies handled by the unit. The section chief is directly in charge of receipt and storage of supplies and is responsible for determining their location in the storage area. In addition, he directs inspections of supplies and equipment received, conducts periodic inventories, supervises stock accounting and records, and coordinates the function of supply specialists in the section, who inspect, count, and classify incoming shipments in accordance with the storage layout plan.

e. To insure transmission of recurring supply requirements and maintenance data to the supporting supply source, the direct support unit requires a reliable communications system. The teletypewriters authorized in the supply section provide a recorded source for ready reference as requests are received and processed, aid in reducing errors in receiving and interpreting data, and reduce man-hour requirements for processing supply documents.

78. General Support Maintenance

a. General support maintenance is that maintenance authorized and performed by designated TOE and TD organizations in support of the Army supply system. Normally, general support maintenance units repair or overhaul materiel to required maintenance standards in a ready-to-issue condition according to applicable area supply requirements.

b. The floating craft general support company provides general support maintenance and supply for all Army floating equipment (amphibians, landing craft, and harbor craft) and at full-strength has the following capabilities:

(1) Providing 31,414 man-hours per month of general support maintenance for amphibians, landing craft, and harbor craft and their components.

(2) Providing 1,668 man-hours per month of inspection, test, adjustment, and repair of communications and electronics equipment authorized and installed on supported floating craft.

(3) Receiving, storing, and issuing approximately 8,000 line items per month of marine-peculiar repair parts and related items of supply required by the supported units.

c. The company is attached to the appropriate field depot of the supply and maintenance command, theater army support command, in a theater and is normally further attached to the terminal group or brigade which it supports.

d. Although shore-based repair facilities may be established if required, the bulk of the unit's work is accomplished aboard a 210-foot, nonpropelled, floating machine shop (FMS), which contains all of the shop facilities necessary to support the company mission. Three repair sections, a supply platoon, and a repair control section normally function aboard the FMS. The barge crew contains the necessary personnel to maintain and secure the FMS and to operate on-board machinery. In addition to the repair shops, the FMS is also equipped with a 10-ton crane mounted on the center deckhouse and three internal monorails.

e. The unit is also authorized a 120–foot flat barge with a deck-inclosure kit and two LCM–8's. When fitted with the deck inclosure, the barge provides an additional sheltered working space and storage area for supplies, materials, and equipment. The LCM's are used to transport work teams and equipment about the port area or to tow floating equipment undergoing repairs when suitable tugs are not available.

f. Because of the requirement for a protected anchorage for the FMS, the floating craft general support company normally operates in an established port terminal that is centrally located in relation to other terminals. In addition to its mission support for all floating craft located within its area of responsibility, the floating craft general support company provides direct support maintenance for all harbor craft operating in the same terminal. Disabled floating craft from other supported terminals are normally evacuated by land or water to the general support unit, but emergency contact teams may be organized from the various shop sections and transported by LCM to outlying terminals to accomplish on-site repair.

g. The floating craft general support company obtains replenishment of its repair parts stocks by submitting requests directly to the inventory control center (ICC). The ICC directs shipment from the field depot that stocks the requested items. Items repaired by the general support company are disposed of as follows:

(1) Returned to the using unit through the appropriate direct support organization.

(2) Returned to general support supply stocks, either within the company or to the appropriate field depot that stocks marine items.

h. Overall maintenance policies, general operational guidance, reports criteria, stockage levels, etc., are provided to the general support company by the parent field depot. However, the company's single-user support function requires that control of its day-to-day operations be vested in the terminal group or brigade to which the supported units are assigned. The marine maintenance officer on the staff of both the terminal group and the terminal brigade exercises staff supervision over the operation of the attached floating craft general support companies. In addition to his normal staff function as an adviser to the terminal commander, this officer is responsible for maintaining liaison with the appropriate field depot to insure that the operations of the general support company meet the requirements of both commands.

79. Depot Maintenance

a. Floating craft depot maintenance consists of periodic drydocking, scheduled major overhaul, overhaul of craft for return to stock, and unscheduled repairs or modifications beyond the capabilities of general support units.

b. Since depot maintenance of floating equipment will not be performed in theaters of operations during wartime, there are no Army TOE units provided for this purpose. Peacetime depot maintenance overseas and all CONUS depot maintenance of floating equipment is accomplished through contract by commercial facilities.

80. Maintenance Management

Amphibian maintenance management is the responsibility of terminal group and battalion

commanders to which these craft are attached and includes the following:

a. Establishing the requirements for time, trained personnel, tools, test equipment, facilities, funds, repair parts, and other maintenance supplies which are essential in accomplishing the maintenance mission.

b. Planning, programing, and budgeting for the proper use of maintenance resources.

c. Providing technical supervision and management control over maintenance programs and activities.

d. Reviewing accomplishments in relation to the effective and economical utilization of maintenance resources.

e. Evaluating maintenance concepts, policies, doctrine, plans, and procedures to insure that they contribute to the accomplishment of the overall military mission.

f. Recommending new maintenance concepts, policies, doctrine, plans, and procedures for the improvement of the Army maintenance system.

81. Command Maintenance Management Inspections

a. Command maintenance management inspections of amphibian units are conducted as often as necessary, but at least once each year, except for small or isolated units and activities which are inspected not less than once every 2 years. These inspections provide terminal group and battalion commanders with an indication of the maintenance effectiveness of each subordinate unit and activity and measure the proficiency and effectiveness of organizational, direct, and general support maintenance under their jurisdiction.

b. Marine maintenance support units submit reports and data on maintenance operations, workloads, production, problem areas, and materiel readiness to the maintenance management center (MMC). Most of these reports and data are submitted in punched card format to the automatic data processing center supporting the MMC. The MMC, on behalf of the assistant chief of staff, maintenance, supply and maintenance command, exercises overall maintenance management and control over maintenance support operations and provides appropriate information, direction, and instructions relative to maintenance operations. Information and instructions stemming from the MMC are provided through designated command channels.

APPENDIX A

REFERENCES

1. Army Regulations

AR 55–510	Harbor Craft
AR 55–510–1	Harbor Craft
AR 220–10	Preparation for Oversea Movement of Units (POM)
AR 220–58	Organization and Training for Chemical, Biological and Radiological Operations
AR 320–5	Dictionary of United States Army Terms
AR 320–50	Authorized Abbreviations and Brevity Codes
AR 600–20	Army Command Policy and Procedure
AR 611–101	Manual of Commissioned Officer Military Occupational Specialties
AR 611–112	Manual of Warrant Officer Military Occupational Specialties
AR 611–201	Manual of Enlisted Military Occupational Specialties
AR 725–50	Requisitioning, Receipt, and Issue System
AR 735–35	Supply Procedures for TOE and TDA Units and Activities
AR 746–5	Color and Marking of Army Materiel
AR 750–1	Maintenance Concepts
AR 750–5	Organization, Policies, and Responsibilities for Maintenance Operation
AR 750–16	Maintenance of Transportation Corps Amphibians
AR 750–1900–1	Maintenance of Army Watercraft and Floating Equipment

2. Field Manuals

FM 3–12	Operational Aspects of Radiological Defense
FM 5–144	Engineer Amphibious Units
FM 7–11	Rifle Company, Infantry, Airborne, and Mechanized
FM 7–30	Infantry, Airborne, and Mechanized Division Brigades
FM 19–25	Military Police Traffic Control
FM 21–40	Chemical, Biological, and Nuclear Defense
FM 21–41	Soldier's Handbook for Defense Against Chemical and Biological Operations and Nuclear Warfare
FM 21–48	Chemical, Biological, and Radiological (CBR), and Nuclear Defense Training Exercises
FM 23–65	Browning Machinegun, Caliber .50 HB, M2
FM 29–22	Maintenance Operations in the Field Army
FM 30–5	Combat Intelligence
FM 30–16	Technical Intelligence
FM 31–11	Doctrine for Amphibious Operations
FM 31–12	Army Forces in Amphibious Operations (the Army Landing Force)

FM 31–15	Operations Against Irregular Forces
FM 31–20	Special Forces Operational Techniques
(C) FM 31–20A	Special Forces Techniques (U)
FM 31–21	Special Forces Operations
(S) FM 31–21A	Special Forces Operations (U)
FM 31–30	Jungle Training and Operations
FM 31–60	River-Crossing Operations
FM 31–70	Basic Cold Weather Manual
FM 31–71	Northern Operations
FM 44–1	U.S. Army Air Defense Employment
FM 54–5–1 (Test)	The Supply and Maintenance Command
FM 54–6–1 (Test)	The Area Support Command, TASCOM
FM 54–8 (Test)	The Administrative Support Theater Army, (TASTA–70)
FM 55–4–1 (Test)	Transportation Movements in a Theater of Operations
FM 55–6–1 (Test)	Transportation Services in Theaters of Operations
FM 55–8	Transportation Intelligence
FM 55–9	Transportation Services and the Transportation Brigade in the Field Army
FM 55–15	Transportation Reference Data
FM 55–35–1 (Test)	Motor Transport Operations and Units
FM 55–55–1 (Test)	Transportation Terminal Operations
FM 55–57	Transportation Harbor Craft Units and Marine Maintenance Units
FM 55–58	Transport Boat Operations
FM 57–10	Army Forces in Joint Airborne Operations
FM 60–30	Embarkation and Loading—Amphibious
FM 100–5	Field Service Regulations—Operations
FM 101–5	Staff Officers' Field Manual: Staff Organization and Procedure
FM 101–10–1	Staff Officers' Field Manual: Organizational, Technical and Logistical Data, Unclassified Data
FM 101–10–2	Staff Officers' Field Manual: Organizational, Technical, and Logistical Data, Extracts of Tables of Organization and Equipment
(S) FM 101–10–3	Staff Officers' Field Manual: Organization, Technical, and Logistical Data, Classified Data (U)

3. Technical Manuals

TM 3–220	Chemical, Biological, and Radiological (CBR Decontamination)
TM 5–311	Military Protective Construction (Nuclear Warfare and Chemical and Biological Operations)
FM 9–238	Deepwater Fording of Ordnance Materiel
TM 10–405	Army Mess Operations
TM 38–230	Preservation, Packaging, and Packing of Military Supplies and Equipment
TM 38–750	Army Equipment Record Procedures
TM 38–750–1	Maintenance Management: Field Command Procedures
TM 55–501	Harbor Craft Crewman's Handbook

TM 55–508	Landing Craft Operator's Handbook
TM 55–509	Harbor Craft Engineman's Handbook
TM 55–510	Amphibious Lighter: Operator's Handbook
TM 55–513	Transportation Corps Military Stevedoring
TM 55–1930–205–10	Operator's Manual: Lighter Amphibious (LARC V), Self-Propelled, Diesel, Aluminum, 5-ton, Design 8005, FSN 1930–710–5728
TM 55–1930–206–10	Operator's Manual: Lighter, Amphibious, Resupply, Cargo (LARC XV), Self-Propelled, Diesel, Aluminum, 15-ton, Design 8004, FSN 1930–710–5729

4. Technical Bulletins

TM 38–750/1	The Army Equipment Record System and Procedures: Protection and Storage of Army Equipment Log Book Assembly
TM 55–1900–201–12/1	Application of Nonslip Walkway Compound, Harbor Tugs
TB 55–1900–202–12/1	Floating Craft Preventive Maintenance
TB 55–1930–203–12/1	Installation of Ways, Stowing, and Launching of BARC from Cargo Vessels
TB 746–93–1	Color and Marking of Military Vehicles, Construction Equipment and Materials Handling Equipment
TB 746–93–4	Painting of Vessels
TB TC 11	Arc Welding on WaterBorne Vessels
TB TC 16	Standard Tug Boat Signals

5. Supply Bulletins

SB 38–100	Preservation, Packaging, and Packing Materials, Supplies, and Equipment Used by the Army

6. Tables of Organization and Equipment

TOE 5–500	Engineer Service Organization
TOE 55–111	Headquarters and Headquarters Company, Transportation Terminal Brigade
TOE 55–112	Headquarters and Headquarters Company, Transportation Terminal Group
TOE 55–116	Headquarters and Headquarters Company, Transportation Terminal Battalion
TOE 55–117	Transportation Terminal Service Company
TOE 55–118	Transportation Terminal Transfer Company
TOE 55–138	Transportation Light Amphibian Company
TOE 55–139	Transportation Medium Amphibian Company
TOE 55–157	Transportation Floating Craft General Support Company
TOE 55–158	Transportation Lighterage Direct Support Company
TOE 55–500	Transportation Service Organization

7. Army Training Programs

ATP 21–113	Personnel Aboard Ship and En Route to Oversea Stations
ATP 55–111	Transportation Terminal and Water Transport Units

8. Army Subject Schedules

ASubScd 21–6	Individual Protective Measures for Chemical and Biological Operations and Nuclear Warfare
ASubScd 21–22	Marches and Bivouacs
ASubScd 38–1	The Army Equipment Record Procedures
ASubScd 55–1	Organization, Mission, Functions, and Capabilities of Transportation TOE Units
ASubScd 55–8	Marine Maintenance
ASubScd 55–10	Introduction to Transportation Intelligence
ASubScd 55–11	Orientation of Vessel Personnel
ASubScd 55–12	Nomenclature and Types of Army Vessels and Amphibians
ASubScd 55–13	Marlinspike Seamanship
ASubScd 55–14	Transportation Intelligence
ASubScd 55–15	Shipboard Emergency Drills
ASubScd 55–16	Piloting and Navigation
ASubScd 55–17	Vessel Operations—Deck Department
ASubScd 55–20	Vessel Tows and Towing
ASubScd 55–21	Landing Craft Operations
ASubScd 55–22	Marine Communications
ASubScd 55–25	Water Terminal and Beach Operations
ASubScd 55–61A10	MOS Technical Training of Seaman and Harbor Craft Boatswain—MOS 61A10 and MOS 61B20 and Refresher Training of MOS 61B20

9. Army Training Test

ATT 55–111	Transportation Terminal Units and Teams

10. Training Circulars

TC 5–9	Near Infrared Night Vision and Detection Equipment and Its Application

11. Department of the Army Pamphlets

DA Pam 108–1	Index of Army Films, Transparencies, GTA Charts and Recordings
DA Pam 310–1	Index of Administrative Publications (Army Regulations, Special Regulations, Circulars, Pamphlets, Department of the Army Posters, Joint Chiefs of Staff Publications, and General Orders)
DA Pam 310–2	Index of Blank Forms
DA Pam 310–3	Index of Doctrinal, Training, and Organizational Publications (Field Manuals, Reserve Officers' Training Corps Manuals, Training Circulars, Army Training Programs, Army Subject Schedules, Army Training Tests, Firing Tables and Trajectory Charts, Tables of Organization and Equipment, Type Tables of Distribution, and Tables of Allowances)
DA Pam 310–4	Index of Technical Manuals, Technical Bulletins, Supply Manuals (types 7, 8, and 9), Supply Bulletins, Lubrication Orders, and Modification Work Orders

12. Forms

DA Form 2400	Equipment Utilization Record
DD Form 1384	Transportation Control and Movement Document

APPENDIX B

BEAUFORT WIND SCALE

No.	Knots	Descriptive terms	Description	Approximate equivalent sea disturbance scale in open sea		
				Code fig.	Description	Mean height of waves in feet
0	Less than 1	Calm	Sea like a mirror	0	Calm (glassy)	
1	1–3	Light air	Ripples with the appearance of scales formed but without foam crests.	1	Calm (rippled)	½
2	4–6	Light breeze	Small wavelets, still short but more pronounced; crests have a glassy appearance and do not break.	1		1
3	7–10	Gentle breeze	Large wavelets; crests begin to break; foam of glassy appearance; perhaps scattered whitecaps.	2	Smooth (wavelets)	2½
4	11–15	Moderate breeze.	Small waves, becoming longer; fairly frequent whitecaps.	3	Slight	5
5	16–20	Fresh breeze	Moderate waves, taking a more pronounced long form; many whitecaps are formed; chance of some spray.	4	Moderate	9
6	21–26	Strong breeze	Large waves begin to form; the white foam crests are more extensive everywhere; probably some spray.	5	Rough	14
7	27–33	Moderate	Sea heaps up and white foam from breaking waves begins to be blown in streaks along the direction of the wind; spray can be seen.	6	Very rough	19
8	35–40	Fresh gale	Moderately high waves of greater length; edges of crests break into spray; foam is blown in well-marked streaks along the direction of the wind.	7	High	25
9	41–47	Strong gale	High waves; dense steaks of foam along the direction of the wind; sea begins to roll; spray may affect visibility.	7	----------	31

BEAUFORT WIND SCALE (Continued)

No.	Knots	Descriptive terms	Description	Approximate equivalent sea disturbance scale in open sea		
				Code fig.	Description	Mean height of waves in feet
10	48–55	Whole gale	Very high waves with long overhanging crests; the resulting foam in great patches is blown in dense white streaks along the direction of the wind; on the whole, the surface of the sea takes a white appearance; the rolling of the sea becomes heavy and shocklike; visability is affected.	8	Very high	37
11	56–65	Storm	Exceptionally high waves; small- and medium-sized ships might be lost to view for a long time behind the waves; the sea is completely covered with long, white patches of foam lying along the direction of the wind; the edges of the wave crests are blown in froth; visibility affected.	9	Phenomenal	45 or more
12	Above 65	Hurricane	The air is filled with foam and spray; sea completely white with driving spray; visibility very seriously affected.	9		

Nos. 13–17 are used as follows: to record in knots the velocity of hurricanes exceeding force 12, 13, 72–80 knots; 16, 100–109 knots; 17, 110–118 knots.

APPENDIX C

EMPLOYMENT OF NON-AIR DEFENSE WEAPONS AGAINST AIRCRAFT

1. General

The doctrine contained in this appendix prescribes the normal conditions under which non-air defense weapons will be employed against the low-altitude air threat. It has the objectives of increasing the effectiveness of these fires and of reducing the incidence of indiscriminate employment of these weapons when their use is not appropriate or is likely to be ineffective.

2. Concept

a. The substantial low-altitude air threat faced by units in the combat theater may be partially countered by agressive use of the large volume of fire which non-air defense weapons can place against this threat.

b. Exercise of the individual and collective right of self-defense against hostile aircraft must be emphasized. Hostile aircraft include all attacking aircraft and those positively identified enemy aircraft which pose a threat to the unit. Large volumes of fire from non-air defense weapons have proven capable of destroying both high- and low-speed aircraft or disrupting their attack. Exercise of this right does not demand specialized use of communications and is independent of theater air defense rules for engagement and air defense control procedures.

c. Indiscriminate use of non-air defense weapons must be prevented because of the danger to friendly aircraft and troops and the requirement to place in proper perspective the techniques of withholding fire to preclude disclosure of positions. Effective and safe employment of these weapons necessitates Army-wide training.

d. Situations may arise in which the exercise of the right of self-defense should be temporarily suppressed or in which freer use of non-air defense weapons against aircraft should be encouraged. The former case involves a local decision that prevention of position disclosure is paramount. Notice of such restriction is disseminated through command channels. The latter case should be based on a theater-level decision.

e. Use of a single rule of engagement—"Engage hostile aircraft"—is based on common-sense interpretation. For example, all aircraft attacking the unit and enemy aircraft performing operations such as forward air control, reconnaissance, surveillance, or dropping or landing troops are clearly hostile aircraft.

3. Rule of Engagement

In the absence of orders to the contrary, individual weapon operators will engage attacking aircraft. Engagement of all other hostile aircraft will be on orders issued through the unit chain of command and will be supervised by unit leaders. Nothing in this rule is to be taken as requiring actions prejudicial to accomplishment of the primary mission of the unit.

4. Techniques

The following techniques should minimize the destructive and/or deterrent effect against aircraft. Aircraft may be divided into two categories: low-speed and high-speed. Low-speed aircraft include helicopters and liaison, reconnaissance, and observation fixed-wing aircraft. High-speed aircraft include all other propeller aircraft and all jet fixed-wing aircraft. This distinction will result in simplified engagement procedures.

a. Engagement of Low-Speed Aircraft. In accordance with the rule for engagement, low-speed enemy aircraft are engaged with aimed fire, employing the maximum weapon rate of fire. Aerial gunnery techniques (less lead) generally applicable to all small arms and automatic weapons are presented in FM 23–65.

b. Engagement of High-Speed Aircraft. In accordance with the rule of engagement, high-speed enemy aircraft are engaged with maximum fire aimed well in front of the aircraft and above its flight path in order to force it to fly through a pattern of fire. This technique is not unaimed barrage fire, but requires a degree of aimed fire. It does not, however, call for careful estimation of aircraft speed and required lead.

c. Use of Tracer Ammunition. Automatic weapons should utilize the highest practical proportion of tracer ammunition to enhance the deterrent or disruptive effect.

d. Massed Fire. Units should employ a massed fire technique when using small arms and automatic weapons in an air defense role.

5. SOP Outline

Company level SOP should cover, but not be limited to, the following items relevant to engagement of aircraft with non-air defense weapons:

a. Applicability. Operators of designated weapons.

b. Relation to Primary Mission. Primary mission is never prejudiced.

c. Relation to Passive Air Defense. The necessity for aggressively engaging hostile aircraft is balanced with the requirement to place in proper perspective the tactic of withholding fire to preclude disclosure of position.

d. Authority to Engage. Authority to engage attacking aircraft delegated to individual weapons operators and to engage all other hostile aircraft on orders through unit chain of command, subject to the rule for engagement and rules for withholding fire.

e. Rule for Engagement. Normally self-defense only against all attacking aircraft and those positively identified enemy aircraft which pose a threat to the unit.

f. Rules for Withholding Fire. When ordered; when not positive that aircraft are actually attacking or otherwise hostile; when friendly aircraft or troops are endangered.

g. Position Selection (FM 44–1). Applicable only to weapons specifically assigned an air defense role; for example, designated single barrel, caliber .50 machineguns.

h. Firing Techniques. Lead and superelevation; massed discipline, gunnery, aircraft recognition.

By Order of the Secretary of the Army:

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Chief of Staff.

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The Adjutant General.

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