MCTP 3-10C

Employment of Amphibious Assault Vehicles

U.S. Marine Corps

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FOREWORD

Marine Corps Tactical Publication (MCTP) 3-10C, *Employment of Amphibious Assault Vehicles* provides the basis for the use of amphibious assault vehicles (AAVs) in support of Marine Corps operations. This publication addresses the mechanized capability of the assault amphibian unit, section, and platoon in support of Marine air-ground task force (MAGTF) or other ground combat element (GCE) missions. These missions include the seizure and defense of key maritime terrain, the conduct of land operations essential to naval operations, and sustained operations ashore that support joint or combined force land or maritime operations.

The target audience for this publication is officers and staff noncommissioned officers serving as members of MAGTF and GCE staffs, as well as assault amphibian battalions. The publication provides best practices and planning considerations for AAV employment during military operations conducted across the competition continuum.

This publication supersedes MCTP 3-10C, *Employment of Amphibious Assault Vehicles (AAVs)* dated 10 September 2003, change 1 dated 17 February 2005, erratum dated 2 May 2016, and erratum dated 4 April 2018.

Reviewed and approved this date.

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EMPLOYMENT OF AMPHIBIOUS ASSAULT VEHICLES

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CHAPTER 1
ASSAULT AMPHIBIAN UNITS

The mission of the assault amphibian (AA) battalion is to conduct amphibious and mechanized operations in order to support the ground combat element (GCE) with maneuver, fires, force protection, and command and control. The AA battalion and subordinate units—

- Provide task-organized forces in order to transport assault elements, selected equipment, and supplies ashore in mechanized ship-to-shore movement, and conduct other combat support operations.
- Support amphibious operations, including participating in the planning, coordination, and execution of ship-to-shore, shore-to-shore, riverine, and other operations, as directed.
- Conduct and support the breaching of barriers and obstacles during both amphibious and subsequent operations ashore.
- Conduct offensive and defensive mechanized operations to support embarked infantry with armor protected firepower, communication assets, and mobility.

COMMAND RELATIONSHIPS

Command and support relationships should provide for cooperative planning between the supported infantry commander and the AA commander/special staff officer to accomplish the specified mission. The supported infantry commander and the AA commander/special staff officer must develop unit standing operating procedures (SOPs) inherent to successful mechanized operations. To ensure the proper employment of the AA unit, the AA unit commander/special staff officer must be involved with planning operational phases involving waterborne and ground movement. Once the commander's intent is established, the AA unit commander/special staff officer will provide valuable guidance on the maneuver/employment of the AA unit, based on its capabilities and limitations and in relation to an analysis of the mission, enemy, terrain and weather, troops and support available—time available (METT-T). Assault amphibian units may find themselves in any combination of command or support relationships as outlined in Joint Publication (JP) 1, *Doctrine for the Armed Forces of the United States*. Table 1-1 on page 1-2 and table 1-2 on page 1-3 describe the command and support relationships.

Table 1-1. Command Relationships.

Type	Description
Organic	Those parts of a unit listed in its table of organization.
Attached	A unit that is bound temporarily to a command other than its organic command.
OPCON	The authority to perform those functions of command over subordinate forces involving organizing and employing commands and forces, assigning tasks, designating objectives, and giving authoritative direction necessary to accomplish the mission.
TACON	The authority over forces that is limited to the detailed direction and control of movements or maneuvers within the operational area necessary to accomplish missions or tasks assigned.
ADCON	Direction or exercise of authority over subordinate or other organizations in respect to administration and support.
Supporting	Support is a command authority; a supporting relationship is established by a superior commander between subordinate commanders when one organization should aid, protect, complement, or sustain another force.
DIRLAUTH	That authority granted by a commander (any level) to a subordinate to directly consult or coordinate an action with a command or agency within or outside of the granting command.
NATO OPCON	The authority delegated to a commander to direct forces assigned so that the commander may accomplish specific missions or tasks which are usually limited by function, time, or location; to deploy units concerned; and to retain or assign TACON of those units. It does not include authority to assign separate employment of components of the units concerned. Neither does it, of itself, include administrative or logistic control.
NATO TACON	The detailed and, usually, local direction and control of movements or maneuvers necessary to accomplish missions or tasks assigned.
LEGEND	
ADCON	administrative control
DIRLAUTH	direct liaison authorized
NATO	North Atlantic Treaty Organization
TACON	tactical control

Table 1-2. Support Relationships.

Type	Description
Direct Support	A mission requiring a force to support another specific force and authorizing it to answer directly to the supported force's request for assistance.
General Support	That support given to the supported force as a whole and not to any particular subdivision thereof.
General Support—Reinforcing	A mission requiring the supporting unit to furnish support for the force as a whole while augmenting the capabilities of another similar unit as a second priority, general support—reinforcing is assigned only to indirect fire support agencies, principally artillery units.
Reinforcing	A support mission in which the supporting unit assists the supported unit's mission. Only like units, such as artillery supporting artillery, intelligence supporting intelligence, or armor supporting armor, can be given a reinforcing/reinforced mission.

To maximize the capabilities of the AA unit, the supported infantry commander should integrate the unit and establish cohesive working command relationships. Keeping the lines of communication open will help command and control and foster the "one team, one fight" ethos. Normally, an infantry company is not equipped to logistically support an AA platoon; hence, AA units are seldom attached to units below the infantry battalion level. For example, an AA platoon is attached to a battalion landing team (BLT) and is in direct support of one of the infantry companies (i.e., a mechanized infantry company).

ORGANIZATION

Assault Amphibian Battalion

The AA battalion is a separate battalion organic to the Marine division. The AA battalion possesses the assets (see fig. 1-1 on page 1-4) to mechanize one infantry regiment or parts of multiple regiments (see fig. 1-2 on page 1-5). In some cases, task organizations will rely on aggregation to fulfill this requirement, as equipment and manning capabilities vary based on assigned Marine divisions. The AA battalion commander serves as a special staff officer to the commanding general of the Marine division, and directs the maintenance and logistic efforts of the battalion to support operations. The battalion or its subordinate units are attached to or placed in support of a GCE commander to provide ship-to-shore lift of the surface assault elements of the landing force. Once ashore, the battalion provides tactical mobility, firepower, and command and control (C2) capabilities to the supported force. The AA battalion augments the AA company's organic logistical capability by providing personnel, medical, resupply, and field-level maintenance. Though primarily employed to mechanize the surface assault elements of a regimental landing team, AA battalion elements may be employed in a combat service support (CSS) role. Assault amphibian battalions are capable of planning and executing independent operations only after being heavily augmented with personnel and equipment based on METT-T analysis.

Note: I Marine Expeditionary Force (MEF) and II MEF each have uniquely organized AA battalions capable of supporting a Marine expeditionary brigade. 3d AA battalion provides one AA company to III MEF through the unit deployment program. United States Marine Corps Forces Reserve has one AA battalion consisting of four companies and one headquarters and service (H&S) company.

When in general support of the Marine division or in direct support of an infantry regiment, the AA battalion can serve as an independent unit to provide close and continuous maintenance and logistics support for its detached subordinate AA units. The AA battalion's organic capabilities (e.g., command and control, mobility, maintenance, and transportation capacity) should be leveraged to best support the GCE.

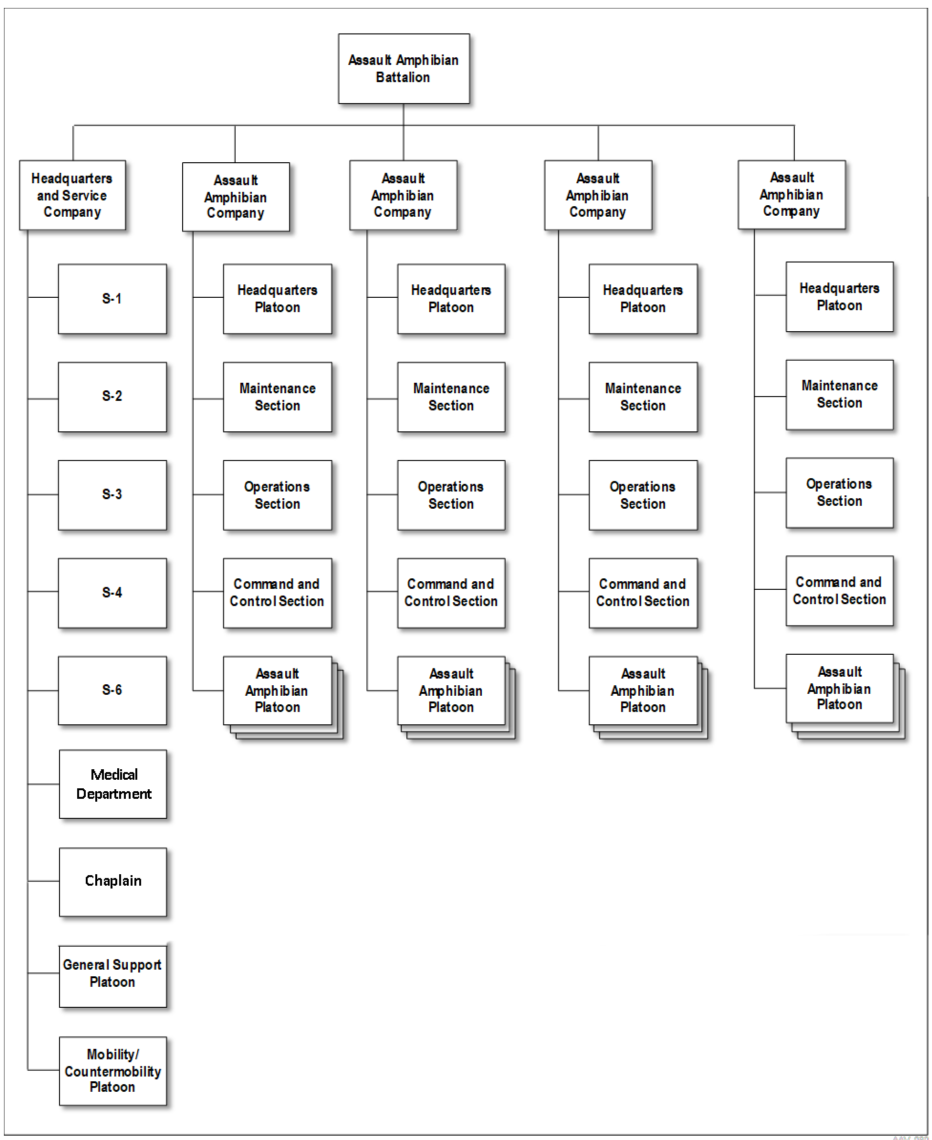


Figure 1-1. Assault Amphibian Battalion.

Assault Amphibian Employment Expertise. Positioned near the division forward combat operations center (COC) or collocated with an infantry regiment, the AA battalion leverages its inherent expertise in AA employment and support requirements to enable the division and/or regiment's momentum. Assault amphibian battalion staff members (e.g., from the operations, logistics, and maintenance sections) coordinate closely with the division and/or regiment staffs to facilitate planning; anticipate and communicate requirements; and translate/coordinate operations, logistics, and maintenance considerations.

Maintenance Operations. The AA battalion provides its detached subordinate units with responsive maintenance support. It employs its robust organic maintenance capabilities, fielding contact teams and conducting critical field-level maintenance activities such as preventative maintenance checks and services, discrepancy troubleshooting and repairs, parts fabrication and replacement, limited electronics maintenance and repair, and battle damage assessment and repair.

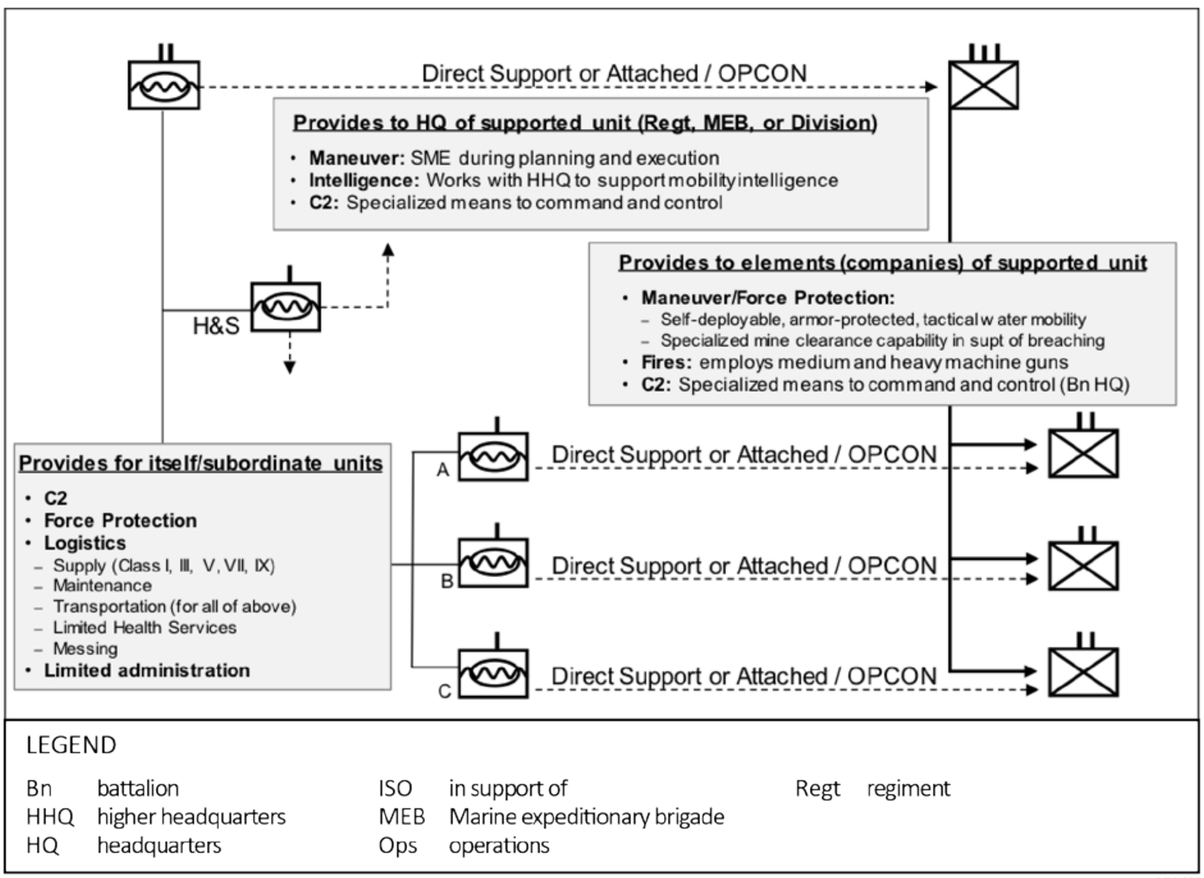


Figure 1-2. Assault Amphibian Battalion Employment in Support of an Infantry Regiment.

Logistics Operations. The AA battalion employs its organic motor transport assets and general support AAVs—while coordinating with the supported regiment and the appropriate units in the logistics combat element (LCE)—to ensure flexible and responsive logistics support for its detached subordinate units. The AA battalion logistics trains often provide their own security as they augment LCE efforts to deliver personnel, fuel, and supplies to detached subordinate AA units.

Headquarters and Service Company

The H&S company conducts functions associated with supporting and coordinating personnel, logistics, and training requirements for its assigned personnel. The company also exercises command functions over the general support platoon and mobility/countermobility platoon when not placed in support of other units (see fig. 1-3).

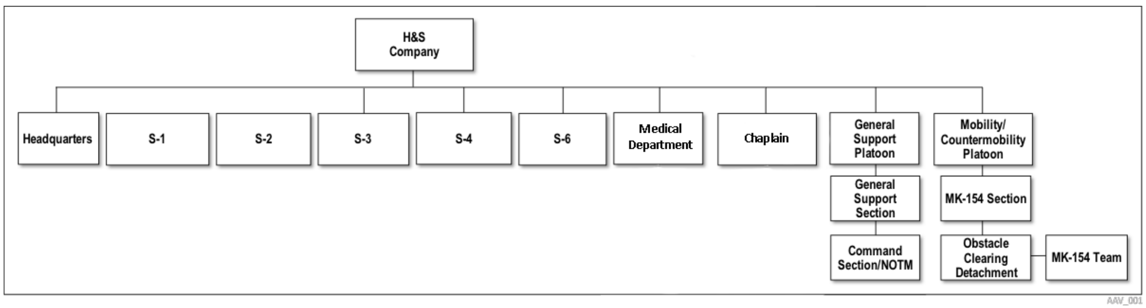


Figure 1-3. Headquarters and Service Company.

Battalion Headquarters. The AA battalion headquarters provides the commander with the means to command and control the battalion through the administrative, intelligence, operations and training, logistic, communications, supply, chaplain, motor transport, and medical sections. In addition to the aforementioned capabilities, these sections provide advice on the employment of amphibious assault vehicles (AAVs) as mobile aid stations and casualty evacuation vehicles.

General Support Platoon. The general support platoon is composed of a general support section and a command, control, and communications section. The general support section is composed of nine AAVP7A1 personnel variant vehicles organized into three sections of three vehicles each, and provides support to the battalion logistic trains. The command, control, and communications section is composed of six AAVC7A1 C2 variant communication vehicles and six AAVP7A1 support vehicles. It supports the C2 requirements of the AA battalion and supported GCE maneuver units.

Mobility/Countermobility Platoon. The mobility/countermobility platoon is composed of 24 AAVP7A1s (of which 12 vehicles include Mk-154 launcher, mine clearance systems) that are divided into 2 sections of 12 vehicles each. Each section consists of three breach teams of four AAVP7A1s, two of which have the Mk154 systems installed (AAVP7A1s equipped with Mk-154 systems are referred to as Mk-154 Mod 1 AAVs). The mission of the mobility/countermobility platoon is to support breaching operations from ship to shore through minefields and other obstacles during amphibious operations, and breaching operations during operations ashore.

Maintenance Platoon. The maintenance platoon provides field-level maintenance, to include complete organizational and limited intermediate maintenance capabilities for the AAV family of vehicles and associated equipment. The maintenance platoon operates and maintains the battalion's two recovery teams, which are each equipped with an AAVR7A1 recovery variant vehicle.

Assault Amphibian Company

The AA company consists of three AA platoons, a headquarters platoon, and a maintenance platoon (see fig. 1-4). Each AA platoon has 12 AAVP7A1s. The headquarters platoon provides administrative and logistic support to the AA company. Its C2 section provides AAVC7A1 C2 variant vehicles and AAVP7A1 chase vehicles to the supported unit, and its general support section provides the company tactical mobility and logistic train assets. The maintenance platoon provides the AA company with an organizational field maintenance capability and is made up of the AAV maintenance section, a communications section, and a recovery section.

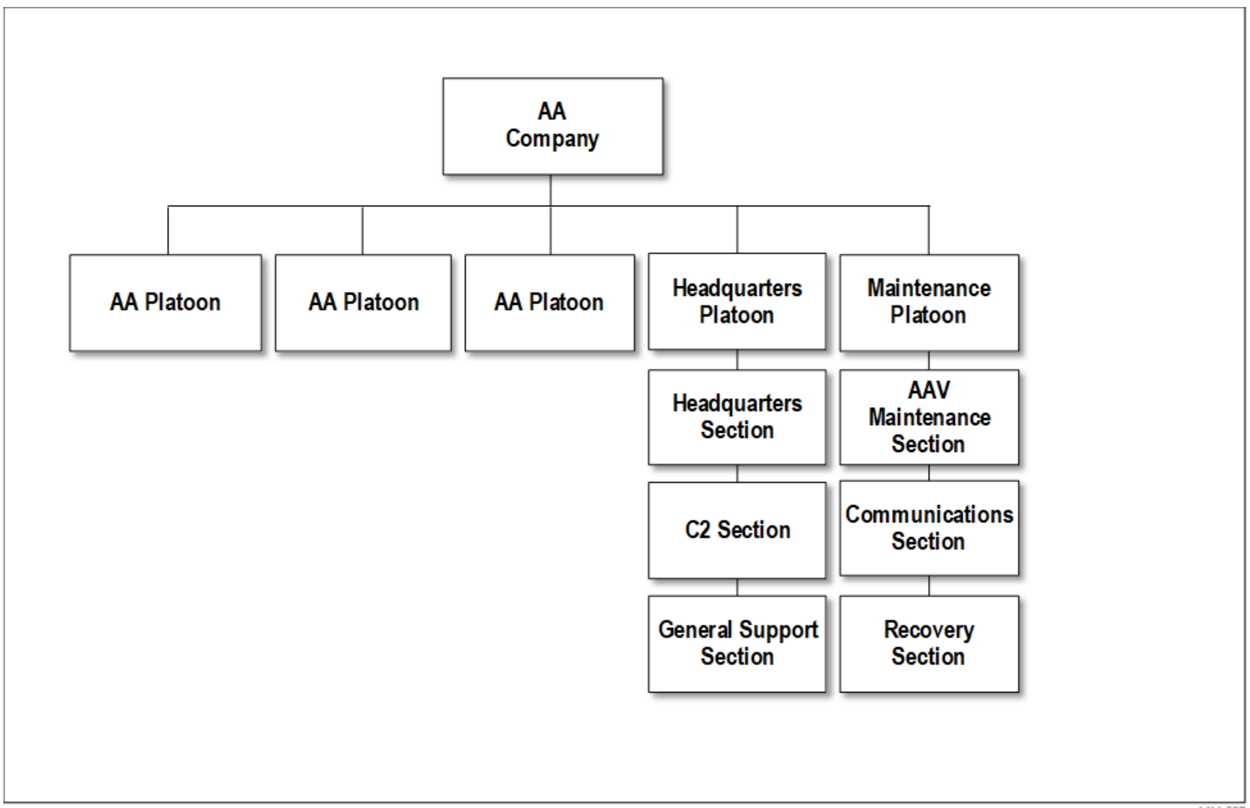


Figure 1-4. Assault Amphibian Company.

Like the AA battalion, the AA company possesses the assets to mechanize one infantry battalion or parts of multiple battalions (see fig. 1-5 on page 1-8). Additionally, when the AA company is placed in support of another organization, its commander becomes a special staff officer to the supported unit commander. The AA company commander's primary duties include directing their organic maintenance and logistics support and advising the supported commander on the employment of AAVs.

The AA company commander functions as a special staff officer on AAV employment to the supported unit. The supported unit and AA units are task-organized to create a single tactical combat unit. The AA company commander and the subordinate platoon commanders work with their supported unit counterparts to achieve unity of command and effort according to the supported unit commander's concept of operations. The AA company's AAVC7A1s, along with its support AAVP7A1s, are employed by the supported unit headquarters to facilitate command and control. The AA company's limited CSS capabilities, augmented by AA battalion resources, provide essential administrative and logistic support.

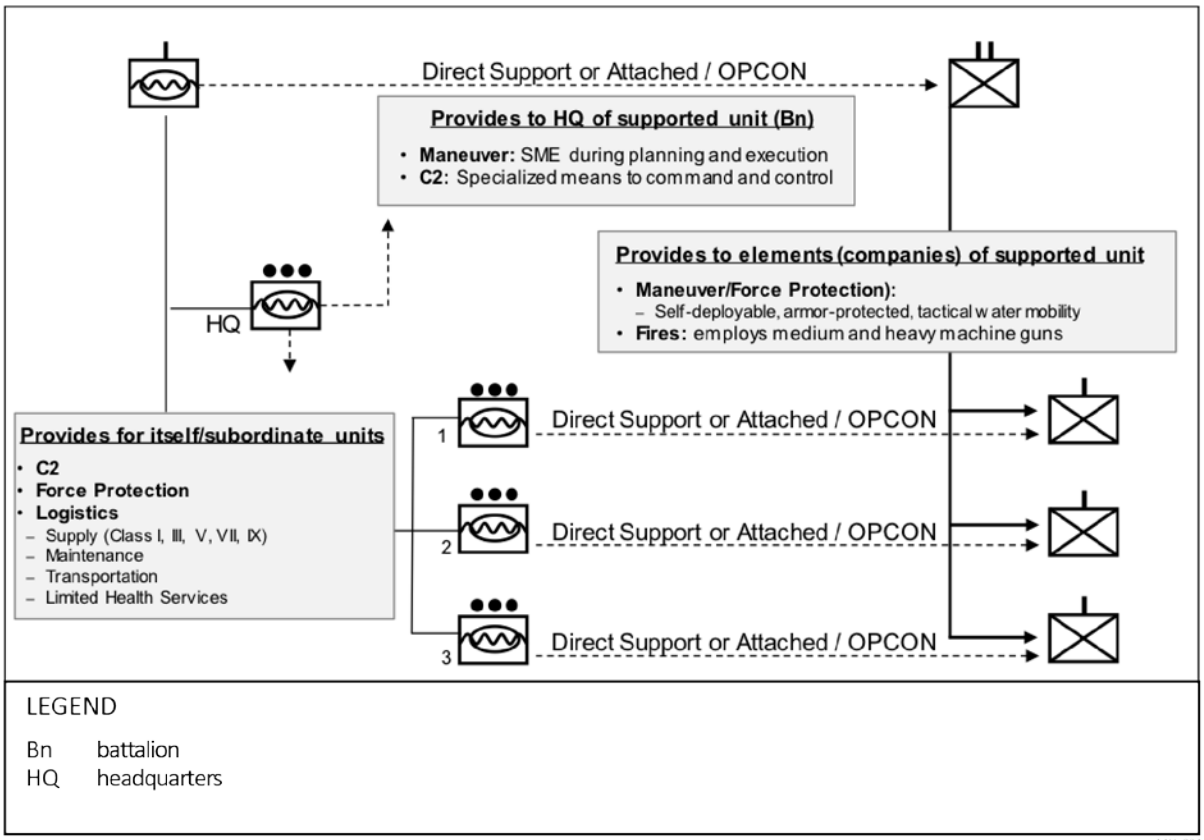


Figure 1-5. Assault Amphibian Company Employment in Support of an Infantry Battalion.

Assault Amphibian Platoon

The AA platoon is generally organized into three sections and possesses the assets to mechanize one infantry company. When it is attached to another organization or given a support mission, the AA platoon commander serves as a special staff officer to the supported unit commander and advises them on the tactical employment of AAVs. Based on the mission, the supported commander may be from a combat, combat support, or CSS unit (e.g., as task-organized within a larger force participating in a foreign humanitarian assistance [FHA] mission or attached to a BLT).

For ease of command and control, the supported commander is normally collocated with the AA platoon commander in the command vehicle. The AA platoon commander occupies the AAV turret, while the supported commander is positioned in the troop commander's hatch. Additionally, the supported unit commander exercises maneuver control through the AA platoon commander and, whether mounted or dismounted, also coordinates AAV direct fires through the AA platoon commander.

Assault Amphibian Section

The AA section is generally organized with four AAVP7A1 vehicles and possesses the assets to mechanize one infantry platoon (or similar size supported unit). The AA section leader both advises the supported unit commander and serves as the subject matter expert on AAV employment. Section leaders are responsible to their AA platoon commanders for the maintenance and readiness of their AAVs. The section leader occupies the AAV turret, thus filling the position of vehicle commander, and must train as part of the crew for gunnery and other collective tasks. The supported unit leader is positioned in the troop commander's hatch. In addition to performing duties similar to those of the AA platoon commander, the section leader serves as a focal point for rapid dissemination of the AA unit's SOP to the supported unit leader, and helps the supported unit leader and AAV crews form a cohesive team. While mounted or dismounted, the supported unit leader coordinates AAV maneuver and direct fires through the AA section leader.

Assault Amphibian Crew

The AA crew generally consists of three Marines who primarily support a reinforced infantry squad (or similar size supported unit). The AAV commander is responsible for the employment of their AAV, and serves as the subject matter expert to the senior embarked unit leader. The others are a vehicle driver and a third crew member. Personnel with the military occupational specialty of 2141 (AAV Repairer/Technician) can serve as rear crew member, as well as Marines with other specialties who have completed the rear crew member course as prescribed by the battalion commander.

Task Organization

The Marine Corps is one of the few armed forces in the world that conducts mechanized operations with temporarily formed units task-organized from light infantry and armor/antiarmor units. The decentralized nature of an AA unit allows a supported unit commander the flexibility to task-organize their forces based on the situation and mission analysis without sacrificing the mobility and direct fire support the vehicles provide to the supported units.

To maximize the capabilities of the AAVs and their crews, the supported unit should fully integrate the AA unit, establish close working relationships at all levels, and jointly develop an SOP that maximizes the capabilities of the mechanized infantry team. Employed as an integrated team, the level of success achieved depends largely on the level of cooperation and trust established at the lowest levels between AAV crews and their embarked Marine infantry elements.

Fundamentals

The process of task organization distributes available units to a supported headquarters by establishing various command and support relationships. The following fundamentals apply to task organization:

- **Flexibility.** Task organization is based on the current situation, but must also be prepared to meet new requirements caused by rapidly changing events.
- **Unity of command.** Mechanized forces normally operate at a distance and tempo that preclude the centralized control of supporting units by the parent headquarters. To ensure positive control and unity of effort, supporting/supported commanders should position themselves where they can best command and control their forces to meet the commander's intent and successfully accomplish the mission. Command and support relationships must provide the commander maximum flexibility to accomplish the mission. To develop familiarity, teamwork, and trust within subordinate units, the supported commander should avoid making frequent changes to the task organization whenever possible.
- **Self-sufficiency.** Subordinate units are highly mobile and may operate at considerable distances from one another. The supported commander should assign sufficient logistical assets to accomplish the mission.
- **Tactical integrity.** To facilitate command and control, the supported commander should maintain the tactical integrity of units when task-organizing. Maintaining the tactical integrity of combat support units is secondary to the tactical integrity of combat units.
- **Cross-attachment.** Specific task organizations are often formed by an AA unit (normally at the battalion or company level) attaching a subordinate unit to an infantry unit and the infantry unit attaching one of its subordinate units to the AA unit headquarters, as described below.

Assault amphibian units may be task-organized with other combat and combat support units into a task force or a company, battalion, or regimental landing team. A company through regimental landing team is a task-organized combined arms force based on a core infantry unit, reinforced with any necessary combination of combat and combat support assets required by the mission that is capable of combined arms employment. Any task-organized force that is not capable of combined arms employment or is not based on an infantry unit is a task force. For further information on these classifications, refer to Marine Corps Warfighting Publication (MCWP) 3-10, *MAGTF Ground Operations.*

A task-organized unit comprised of a combination of AAVs, tanks, and infantry—usually supported by combat engineers—is commonly known as a mechanized force (whether an infantry-based landing team or a task force). The AA unit provides the force self-sufficient mobility and the direct fires of the AAVs, along with the capabilities of any other AAV assets built into the task organization (e.g., a mobility/countermobility AAV section). Tanks allow the force to take advantage of their speed, firepower, armor, and shock value. Furthermore, the infantry can dismount during an engagement to protect the armored vehicles against close-in antiarmor threats and provide antiarmor fires, as well as to conduct the final assault against enemy infantry. Finally, an obstacle clearing detachment comprised of combat engineer and/or AA assets provides the force with mobility against natural and man-made obstacles, countermobility support, and the ability to enhance survivability through the construction of combat vehicle, individual, and crew-served weapon fighting positions, as well as hardened command posts (CPs). For additional information on mobility, countermobility, and survivability support to a mechanized force, refer to Marine Corps Tactical Publication (MCTP) 3-34A, *Combined Arms Mobility*; MCTP 3-34B, *Combined Arms Countermobility Operations*; and MCTP 3-34C, *Survivability Operations*.

A tank unit and an infantry unit mechanized with AAVs can cross-attach subordinate units to form a tank-heavy force and a mechanized-heavy force (usually at the battalion or company level). A *tank-heavy force* has more subordinate tank units than mechanized infantry units (see fig. 1-6). The headquarters of a tank-heavy force is usually that of a tank unit; therefore, it is considered a task force. The use of tank-heavy task forces is ideal when—

- Shock action and firepower are desired.
- Terrain is open, with few obstacles.
- Enemy antitank fire is easily suppressed.

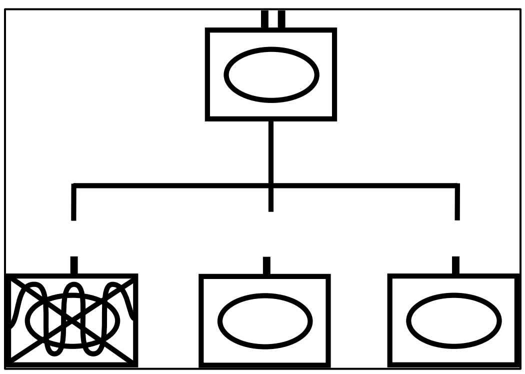


Figure 1-6. Tank-Heavy Force Example.

A *mechanized-heavy* force, also known as an infantry-heavy force, has more subordinate infantry units mounted in AAVs than subordinate tank units (see fig. 1-7 on page 1-12). The headquarters of a mechanized-heavy force is usually that of an infantry unit; therefore, it is considered a landing team. Mechanized-heavy forces are employed—

- When specific terrain must be seized and held.
- In built-up areas or other restrictive terrain.
- Against strong points.

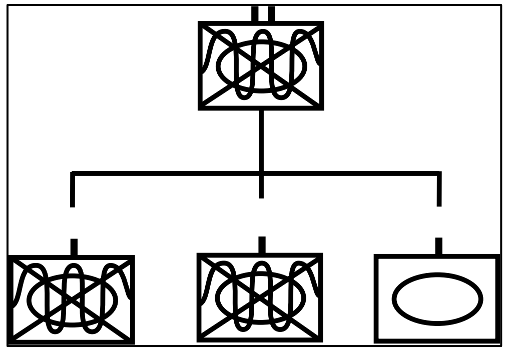


Figure 1-7. Mechanized-Heavy Force Example.

A *balanced force* has an equal number of subordinate tank and mechanized infantry units, which enhances tank and infantry capabilities while retaining mobility. The headquarters of a balanced force can be either that of a tank or infantry unit (see fig. 1-8); therefore, it can be either a task force or a landing team.

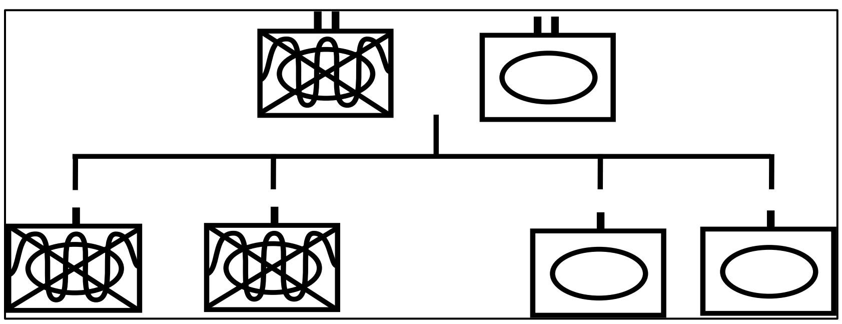


Figure 1-8. Balanced Force Example.

Combat Support to a Mechanized Task Force or Landing Team

An AA unit supporting a mechanized task force or landing team provides armor-protected mobility to the combat support elements of the infantry or armor unit. In carrying out their mission of supporting the infantry, AA units typically work in conjunction with antiarmor, mortar, artillery, combat engineer, heavy machine gun, and reconnaissance units, along with naval surface fire support, anti-air support, and air support. These combat support elements may be attached, in general support or direct support, or organic to the supported unit. Support will come from the GCE and other elements of the Marine air-ground task force (MAGTF). The types of combat support provided will depend on METT-T considerations.

Amphibious Assault Vehicle Allocations

Each AA battalion, or the AA company in 3d Marine Division, has the requisite assets available to support their assigned division. Each AA company consists of three AA platoons and a general support section. The AAVs used to support the GCE come from the three AA platoons of each AA company (see fig. 1-9). Normally, the vehicles that make up the general support section tow disabled AAVs to the maintenance collection point for repair, provide C2 capabilities to the supported unit, support the company logistic train, and provide local security to the AA company headquarters.

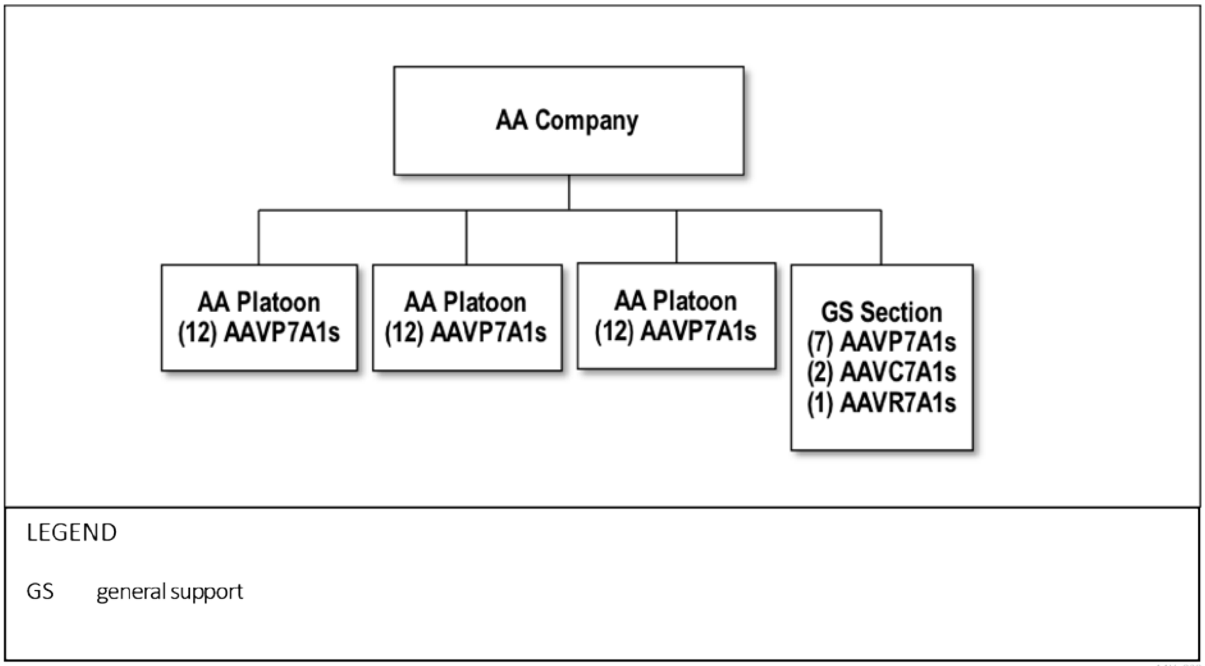


Figure 1-9. Assault Amphibian Company Vehicle Allocations.

The typical method of task organization utilizes three vehicles of an AA section to lift a rifle platoon, with one vehicle per section of four utilized by the headquarters element. The headquarters element consists of the AA platoon commander's vehicle, the platoon sergeant's or a logistic vehicle, and a vehicle utilized for the 60-millimeter (mm) mortar section. Examples of employment include the AA platoon commander's vehicle carrying the supported infantry company commander and fire support team and the platoon sergeant's vehicle carrying company headquarters assets, such as the marshaling area control officer.

MILITARY OPERATIONS

The Unites States employs all instruments of National power to accomplish its strategic objectives. The military instrument of National power is utilized in combination with the other instruments (i.e., diplomatic, informational, and economic) in a variety of ways that vary in purpose, scale, risk, and intensity along the competition continuum. There are three general categories of military operations:

- Military engagement, security cooperation, and deterrence.
- Crisis response and limited contingency operations.
- Large-scale combat operations.

The level of violence can vary within all of these groups. As part of the Nation's expeditionary force in readiness, the Marine Corps AA battalion or its subordinate units may participate in security cooperation activities with host nation forces, deliver humanitarian aid supplies during an FHA mission, or participate in high-intensity combat operations. In fact, such operations may occur simultaneously, and are not exclusive (e.g., humanitarian assistance during major combat operations).

Employment Considerations

When maneuvering forces, a commander should consider dispersion, speed, possible immediate actions, and their location and ability to effectively control the unit. During movement, the commander should—

- Use terrain to mask movement and noise to avoid exposure to the enemy.
- Use supporting arms to suppress enemy antiarmor fires.
- Move quickly out of the impact area when encountering enemy indirect fire.
- Change the AAV's primary position after engaging the enemy.

Movement

Self-deploying AAVs allow the MAGTF to maneuver forces from ship to shore and inland in a seamless transition. The AAV provides the principal means of armor-protected land and waterborne mobility for supported units.

Movement Techniques. The term "movement techniques" does not refer to the movement of fixed formations, but to the fluctuating distances between vehicles. These distances vary based on the factors of METT-T. As the probability of enemy contact increases, the mechanized unit adjusts the movement technique to provide greater security. The selection of the three movement techniques—traveling, traveling overwatch, and bounding overwatch—is based on several battlefield factors:

- The likelihood of enemy contact.
- The type of contact expected.
- The availability of an overwatch element.
- The terrain over which the moving element will pass.
- The level of security required during movement.
- Higher headquarters' timeline.

Traveling. The traveling movement technique is utilized when speed is necessary and contact with the enemy is not likely. All elements adopt appropriate movement formations suitable for the terrain and visibility, and move simultaneously. Figure 1-10 shows an example of the traveling technique. Leaders should locate themselves where they can best control the situation. The traveling movement technique is similar to a tactical road march, but not the same.

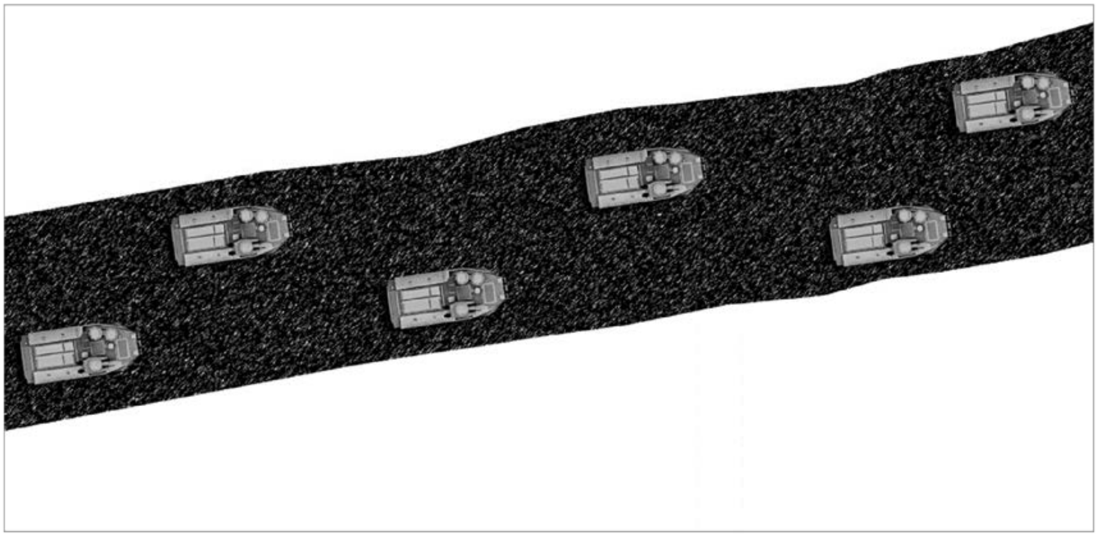


Figure 1-10. Traveling Technique.

Traveling Overwatch. The traveling overwatch movement technique is used when contact with the enemy is possible, but speed is important. The lead and trailing elements maintain short dispersion relative to the terrain. The trailing element moves at variable speeds, pausing for short periods when necessary to overwatch the lead element. It keys its movement to terrain and the lead element, conducting overwatch from a distance that, should the enemy engage the lead element, will not prevent the trailing element from firing or moving to support the lead element. Figure 1-11 shows an example of the traveling overwatch technique with the trailing element providing overwatch for the lead element. Due to the need for speed and mobility by overwatch elements, especially when dismounted, care must be taken to ensure that overwatch elements are not overburdened with extraneous gear or equipment.

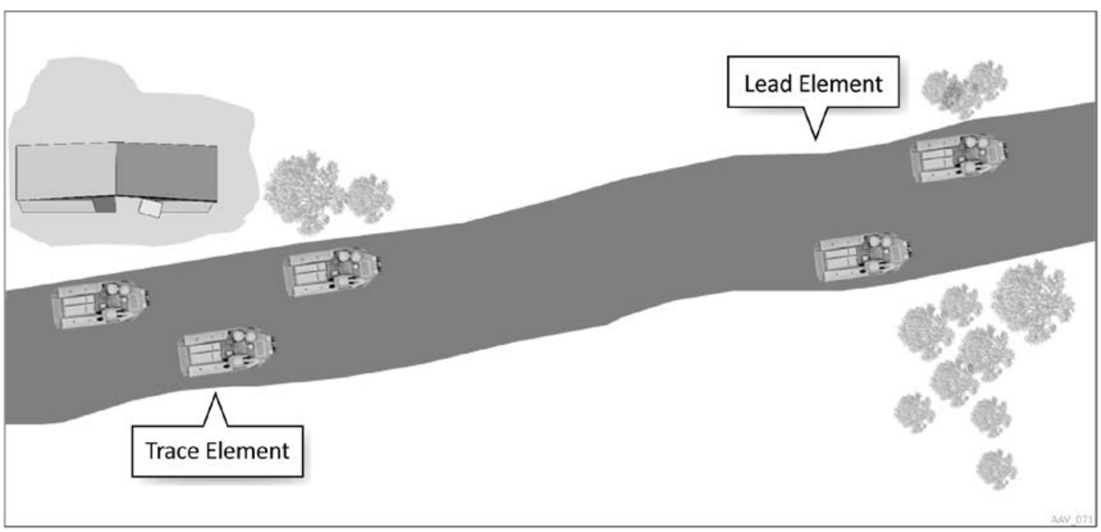


Figure 1-11. Traveling Overwatch Technique.

Bounding Overwatch. Bounding overwatch is used when contact with enemy forces is expected. The unit moves by bounds; one element is always halted in position to overwatch another element while it moves (see MCWP 3-01, *Offensive and Defensive Tactics*). The overwatch elements are positioned to support the movement of the main body by fire or by fire and movement. Bounding overwatch is performed using two techniques:

- **Alternate Bounds.** Covered by the rear element, the lead element moves forward, halts, and assumes overwatch positions. The rear element advances past the lead element and takes up overwatch positions. This sequence continues as necessary, with only one element moving at a time. This method is usually more rapid than successive bounds (see fig. 1-12).
- **Successive Bounds.** Covered by the rear element, the lead element advances and takes up overwatch positions. The rear element then advances to an overwatch position roughly abreast of the lead element and halts. The lead element then moves to the next position, and the process is continued. Only one element moves at a time, and the rear element avoids advancing beyond the lead element. This method is slower, though easier to control and more secure than the alternate bounding method (see fig.1-13).

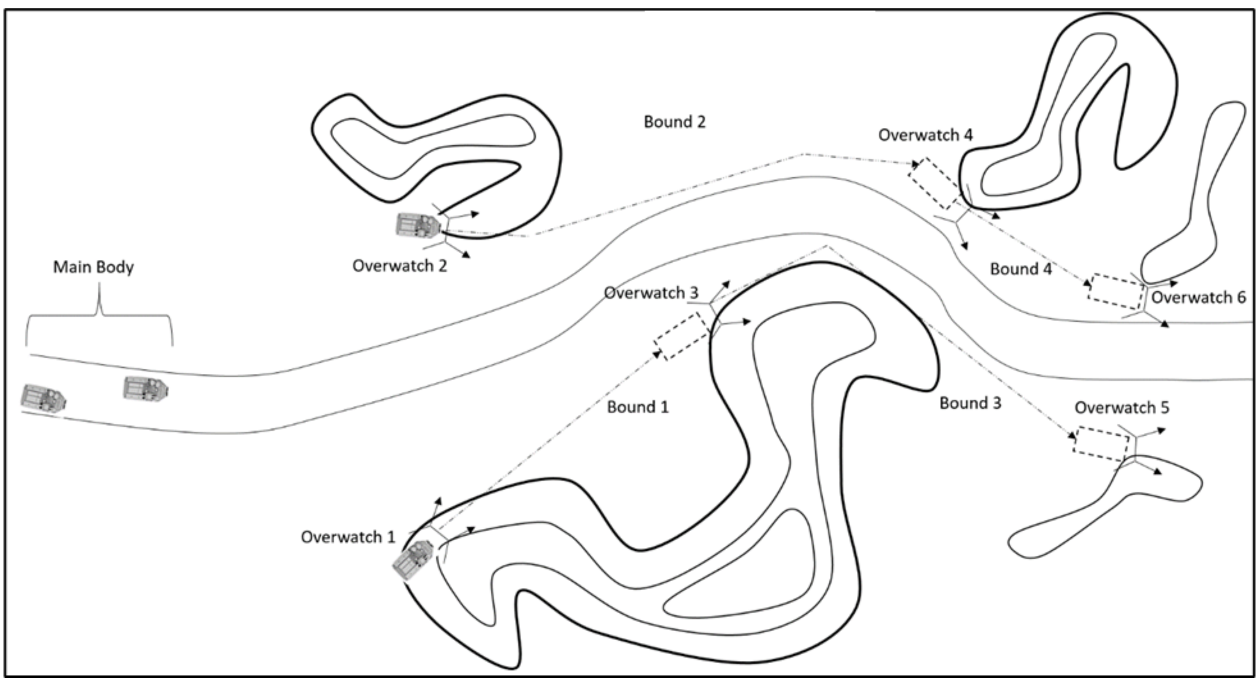


Figure 1-12. Bounding Overwatch Using Alternate Bounds.

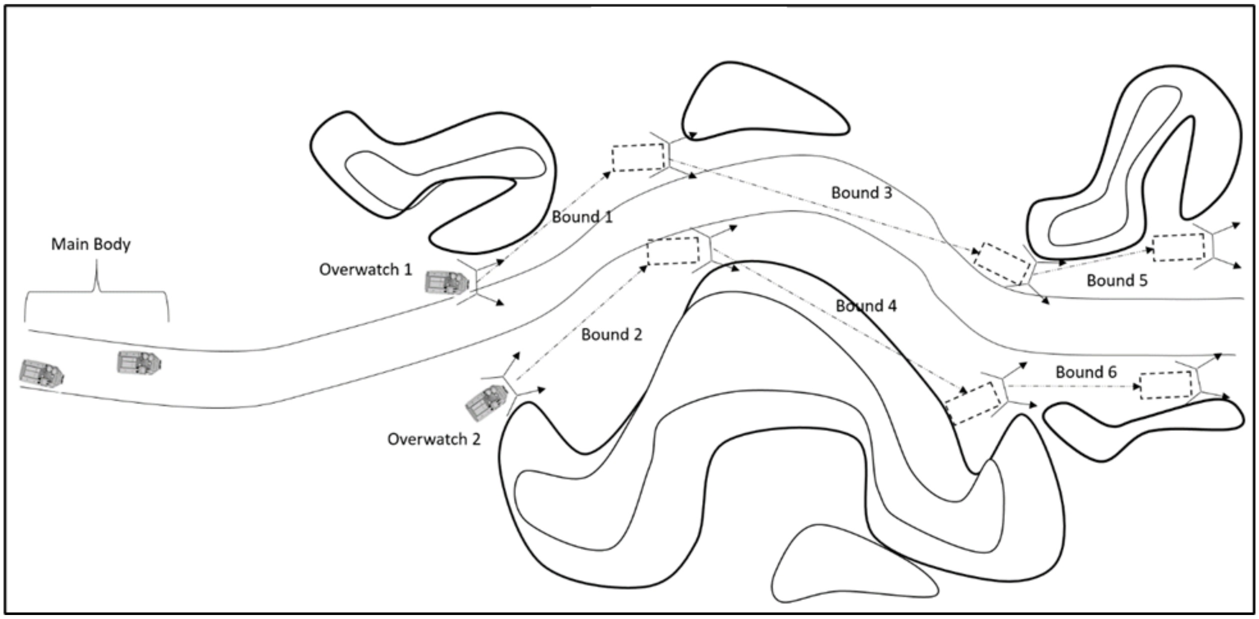


Figure 1-13. Bounding Overwatch Using Successive Bounds.

Formations. The unit commander uses mechanized formations for movement and halts, such as column, wedge, vee, line, echelon, coil, and herringbone, in order to—

- Establish the relationship between one element and another on the ground.
- Allow the team to position firepower where it is needed in support of the direct fire plan.
- Establish responsibilities for sector security among small units.
- Facilitate the concept of operations and immediate actions.

Like movement techniques, formations are planned based on where enemy contact is expected, how the higher commander expects to react to the contact, and what the terrain and vegetation allow. The unit commander must conduct a thorough estimate of the situation to determine which formation to use. It is not necessary for a subordinate unit's formation to be the same as the main body formation; however, it is critical for the subordinate unit commander to coordinate formations with those of other subordinate units moving in the main body.

An important consideration in movement planning and execution is that formations are not rigid. Spacing requirements and other METT-T considerations require the mechanized unit commander and subordinate leaders to adapt the basic formations. Each movement formation provides various degrees of security, fires, control, and speed (see table 1-3 on page 1-18). They must be ready to adjust the distance between elements and individual vehicles based on terrain, visibility, and mission requirements. Generally, the mechanized unit moves in formation when using traveling or traveling overwatch. When the unit is using bounding overwatch, the bounding element makes the best use of the terrain to move effectively while maintaining adequate security, rather than adopting a precise formation.

Note: The formations shown in the figures in this chapter are examples. They are generally depicted without consideration for terrain and other METT-T factors, which are always the most crucial elements in selecting a formation. Leaders must be prepared to adapt their choice of formation to the specific situation.

Table 1-3. Movement Formations.

Formation	Security	Fires	Control	Speed
Column	-Good dispersion -Good all-round security	-Good to the front and to the rear -Excellent to the flanks	-Easy to control -Flexible formation	Fast
Wedge	-Good all-round security	-Good to the front and flanks	-Less difficult to control than line -Flexible formation	Medium
Line	-Excellent to the front -Poor to the flanks and to the rear	-Excellent to the front -Poor to the flanks and to the rear	-Difficult to control -Inflexible formation	Slow
Echelon	-Good to the front and flank	-Good to the front and flank	-Difficult to control	Slow
Vee	-Better to the front	-Very good to the front	-Very difficult to control	Slow

Column. The column formation is used when enemy contact is not likely, when speed is critical, or when the mechanized unit is moving through restricted terrain on a specific route or a breached lane. When possible, vehicles should be staggered during movement (see fig. 1-14). The advantages of the column formation are that it—

- Is easy to control over long distances, at night, or during periods of limited visibility.
- Provides excellent control and fires to the flanks.
- Increases firepower to the flanks.
- Adapts to restrictive terrain or breach lanes.

The disadvantages of the column formation are that it—

- Provides extremely limited overall security.
- Limits firepower to the front and rear.

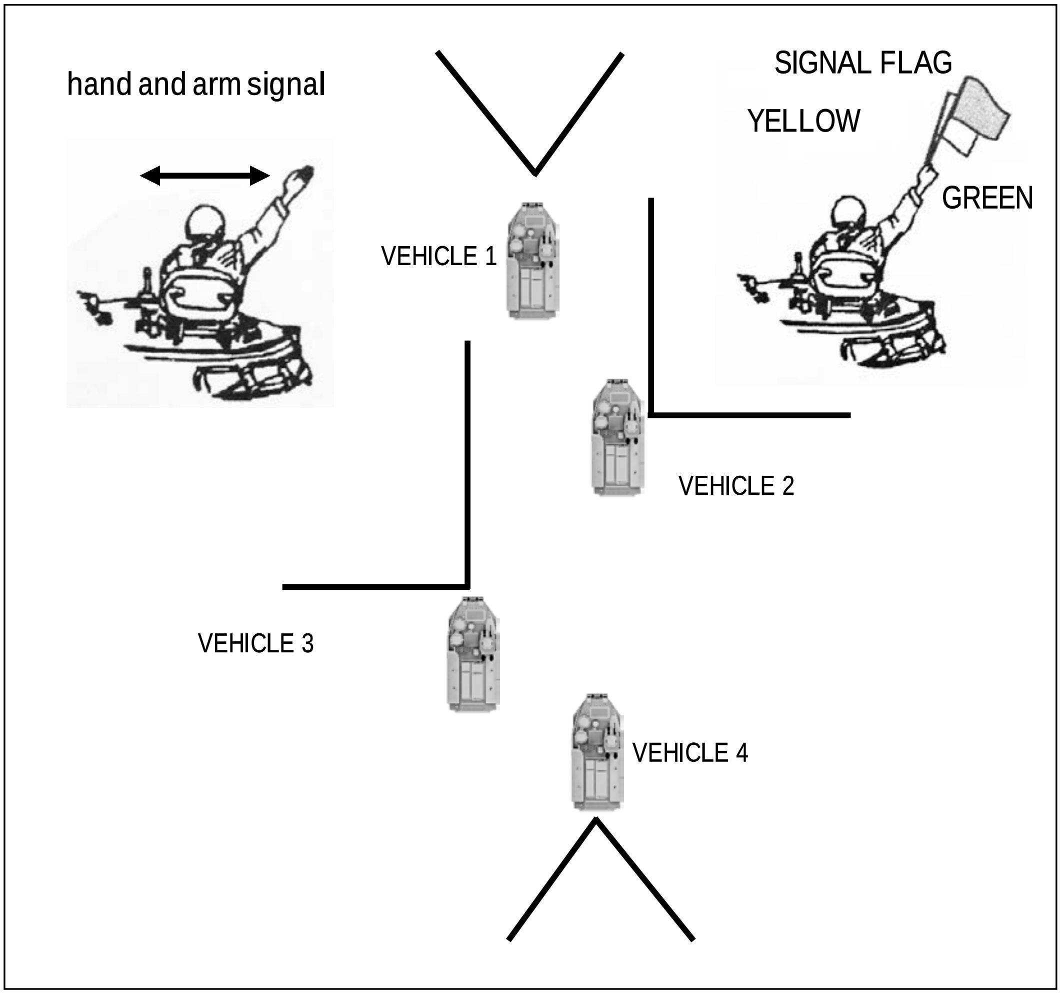


Figure 1-14. Column.

Wedge. The wedge formation is often used when the enemy situation is unclear or when contact is possible. When in a wedge formation, the lead element of a mechanized force is in the center of the formation with the remaining elements located to the rear and outside of the lead element (see fig. 1-15 on page 1-20). The advantages of the wedge formation are that it—

- Provides security and firepower to the flanks and front.
- Is easy to control.
- Can be used with the traveling and traveling overwatch techniques.
- Allows for rapid transition to bounding overwatch.

The disadvantages of the wedge formation are that it—

- Provides a slower buildup of combat power ashore.
- Requires a wider boat lane for AAV maneuver during ship-to-shore movement.

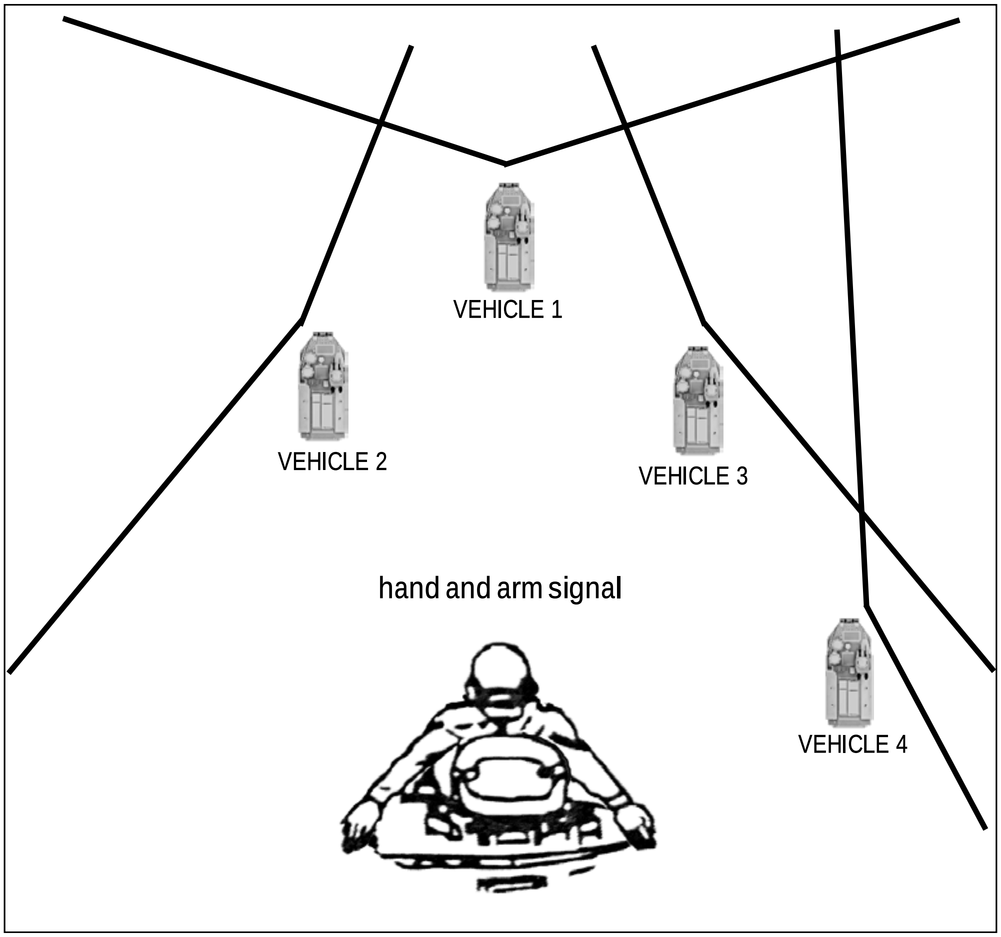


Figure 1-15. Wedge.

Line. The line formation is primarily used when a unit or element is crossing a danger area or otherwise needs to maximize firepower to the front (see fig. 1-16). When in a line formation, elements of a mechanized force move abreast of one another and are dispersed laterally. The advantages of the line formation are that it—

- Permits maximum fires to the front or rear.
- May be used in an assault to maximize the firepower and shock effects of the heavy mechanized unit—this is normally done when there is no more intervening terrain between the unit and the enemy, when antitank systems are suppressed, or when the unit is exposed to artillery fire and must move rapidly.

The disadvantages of the line formation are that it—

- Is difficult to control over long distances, at night, and during periods of limited visibility.
- Is less secure than other formations because of the lack of depth.
- Permits minimum fires to the flanks.

- Is vulnerable to fire from the flanks.
- Requires large frontages.
- Is the most difficult to transition to other formations.

Line formations are typically used to assault defended beaches while waterborne, and are used as the attack formation on land. In this formation, vehicles approach the beach or objective abreast of each other and parallel to the shoreline or objective. The line formation is used when—

- Rapid buildup of combat power ashore is desired and there is a limited obstacle threat.
- A lane or gap in the enemy obstacle belt has been created or discovered.
- Firepower to the front is needed.
- The tactical integrity of units must be maintained.

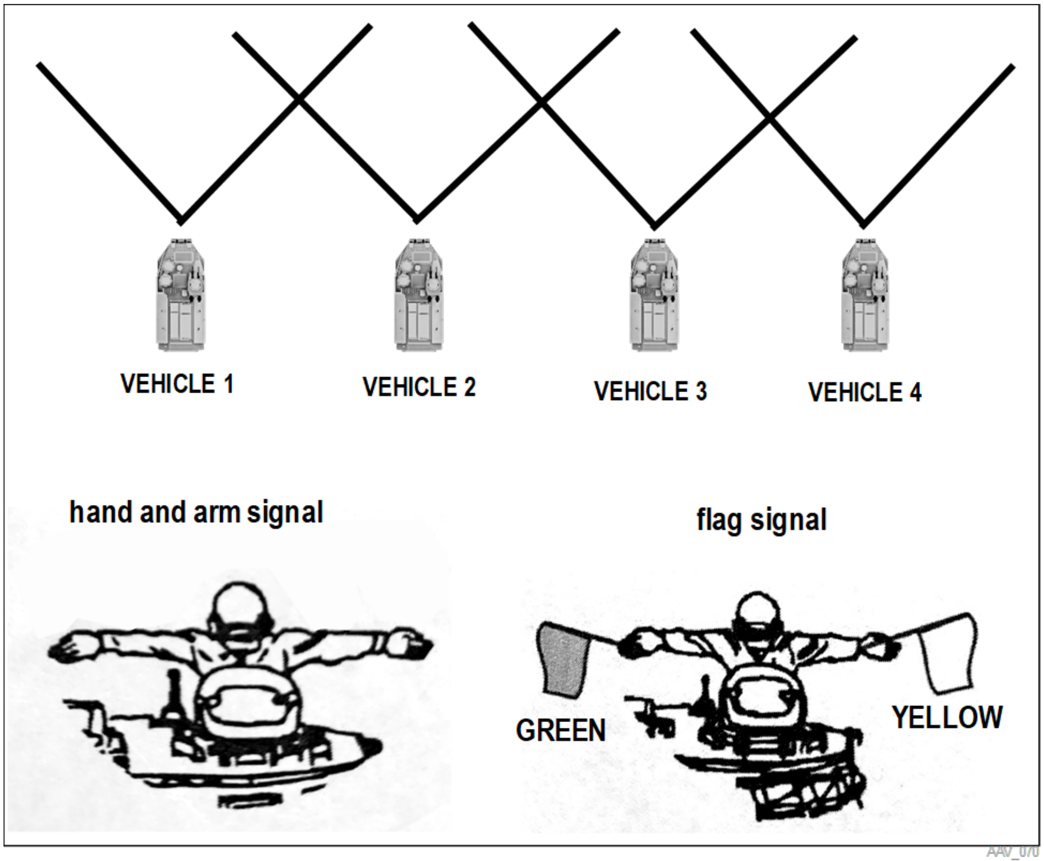


Figure 1-16. Line Formation.

Echelon. The echelon formation is used when the mechanized unit wants to maintain security/observation toward one flank and enemy contact is not likely. In the echelon formation (either echelon left or echelon right), the lead element is positioned farthest from the echeloned flank, with each subsequent element located to the rear and outside of the element in front of it (see fig. 1-17). The advantages of the echelon formation are that it—

- Affords excellent security for the parent unit in the direction of the echelon.
- Facilitates deployment toward the echeloned flank.

Echelon left or right can be used to protect an exposed flank; however, the disadvantages of the echelon formation are that it is—

- Difficult to control.
- Difficult to use over long distances or in poor visibility.

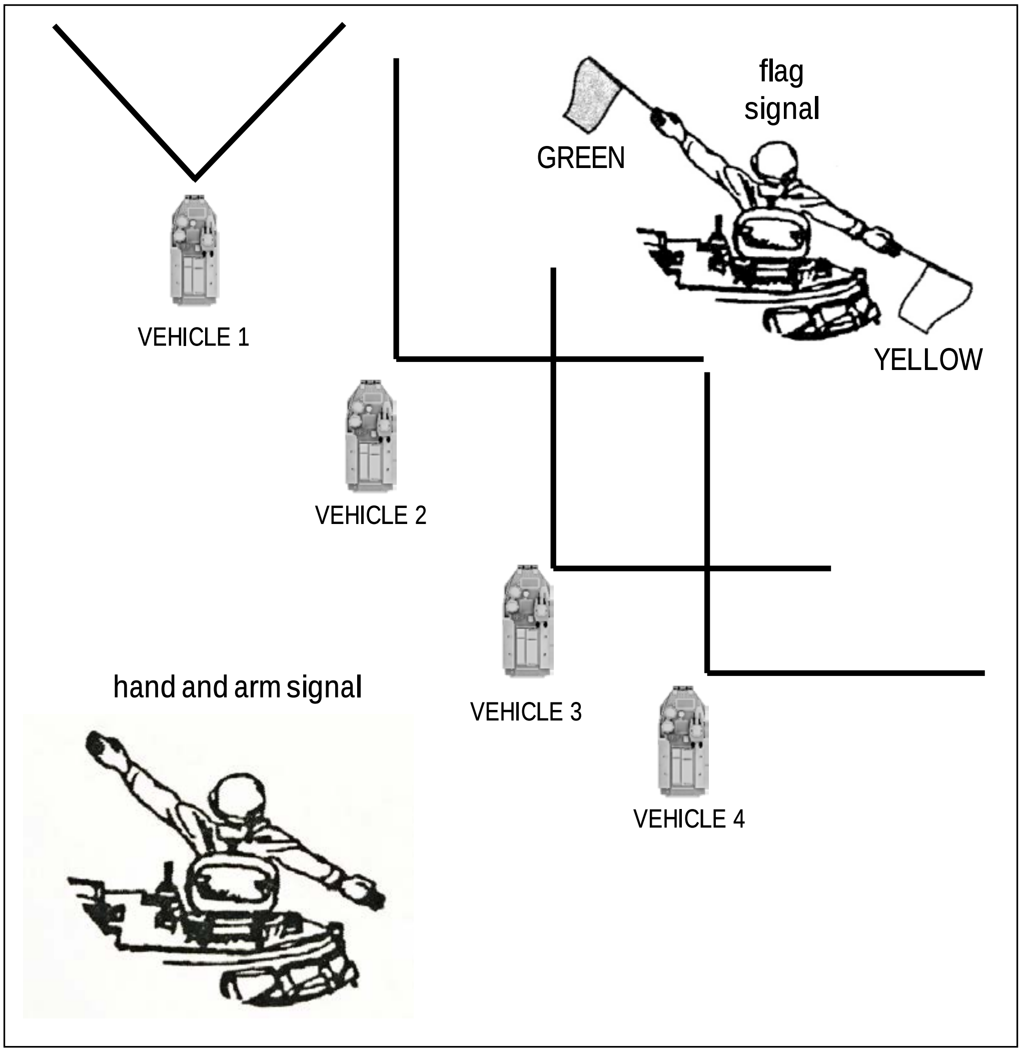


Figure 1-17. Echelon Right.

Vee. The vee formation is typically used by the lead or trace (i.e., rear guard or rear point) elements in a larger movement formation. As a lead element, the vee formation allows two or three AAVs to act as a maneuver element on enemy contact. As a trace element, the vee formation effectively creates a wedge formation upon contact from the rear. Refer to figure 1-18.

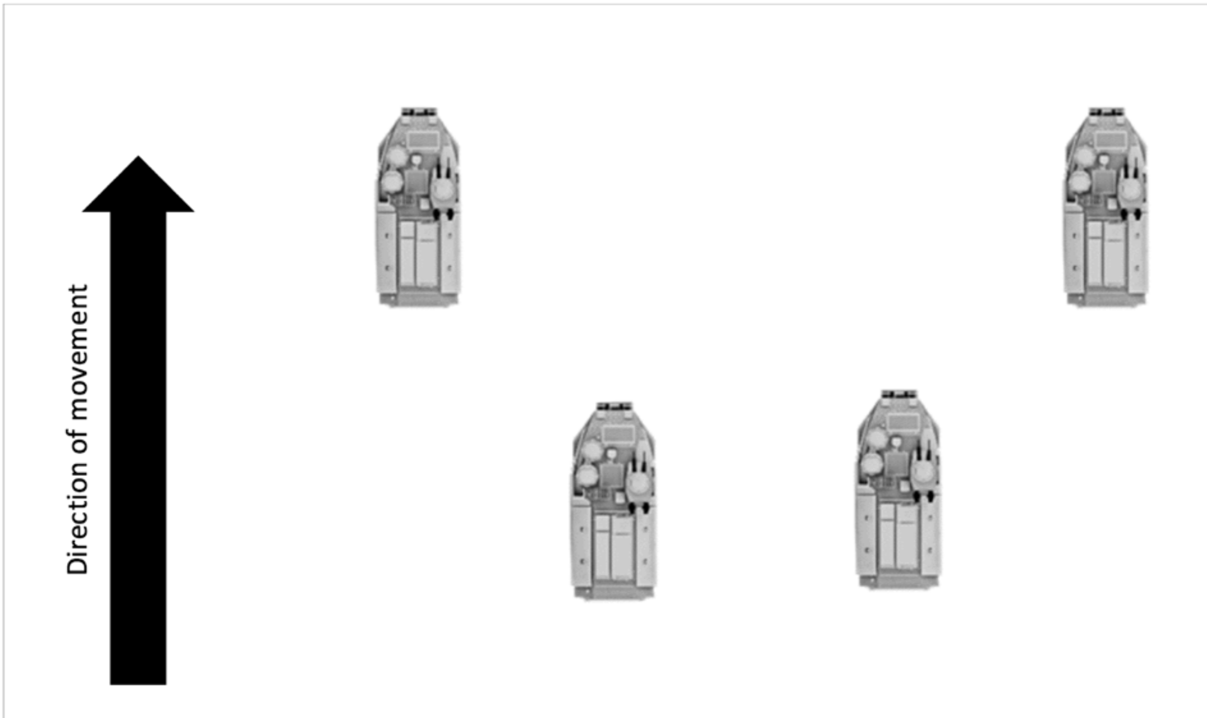


Figure 1-18. Vee Formation.

Coil. The coil is a defensive formation employed when the mechanized unit will be stationary for an extended period of time and must maintain 360-degree security. The lead vehicle halts in the direction of travel (i.e., 12 o'clock) while the other vehicles position themselves in a circular formation covering all suspected enemy avenues of approach and assigned sectors of responsibility (see fig. 1-19 on page 1-24).

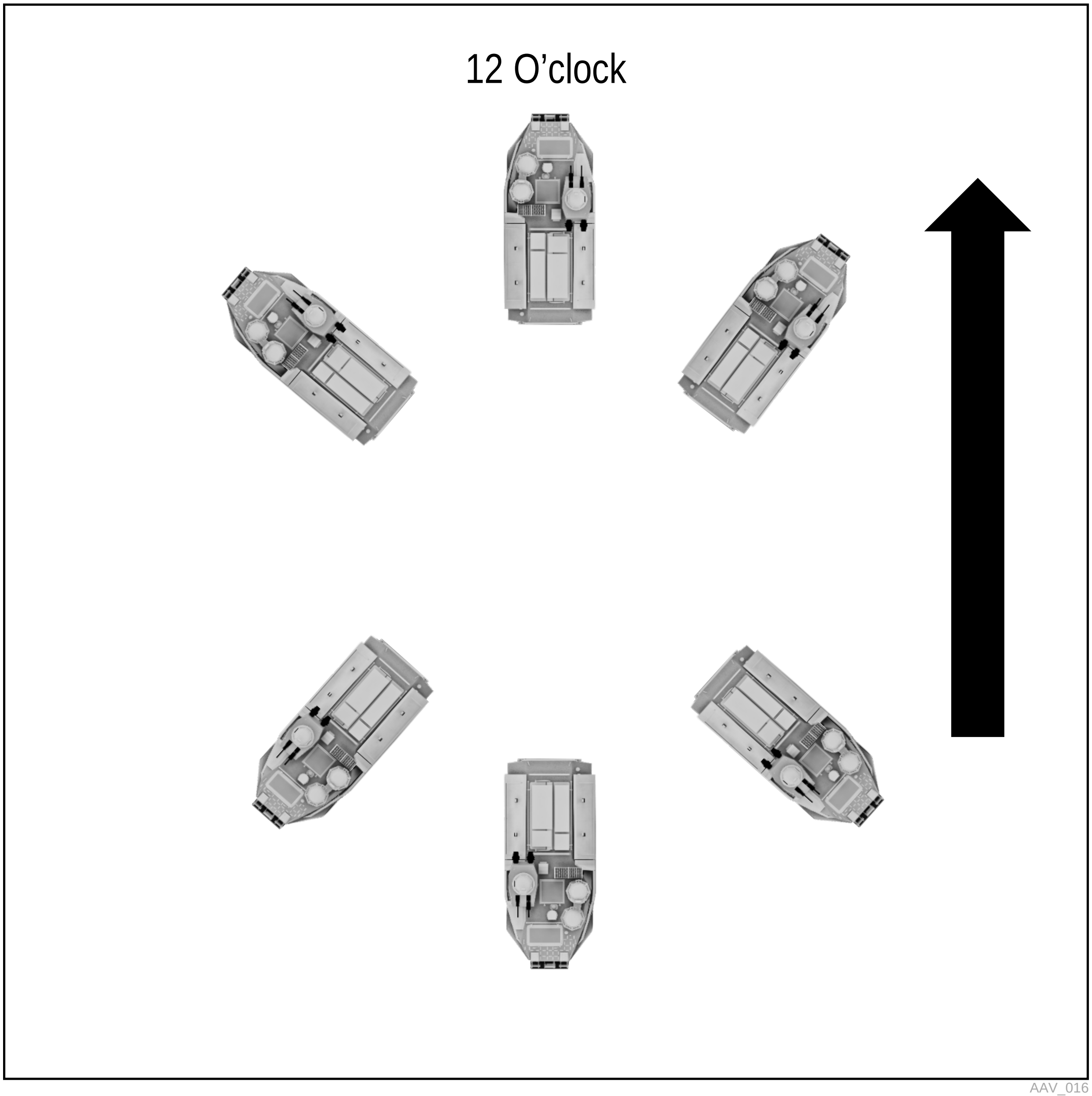


Figure 1-19. Coil.

Herringbone. The herringbone formation is used when the mechanized unit must assume a defensive posture with 360-degree security while remaining ready to resume movement in the direction of travel (see fig. 1-20). It is normally employed during scheduled or unscheduled halts in a road march. If terrain permits, each vehicle should move off the route and stop at a 45-degree angle, allowing for the passage of vehicles through the center of the formation.

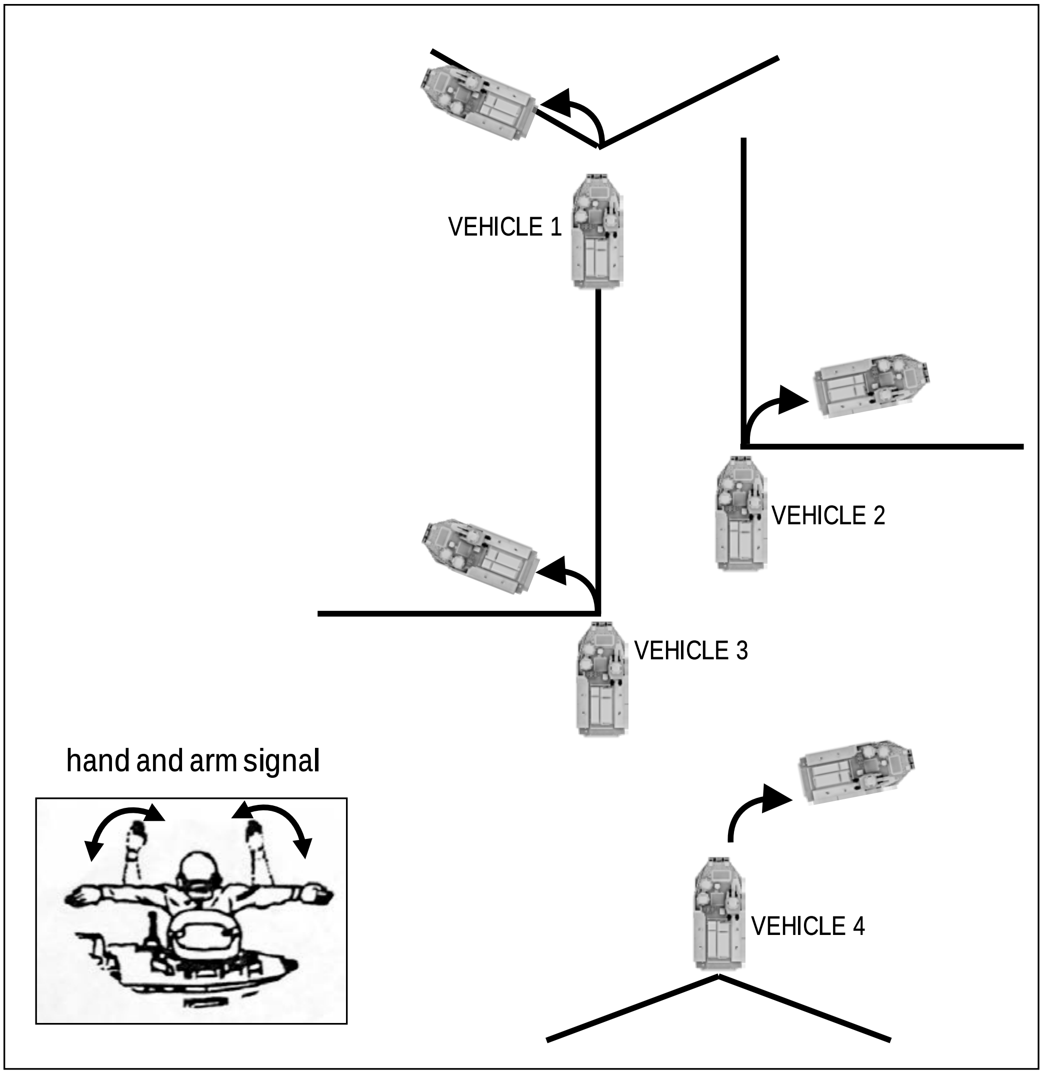


Figure 1-20. Herringbone.

Control. The AA unit's movement is controlled through centralized and decentralized techniques. The centralized control technique enables the supported commander to control the movement of the mechanized force through verbal orders to the AA unit leader. This technique maximizes the experience and skill of the AA unit to facilitate the movement of the force. In addition, the centralized control technique may be employed for tactical road marches or movement to contact when the unit is traveling together. Centralized control allows the supported commander to—

- Coordinate fire support.
- Plan.
- Issue orders to assigned unit leaders.
- Conduct liaison with other units on the march while retaining centralized control of the embarked force.

The decentralized control technique passes control for the movement of the AA sections to the subordinate leaders of the embarked force. For example, an infantry platoon commander would control movement through the supporting AA section leader. The AA section leader receives direction from the infantry platoon leader and controls the movement of the AAVs in the section accordingly. This technique may be used in the following situations:

- Upon initiating contact.
- In the approach to the point of debarkation.
- When the mechanized infantry platoons are operating away from the main body.

Speed. Mechanized columns routinely travel at speeds averaging 20 miles per hour (mph). A meeting engagement of two opposing mechanized forces will occur quickly, and a single column can quickly move into an opposing force's antiarmor kill zone without notice. The advantages of speed are that it—

- Permits rapidly massing combat power from across a broad expanse of terrain at the decisive point in the battle.
- Supports rapidly exploiting openings in the enemy's front, permitting the armor-protected movement of infantry into the enemy's rear.
- Permits the commander to maneuver forces swiftly and place them on crucial sections of the battlefield, thereby forcing the opposing commander to surrender the initiative.

Mutually Supporting. Ideally, AAVs are employed at the section level, with a minimum of two vehicles operating in pairs. This support prevents an AAV from becoming isolated, increases overall security, and enables the ability to recover a vehicle.

Dispersion. The factors of METT-T greatly influence dispersion and mobility. For example, when traveling in a column, a mechanized battalion can occupy over 17 kilometers (km) from front to rear. Such a unit cannot generate significant combat power quickly. If the point elements halt and engages the enemy, it could take 30 minutes for the remainder of the column to close the formation and join the fight. Commanders must minimize the effects of this dispersion of combat power. Having units maneuver on broader fronts when the terrain permits can reduce the effects of dispersion.

Use of Terrain. Terrain must play a part in all aspects of planning—establishing the defense, conducting an attack, or making a movement from one point to another. Poor use of terrain will quickly result in the loss of surprise during an attack or the exposure of vehicle locations in the defense. In natural terrain, there are limitations on observation caused by relative, localized, and subtle variations in terrain elevations. These limitations are known as intervisibility lines. Intervisibility is the condition of being able to see one point from another. An intervisibility line is terrain that interrupts the line of sight, such as a ridge or horizon, beyond which equipment or personnel can be hidden from observation. Intervisibility lines should always be considered during the employment of mechanized forces. The following techniques can help maximize the use of terrain and enhance survivability:

- Using available cover and concealment.
- Avoiding silhouetting the vehicle.
- Controlling the dust signature.
- Moving quickly across open areas.
- Backing out of a defilade position.

***Use of Waterways**.* The AAV allows the use of inland waterways as nontraditional avenues of approach. This capability permits surprise, speed, and the ability to mass forces in unexpected locations. When the situation permits, AA unit leaders are expected to follow the international and inland navigation rules for maritime vessels and boats when AAVs are waterborne in coastal waters, rivers, and bays. For further information concerning riverine operations, see chapter 6 and appendix A.

Waterway Rules. During combat assaults, friendly forces use the international and inland navigation rules to ensure safe operations of all vessels/craft within the designated restricted maritime operating area. The rules of engagement should address actions authorized to prevent unidentified or enemy vessels from entering the restricted maritime operating area. The following international and inland navigation rules are applicable during all other operations:

- When an AAV and a sailboat are approaching in such a direction as to involve risk of collision, the AAV shall avoid the sailboat.
- When AAVs or powered boats are approaching bow to bow, each shall pass on the port side of the other by steering to starboard.
- When two AAVs or powered boats are on crossing courses that involve the risk of collision, the AAV or boat that has the other on its starboard side shall give way to avoid the other.
- When safe and practical, AAVs in narrow channels shall keep to the right of the channel.
- During night operations, AAVs shall clearly exhibit a searchlight, or headlights if no searchlight is available, in time to prevent collisions.

Navigational Aids. Various channel markers can be found along local waterways. The local rules of the road and regulations should be clarified before launching and conducting operations. The *red-right-returning* rule applies in most parts of the world; however, in some parts of the world these rules are reversed. Under the red-right-returning rule, vessels moving up river will keep red channel markers on the right and green markers on the left. When going out to sea, vessels keep red markers on the left and green markers on the right.

Immediate Action and Battle Drills

The individual training of AAV crew members and infantry are key to the first critical moments of a mechanized battle, while the mechanized force continues to maneuver by advancing or seeking cover and concealment from enemy fire. Immediate action drills to enemy actions and unforeseen threats must be wargamed and rehearsed to the point that they can be carried out instantly with confidence. In mechanized operations, the commander's decision-making process is often limited to a matter of seconds, and actions are executed in less time than it takes the commander to assess the situation and decide on a specific action.

Immediate Action Drills. Mounted immediate action drills are usually similar to dismounted drills. Whether the contact is from the front, rear, flanks, from a near or far ambush, or in open or restrictive terrain, the goal of the section or platoon should be to conduct the following procedures:

- Identify the source of the contact by calling out, "***Contact front/right/left/rear.***"
- Return fire and establish fire superiority.
- Establish fire superiority.
- Use the appropriate technique to withdraw or assault through the kill zone.
- Maintain support by fire and overwatch throughout maneuver.
- Deploy dismounted infantry to evacuate vehicles if rendered unrecoverable.

Battle Drills. Battle drills at the vehicle and crew level represent the basic actions needed for the vehicle to perform as an effective part of the unit in unforeseen circumstances on both land and water. Mounted battle drills include the following:

- Dismount drills (both rapid and normal).
- Disabled vehicle or roll-over.
- Disabled weapon and reload drills.
- Incapacitated driver.
- Establishing hasty roadblocks or traffic control points.
- Sensitive equipment destruction plan.
- Vehicle recovery plan.

Commander's Location

Normally positioned as far forward in the formation as feasible under the tactical situation, the commander should position the command vehicle immediately behind the forward screening section of AAVs, tanks, or light armored vehicles. From an overwatch position, the commander can employ supporting arms and direct additional mechanized forces forward to the developing tactical situation.

CHAPTER 2
AMPHIBIOUS OPERATIONS

An amphibious operation is a military operation launched from the sea by an amphibious force to conduct landing force operations within the littorals. They can be conducted in permissive, uncertain, or hostile environments. Amphibious assault vehicles may be employed to support any of the types of amphibious operations. While their primary purpose is ship-to-shore movement, their nature as tracked amphibious vehicle makes them useful in a variety of ways. Marine Corps Tactical Publication 13-10E, *Ship-to-Shore Movement* (designated Navy Tactics, Techniques, and Procedures [NTTP] 3-02.1M by the US Navy) provides detail and guidance for the commander, amphibious task force (CATF) and commander, landing force (CLF) and their staffs to plan and conduct ship-to-shore movement. For more information regarding amphibious operations, see JP 3-02, *Amphibious Operations*.

The AAV family of vehicles' (see appendix B) demonstrated ability to negotiate various surf conditions and obstacles, coupled with their armor-protected mobility, make them uniquely suited for amphibious operations. These characteristics allow the MAGTF the flexibility to exploit gaps in the enemy's coastal defenses and/or mass substantial combat power at a decisive place to create such gaps. They also may allow a force to move on partially destroyed routes or to use alternate bypass routes after damage caused by a natural disaster or high-intensity combat.

The phases of an amphibious operation are planning, embarkation, rehearsal, movement, and action. Among other considerations, this chapter presents information on each of these phases that is specific to the employment of AAVs.

TYPES OF AMPHIBIOUS OPERATIONS

The five types of amphibious operations, in their order of likelihood (per Marine Corps Doctrinal Publication 1-0, *Marine Corps Operations*), are amphibious forces support to crisis response and other operations, amphibious raids, amphibious assault, amphibious withdrawals, and amphibious demonstrations. The various capabilities and functions of AAVs provide support for these operations.

Amphibious Forces Support to Crisis Response and Other Operations
Amphibious forces support to crisis response and other operations contributes to conflict prevention or crisis mitigation, such as security cooperation, FHA mission, civil support, noncombatant evacuation operations (NEOs), peace operations, or disaster relief. These operations may involve elements of both combat and noncombat operations. Some may parallel other types of amphibious operations (e.g., a NEO may closely parallel an amphibious raid) and may require minor adjustments to planning. Others, such as an amphibious force providing humanitarian assistance, may require considerable flexibility on the part of the planners. These operations are normally more sensitive to political considerations due to the overriding goal to

prevent, preempt, or limit potential hostilities. In addition to the vehicles' flexibility, amphibious and mechanized capabilities, and force protecting armor, AAVs have a substantial cargo capacity to assist in conducting varied operations such as NEOs and humanitarian relief.

Amphibious Raid

An amphibious raid is a type of amphibious operation involving a swift incursion into or the temporary occupation of an objective, followed by a planned withdrawal. Raids are conducted to—

- Destroy certain targets.
- Harass the enemy by attacking isolated posts, patrols, and headquarters and capturing or killing key personnel.
- Attack the enemy's rear or flank positions in support of other forces engaged with the enemy.
- Obtain information on hydrography, terrain, and the enemy.
- Create a diversion.
- Evacuate individuals or materiel.
- Establish, support, or coordinate unconventional warfare activities.

Raid forces consist of individuals or units with the capabilities and skills required for the mission. Raid forces should be as small as possible to maximize stealth and speed. The AAVs should be used when the mission requirements dictate the need for armor protection, firepower, and mobility. The AAVs also have the ability to extract the raid force back to sea without the assistance of additional landing craft.

Amphibious Assault

An amphibious assault is launched from the sea by an amphibious force, embarked in ships or crafts, to land the landing force and establish it on a hostile or potentially hostile shore. The unique combination of armor protection, heavy machine guns, breaching capabilities, and amphibious capabilities make the AAV the mainstay of surface assault forces conducting amphibious assaults.

Amphibious Withdrawal

An amphibious withdrawal is the extraction of forces by sea in ships or craft from a hostile or potentially hostile shore. They can be conducted under enemy pressure, under operational urgency to obtain forces needed elsewhere, or to remove forces whose mission is completed. The armored and amphibious nature of AAVs makes them particularly well suited for withdrawing forces from hostile shores. Their self-deploying amphibious capability enables them to act as a covering force for other assets withdrawing by landing craft.

Amphibious Demonstration

An amphibious demonstration involves a show of force conducted to deceive the enemy with the expectation of deluding the enemy into an unfavorable course of action (COA). The effectiveness of a demonstration increases in direct proportion to the degree of realism involved in its execution. Enhanced by their smoke generation system and noise signature, AAVs present a convincing show of force. The amphibious and mechanized nature of the AAV may influence the enemy to divert forces to deal with the threat, thus generating the desired effect.

MARINE EXPEDITIONARY UNIT OPERATIONS

A Marine expeditionary unit (MEU) is responsible for being able to conduct six general missions: amphibious raids, NEOs, security operations, tactical recovery of aircraft and personnel, direct action, and FHA. There are also additional conventional capabilities for which the MEU is responsible. The AAV offers the MEU and BLT commanders a rapid method of power projection ashore. Amphibious mechanized company personnel are organized and trained to perform or support MEU missions. The AAVs provide the mechanized company of the MEU's BLT with increased firepower, armor protection, and mobility compared to the other infantry companies.

Conventional Capabilities

The MEU is tasked with a number of conventional capabilities, some of which are listed herein. The mechanized unit provides significant advantages in many of these tasks due to the AAV's capabilities. Armored firepower and the ability to self- deploy from amphibious shipping give the mechanized unit a decided advantage. The AAV also provides a significant logistical and mobility capability for NEOs and FHA missions. The following are some of the MEU's conventional capabilities:

- Amphibious operations:
  - Conduct amphibious assault.
  - Conduct amphibious raid.
  - Conduct maritime interception operations.
  - Conduct advance force operations.
- Expeditionary support to other operations/crisis response and limited contingency operations:
  - Conduct NEOs.
  - Conduct humanitarian assistance.
  - Conduct stability activities.
  - Conduct tactical recovery of aircraft and personnel.
  - Conduct joint and combined operations.
  - Conduct aviation operations from expeditionary shore-based sites.
  - Conduct/support theater security cooperation.
  - Conduct airfield/port seizure.

Organization

The AA platoon is reinforced with maintenance personnel, communication technicians, and a cook before it is attached to the MEU. The approximate total strength in personnel and equipment is—

- 1 officer.
- 50 enlisted.

- 1 corpsman.

The platoon deploys with—

- 13 AAVP7A1s.
- 1 AAVC7A1.
- 1 AAVR7A1 (normally in the MEU's combat logistics battalion in a direct support role).

The AA platoon attaches to the BLT and is often placed in direct support of the mechanized company, but can be in general support. When attached, the BLT accepts full responsibility for the logistical and administrative support of the AA platoon and its vehicles. The AA platoon commander reports to the BLT commander and staff to establish a relationship early and to support the mission of the infantry company.

Deployment Cycle

There are generally four phases during the MEU deployment cycle from the AA unit perspective (the command relationships are complex and vary from phase to phase):

- The first phase is the predeployment training phase. During this phase, the AAV platoon is stabilized and begins to conduct the required annual training.
- The second phase consists of the change of operational control (OPCON) to the BLT and the ensuing predeployment training. Joint limited technical inspections are conducted before the AA platoon attaches to the BLT. These should be conducted with participation from the supported BLT, who should be present at all inspections and debriefs. In addition to the joint limited technical inspections, support, logistic, administrative, and personnel inspections are also performed. The AA unit also inspects and verifies each component of the AAV class IX block. This phase includes several training periods at sea working with the amphibious ships that transport the MEU, as well as land-based training with the supported infantry battalion.
- The third phase is the deployment phase.
- The fourth and final phase consists of redeployment to home station and returning inspections. These returning inspections should be conducted with the same participation as the first inspections—with heavy participation from the BLT, as well as the parent AA battalion.

Intelligence Requirements

The impact of environmental conditions and enemy defenses must be considered when AAVs are employed, since AAVs are typically the initial assault waves in amphibious operations. Intelligence information on hydrography and enemy defenses will be required for AAVs to negotiate the seaward approaches and to move from the surf zone to inland objectives. The following surveys and reports should be used when planning for an operation involving AAVs (see appendix C):

- Hydrographic surveys.
- Surf observation (SUROB) report.
- Modified surf index (MSI).
- Other hydrography sources.

Hydrographic Survey. The purpose of a hydrographic survey is to systematically collect information about the foreshore and nearshore sea approaches to a designated landing beach. This information will be transferred to a hydrographic sketch, which may be used by the CLF to plan the amphibious operation. The survey normally encompasses the nearshore area from the three-fathom line to the water's edge or designated clearance coordination line; the foreshore, backshore, and hinterland for about 100 yards; and the length of the beach as designated by CLF. The hydrographic survey and beach survey overlap in that they both cover the foreshore.

Surf Observation Report. The safety and success of an amphibious landing is largely dependent upon known surf conditions. A SUROB report is an observation of surf conditions disseminated in a prescribed format. It is essential that these reports are accurate and timely. Darkness inhibits the observer's ability to determine such critical parameters as breaker height, breaker type, or breaker angle. Nighttime observations can be checked by reviewing MSI trends established by the preceding daytime observations. That is, did the last few daytime observations indicate that the MSI was increasing, decreasing, or remained constant? This information, in conjunction with the current meteorological situation, will indicate if any large variations between the daytime and nighttime observations are justified. Operation orders for amphibious operations should provide for the taking and transmission of SUROB reports. The SUROB report format can be found in appendix C.

Modified Surf Index. The MSI is a single dimensionless number that provides a relative measure of the conditions likely to be encountered in the surf zone. For the reported or forecast conditions, the MSI provides a guide for judging the feasibility of landing for each type of landing craft. It is derived from the SUROB report. The MSI format can be found in appendix C.

Other Hydrography Information Sources. Other intelligence sources may include mapping, charting, and geodesic materials, tourist guides and maps, aerial observation and photos, multispectral imagery, or other intelligence preparation of the battlespace (IPB) products.

Hydrography

Hydrography, the description and study of bodies of water and their adjacent land areas, is used to interpret sea, surf, and beach conditions related to the employment of AAVs. Many complex factors influence these conditions and have varying effects upon the operation of AAVs. The success or failure of an amphibious landing using AAVs largely depends on the completeness and accuracy of intelligence and upon the AA unit leader's interpretation of that intelligence.

Sea State. Sea state is measured on a scale that categorizes the force of progressively higher seas by wave height. Table 2-1 provides a list of sea states and their conditions. The AAV has a demonstrated ability to easily negotiate sea states 1 through 3, but will experience difficulty maintaining speed and maneuverability in sea state 4. Amphibious assault vehicle operations conducted during sea states 3 through 5 may present challenges to towing operations or conducting troop transfers safely if AAVs become disabled. An AAV can withstand operations in sea state 5, but at reduced effectiveness. Commanders should assess if sea states 4 through 5 preclude embarking troops.

Table 2-1. Sea State Conditions (Beaufort Scale).

Sea State	Conditions
1	Wind speeds between 5 to 9 mph (5 to 8 knots). Wave heights considered small wavelets between 0.5 and 1 foot (0.6093 to 0.304 meters). Small wavelets with glassy-appearing crests and not breaking.
2	Wind speeds between 10 to 11 miles per hour (9 to 10 knots). Wave heights considered large wavelets, between 1.5 and 2 feet (0.456 to 0.609 meters). Large wavelets, crests begin to break and whitecaps are scattered.
3	Wind speeds between 16 to 17 miles per hour (14 to 15 knots). Wave heights considered small, between 3.5 and 4 feet (1.06 to 1.21 meters). Small waves becoming longer and whitecaps are numerous.
4	Wind speeds between 19 to 24 miles per hour (17 to 21 knots). Wave heights considered moderate, between 4 and 7.5 feet (1.24 to 2.5 meters). Moderate waves forming numerous whitecaps and some spray.
5	Wind speeds between 24 to 28 miles per hour (21 to 25 knots). Wave heights considered large, between 8 and 12 feet (2.43 to 3.65 meters). Large waves form and whitecaps are common, along with more spray.

Sea Waves. Caused by high winds in storm areas, sea waves are usually steep, have a short period, and often crest and break in deep water. They are commonly referred to as whitecaps or combers, if very large. Combers affect the speed and maneuverability of the AAV; the driver's visibility will be reduced because of the spray encountered. Operations in sea states 3 to 5 should be conducted with the driver's hatch closed to enable the driver to maintain speed. In these conditions, a magnetic heading device or precision lightweight global positioning system receiver may be used to maintain course. High seas must be anticipated in the navigation plan, landing formation, and landing schedule.

Swell. A swell is characterized by its lack of steepness and longer, rolling period. Depending on their size and orientation to an AAV, moderate to heavy swells can impede the vehicle's speed and maneuverability. Swell conditions must be anticipated in the navigation plan, landing formation, and landing schedule. Heavy swells (i.e., sea state 5 or greater) may also make debarkation from Naval shipping more difficult or dangerous. Swells more commonly affect embarked personnel by causing motion sickness (i.e., seasickness) and fatigue. Long waterborne movements (greater than 15,000 yards) in large swells (i.e., sea state 4 or greater) should be avoided, as they reduce the combat effectiveness of embarked assault forces. Swells have the greatest effect upon AAVs once they reach the shore and form breakers.

Tides. Tide variations affect the width of the beach and surf zone; therefore, both the high and low tide levels and the tidal range must be known. Tides affect the type of surf, the depth of water over sandbars and reefs, and the effectiveness of underwater obstacles. For example, high tides enable AAVs to more easily overcome sandbars, reefs, and other obstacles; however, because they shorten the surf zone, the percentage of plunging breakers may increase. Conversely, low tides may have the opposite effect by increasing the number of spilling breakers and failing to provide the necessary water depth for the vehicles to climb over reefs or other underwater obstacles. Extreme highs and lows, which may remain unchanged over the course of several days, can severely affect operations.

Surf. Various other factors can greatly affect AAVs in the surf zone. To increase operation safety levels, a SUROB report must be conducted before these operations begin. The following information on surf conditions is recorded in this report:

- Significant breaker height.
- Maximum breaker height.
- The breaker period or interval in seconds.
- Breaker types, such as spilling, plunging, or surging.
- Breaker angle.
- The littoral or longshore current in knots.
- The width of the surf zone.
- The number of breaker lines.

> Note: For operations involving multiple organizations and in-depth coordination, a SUROB report should be conducted hourly for four hours prior to H-hour, which is the specific time an operation or exercise begins. For notes on completing a SUROB report, see appendix C.

Surf Zone. The surf zone is the area of water from the surf line to the beach. The most dangerous portion of an amphibious landing is negotiating the surf zone. The energy of the wave is released at this point, and most landing craft casualties occur at this time. Conditions in the surf zone are the combined result of the following factors:

- Breaker type.
- Maximum breaker height.
- Breaker period or interval.
- Vehicle load.

Table 2-2 on page 2-8 illustrates the handling capabilities and safety criteria of the AAV under various conditions. It also represents the maximum safe breaker heights and breaker periods allowed for each type of AAV load. Exceeding these conditions is unsafe for AAV operations.

Table 2-2. Safe Breaker Heights and Breaker Periods.

Type of AAV Load	Maximum Breaker Height (feet)	Breaker Period (seconds)
100% Plunging Breakers		
Combat-loaded	6 10*	9 9*
Troop-loaded	6 10*	9 9*
Combat-equipped	6 8*	13 13*
50% Plunging Breakers/50% Spilling Breakers		
Combat Loaded	6	8
Troop-loaded	6	8
Combat-equipped	6	10
100% Spilling Breakers		
Combat-loaded	6	5
Troop-loaded	6	5
Combat-equipped	6	7
* When planning combat operations		

The load types are based on three internal cargo weights that act as a type of ballast for the AAV: combat equipped, troop loaded, and cargo loaded. The vehicle can handle shorter intervals between breakers or right itself as the cargo or ballast increases. The breaker period listed in Table 2-2 should be read as the minimum interval in seconds.

Warning: Narrow surf zones can hinder AAV operations if the surf is high (4-6 feet) and moving in excess of 8.5 knots. These combined conditions can cause the vehicle to contact the bottom quickly and sometimes violently enough to become swamped and flip over.

Reefs, Sandbars, and Obstacles. A distinct advantage AAVs have over conventional landing craft is their tracked suspension. This enables them to negotiate reefs, sandbars, and other obstacles that may impede other landing craft. The surf beat, vertical climb, and breakers must be considered before AAVs are navigated through those obstacles. The information needed for AAV operations over reefs or bars should include the following:

- The nature or type of obstacle.
- The distance offshore or location of the obstacle.
- Slope (seaward).
- Water depth at various tidal stages, or height of the obstacle above water.
- The location of gaps or passages in the sandbar or reef.
- Breaker height.

Surf Beat. Surf beat is the distinct rise and fall of the mean water level within the surf zone. Surf beat can be of significance to AAVs approaching submerged obstacles, such as sandbars or reefs. Normally, surf beat is equal to 10 percent of the breaker height. This quick rising and falling, almost a foot at times, can throw an AAV against a reef hard enough to severely damage the suspension. The damaging effects of surf beat upon a vehicle can be overcome if the tide provides sufficient water depth over the obstacle, or if the sandbar or reef has a soft composition.

Vertical Climb. On land, AAVs can climb a three-foot wall, but in water, the vertical distance is much less. The depth of the water over a steep gradient obstruction (e.g., a reef or sea wall) should be at least three feet to allow the tracks of the vehicle to be able to engage and climb it. This is not a concern where the gradient is less steep (e.g., sandbars), since the tracks will eventually contact the bottom and gain traction to traverse the obstacle. Since reefs are irregular and often contain many pockets or holes, care should be taken to avoid getting an AAV stuck in one without sufficient water depth to climb out.

Breakers. Despite the AAV's ability to climb sandbars and reefs, additional care should be taken whenever approaching these obstacles, as swells may break violently upon them. Wherever bars or reefs are present, the wave crest will peak as the waves roll over them. The water depth over the sandbar or reef and the wave height determine whether or not breaking takes place on or near the obstruction. Generally, if the depth is less than 1½ times the breaker height, waves will break upon the sandbar or reef. For example, a six-foot swell will break upon a sandbar or reef unless the water depth over that obstruction is at least nine feet (see *Gradient* below, as well as table 2-2).

Currents. Planners are most often concerned with the effects of longshore or littoral current when conducting amphibious landings; however, offshore seasonal currents can have a greater effect on AAVs. Therefore, the speeds of longshore (i.e., littoral) and offshore currents should be collected and considered when conducting AAV operations.

Offshore Currents. Tidal and offshore currents are found outside the surf zone. Currents in excess of three knots will adversely affect an AAV's navigation and speed.

Longshore/Littoral Currents. Longshore or littoral currents occur within the surf zone and are caused by breaking waves. They flow parallel to the shoreline inside the breaker line and increase with larger breaker angles, beach gradients, and breaker heights. Larger intervals between breakers tend to slow the velocity of littoral currents. These currents present little problem for AAVs since the vehicles have usually gained positive traction before reaching the point where they occur.

Gradient. Unless it is nearly vertical, gradient tends to have little effect upon AAV performance. Gradient characteristics that may affect AAV operations include:

- The depth of the surf zone.
- The number of breakers present.
- The type of breakers encountered.

Steep gradients of more than 1:15 (i.e., more than 7 percent) tend to produce a very high percentage of plunging breakers. Steep beaches normally have short surf zones with one line of breakers present. Moderate gradients of between 1:15 (i.e., 7 percent) and 1:30 (i.e., 3 percent) tend to produce spilling breakers, but often create a mixed percentage of both plunging and spilling breakers. Moderate gradients also produce bars and extend the surf zone, which creates two to four lines of breakers. Mild gradients of greater than 1:30 (i.e., less than 3 percent) tend to produce a very high percentage of spilling breakers. They also produce several bars that greatly extend the surf zone and lines of breakers.

Beach Composition. A beach may be composed of silt, mud, sand, gravel, boulders, rock, coral, or any combination of these. The nature and composition of the beach foreshore, backshore, and hinterland may affect the trafficability for AAVs.

Foreshore. The foreshore is the portion of a beach extending from the low water (datum) shoreline to the limit of normal high-water wave wash. Due to the increased gradient and looseness of the material, the most critical area of trafficability on the beach is the foreshore. As the gradient increases to its peak, AAVs tend to become stuck or mired in the loose bottom material. Coarser materials beyond the surf zone, such as gravel, rocks, or cobblestones, provide poor traction for AAVs beginning to ground themselves and move out of the water. Since AAVs are not fully grounded at the foreshore, they tend to slip on these coarse materials. The heavier the AAV and the steeper the gradient, the AAV will have less traction.

Backshore. The backshore is the area of a beach extending from the limit of high-water foam lines to dunes or the extreme inland limit of the beach. The composition of the backshore is usually soft, loose, and dry. Normally, since it generally has a mild gradient, the backshore does not present a problem to trafficability; however, AAVs may lose traction if the gradient is steeper.

Hinterland. The hinterland is the area just past the backshore behind the first line of permanent vegetation. Amphibious assault vehicles may encounter trafficability problems in the hinterland if confronted with dunes or cliffs. If these obstacles are too steep, they may advance only to the backshore.

Beach Exits. Beach exits allow AAVs to quickly move inland; however, natural or reinforcing obstacles may channel or prevent AAVs from exiting the beach and moving inland. Urban or developed terrain in the vicinity of landing beaches can present a unique set of complications or advantages when planning an amphibious operation. The AAV can climb a three-foot wall and cover an eight-foot span, but any obstacle greater than this must be breached, bridged, or avoided.

Enemy Defenses

Amphibious operations normally avoid concentrated enemy defenses when possible. Enemy defenses against AAV landings can vary from a hastily organized, lightly defended beachhead to a deliberate, well-planned, fortified traditional defense. Therefore, careful consideration must be given to the enemy’s long-range weapon capabilities when planning for an amphibious operation. Waterborne movement in AAVs may result in decreased maneuverability, resulting in increased exposure time to direct and indirect enemy fires.

Enemy obstacles can range from anti-vehicle and personnel mines or improvised explosive devices to steel tetrahedrons and rock-filled cribs. Beach obstacles are typically laid out in belts from the surf zone to the beach exit and beyond. Deep-water depth at high tide will assist in overcoming these obstacles; however, even at high tide, vehicle casualties are likely to occur. Surface or submerged obstructions must be cleared before landing operations commence. If only narrow passages or lanes are cleared, AAVs will commonly use the column formation to safely traverse the cleared lanes.

SHIP-TO-SHORE MOVEMENT CONTROL

The CATF controls the ship-to-shore movement and surface assault through the Navy control group in accordance with the landing plan specified using the documents in appendix D. The waterborne portion of an amphibious landing requires precise navigation, timing, and coordination by elements of the amphibious task force (ATF). The AA unit leader must understand the responsibilities and missions of the elements of the ATF. The AA units must have a thorough understanding and knowledge of the ship-to-shore movement information and control procedures contained in MCTP 13-10E.

Navy Control Group

The surface borne ship-to-shore movement of a brigade-sized landing force may involve multiple landing beaches identified by colors. The organization of the Navy control group is based on the arrangement and number of those beaches. The Navy control group consists of the personnel, ships, boats, and landing craft that are designated to plan and control the waterborne ship-to-shore movement. The organization of the control group is based on the arrangement and number of landing beaches. Normally, it includes a central control officer (CCO), a primary control ship (PCS) and primary control officer (PCO), a secondary control ship and officer, a boat control team, a boat group commander, a wave commander, and safety boats. The AA unit leader, as the wave commander, is part of the Navy control group.

Central Control Officer. The CCO is the officer, embarked in the central control ship, designated by the CATF for the overall coordination of the waterborne ship-to-shore movement. If several beaches are specified in the landing plan, the CCO designates a PCO at each landing beach for coordination and control of surface-borne operations. The CCO directs the movement of scheduled waves to the beach and maintains close contact with the tactical-logistical (TACLOG) group.

Primary Control Officer and Ship. A PCO embarked aboard a PCS is designated for each colored beach and transport organization landing. The PCO's mission is to control the movement of AAVs, landing craft, and landing ships to and from the beach. When assault forces are to be landed over widely separated beaches, additional PCOs may be required for each beach. The PCO's responsibilities include—

- Providing detailed plans, or PCO instructions for conducting ship-to-shore movement across a landing beach.
- Landing scheduled waves at the correct beach at the specified time.
- Maintaining the current location and status of ships, landing craft, and boats, including safety and salvage boats, assigned to support landing on a specific beach.
- Monitoring the surf conditions and weather conditions and recommend the termination of operations should surf or weather conditions dictate.
- Maintaining the status of debarkation/embarkation.
- Provide liaison to surface-borne TACLOG detachment.
- Conducting landing craft or amphibious vehicle salvage operations.
- Arranging for the refueling of boats and providing rest and food for boat crews.

Secondary Control Officer and Ship. Secondary control officers embarked aboard secondary control ships may be stationed on the line of departure (LOD) or within the vicinity of the PCS. The secondary control officer's responsibilities include—

- Maintaining duplicate control records and plots required of the PCO and PCS.
- Monitoring the PCO and PCS communications.
- Assuming PCO and PCS duties in the event of an emergency.

Boat Control Team. The boat control team plots, tracks, and controls the movements of scheduled waves from the PCS combat information center (CIC). The team is composed of the following:

- Supervisor.
- Wave controller.
- Grid plotter/amphibious assault direction system operator.
- Radio net operators (primary and secondary).
- Radar operator.
- Visual bearing takers.
- Quartermaster for visual communications (i.e., signaling).

The boat control team uses the signals in appendices E and F and the grid reference system in appendix G for wave control. See MCTP 13-10E for additional signals information and specifics regarding boat team composition and duties.

Boat Group Commander. The PCO employs boat groups, controlled by a Navy officer serving as the boat group commander, to control AAVs and landing craft in scheduled waves for each numbered beach. During the waterborne movement, boat groups are organized into waves (i.e., groups of AAVs or landing craft) that are scheduled to land simultaneously. Each boat group will have a boat group commander, and possibly an assistant boat group commander (if required), to help guide the movement of the group to or from the beach.

Wave Commander. A wave commander is assigned to each AAV wave. The senior AAV officer, staff noncommissioned officer, or noncommissioned officer (NCO) in each wave is designated as the wave commander. The wave commander leads the wave to the LOD and assumes a position in the wave to best control movement. The responsibilities of the wave commander include—

- Forming the AAVs into the proper organization for landing.
- Reporting to the PCS, giving any details concerning the wave's readiness.
- Ensuring that the wave is maintaining proper position and interval in the boat lane.
- Controlling the fires of AAVs.
- Retracting embarkation of AAVs from the beach.

Safety Boats. Safety boats may be employed to render assistance and pick up personnel from disabled or sinking AAVs. Safety boats are normally naval craft from the launching ship. During the conduct of amphibious operations involving naval shipping, an AAV shall be identified and marked as a safety vehicle. During daylight operations, the safety vehicle may be identified by orange or red colored tape on the starboard aft antenna. During limited or reduced visibility, the starboard antenna will be marked with an orange or red chemical light. During the conduct of split operations, or as appropriate, multiple vehicles can be designated and marked as safety vehicles. Additional safety procedures for AAV operations are contained in appendix H.

Communications

Communications for ship-to-shore movement should consist of primary, alternate, and tertiary methods. Usually, radio is primary, lights and flags are the alternate, and hand and arms signals are the tertiary means; however, all three may be utilized.

Radio. Radio is normally the primary means of communication between the PCS and the wave, and between units/vehicles within the wave. Naval and AA units will use the following nets during the ship-to-shore movement:

- **Beach Boat Control (Alpha Net).** The Alpha Net is a directed net used during ship-to-shore movement to provide control of displacement landing craft and AAVs in scheduled waves for a landing beach. Upon reaching the beach, AAVs shift to landing force tactical nets, and displacement landing craft shift to Beach Boat Operations (i.e., Bravo Net) circuits. The AAV tactical net is used by the AA unit for the command and control of the waves and for fire control during the assault. It is guarded by AAVs in the unit and is assigned as their tactical net.
- **Beach Boat Operations (Bravo Net).** The Bravo Net is a free net used to coordinate the launch of displacement landing craft, AAVs, and the initial and general offload at a landing beach. If no more than two waves are being launched, only one net (alpha or bravo) is necessary to control landing craft or AAVs. The other net is activated, but used only in the event of a loss of communications on the active net.

Lights and Flags. Light and flag signals from the PCS are the alternate method used to control respective waves. It is helpful for wave commanders or the platoon communicator to understand semaphore (i.e., signaling). See appendix F for illustrations of standard flags, lights, and markers used to control AAVs.

Hand and Arm Signals. Communications within an AAV wave may rely on hand and arm signals as a secondary or tertiary method of control. The AAV crew members must be familiar with the standard hand and arm signals used. See appendix E for illustrations of hand and arm signals used in AAV operations.

Organization for Amphibious Actions

An amphibious operation is inherently among the most complex operations to plan, involving air, Naval, and land units. To facilitate planning for movement and landing, troops and equipment must be organized into serials, boat teams, and landing categories.

Serials. A serial is an element or group of elements (e.g., people, vehicles, equipment, or supplies) within a series that are assigned a numerical or alphabetical designation to facilitate planning, scheduling, and control. A serial is embarked aboard the same ship and will land on the same beach at the same time. A serial number is a reference number assigned to each serial to identify each element of the landing force and those Navy elements to be landed prior to general unloading. Serial numbers are a means of identification, not a statement of priority, and are published in the serial assignment table, which is included in the landing plan. The planned order for landing serials is published in the landing sequence table of the landing plan. See appendix D for examples of the landing force serial assignment table and landing force landing sequence table. An example of a serial is an infantry company embarked aboard AAVs from the same ship that will land at the same beach at the same time.

Boat Teams. Serials are further broken down into boat teams, which are assigned positions in waves to maintain tactical integrity. For example, a rifle squad and its equipment are assigned in the wave formation in proper relation to other squads of the parent platoon to facilitate unit cohesion and employment on landing.

Normally, serials are assigned to landing craft or groups of landing craft. Boat teams are the tactical units or teams that are assigned to a particular landing craft; therefore, serials can have several boat teams or only one, depending on the number or capacity of the landing craft.

The serial designator of a boat team is a number followed by a dash and another number (e.g., 1-1, 1-2, and 1-3). The first digit indicates the wave number and the second indicates the position in the wave. The AAV with position number one is the vehicle farthest to the left facing the beach, or the first craft in a column, with the numbers going up from left to right.
Table 2-3 denotes a notional boat team organization largely composed of a rifle squad, labeled boat team 1-1, thus being the left-most vehicle of the first wave. Boat teams are made up of boat spaces, which are variables that account for the space and weight of personnel and equipment assigned to the landing craft or amphibious vehicle. These spaces are based on the requirements of individual equipment. An AAV's crew does not count against the boat spaces available.

Table 2-3. Notional Boat Team assigned to an AAVP7A1.

Boat Team	Personnel and Equipment	Boat Spaces
1-1	1st Squad, 1st Platoon, Company B	11
	Corpsman	1
	1st Machine Gun Team, Weapons Platoon, Company B	3
	81 mm Forward Observer Team	2
	Communicator	1
	Total passengers:	18

Landing Categories. Personnel, equipment, and supplies are further subdivided into one of five categories—scheduled waves, on-call waves, non-scheduled units, prepositioned emergency supplies, and remaining landing force supplies—based upon their importance to the operation and the planned times they will be needed ashore.

Scheduled Waves. Scheduled waves are units that have a predetermined time and place of landing. They consist of AA units, landing craft, or aircraft that carry the MAGTF assault troops and their initial combat supplies. After the waterborne waves have crossed the LOD, the landing of scheduled waves proceed without change, except in an emergency. Scheduled waves land according to the assault schedule. The AAVs and their embarked forces are typically landed in scheduled waves.

On-Call Waves. On-call waves consist of elements of the landing force expected to be needed ashore early in the operation; however, their time and place of landing cannot be accurately predetermined. They are subject to immediate or emergency call and are positioned to be readily available after H-hour on D-day (i.e., the day on which operations commence or are scheduled to commence). On-call waves consist of serialized combat units, combat support units, and CSS units, and are requested by tactical commanders ashore through the TACLOG group. Because the units in on-call waves have a high priority for landing, their number should be kept to a minimum consistent with transportation asset availability and expected requirements ashore. The landing of any other elements may be preempted to permit the landing of on-call waves. If an adequate numbers of landing craft are unavailable, on-call serials may wait aboard ship pending landing craft availability. The AA units can be assigned as on-call waves.

Non-Scheduled Units. The non-scheduled units are the remaining serialized units, with their CSS, that are expected to land before the commencement of general unloading. There is usually not an immediate or emergency requirement ashore for non-scheduled units. Tactical commanders request non-scheduled units by their serial numbers through the TACLOG group. Once started, the landing of non-scheduled units may be interrupted to permit landing on-call waves, prepositioned emergency supplies, or other selected supplies or equipment for which there is a greater requirement ashore. Non-scheduled units are generally moved ashore after completing scheduled landings by surface means, not via vertical lift aircraft. Amphibious assault vehicles are not normally employed in the landing of non-scheduled units.

Prepositioned Emergency Supplies. Prepositioned emergency supplies are designated by the landing force commander to meet anticipated critical needs for replenishment early in the ship-to-shore movement. These serialized supplies, available for immediate delivery ashore, are organized into floating dumps and pre-staged airlifted supplies. Amphibious assault vehicles are not normally employed as floating dumps.

Remaining Landing Force Supplies. Remaining landing force supplies are serialized, and consist of replenishment supplies and equipment not included in a unit commander's basic loads, floating dumps, or pre-staged airlifted supplies. For more information on landing categories, see JP 3-02 and MCTP 13-10E.

Free Boat. Free boats are AAVs or landing craft that are available to carry ashore commanders, unit headquarters, or other landing force personnel. The supported commander establishes the requirements for free boats. Requirements are weighed against the landing craft and AAV availability, since craft dedicated to this purpose are unavailable for troop lift except on a second-trip basis. The operation of free boats in the vicinity of the LOD and boat lanes prior to the landing of scheduled waves is coordinated with the PCO.

PLANNING

The planning phase of an amphibious operation normally extends from the issuance of an initiating directive that triggers planning for a specific operation and ends with the embarkation of the landing force. However, planning is continuous throughout the amphibious operation. It requires concurrent, parallel, and detailed planning by all participating forces. See appendix I for additional planning considerations.

Assault Amphibian Special Staff Officer

The AA unit leader is a special staff officer to the supported unit commander under the staff cognizance of the operations officer. The AA unit leader deals with matters pertaining to the employment of the supported unit's AAVs in the conduct of amphibious operations and subsequent operations ashore. Their staff responsibilities include the following:

- Advising on the assignment of AAVs to various classes of shipping based on each ship's capacity; the location of personnel, equipment, and supplies to be lifted; and anticipated employment ashore.
- Advising—from an AAV standpoint—on the optimum placement and distance from the AAV launch areas to the LOD and from the LOD to the beach.
- Advising on techniques for dismounting assault troops on the objective, including using AAVs in projected mechanized operations ashore.
- Advising on optimum AAV formations and timing of AAV waves.
- Assisting in planning for the employment of AAVs as mobile or floating dumps.
- Advising on the cargo carrying capacity of AAVs, the use of the vehicles in other roles, and the economy of such operations.
- Assisting the landing support officer in planning for CSS employment for AA units.
- Coordinating all aspects of AAV employment with naval control groups and ships involved with AAV operations.

- Advising on maintenance requirements for AA units, including the locations of maintenance areas ashore, the assignment of maintenance personnel to higher echelon maintenance units, the phasing of spare parts ashore, and probable breakdown rates.
- Advising on AA unit requirements for fuel and other petroleum, oils, and lubricants (POL) during operations ashore.
- Coordinating with unit logistics sections to plan for AA unit assistance in fuel resupply using the AA unit's organic refueling vehicles (i.e., trucks) or by transporting expeditionary fuel assemblies in AAVs.
- Assisting in planning for the employment of AAVs as CPs or observation posts.
- Assisting in planning for the employment of AAVs in unique operations such as river crossings, obstacle breaching, and operations in urban, jungle, or mountain environments.
- Advising on the employment of devices for controlling the movement of AAVs (e.g., signals or markers) during night landings and operations conducted in low visibility.
- Advising on safety requirements when personnel are to be embarked in AAVs and recommending training programs for units to be embarked.

Coordination. Although a subordinate element of the GCE, the AA unit leader is responsible to the CATF or the supported unit commander for the unit's ship-to-shore movement, as well as waterborne operations conducted in the amphibious objective area (AOA). The AA unit leader must conduct the necessary coordination with the Navy personnel responsible for planning and executing the operation. The AA unit leader should ensure adequate safety measures have been planned for the launch, recovery, and coordination of emergency procedures. The coordination must be conducted with the concurrence of the GCE commander and CLF and should support the GCE's scheme of maneuver. To ensure that the tenets of parallel and concurrent planning are adhered to, the AA unit leader should always participate in the planning of the amphibious operation to provide appropriate recommendations and expertise regarding AA operations. The AA unit leader should be collocated with the supported commander during planning and in communication with the supported higher unit during the conduct of the operation.

Estimates of Supportability. Planning continues with receipt of the order alerting elements of upcoming operations. The AA unit leader is responsible for providing appropriate recommendations regarding the unit's tactical employment, operational safety, and logistical support requirements. The estimates of supportability should be provided for each COA considered by the GCE commander for the ship-to-shore operation and subsequent operations ashore. The AA unit leader must support operational planning and should make recommendations regarding the following aspects of the operation:

- The mission and task organization of the AA unit.
- The assignment of AAVs to the various classes of shipping.
- Requests for essential elements of information from the Navy component intelligence staff officer and the GCE intelligence section.
- Estimates of supportability for proposed GCE courses of action.
- The scheme of maneuver for ship-to-shore movement.
- The development of the landing plan.
- The tactics, techniques, and procedures (TTP) of conducting an amphibious assault using AAVs.

- The capability of mine countermeasure configured AAVs to proof previously breached assault lanes and breach obstacles (e.g., wires or minefields) beyond the clearance coordination line.
- Night operations/landings.
- Rehearsals and associated preparatory training.
- Logistical requirements.
- Communications considerations.
- Personnel and vehicle recovery planning.
- Subsequent operations and tactics ashore.

Landing Plan

The landing plan is the compilation of detailed plans prepared by the landing force. It designates the forces going ashore and promulgates the means, organization, sequence, and landing priorities. In addition, the landing plan—

- Allocates blocks of serial numbers to subordinate commands.
- Coordinates GCE landing plans.
- Correlates the landing sequence for units not landing with the assault waves, but landing prior to general unloading.

The landing plan is the product of extensive planning and coordination between the CATF and the CLF and supports the GCE's maneuver ashore. The AA unit commander should actively participate in the formulation and execution of the landing plan. The GCE scheme of maneuver ashore is of primary concern in the development of the landing plan. The scheme of maneuver should be well understood by the AA unit's Marines to facilitate the planning and coordination of the ship-to-shore movement and subsequent operations ashore. Other factors include the combat load of the infantry being supported, their assigned objectives, and the commander's intent.

The landing documents completed by the landing force for the ship-to-shore movement are of vital concern to participating AA units. These documents assign AA units to elements of the landing force, prescribe loads, stipulate landing formations, and provide for AAV employment subsequent to the landing. Appendix G contains landing documents that are of specific interest to AA units.

Organization of the Amphibious Objective Area

The AOA is organized into operating areas to meet tactical requirements and to facilitate control of the ship-to-shore movement. The landing area is part of the AOA. Refer to JP 3-02 for a detailed discussion of the AOA.

The landing area diagram (see fig. 2-1) provides the overall picture of the seaward approaches in the landing area and overlays an appropriate scale chart. It graphically depicts the landing area's most important details, such as beach designations, boat lanes, the LOD, amphibious vehicle and craft launch areas, transport areas, and fire support areas in the immediate vicinity of the boat and landing craft, air cushion (LCAC) transit lanes. This diagram is prepared by the CCO.

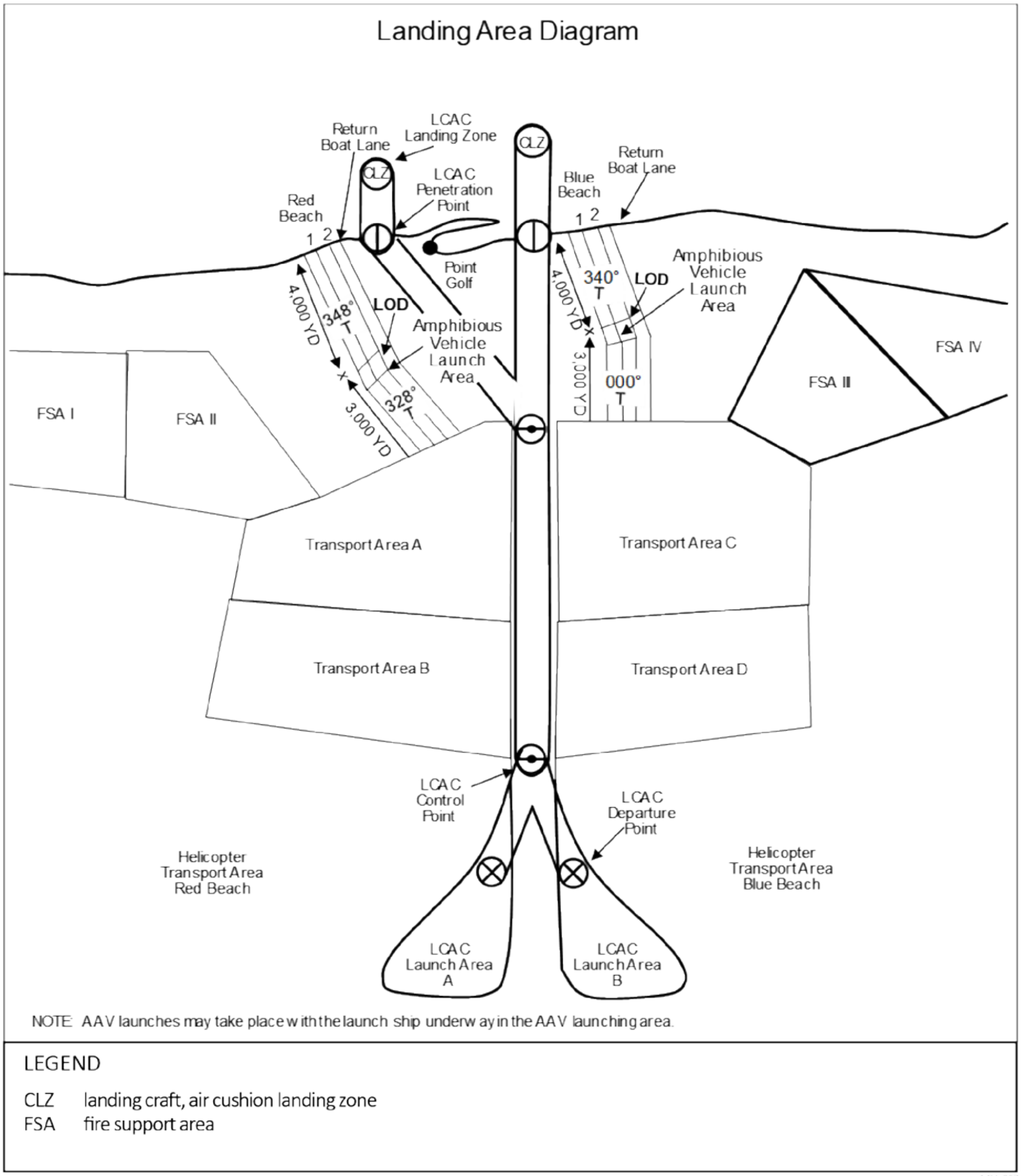
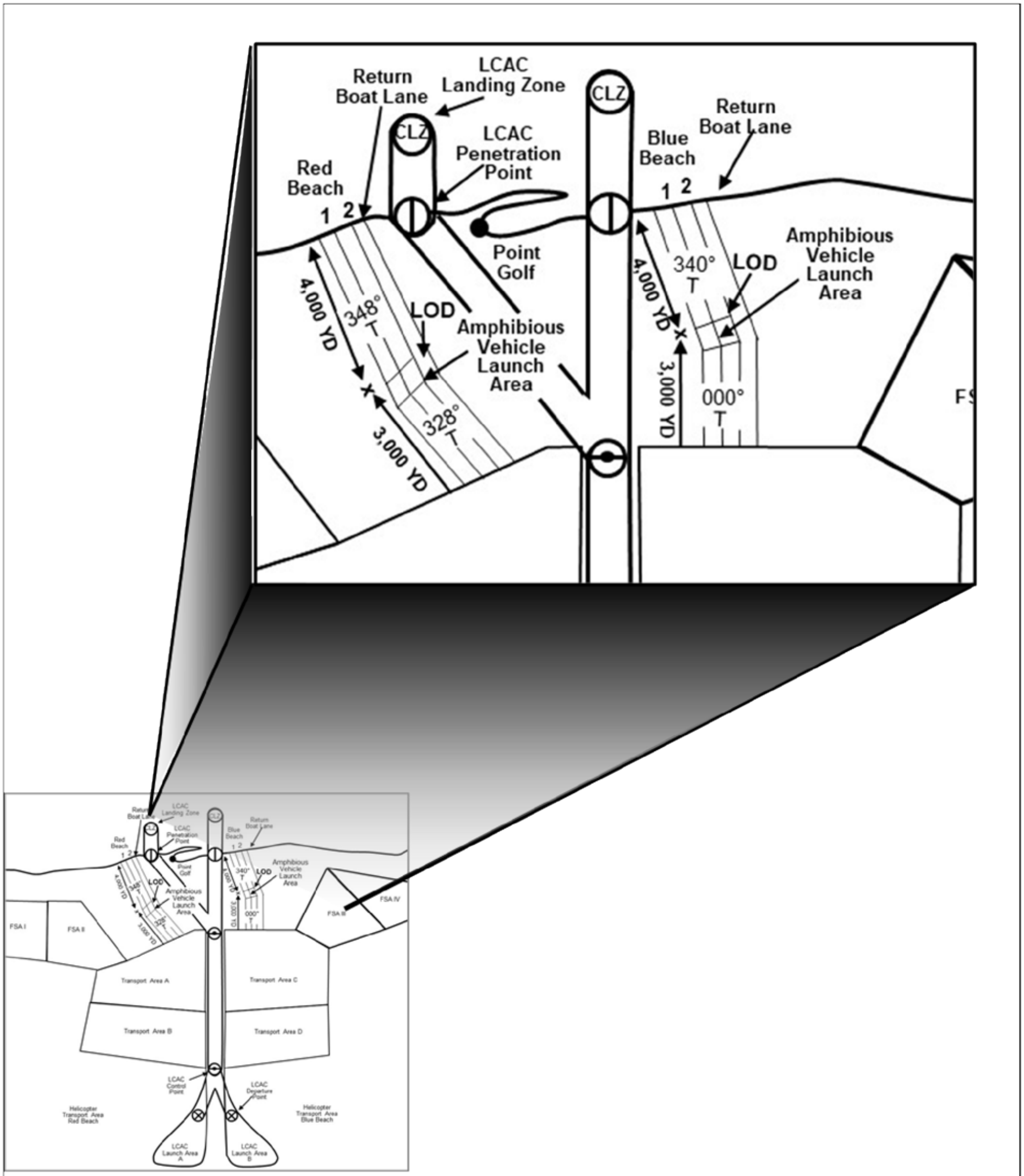


Figure 2-1. Landing Area Diagram.

Transport Area. The transport area is a designated portion of the AOA where one or more amphibious warfare ships debark troops and equipment for an amphibious operation. It supports one or more landing beaches, depending on the distance between them. A transport area may be divided into inner and outer sections. The outer transport area is located inside the screening area to which ships proceed upon entering the AOA. It is located sufficiently seaward of landing beaches to provide for effective protection against shore batteries or anti-ship missiles. Ships involved in the operation remain underway in this area and may initiate over-the-horizon operations or be phased into the inner transport area for a nearshore assault. The inner transport area is located as close to the landing beach as the water depth, navigational hazards, boat traffic, and known enemy weapon capabilities permit assault shipping to move to expedite unloading.

Amphibious Assault Vehicle Launch Area. The AAV launch areas (see fig. 2-2) are usually located as close to the seaward side of the LOD as possible (generally within 1,500 yards). Amphibious warfare ships carrying AAVs conduct either a static or an underway launch of their AAVs in this area. Upon entering the water, the AAVs are directed to the LOD or to an assigned maneuvering area to await dispatch to the LOD. The AA unit leaders should coordinate their launch to minimize loitering in the AAV launch area.



LEGEND

CLZ	cushion landing zone
FSA	fire support area
LOD	line of departure

Figure 2-2. Amphibious Assault Vehicle Launching Areas.

Approach Lane. An approach lane is an extension of the boat lane from the LOD toward the transport area. It indicates the route displacement landing craft—including AAVs—use to approach the LOD from the transport area. Generally, this lane is used when AAVs must launch further than 1,500 yards from the LOD or from launch distances as far as over the horizon. If necessary, a boat or buoys may be used to mark the approach lane; however, displacement landing craft are more often vectored to the beach by the PCS boat control team.

Control Ship Stations. Control ship stations are assigned to guide and control the ship-to-shore movement. These stations are generally assigned as underway sectors to avoid shore-based threats. If the enemy situation permits, these stations may be located on either flank of the LOD. When landing under limited visibility, AA unit leaders receive visual control signals from control ship stations for the ship-to-shore movement.

Line of Departure. In amphibious operations, the LOD is a suitably marked offshore coordinating line, located at the seaward end of a boat lane, use to assist in the landing of landing craft and amphibious vehicles on designated beaches at the scheduled times. It is a coordinating line from which successive assault waves are dispatched for their final movement ashore. If multiple beaches are being used, each landing beach has its own LOD. Topographic, hydrographic, and tactical considerations determine the specific locations of the landing beaches. If necessary, the LOD may be marked by the PCS, boats, or buoys; however, when scheduled waves are launched underway, the LOD may be unmarked. Displacement craft waves are dispatched to the beach from this line. A separate LOD may be provided for AAVs to reduce transit times.

Boat Lane. A boat lane extends from the LOD to the beach and is transited by amphibious assault landing craft moving ashore. Analysis of METT-T factors relative to the selected landing should be used to determine the width of the boat lanes. The most significant factors affecting lane width include environmental effects, enemy defenses, and the clearance or neutralization of naval mines. Refer to the grid reference system in appendix J for details. The flanks of the boat lane may be marked at the LOD by a control ship, marker boats, or buoys. The naval task force commander designates responsibilities for clearing mines or obstructions in the boat lane. The movement of AAVs from the AAV launch area to the beach up to the clearance coordination line is controlled by the PCS or secondary control ship, when designated. For more information, see Marine Corps Reference Publication (MCRP) 13-10J.1, *Mine Countermeasures in Support of Amphibious Operations* (designated NTTP 3-15.24 by the US Navy).

Return Boat Lane. A boat return lane is designated to the left or right of the boat lane to facilitate the return of landing craft or disabled AAVs seaward without interfering with the landing. Any AA units returning to their ships following a turn-away landing also use the boat return lane.

Landing Beach. A landing beach is the portion of a shoreline required to land an amphibious force. Beaches are colored and numbered to facilitate the identification and control of the force beachhead. Colored beaches are generally allotted to land elements of one unit or a regimental-sized unit, with numbered beaches supporting the landing of battalion-sized units within the regimental (i.e., colored) beach.

Cushion Landing Zones. Cushion landing zones are the designated landing areas for LCACs. Due to the unique operating characteristics of LCACs, LCAC transit lanes and cushion landing zones are located at least 500 yards away from boat lanes and landing points used by displacement craft such as AAVs or landing craft, utility.

Launch Planning

Launch planning is essential to the support of the established landing plan. It provides for the underway or static launch of AAVs from amphibious ships, the formation of waves, and the linkup with designated safety boats. This process can become more complex if the AAVs comprising the assault waves come from two or more ships. The AAV launch must be planned to facilitate the expeditious formation of waves to execute the landing plan. The AA unit leader must coordinate the proposed launch and ship-to-shore movement with the PCO, ship operations officer, boat officers, and ship's first lieutenant. Considerations for coordination include, but are not limited to—

- The ship's AAV launch/recovery safety criteria.
- The ship's ship-to-shore timeline.
- Serial numbers.
- Units.
- The relation of the AAV launch area with respect to the LOD.
- The ship's speed (if launched underway).
- Well deck lighting (if launched at night).
- Current and forecasted sea state.
- AAV staging for launch.
- Communications and signals.
- The launch interval between vehicles.
- The location and dispositions of other amphibious warfare ships in the AAV launch area, transport area, LOD, or boat lane (safe/boat havens).
- The location of guide boats.
- The coordination of safety procedures for AAV emergencies.

Amphibious Assault Vehicle Load Planning

As the result of the increased weight of combat loaded Marines, AAV systems and subsystems, as well as the number and type of weapon systems in the Marine Corps inventory, detailed load planning should be conducted in order to ensure the safe and effective employment of AAVs, especially while waterborne. Assault amphibian unit leaders shall ensure the distribution and weight of personnel and cargo to ensure combat loads remain within established capabilities and limitations.

Buoyancy. In regards to buoyancy, several factors influence AAVs when waterborne. The vehicle draft is the vertical distance from the waterline to the keel at the deepest point. Freeboard is the vertical distance from the waterline to the top deck of the hull. The correlation of these two points directly relates to the reserve buoyancy, or the volume of the watertight portion of the vehicle above the waterline. The reserve buoyancy with a given operational load can be determined by subtracting the weight of the loaded vehicle from the zero-freeboard weight. Figure 2-3 provides a graphic depiction of these definitions.

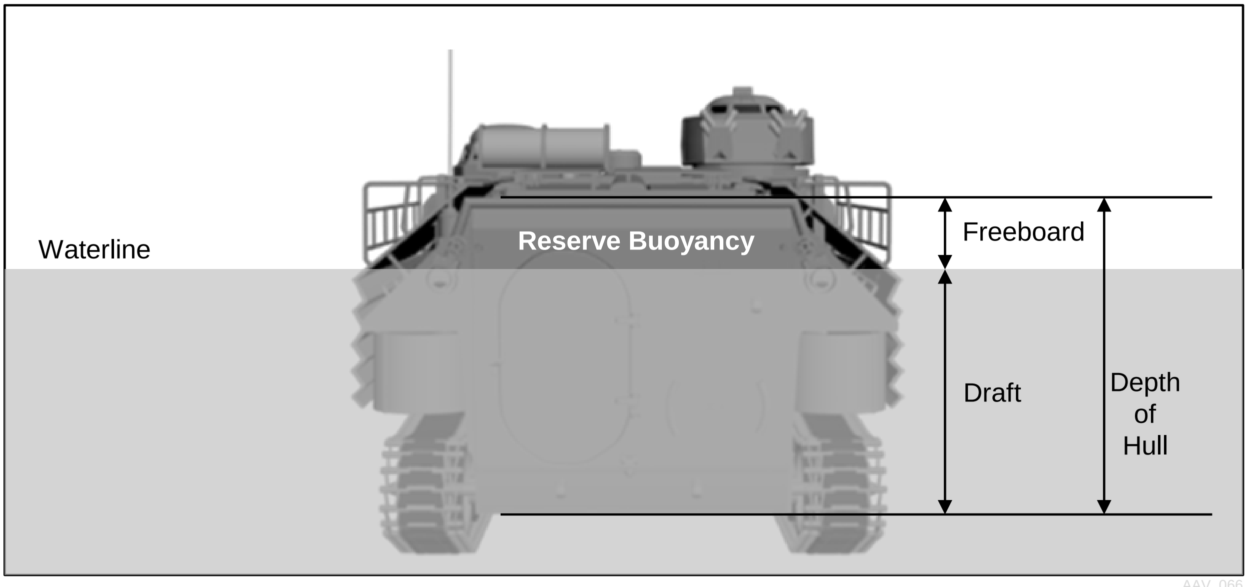


Figure 2-3. Amphibious Assault Vehicle Reserve Buoyancy.

Operational Load Conditions. Table 2-4 lists documented AAV operational load conditions by percent reserve buoyancy at various weight conditions. In the water, the maximum weight of the AAV before loss of buoyancy (i.e., sinking) is approximately 79,098 pounds. The maximum safe operational weight of an AAV is 62,904 pounds (e.g., the weight of a Mk-154 Mod 1 AAV). Increasing above the safe operational weight reduces an AAV's buoyancy and significantly increases the risk to its safe and effective employment. Therefore, any planned personnel and/or cargo weight ***IN EXCESS*** of 64,904 pounds requires the AA battalion commander's authorization during training. During combat operations, the factors in table 2-4 must be evaluated for risk relative to the assigned mission in order to prevent exceeding the AAV's operational capability.

Table 2-4. Reserve Buoyancy at Amphibious Assault Vehicle Operational Load Conditions.

Condition	Details of Vehicle Weight	Percent Reserve Buoyancy
Unloaded	48,060 Pounds (With EAAK, Less crew, fuel, OEM, and ammo)	39
Combat Equipped	52,504 Pounds (With EAAK, crew, fuel, OEM, and ammo)	34
Troop Loaded	58,489 Pounds (Combat equipped with troops)	26
Cargo Loaded	62,504 Pounds (Combat equipped with cargo)	21
Mine Clearance Kit	62,904 Pounds (Combat equipped with Mk-154)	20
LEGEND EAAK enhanced appliqué armor kit OEM operational equipment material		

Additionally, all gear stored within the personnel and cargo areas should be secured to prevent injury and maximize access to egress and evacuation points. Assault amphibian unit leaders must keep in mind that unsecured gear will become buoyant, block egress routes and points, and may become projectiles causing injury and/or death in the event of a vehicle mishap (e.g., rollover or submersion). Mission planning for amphibious and mechanized operations must include the passenger and cargo considerations listed below:

- 62,904 pounds is the maximum operational weight of an AAV and should not be exceeded.
- The weight of the AAVP7A1 with enhanced appliqué armor kit is 48,060 pounds (less crew, fuel, operational equipment material, and ammunition).
- The average combat loaded Marine weighs 360 pounds.
- The weight of radios, batteries, and other mission essential equipment.
- Class I, III, and V, including both AA and supported unit combat loads.
- Individual/crew sustainment equipment that does not need to be accessed to accomplish the specific mission should be waterproofed and secured to the exterior of the AAV utilizing the slope rack kit (i.e., “gypsy” rack) to the greatest extent possible in order to prevent blocking evacuation and egress routes.
- The uniformity of gear placement and storage across the AA unit.
- Extraneous equipment, as well as Class VI supplies (i.e., personal demand items), should be limited to mission requirements.

The maximum troop load for both vehicles consists of 3 crew members and 21 combat-loaded Marines. The maximum cargo payload for the AAVP7A1 is 10,000 pounds. Typical cargo loads include—

- Seventeen 55-gallon drums.
- 400 cases of meals, ready to eat.

- 138 cases of .50-caliber machine gun ammunition.
- Two 500-gallon fuel bladders.

Amphibious Assault Vehicle Maximum Ship-to-Shore Swim Distance

The maximum operating time for an AAV in the water is approximately seven hours under normal operating conditions. Advised by the AAV and supported unit commander, the distance from shore from which an amphibious warfare ship launches AAVs is normally determined by the ship's captain, considering METT-T and troop and crew fatigue.

> Note: When considering extended transit periods for amphibious assaults involving AAVs, Marines may experience observed changes in decision making skills and reaction times following two to three hours of waterborne motion exposure; the increase may also be associated to a rise of motion sickness symptoms. Physical coordination issues will be less dramatic, resulting in greater variability depending on physical conditioning prior to executing these types of missions. Decisions regarding the length of transit time for amphibious operations should factor in these performance changes when analyzing alternatives for amphibious operations.

EMBARKATION

The AAVs are normally embarked and transported to the AOA on the following amphibious warfare ship types: dock landing ship (LSD), amphibious transport dock (LPD), amphibious assault ship (multipurpose) (LHD), and amphibious assault ship (general purpose) (LHA), excluding LHA-7 and LHA-8, which lack well decks. Their employment to transport AAVs allows for—

- Rapid embarkation/debarkation of AAVs.
- Ease of maintaining and preparing vehicles for assault.
- The high-speed underway launch of AAVs on or near the LOD.

Amphibious Warfare Shipping Characteristics

Amphibious warfare ships have various characteristics that affect their capacity to transport AAVs. Each ship has a published ship's loading characteristics pamphlet that provides a guideline for AAV capacity and other limitations of the ship. Appendix K provides the estimated AAV capacities for the listed classes and variants of ships for planning purposes. Close liaison with the designated embarkation officer and ship's first lieutenant will provide the actual AAV spaces available for embarkation.

Embarkation Planning

Representatives of AA units must attend planning or pre-sail conferences to advise supported unit commanders and naval representatives on shipping requirements and recommended methods of embarking and employing their units. The resulting plans show the types and number of

AAVs to be carried by transport group or task force ships. Embarkation planning considerations for AA units include—

- The embarkation of vehicles and crews.
- The coordination of plans for underway launch with respect to embarkation.
- The embarkation of command, maintenance, and communication personnel; equipment; and wheeled vehicles to support AAV operations.
- The loading of supplies, POL, ammunition, and repair parts or equipment to support embarked vehicles.
- Staffing and equipping ships designated as AAV repair ships.
- Preloading the supported unit's equipment and cargo, as required.

Embarkation of Amphibious Assault Vehicles

The AAVs can move on dry land without entering the water (i.e., dry-loaded) pier side or at anchorage under the supervision of the embarkation officer or ship's first lieutenant; however, AAVs normally enter the water and transit out to the ship (i.e., wet-loaded) offshore. In doing so, AAVs are normally grouped on the beach according to the ship on which they will embark. Upon notification that the ship is ready for embarkation, the AAVs proceed to the ship for loading. The AA unit leaders must ensure the AAVs are embarked in the proper launching sequence for landing (i.e., the first vehicle on is the last vehicle off). Amphibious assault vehicles are primarily embarked on LSDs and LPDs; however, they are capable of being embarked aboard LHDs and LHAs also. See appendix K for information on embarkation procedures.

REHEARSAL

A rehearsal is the phase of an amphibious operation in which one or more exercises are conducted by the amphibious force, or elements thereof, under conditions simulating those of the anticipated amphibious operation. It is executed according to a plan that parallels the plan for the specific operation. Accordingly, the rehearsal participants should include the units that are to take part in the operation. Rehearsals are used to test the following:

- Plan and procedures.
- The timing of detailed operations, such as debarkation schedules.
- The combat readiness of vehicles and crews.
- Communications.

Planning Considerations

The AA unit leader must make time to attend all rehearsals; this may include planning personnel movement between the ships of the ATF. Leaders planning rehearsals should consider the number, nature, and scope of rehearsals, as well as the date, time, and location for each. Specific considerations for AAVs include—

- Delays involved in embarking and refueling AAVs aboard ship.
- Required repairs or replacement of AAVs damaged during rehearsals.
- Additional requirements for fuel, repair parts, and other related supplies.

The AA unit leader must participate in amphibious force debriefs to evaluate the rehearsal results and correct the shortfalls identified from the AA unit's perspective. Each rehearsal should also be critiqued within the AA unit.

Types of Rehearsals

Given the complexity of the mission assigned, the level of unit training, the time available, and operational security considerations, every attempt should be made to conduct staff rehearsals, rehearsals without attached and supported units, and integrated rehearsals with infantry before the landing.

Staff Rehearsals. Staff rehearsals are conducted by staffs participating in the operation and take the form of war games or tactical exercises without troops. They are conducted before integrated rehearsals and should include the use of the AAVC7A1's communications system and fire support teams.

Rehearsals Without Attached or Supported Units. A rehearsal without attached or supported units is an integrated rehearsal conducted by the AA unit. It generally involves a turn-away before the beach. Focusing on AAV and naval personnel, these rehearsals are conducted to perfect the command and control of the ship-to-shore movement. The timing of the ship-to-shore movement is the most critical aspect to evaluate and is vital to the successful coordination of naval surface fire support and air support. The AA unit leader should adjust the time and distance-to-shore factors with the PCS as required. Most PCOs plan on an average speed of five knots or less for timing AAV movement in the boat lane; however, consideration must be given to the effects of wind, currents, and sea conditions in the AOA in order to ensure an accurate timeline.

Integrated Rehearsals. The rehearsal with the supported unit is a final integrated rehearsal conducted, as nearly as possible, in accordance with the planned landing. It should involve extensive troop participation, including actions on objectives, and each rehearsal should be followed by a mission debrief. Ships conduct periodic embarkation drills in which the supported unit is called away to the designated staging area to practice embarking on their assigned AAVs. During the rehearsal, vehicle commanders guide their assigned supported unit (e.g., an infantry squad) in properly loading the AAV and review waterborne safety and evacuation procedures. Additionally, embarking supported unit leaders allows them to practice with the communication equipment, view the boat lane, and identify targets inland.

Pre-Operational Briefing

Before rehearsals, and again before the operation, pre-operational briefings should be conducted down to the lowest level. In addition to the regular operational briefs, AA unit personnel receive special briefs concerning the beach hydrography, weather, and amphibious control measures.

MOVEMENT

During movement to the AOA, a maximum effort is made to prepare Marines, machines, and equipment for combat, considering both the AA unit's and supported unit's SOPs. The AA unit leaders should allow time for the following activities:

- Equipment inspections, storing, and securing.
- Pre-operational checks.
- Communication checks.
- Weapon checks and test firing.
- Training for attached, supported, and AAV personnel, as required.
- Pre-combat checks and pre-combat inspections.

ACTION

The AA unit focuses primarily on providing the amphibious capability and direct fire support necessary for the surface assault elements to seize the landing force and ATF objectives. The CLF's concept of operations determines the nature of the landing. The factors of METT-T determine whether the amphibious landing will be conducted from nearshore or beyond. The nearshore assault is conducted from approximately 2,000 to 15,000 yards off the target landing beaches. Although the nearshore assault allows for launching AAVs outside the range of direct fire antitank weapons and for a short ship-to-shore transit time, it may require the amphibious ships to operate within the range of enemy weapons (e.g., missiles or mines). When launching AAVs and landing craft outside of the range of enemy weapons systems, the aforementioned time, space, logistical, and human factors become more difficult as distance increases.

Issue the Warning Order

Upon being alerted that a launch may occur, the AA unit leader should issue a warning order to personnel, which allows them to begin the following preparations for the actual launch:

- Drawing personal weapons from the ship's armory.
- Bore-sighting/checking crew-served weapons.
- Drawing and stowing ammunition aboard vehicles.
- Conducting pre-combat inspections and pre-combat checks.
- Conducting communications checks.
- Obtaining any updated intelligence or operational information.

Coordinate Intelligence and Launch Information

The intelligence and launch information must be updated and checked for accuracy prior to launch time. It is the responsibility of AA unit leaders to ensure this happens and the information is disseminated.

Hydrographic/Surf Conditions. Intelligence requirements should be checked and updated before launch. At a minimum, a current SUROB report must be analyzed to determine if it is or will be safe to launch AAVs.

Center Beach Location. Coordination on the exact location of center beach and the marking plan should be conducted before launch. The coordinates for center beach location are entered into the Defense Advanced Global Positioning System Receiver (i.e., DAGR) aboard AAVs landing in all waves. Additionally, this system is used by Mk-154 Mod 1 AAVs to navigate to designated firing points as required. The AA unit leader should ensure that the ATF's plot for center beach is consistent with the landing force's concept of operations ashore.

Boat Lane Length/Width. Boat lane lengths and widths are based on METT-T. The AA unit leader should check assigned boat lanes for accuracy.

Launch Track. If an underway launch is planned, the ship's approach to the launch site or launch track should be checked. The approach that the ship takes will greatly affect the launch and landing of AAVs. The underway launch tracks employed by the Navy are covered in appendix J.

Launch Speed and Interval. The speed of the ship affects the interval between AAVs in time and distance. The interval is a function of ship speed at launch, the width of the area AAVs are to be launched in, and the number of AAVs to be launched. The minimum safe interval between vehicles is five seconds. Intervals of at least 15 seconds are needed at speeds less than 10 knots to provide for a safe distance of 50 meters between vehicles in the water after launch. Launch control must ensure that each vehicle clears the ship's wake before another AAV is launched. The AAVs may be launched singularly or by two columns from LPDs, LSDs, LHAs, and LHDs. Table 2-5 can be used to adjust the spacing between vehicles in the water.

Table 2-5. Amphibious Assault Vehicle Launch Intervals.

Speed of Ship (knots)	50-Meter Interval	60-Meter Interval	70-Meter Interval
	(seconds)		
0	12	14	16
2	11.2	13.1	15
4	10.2	12.2	14
6	9.5	11.3	13
8	8.9	10.5	12.2
10	7.5	9.5	11
12	6.3	8.7	10.1
14	5.5	7.5	8.8
16	5	6.7	7.8
18	5	6	7
20	5	5.3	6.2

Launch Criteria. The ship ensures that proper safety procedures for launching AAVs are followed. Various types of ships have different criteria. The AA unit should know the correct launch parameters for the following criteria:

- Stern gate position.
- Vent fan status.
- Ship's ballast position.
- Water depth at the sill.
- Maximum ship speed.

Squat Draft. The ship's captain will be concerned with the effect the ocean's bottom has on the ship as it travels at high speeds. The launch track should avoid large variations in water depth, especially at depths less than 100 feet. Transiting from deep water to relatively shallow areas causes the ship to squat. The resulting increase in water depth over the sill or in the well is undesirable and extremely dangerous, causing AAVs to lose steering control during launches, collide with the bulkheads, and get caught in the ship's wake. In some cases, this squat draft effect may increase the draft as much as 8.5 feet deeper than the pre-selected ballast draft. To reduce this effect, either a reduction in speed is required or the pre-selected draft must be reduced to allow for squat. The AA unit leader should be aware that significant squat draft occurs in depths less than 60 feet.

Approach Lane Length. The ATF staff determines the approach lane length considering METT-T and input on vehicle capabilities from the embarked landing force units, including the AA unit. The total approach lane and boat lane distance should not exceed the AAVs' range unless underway refueling is planned.

Debarkation from Shipping

The following procedures are a general outline for conducting debarkation from amphibious warfare ships. See appendix K for more additional debarkation procedures.

The Navy control group establishes the time for AAV launching and provides for the calculated launch time, wave formation, ship-to-shore transit, and landing in accordance with the assault schedule. Each ship publishes a ship-to-shore timeline that details the exact time each event will occur. Normally, AAV crews board their vehicles at least one hour before the scheduled launch time to conduct the required pre-water operations checks and any necessary repairs.
The officer in charge of the well deck orders the start-up and warm-up of vehicles. The embarked unit leader ensures their Marines are embarked according to the landing craft and amphibious vehicle assignment table and serial assignment table. Commanders of AAVs supervise the embarkation of the assigned personnel. A written manifest for each AAV must be prepared, life jackets must be issued and put on, and appropriate safety briefs must be given to the embarked troops. Before launching AAVs, designated naval personnel guide or stage each vehicle into its launch position. The AAV crews close the rear personnel and cargo hatches and plenums before staging. The driver, troop commander, and vehicle commander hatches are closed no later than two minutes before launch. Naval personnel in the launch control station supervise and conduct the launching of AAVs, during which light and flag signals are used.

To debark AAVs from static or underway amphibious warfare ships, the AA unit leader conducts close small-unit liaison with the respective ship's personnel. Issuing the warning order and coordinating intelligence and launch information are vital to the success of the operation.

Launch Vehicles. There are two methods for launching AAVs from amphibious warfare ships: underway launch and static launch.

Underway Launch. The underway launch of AAVs combines the elements of speed and surprise (see appendix J for underway launch illustrations). This technique should be used whenever minimum exposure time is desired for the protection of the ATF. The underway launch does not require the congestion of ships anchored about the LOD. As an example, two LSDs carrying 46 troop-laden AAVs can make a high speed (21.5 knots) angled approach to an LOD that is 2,000 yards from a target beach. The AAVs can be launched in two columns at five-second intervals and, within two minutes, 48 vehicles will be waterborne. Within 11 minutes, an infantry battalion will be ashore and the amphibious warfare ships will be quickly approaching the horizon.

Static Launch. The near-static or at-anchor launching of AAVs may be required by the hydrographic size or depth limitations of the AAV launch area from amphibious warfare ships. The static launch requires a greater launch interval between vehicles. The AAVs should enter the water at a speed sufficient to clear the end of the stern gate without striking towing pintles.

> Note: An LCAC can, for example, deliver a mechanized raid force comprised of AAVs to a launch point seaward of the landing beach. The launch is conducted across the stern gate while the LCAC is off-cushion. Special coordination is required and rehearsals are vital. The LCAC cannot, however, conduct an at-sea recovery of the AAVs. For more information, see Navy Warfighting Publication 3-02.12, *Employment of Landing Craft Air Cushion (LCAC).*

Movement to the Line of Departure. After the AAVs have entered the water in column, each wave commander reports to the PCO/PCS on the Boat Bravo net and commences movement to the LOD. Each wave, in turn, forms on line and maneuvers across the LOD by executing a flanking movement. The primary method of control for vehicles in the water is radio. During daylight landings, the PCS will use semaphore as a secondary signal plan. The PCS will hoist a numeral-one flag at half-mast five minutes before the first wave is to cross the LOD. The first wave then moves to a position just seaward of the LOD. Two minutes before crossing, the flag is hoisted to the top and when the flag drops, the first wave crosses the LOD. For succeeding waves, only the two-minute warning and execute signals are given, using the numerical flag corresponding to the wave being dispatched.

Rate of Advance. The vehicles' speed afloat will depend on the wave's scheduled progress down the boat lane and should average slightly over five knots. Each driver within the wave can set uniform engine revolutions per minute (RPM) to establish and maintain the desired speed. The initial speed or RPM should be set before launch. Upon reaching a point 1,000 yards from the beach, the wave commander orders battle speed. At this point, the AAVs close their hatches and advance to maximum speed. Once inside small arms range, speed is more important. Table 2-6 lists calm water speed for each designated engine RPM.

Table 2-6. Revolutions Per Minute/Speed Conversions.

RPM	MPH	Knots
1500	5.7	5.0
1700	6.4	5.6
1900	7.3	6.3
2000	7.6	6.7
2300	7.7	6.9
2500	8.1	7.0
2800	8.2	7.1

Grid Reference System. The AA units use the grid reference system to control AAV waves moving across the LOD and down the boat lane until the waves land on their assigned beach. A standard voice procedure is used to reduce voice transmission to a minimum while transmitting accurate positions to the waves (see appendix G).

Formations. The wave commander's senior AAV leader in each wave will establish the formation, vehicle interval, speed, and direction of movement within the boat lane. The line, column, wedge, and echelon formations may be employed when conducting landings. See chapter 1 for more information regarding formations.

Obscuration. The AAV is equipped with a smoke generation system. The effective use of this system can enable the assaulting force to obscure its advance and the advance of follow-on waves. The system is most effective with an onshore wind. The employment of AAV smoke generators is normally ordered at the same time as battle speed. The vehicle's smoke grenade launchers should be saved for obscuration of a specific threat once ashore.

Actions on the Beach. Once a wave lands, the wave commander reports to the boat control group over the Boat Alpha net. If the enemy situation permits, the AAVs should continue through the beach inland, across the clearance coordination line, to make room for subsequent landing craft and to avoid becoming targets for enemy fires. If AAVs are required to dismount infantry, they should avoid stopping in the open. Upon the infantry's debarkation, AA units should establish a defensive posture, continue to provide fire support as required, and await further orders.

Re-Embarkation and Force Re-Aggregation

Upon completion of actions ashore, whether successful or otherwise, the landing force units must normally be re-embarked aboard amphibious warfare shipping. This retrograde may or may not happen under pressure from enemy forces. The pressure will determine if it is conducted deliberately or hastily.

Shore Launch Procedures

A SUROB report must be completed prior to any AAVs entering the water. Once complete, the SUROB report is sent to the controlling ship along with the following confirmations:

- The pre-water operational checks have been completed.
- The passengers have been briefed, instructed, and embarked.
- The manifest list has been submitted to the unit leader.
- Permission has been received to launch.

A designated unit leader controls the launch of the AAVs into the water. When satisfied that the AAVs are ready for waterborne operations, the unit leader launches the AAV by visual signal or radio. The launch interval will depend on the sea state, tactical situation, and conditions within the surf zone.

Deliberate Launch. This method involves lining the vehicles up either side by side or in a column on the beach and launching from a secure area while utilizing a launch team. Once personnel are in place, the AA unit leader establishes communications with the ship, designates personnel to conduct the SUROB report, and ensures that pre-water operation checks are conducted. The designated unit leader controls the launch of each vehicle via splash teams, using either radio or hand-and-arm signals, in an order that facilitates embarkation for the proper launching sequence. The AA unit leader coordinates the following information with the ship:

- Launch time (i.e., when will the ship be ready?).
- Launch point (i.e., where is the unit located?).
- Embarkation point (i.e., where will the ship be located?).
- Type of recovery (i.e., static or underway).
- The SUROB report.
- The use of guide boats.
- Recovery procedures for disabled vehicles.

Hasty Launch. The tactical (combat) launch is normally used when withdrawing from a hostile or potentially hostile beach. Units should maintain local security at all times prior to launching, at the shoreline or at the last covered and concealed position prior to arriving at the shoreline (e.g., a secure rally point located further inland). The AAVs should enter the water soon after the pre-water operations checklists have been completed to ensure water-tight integrity is maintained. Typically, the defensive perimeter is established with infantry deployed slightly forward of the AAVs to provide local security. Forming a defensive perimeter will spread the AA unit over several hundred meters and will rely heavily on the individual vehicle commanders and section leaders for control and safety. The AA unit leader must conduct the same coordination with the ship that is required for a deliberate launch.

LIMITED VISIBILITY OPERATIONS

The concept of limited visibility operations must be simple and provide for the seizure of easily recognizable objectives. A desire to minimize amphibious force vulnerabilities to threat weapon systems, to attain secrecy in landing raid or reconnaissance units, and to achieve tactical surprise are the principal factors motivating the conduct of limited visibility ship-to-objective operations. Planning for a limited visibility landing is similar to that for daytime amphibious operations; moreover, such plans must provide the greatest possible detail on the landing beaches, seaward approaches, terrain, enemy situation, and obstacles to movement. Planners should consider the preparation, night launches, and formations and speed, as well as beach markings.

Preparation

The AA units must be trained in limited visibility operations before conducting an operation with embarked troops. Personnel must be thoroughly briefed on the operation, to include emergency procedures (see appendix L). Communications and signals for the AAV launch and ship-to-shore movement must be coordinated with the PCO and ship's launch control.

Each vehicle should be equipped with night vision equipment. Personnel overboard and marking procedures should be reviewed and rehearsed. Based on METT-T, vehicle lights or chemical lights may be used to mark each vehicle in the unit, with special attention to minimizing signature emissions. After pre-operational checks are made, approximately 30 minutes prior to launch, the lighting in the well deck should be changed to red to enable AAV crews to adjust to the dark. The well deck lights should be switched off when the stern gate is lowered to minimize the ship's visual signature during the launching of AAVs.

Night Launches

Appendix E contains the light signals to be employed for the staging of vehicles and subsequent night launching. To avoid a possible collision in the darkness, the launch control officer must ensure that each waterborne AAV clears the ship's wake before launching the next AAV. The last vehicle to enter the water should provide a pre-determined signal to the wave commander.

Formations and Speed

Depending on the degree of visibility, line or wedge formations may be used during a night operation; however, the close column is the preferred formation for ease of control at night. The wave can form a close wedge formation before landing. The vehicle interval should be between 30 to 50 meters, depending on the limit of visibility. Before launch, the wave commander should establish the engine RPM setting for the ship-to-shore movement to maintain an established speed and minimize the accordion effect within the column.

Beach Markings

The CATF, in coordination with the CLF, plans the necessary approach and return lanes, checkpoints, rendezvous points, and navigational aids to help control and coordinate the ship-to-shore movement. In addition, the CATF and staff should consider METT-T when planning for the center and flank markings of the landing beach. Appendix F contains standard light symbols used to indicate various parts of the beach. Infrared strobe lights or chemical lights used to mark the beach will assist the wave in reaching center beach during periods of reduced visibility.

CHAPTER 3
THE OFFENSE

Offense is the decisive form of war; success in battle is achieved by offensive action. Even though defensive operations are often necessary, a commander must take every opportunity to seize the initiative through offensive action. Commanders conduct offensive operations to wrest the initiative from the enemy, gain freedom of action, and generate effects to achieve objectives while imposing their will on the enemy. For more general information on the offense, see MCWP 3-01.

A mechanized force is primarily offensive in nature; only in the offense can the commander fully exploit its mobility, firepower, and shock action. The AA unit provides an important component of the requisite armor-protected mobility and firepower that enables the MAGTF commander to conduct offensive mechanized operations.

TYPES OF THE OFFENSE

The four types of offensive operations are movement to contact, attack, exploitation, and pursuit. At the small unit level, particularly at the individual AAV level, crew actions are essentially the same for these types of operations. The AA unit must be trained and organized to pass immediately from one type of operation to another.

Movement to Contact

Movement to contact is an offensive task designed to develop the situation and establish or regain contact. The two types of movement to contact are an approach march and search and attack. The capabilities of AAVs make them valuable assets for movement to contact. Some of the fundamentals of movement to contact include:

- Focus all efforts on finding the enemy and forcing the enemy to reveal its positions or strength.
- Make initial contact with the smallest force possible to develop the situation and avoid decisive engagement with the enemy's main body until a time of the commander's choosing.
- Task-organize and use movement formations that enable the force to deploy and attack rapidly in any direction.
- Keep subordinate forces within supporting distances to facilitate a flexible response.
- Maintain contact once contact is gained, regardless of the COA adopted.

For a detailed explanation of movement to contact and its types, see MCWP 3-01.

Approach March. An approach march is the advance of a combat unit when direct contact with the enemy is imminent. Troops are fully or partially deployed. The approach march ends when ground contact with the enemy is made or when the attack position is occupied. (MCRP 1-10.2, *Marine Corps Supplement to the DOD Dictionary of Military and Associated Terms*). A commander employs this type of movement to contact when the enemy is operating in larger, organized elements whose locations may be generally—but not specifically—known, when seeking to gain or regain contact with the enemy and develop specific information on their disposition, or when contact is possible and security is more important than speed.

A force conducting this type of maneuver is organized, at minimum, into a forward security force (i.e., either a covering force or an advance guard) and a main body. Commanders may add rear and flank security if the situation requires additional force protection measures.

Security Forces. The security elements (i.e., the forward security force and rear and flank security, if assigned) protect the movement of the main body and develop the situation to prevent the main body from becoming decisively engaged before a time of the commander's choosing. The forward security force is normally the unit's initial main effort, and is also responsible for mobility and countermobility tasks in support of the main body. By observing and reporting enemy activity, the security force protects the unit from surprise. In addition, the security force—

- Reports enemy contact to the unit commander.
- Collects and reports information about the enemy.
- Selects tentative fighting positions for oncoming units.
- Attempts to penetrate enemy security elements to reach and identify the enemy main body.
- Performs chemical, biological, radiological, and nuclear (CBRN) and engineer reconnaissance.
- Bypasses or breaches obstacles (i.e., hasty breach).

> Note: Despite the AAV's mobility and firepower, it is not normally used as the security force due to its large profile and noise signature. Amphibious assault vehicles are more frequently located in the main body.

Main Body. The main body consists of forces not tasked to security duties. It is normally the element that conducts the decisive operation within the movement to contact, and a portion of it is normally designated as the reserve. The combat elements of the main body prepare to respond to contact with enemy security forces. A mechanized infantry unit augmented by tanks and combat engineers permits the greatest amount of flexibility in response to enemy contact through its firepower, mobility, and ability to mass forces at the decisive point. In addition, this combined team can breach obstacles to maintain momentum, secure terrain, and clear small villages and wooded areas.

Search and Attack. The search and attack is a method of movement to contact used to develop the situation, deny the enemy or threat forces the ability to operate in a given area, or when operating in small, dispersed elements. Commanders employ this form of movement to contact when the enemy force consists of small, dispersed elements whose locations cannot be accurately determined other than by a physical search, when the task is to deny the enemy the ability to move within or operate from a given area, or as a possible method of conducting a clearing task.

Units conducting search and attack must accomplish reconnaissance, fixing, and finishing functions. Units execute these functions in one of two ways. In the first instance, units can task-organize themselves into standing reconnaissance, fixing, and finishing elements. Shaping/supporting efforts locate and fix various enemy units, while the main effort finishes them—the decisive action. In the second instance, a unit executes search and attack by function. All subordinate elements execute the reconnaissance function. When an enemy force is found, unengaged units are assigned to the fix (i.e., supporting) and finishing (i.e., decisive) functions. Due to the AAV's capabilities (specifically mobility and firepower), they are usually tasked as either an element of the fixing or finishing force. For more information, see MCWP 3-01.

Attack

An attack is an offensive action characterized by coordinated movement, supported by fire, to defeat, destroy, or capture the enemy or seize and/or secure key terrain (see MCWP 3-01). Attacks may be either decisive or shaping actions, and either hasty or deliberate, depending on the time available for assessing the situation, planning, preparing, and executing.

A ***hasty attack*** is conducted when the commander decides to trade preparation time for speed to exploit an opportunity. It takes advantage of audacity, surprise, and speed to achieve the commander's objectives before the enemy can effectively respond. The commander launches a hasty attack with little preparation, with the forces at hand or in immediate contact with the enemy, before the enemy can concentrate forces or prepare to counter the attack effectively.

By necessity, hasty attacks do not employ complicated schemes of maneuver and require minimal coordination. Habitual support relationships, SOPs, and battle drills contribute to increased tempo and the likelihood of a successful hasty attack. Unnecessary changes to the force's task organization should be avoided to maintain momentum.

A ***deliberate attack*** is the pre-planned employment of firepower and maneuver to close with and destroy or capture the enemy. Deliberate attacks usually include the coordinated use of all available resources. They are used when the enemy cannot be defeated with a hasty attack or there is no apparent advantage that can be rapidly exploited.

Main and supporting efforts are planned and coordinated throughout the battlespace, along with the forward positioning of resources, to ensure the optimal application of the force's combat power. The commander must position follow-on forces and the reserve to best sustain the momentum of the attack. Deliberate attacks may include time for rehearsals and refinement of attack plans. The commander must weigh the advantages of a deliberate attack with respect to the enemy commander's reaction and their own ability to create or improve their offensive or defensive posture, develop the intelligence picture, or take counteraction.

Organization of Forces. Upon selecting a scheme of maneuver, the commander task-organizes the force to give each unit enough combat power to accomplish its mission. An attacking unit is normally organized into a security force, a main body, and a reserve, all supported by organic CSS assets, the LCE, and the aviation combat element. Whenever possible, changes to task organization occur in time to allow units to conduct rehearsals with their attached and supporting elements.

Security Forces. Under normal circumstances, a commander creates security forces in an attack only if the action will uncover the flanks or rear of the attacking force as it advances. Normally, an attacking unit does not need extensive forward security forces; most attacks are launched from positions in contact with the enemy, which reduces the usefulness of a separate forward security force. Exceptions occur during limited visibility attacks, or when transitioning from an operation in which a security force already exists, such as a movement to contact or the defense.

Main Body. The main body is a combined arms formation designed to conduct the decisive action and necessary shaping actions. It focuses on delivering the main effort to the point of decision. The subordinate unit or units designated as the main effort can change during the course of the attack. The commander designates an assault, breach, and support force, if the commander expects to conduct a breach during the attack.

Reserve. In the attack, the reserve exploits success, defeats enemy counterattacks, or restores momentum to a stalled attack. The reserve is not normally committed to any other task, such as follow and support. A reserve must have mobility equal to or greater than that of the enemy. For mounted and armored reserve forces, the key factors are cross-country mobility and the availability and trafficability of road networks.

The AAV's capabilities allow the reserve to respond to trouble spots quickly or to exploit an unexpected gap in the enemy's defense. Its speed, furthermore, allows it to exploit this gap from greater distances and over rugged terrain that other types of vehicles might not be able to negotiate. Additionally, bodies of water that are obstacles to other GCE units may provide avenues of approach for AA units. The commander can plan the use of the reserve along the avenues through which the enemy would not normally expect a unit to maneuver.

Types of Attack. In addition to the general attack, commanders often conduct a special purpose attack—amplified in the following subparagraphs—to create different effects. A single attack that results in the complete destruction or defeat of the enemy is rare. Commanders must capitalize on the resulting disruption of the enemy's defenses through exploitation to reap the benefits of a successful attack.

Spoiling Attack. A spoiling attack is a tactical maneuver employed to seriously impair a hostile attack while the enemy is in the process of forming or assembling for an attack. The speed, communications assets, and firepower of the AAV, along with its embarked infantry, provide a viable platform to conduct a spoiling attack.

Counterattack. This is an attack by part or all of a defending force against an enemy attacking force to regain lost ground, cut off or destroy enemy advance units, or deny the enemy their purpose in attacking. A mechanized force is ideal for a counterattack due to the inherent capabilities of the armored vehicles.

Feint. A feint is a supporting attack that involves contact with the enemy to deceive them about the location or time of the main offensive action. It is a limited-objective attack to make direct fire contact with the enemy without becoming decisively engaged in order to draw the enemy's attention and force them to employ their reserves improperly, shift supporting fires, or reveal their defensive fires. The combat power available in a mechanized force provides sufficient strength to convince the enemy of its intent to attack. Given AAVs' inherent attributes and their ability to mass combat power and conceal the force's true intentions from the enemy, this type of mission is one that the AA unit is uniquely capable of handling. A feint may not require the use of embarked troops.

Demonstration. A demonstration is an attack or a show of force on a front where a decision is not sought, made with the aim of deceiving the enemy. A demonstration, like a feint, is a supporting attack. Unlike a feint, however, contact is not made with the enemy. Assault amphibian forces have been successfully used as a demonstration force in the past and are exceptionally capable of conducting this type of operation.

Reconnaissance in Force. A reconnaissance in force is a deliberate attack made to obtain information and to locate and test enemy dispositions, strengths, and reactions. It is used when knowledge of the enemy is vague and there is insufficient time or resources to develop the situation. A reconnaissance in force is not a decisive attack and is normally conducted to test enemy reactions or cause the enemy to reveal themselves for targeting. It is different from a movement to contact in that units conducting a reconnaissance in force are normally already in contact with the enemy or have relative certainty about the enemy locations, and possibly even enemy dispositions. When the terrain is suitable, AAVs' speed and armor protection can enable a reconnaissance in force and help it avoid decisive engagement.

Raid. A raid is an attack, usually of a small scale, involving a penetration of hostile territory for a specific purpose other than seizing and holding terrain. It ends with a planned withdrawal upon completion of the assigned mission. The inherent capabilities of the AAV make it the optimal platform for raids; specifically, its amphibious capability, which enables the use of all avenues of approach, including bodies of water.

Ambush. An ambush is a surprise attack by fire from concealed positions on a moving or temporarily halted enemy. Ambushes seek to stop, disrupt, or destroy enemy forces by maximizing the element of surprise. Ambushes employ direct fire systems as well as other means, such as command-detonated explosive ordnance and indirect fires. An ambush may include an assault to close with and destroy enemy forces. The firepower and armor protection of AAVs may be assets when conducting an ambush, though their noise and signature may be liabilities.

Limited Visibility Attack. Limited visibility conditions include smoke, haze, snow, rain, fog, and darkness. While attacks conducted during limited visibility tend to be more deliberate in nature than a daylight attack, they possess significant tactical and psychological advantages over a lesser capable enemy. Limited visibility attacks may require more detailed preparation than attacks during good visibility, and the distances to objectives may be closer. Plans must be simple, complete, and easily understood. If time and the enemy situation permit, leaders should reconnoiter routes and observe the objective area during good visibility. Night attacks, the most common type of limited visibility operation, are conducted to—

- Achieve surprise.
- Avoid heavy losses.
- Exploit success and maintain momentum.
- Keep the pressure on the enemy.
- Exploit the advantage of night vision devices.

The physical and psychological effects created by limited visibility attacks may reduce individual effectiveness and increase the difficulty of performing most tasks. Rehearsals for a non-illuminated attack must include all hands, whether the attack is mounted or dismounted, to facilitate control during the attack. The mechanized unit commander must anticipate control, movement, and navigational problems and must plan additional time to accomplish the mission. Mechanized units' night vision and navigational capabilities are advantages during a night attack, though their noise and increased signature could be detrimental.

Illuminated Attack. The planning considerations for an illuminated attack using a mechanized force are similar to those of a daylight attack. The duration of illumination must be carefully planned, as the transition from a planned illuminated attack to a non-illuminated attack involving dismounted infantry and AAVs can be confusing. During the assault, the AA leader must closely control direct and indirect fires to avoid endangering the dismounted Marines. When consolidating with dismounted troops, the infantry unit leader should select positions on the objective for the AAVs and require each rifle squad to provide a ground guide to simplify AAVs' movement into positions.

Non-Illuminated Attack. Non-illuminated attacks can be conducted during any type of limited visibility. The main advantage gained by attacking without illumination is surprise. This is achieved in most cases by maneuvering as close to the enemy's position as possible without being detected before attacking and overwhelming them before they can react. In this scenario, the objective should be relatively close to the line of departure (LD), ideally within range of supporting fires from the AAVs.

Even though a non-illuminated attack is planned, the mechanized unit leader should plan to employ illumination from the LD to the objective so it is available if needed. Close coordination between the mechanized unit leader and the AA unit leader should ensure effective illumination coverage is provided for the proposed axis of attack, if required. The use of smoke during the attack should also be planned in the event that the enemy fires illumination rounds. The AAVs' smoke generators may supplement this requirement.

The nature of night movement is greatly affected by the amount and types of night vision equipment available to the mechanized force. Amphibious assault vehicles are equipped with thermal vision devices for drivers, troop commanders, and vehicle commanders. The thermal sight in the gunner's station can greatly assist in maneuver and enemy targeting at night. Additionally, AAV drivers and vehicle commanders should also be equipped with night vision devices. While night vision devices greatly enhance the ability to move at night, they do not eliminate the need for control techniques. It must also be considered that the enemy may possess the same capabilities.

Exploitation

An exploitation follows a successful attack and is designed to disorganize the enemy in depth. It extends the initial success of the attack by preventing the enemy from disengaging, withdrawing, and reestablishing an effective defense. A mechanized force is ideally suited for exploitation because of its inherent speed, mobility, firepower, and shock action. When working with non-mechanized forces, mechanized forces may be held in reserve and committed to an exploitation after a deliberate attack. The purpose of the exploitation is to take advantage of the enemy's loss of a defensive position by continuing the attack, increasing the tempo of operations, restricting their time to react, and destroying their cohesion. An exploitation operation ends when—

- The enemy loses their ability and will to fight and a pursuit is initiated.
- Enemy resistance increases, requiring a deliberate attack.
- The force conducting the exploitation can no longer be supported or sustained.

An exploitation is conducted similar to a movement to contact with numerous hasty attacks. It is normally assigned to a battalion-sized unit or larger. Orders should emphasize decentralized execution. Deep objectives are selected. Company-sized mechanized units normally attack on a narrow front as part of a task force or regiment employing multiple axes. Enemy resistance of insufficient strength to jeopardize the mission is normally suppressed, bypassed, or cleared by follow-on units. The operation is fast paced, continues day and night, and creates extended supply lines. High consumption rates of Class III and V supplies are normal.

Pursuit

A pursuit is designed to catch or cut off a hostile force attempting to escape, with the aim of destroying it. This type of operation is characterized by rapidly shifting units, continuous day and night movements, hasty attacks, the containment of bypassed enemy forces, large numbers of prisoners, and a willingness to forego some synchronization to maintain contact with and pressure on a fleeing enemy. A pursuit requires swift maneuver and attacks by forces to strike the enemy's most vulnerable areas. The AAV's abilities to maneuver quickly and carry Marines, along with its organic firepower, make an AAV mechanized force in an ideal ground force for a pursuit. Amphibious assault vehicles provide the ability to move rapidly and encircle enemy forces attempting to flee or to strike the enemy on their flanks.

FORMS OF OFFENSIVE MANEUVER

The mechanized unit commander decides which form of offensive maneuver to use based on the factors of METT-T. The forms of maneuver may be combined in different ways at different levels of command (e.g., a company may conduct a flanking attack in executing its portion of the parent battalion's envelopment). While higher commanders rarely specify forms of maneuver, their guidance and intent, along with the mission and any implied tasks, may impose constraints such as time, security, and direction of attack that narrow a subordinate's options of maneuver. Furthermore, a single operation may contain several forms of maneuver, such as a frontal attack to clear a security area, a penetration to create a gap in enemy defenses, and an envelopment to defeat the rest of the enemy force. See MCWP 3-01 for more information on the forms of maneuver.

Frontal Attack

A frontal attack is an offensive maneuver in which the main action is directed against the front of the enemy forces. It is used to rapidly overrun or destroy a weak enemy force or fix a significant portion of a larger enemy force in place over a broad front to support a flanking attack or envelopment (see fig. 3-1). The speed and armor protection of AAVs may reduce the mechanized force’s exposure to enemy fire. Tank-heavy forces may be able to force a rupture in an enemy’s hasty defense, while mechanized-heavy forces are required against a deliberate defense. After a rupture is created, mechanized-heavy forces are best used to hold and widen the gap, while the tank-heavy forces exploit quickly by attacking suitable objectives in the depth of the enemy position.

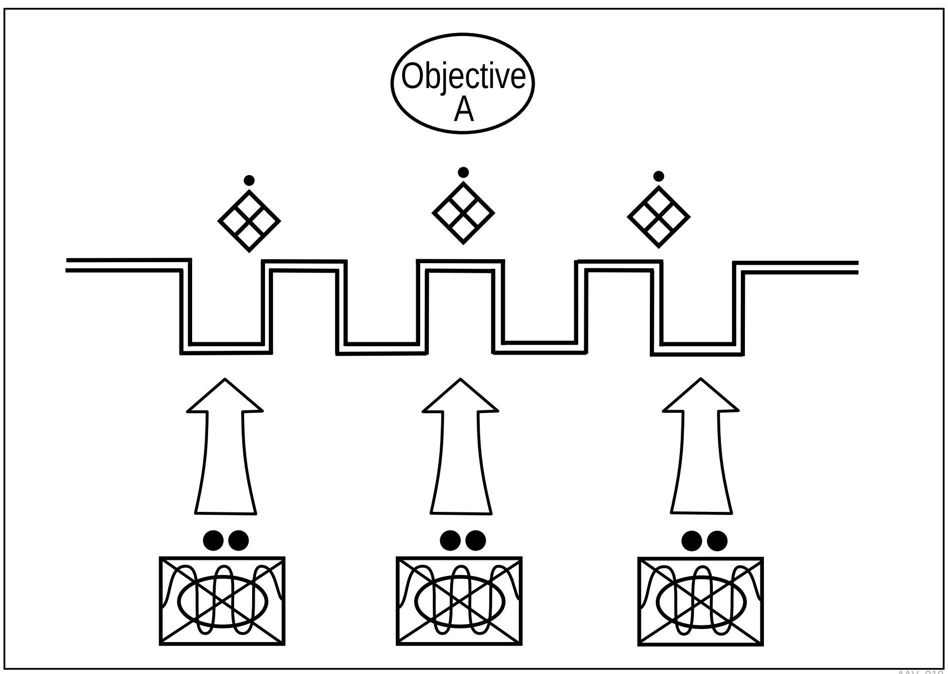


Figure 3-1. Frontal Attack.

Flanking Attack

A flanking attack is a form of offensive maneuver directed at the flank of an enemy force, as illustrated in figure 3-2. A flank may be created by the attacker through the use of fires or by a successful penetration. It is similar to envelopment, but is generally conducted on a shallower axis. Such an attack is designed to defeat the enemy force while minimizing the effect of the enemy’s frontally oriented combat power. To exploit the advantages of speed and cross-terrain mobility, the majority of a mechanized force—AAVs with mounted infantry—are normally included in the main effort, with less mobile forces in a supporting role.

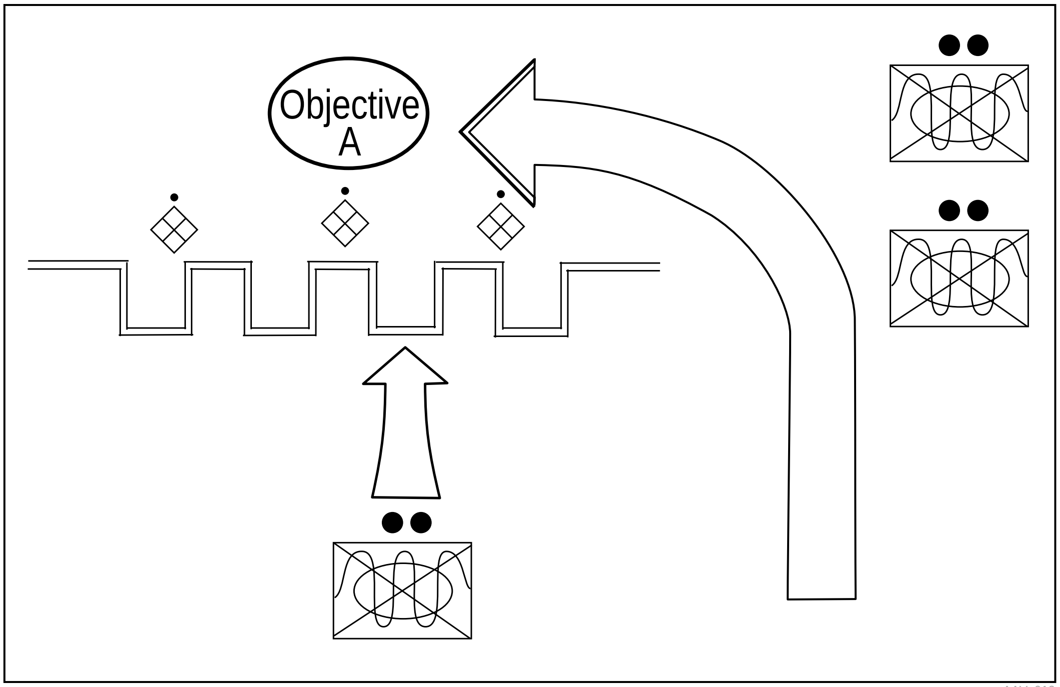


Figure 3-2. Flanking Attack.

Envelopment

An envelopment is an offensive maneuver in which the main attacking force passes around or over the enemy's principal defensive positions to secure objectives to the enemy's rear. There are four types of envelopments: the single envelopment, double envelopment, encirclement, and vertical envelopment. As shown in figure 3-3, on page 3-10, the enemy's defensive positions may be bypassed using ground, waterborne, or air assault forces, compelling the defender to fight on the ground of the attacker's choosing. It requires surprise and superior mobility relative to the enemy. The most mobile forces are typically distributed in the main effort, while those forces with less mobility are in supporting efforts. Deep envelopments may require the displacement of artillery to provide continuous support and may impact the sustainment of Class III and IX supplies.

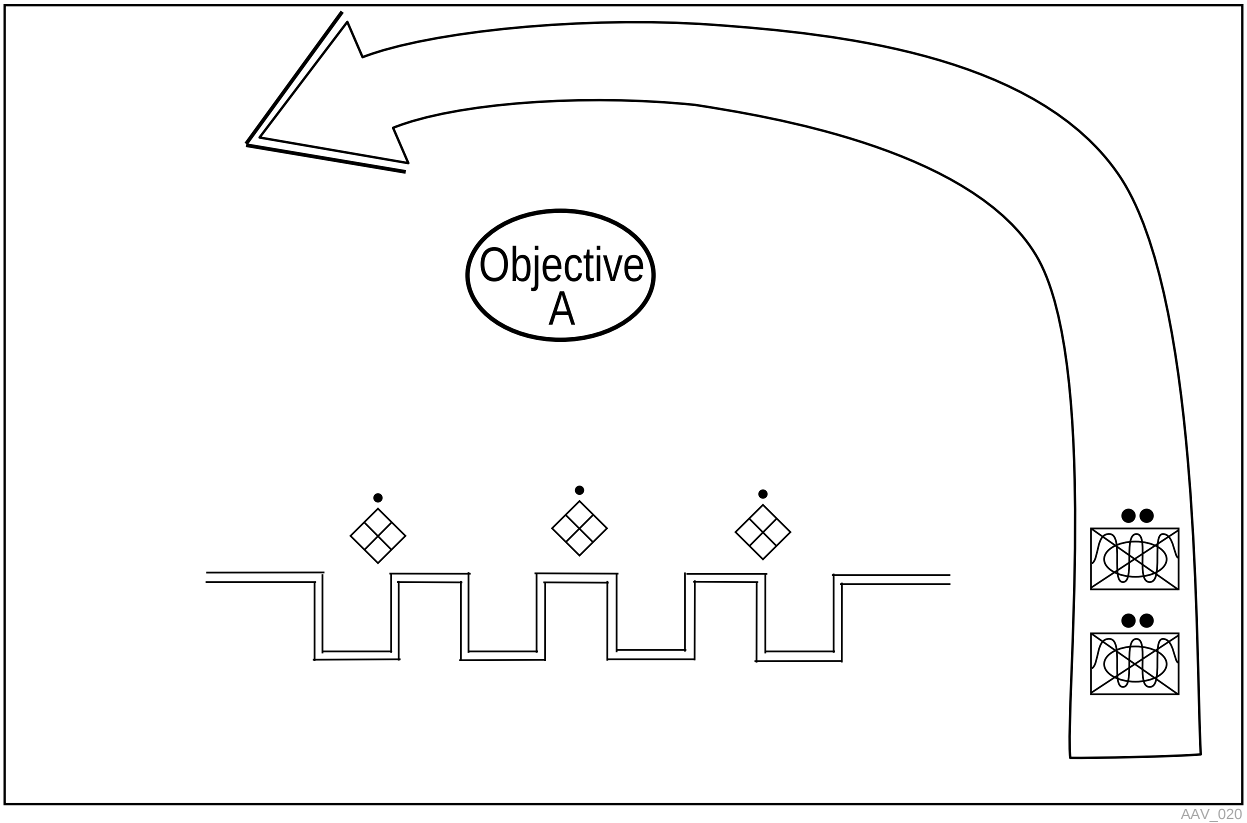


Figure 3-3. Envelopment (Single).

Turning Movement

A turning movement is a variation of an envelopment in which the attacking force passes around or over the enemy's principal defensive positions to secure objectives deep in the enemy's rear. This attack forces the enemy to abandon their positions or to divert major forces to meet the friendly force. As shown in figure 3-4, the main effort normally executes the turning movement as a supporting effort fixes the enemy in position. A turning movement differs from an envelopment in that the turning force usually operates at such distances from the fixing force that mutual support is unlikely. The turning force must be able to operate independently. A turning movement is usually executed by a division-sized or larger force and involves large mechanized units attacking to deep objectives.

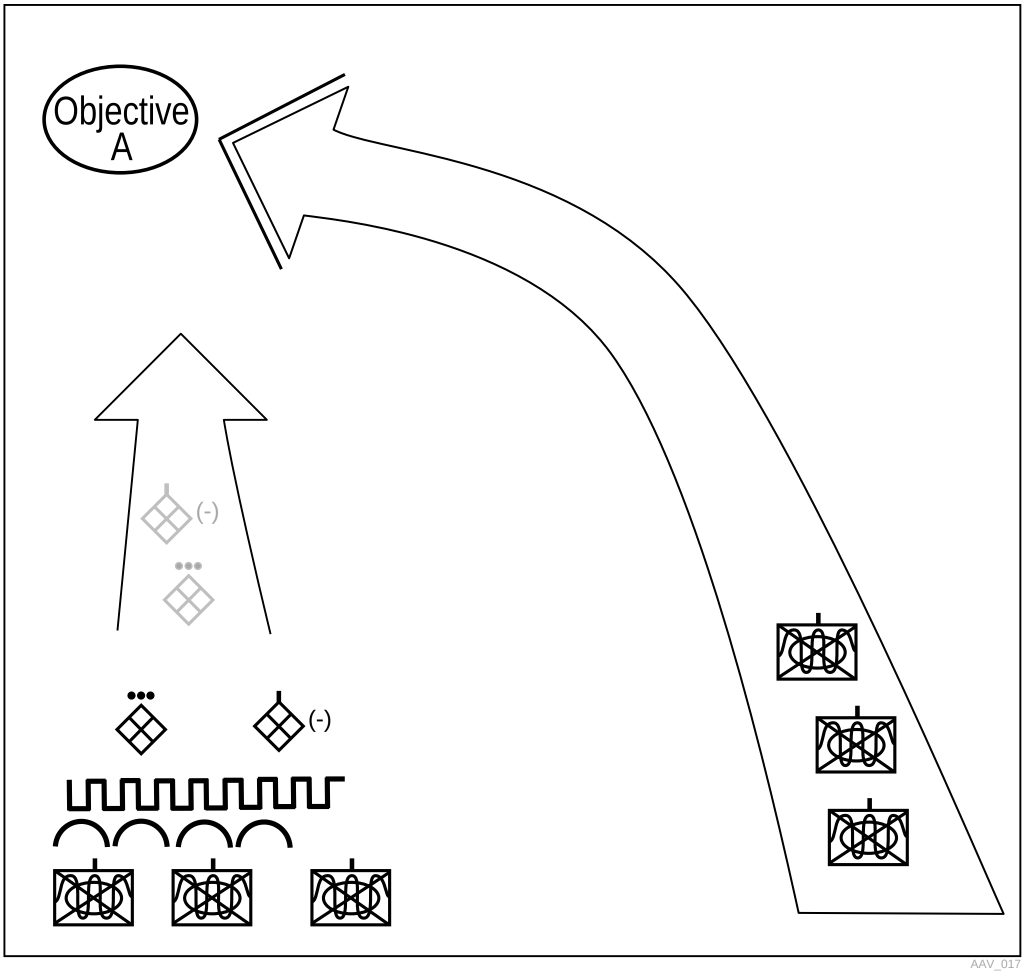


Figure 3-4. Turning Movement.

Infiltration

Infiltration is a form of maneuver in which friendly forces move through or into an area occupied by either friendly or enemy troops. When used in connection with the enemy, it implies that contact is to be avoided. Forces move over, through, or around enemy positions without detection to assume a position of advantage over the enemy, as illustrated in figure 3-5 on page 3-12. Mechanized forces are ideally employed to conduct infiltrations when the enemy is arrayed in defensive positions scattered across a wide frontage. Amphibious assault vehicles provide a unique capability to infiltrate by taking advantage of marshlands and other bodies of water.

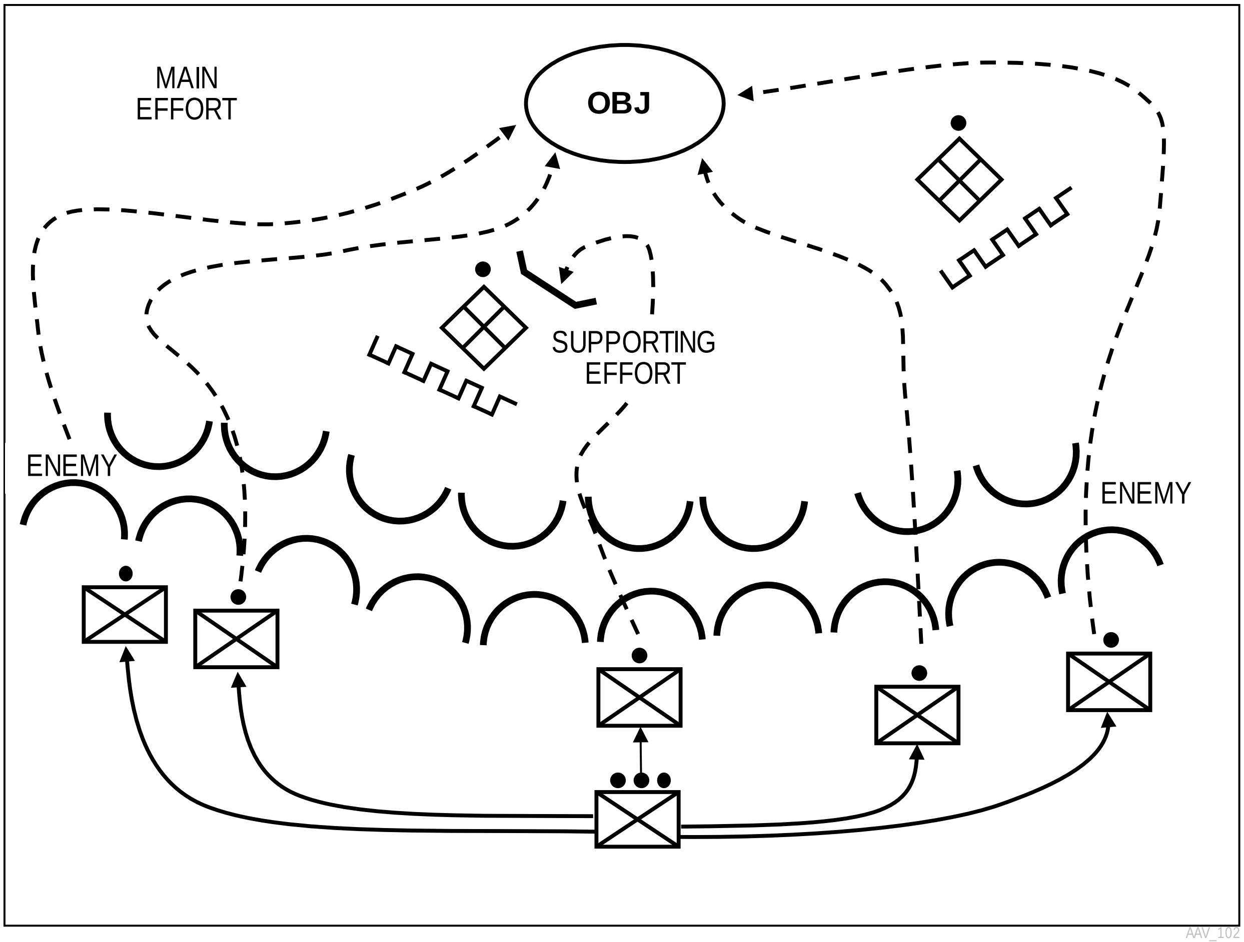


Figure 3-5. Infiltration.

Penetration

A penetration is a form of maneuver in which an attacking force seeks to rupture enemy defenses on a narrow front to disrupt the defensive system. Penetrations are used when enemy flanks are not assailable; when time, terrain, or the enemy's disposition does not permit the employment of another form of maneuver; or when enemy defenses are overextended and possess exploitable weak spots. The shock action, mobility, and breaching ability of a mechanized force, in conjunction with aviation forces, are useful in exploiting and rupturing the enemy's position (see fig. 3-6). Tank-heavy forces may be able to force the rupture in an enemy's hasty defense, while mechanized-heavy forces are normally required against a deliberate defense. After a rupture is created, mechanized-heavy forces are most suitable to exploit success.

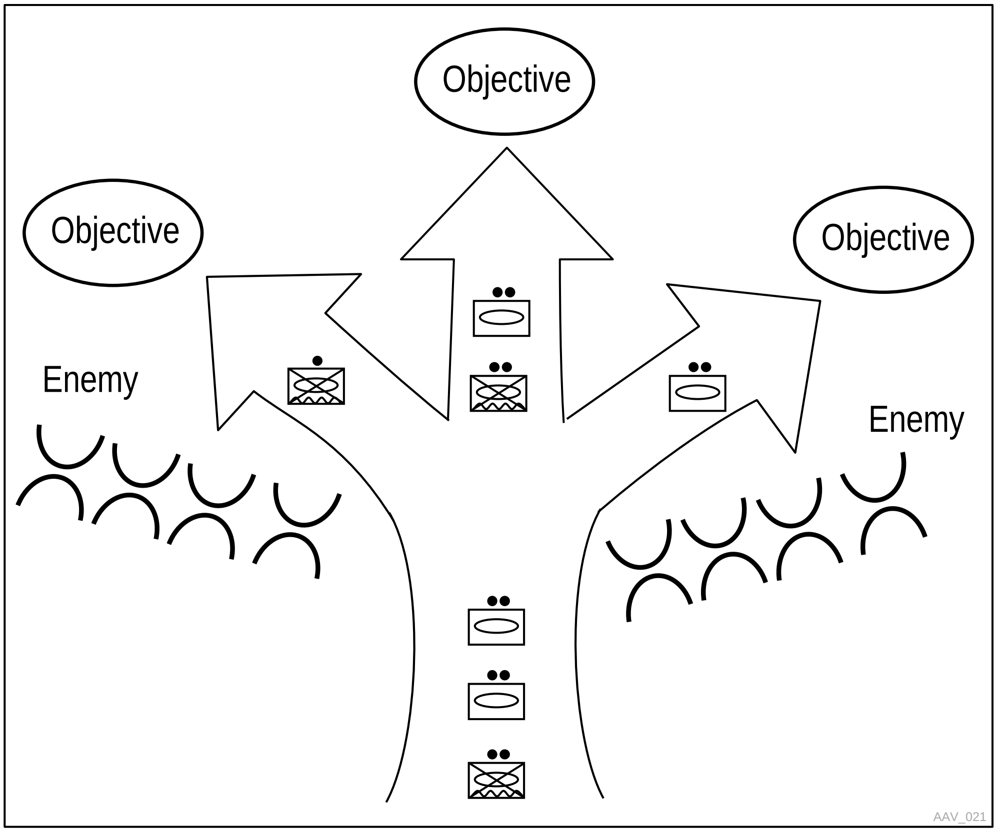


Figure 3-6. Penetration.

MECHANIZED OPERATIONS

Marine Corps mechanized forces are task-organized within the structure of the MAGTF. The mechanized-heavy company landing team and tank-heavy company task force are common ground maneuver elements that normally attack as part of a larger mechanized force, such as a battalion or regimental-sized landing team or task force. A landing team or task force can be used to support the movement of another unit by fire, serve as a maneuver element, or operate as a reserve. To produce combined arms effects, mechanized forces' supporting arms, organic fires, and maneuver must be combined to ensure that any action the enemy takes to avoid one threat makes them more vulnerable to another. While the strengths of the various arms complement and reinforce each other, the weaknesses and vulnerabilities of each arm are protected or offset by the capabilities of the other.

Mutual Support

To exploit the mechanized force's offensive capabilities, infantry, tanks, and AAVs must work together in pursuit of a common goal. Each element of the mechanized force provides a degree of mutual support to the other. The AA and tank units support the infantry by—

- Providing mobile protected firepower.
- Neutralizing or destroying hostile weapons by fire and movement.

- Clearing paths through wire for dismounted infantry.
- Neutralizing fortified positions with direct fire.
- Supporting dismounted infantry by direct fire.
- Providing protection against long-range antiarmor fires.
- Leading the attack whenever possible.
- Assisting in consolidating the objective.
- Providing the cargo capacity required for sustained operations.

Infantry, reinforced by combat engineers, assist AA and tank units by—

- Breaching or removing antiarmor obstacles.
- Assisting in neutralizing or destroying enemy antiarmor weapons.
- Designating targets for tanks and AAVs.
- Protecting tanks and AAVs from enemy infantry and antiarmor weapons.
- Clearing bridges and fording areas.
- Clearing restrictive terrain, such as urban, swamp, or woodland areas.
- Conducting dismounted security patrols.

Employment Methods

Tank and mechanized infantry, mounted or dismounted in AAVs, attack together or support by fire. Based on METT-T, a combination of the two methods may be employed in a multi-axis attack. Prior planning ensures communication can be maintained between the base of fire elements and dismounted infantry during the attack. Prepositioned retransmission sites and pre-planned radio relay procedures are examples of techniques that can overcome a potential loss of communications during the attack.

The scheme of maneuver and fire support plan (i.e., direct fire, indirect fire, and close air support) must be developed concurrently and understood by the elements of the mechanized force. Primarily used to engage targets on the objective, fires are also planned to isolate the objective by engaging targets on adjacent positions or likely enemy avenues of approach and to provide illumination and obscuration.

Tanks and Mechanized Infantry Attack Together. This method allows tanks and mechanized infantry to advance together within mutually supporting distances of each other. Tanks normally lead the formation while the infantry remains mounted in AAVs until the enemy's forward defensive positions have been breached. The infantry generally remains mounted in AAVs when enemy resistance is weak or when the enemy defensive positions are overextended. Employing tanks and mechanized infantry to attack together—

- Exploits the mobility, speed, armor-protected firepower, and shock action of the mechanized force.
- Reduces enemy reaction time.
- Disorganizes the enemy's defense.
- Conserves the energy of the mechanized infantry.
- Reduces the amount of time that the infantry is exposed to enemy fires.

When employing tanks and mechanized infantry to attack together, there is a greater potential for casualties among the elements of the mechanized force if enemy antiarmor fires cannot be bypassed or effectively reduced by suppressive fires. The AAV is not as heavily armored as a tank and should not be employed as such. The AAV armor can provide protection against hand grenades, shell fragments, and some small arms fire. However, even when the enhanced appliqué armor kit is installed, the AAV can be vulnerable to enemy rockets and guided missiles.

Tanks and Amphibious Assault Vehicles Support by Fire Only. During planning, the commander of the mechanized force may decide to attack using the tanks, using the AAVs to support by fire. During a mounted attack, if effective antiarmor fire is received that cannot be suppressed or destroyed by the available fire support and continuing the assault would result in unacceptable casualties, the infantry is dismounted in defilade locations. Commanders should have a plan of action that includes the tanks and infantry attack together method, but has the flexibility to implement the tanks and AAVs support by fire-only method if the situation changes unexpectedly. The tanks and AAVs support by fire-only method should be used when—

- Obstacles prevent mounted movement and cannot be quickly bypassed or breached.
- Enemy antiarmor capability poses significant threat to both tanks and AAVs.
- Terrain canalizes mounted movement into likely enemy ambush sites and minefields.
- Visibility is limited.

The support by fire element can deliver the following types of direct fires to support the dismounted infantry:

- *Point fire* is directed against a specific identified target (e.g., a machine gun position or antitank position).
- *Area fire* is distributed over an area when enemy positions are more numerous and less obvious; fire is distributed in width and depth to keep parts of the target under fire.

Positive control of supporting fires must be maintained throughout the attack between the dismounted infantry and base of fire elements. The infantry uses radio communication, pre-arranged visual signals (e.g., pyrotechnic), and/or messengers to designate targets and coordinate supporting fires. The AAVs, tanks, and other available direct fire support assets normally displace forward to new support by fire positions as they become available.

The momentum of a dismounted infantry attack is achieved by sustained, accurate, and a heavy volume of fire. Suppressive fire helps compensate for the infantry's lack of armor protection and decreased mobility. Long-range precision fires (e.g., guided missiles, rockets, and artillery) are employed against enemy vehicles, protected antitank guns, antitank guided missiles, and other priority defensive targets.

The support by fire element ideally supports from concealed positions (e.g., hull down, turret defilade). To avoid presenting the enemy with easily acquired stationary targets, units serving as the base of fire element should constantly reposition themselves to different support by fire positions. Dismounted infantry should advance on an axis that provides cover and concealment and prevents or minimizes masking the effects of the support by fire position. A disadvantage of the tanks and AAVs support by fire-only method is that the infantry loses the mobility, shock action, and close support of the tanks and AAVs. The infantry is also unsupported on the objective itself when the tanks and AAVs shift or ceasing fires. In addition, tanks and AAVs are not initially available on the objective to cover the consolidation.

Multiple Axis Attack. A multiple axis attack is a combination of the two general methods of employment. A primary consideration is the availability of suitable avenues of approach for the tanks, AAVs, and infantry. The multiple axis attack is often used to exploit the amphibious capability of the AAV in crossing streams, rivers, lakes, and marshes. In addition, multiple axis attacks may be used when a single avenue of approach is too narrow to accommodate the entire mechanized force.

The tanks normally follow the more open terrain while the infantry advance follows an axis offering cover and concealment. Tanks initially support the infantry advance by fire and join the infantry as soon as practical. The movement of the tanks is normally timed so that they assault the objective slightly in advance of the infantry to take maximum advantage of their shock effect. The greatest challenge to employing this method is achieving proper timing among the various elements and coordinating fires during the attack.

Mechanized Movement

Tanks normally lead the mechanized formation because they have better armor protection and heavier firepower than AAVs. When the situation permits, AAVs can support the mechanized force by following the tanks close enough to deliver suppressive fire against enemy infantry and antiarmor weapons encountered on exposed flanks. The order of movement is generally based on the following criteria:

- Tanks lead in open areas or when faced with a significant armor threat.
- Mechanized infantry leads mounted only if the mechanized infantry is pure, with no other antiarmor reinforcements or capabilities.

The desired distance between tanks and AAVs should be determined before starting the attack based on the following considerations:

- **Mission.** If the mission requires rapid, closely controlled movement and closely coordinated dismounted infantry action, the AAVs may closely follow the tanks.
- **Enemy.** The capabilities of the enemy force influence the location of the tanks and AAVs in the assault. If the enemy force possesses a substantial antiarmor capability, both the tanks and AAVs may be better employed in providing direct fire support to dismounted infantry.
- **Terrain and Weather.** When visibility is poor and/or terrain provides numerous defilade positions and short fields of fire, the AAVs may closely follow the tanks. However, there are situations where mechanized infantry mounted in AAVs may lead the tanks. For example, mechanized infantry mounted in AAVs may lead while crossing bodies of water or marshy areas that tanks cannot ford in order to seize an objective from a more favorable direction (e.g., a bridge or other key terrain). In addition, when the mechanized force is confronted with close terrain (e.g., woodland or urban areas),

dismounted infantry should clear the terrain before the AAVs and tanks move through it. This prevents frequent and rapid dismounting and protects the AAVs and tanks from enemy infantry and antiarmor fires.

- **Troops and Support Available.** Task organization also influences the formations and relative positions of the AAVs. Few tanks, other available direct fire weapons, and supporting arms may require that AAVs lead the assault.
- **Time Available.** The less time there is, the closer the AAVs normally are to the tanks. This proximity cuts down reaction time and response time, but may permit faster reorganization.
- **Civil Considerations.** The AAVs may lead when there are urban restrictions, such as the weight classifications of bridges or collateral damage concerns regarding the local infrastructure.

Maneuver Considerations

In mechanized attacks, speed is essential and should be maintained to the greatest degree possible. The critical decision of whether the infantry attacks mounted or dismounted is initially based on METT-T.

Tanks Lead. When tanks lead, they maneuver together with the mechanized infantry and are supported by one or more support by fire elements and available supporting arms. The infantry usually remains mounted when—

- Enemy antiarmor fires can be effectively bypassed or suppressed by fire.
- The terrain is relatively open or obstacles can be easily overcome.
- The terrain and weather afford good trafficability and visibility.

Infantry Mounted. The mobility and limited armor protection of AAVs help the infantry cross the battlefield quickly. Generally, the mechanized infantry remains mounted when—

- Enemy resistance is extremely light.
- The enemy is in hasty positions.
- Suppressive fires have reduced enemy antiarmor fires.
- The terrain near the objective allows rapid movement onto and across the objective.

Infantry Dismounted. Dismounted infantry may designate targets for AAVs and tanks providing overwatch. Dismounted infantry covers the flanks and rear of the mechanized force by employing organic fires, directing fires from the base of fire element, and providing supporting arms against enemy positions. Infantry normally moves far enough behind tanks to avoid being hit by enemy fire directed at the tanks. This technique permits close coordination and maximum mutual support but sacrifices the speed and mobility of the AAVs and tanks. Infantry leads dismounted when—

- The terrain and vegetation are restrictive. For example, when the terrain and vegetation canalize movement into likely enemy minefields and ambush sites, such as urban areas and woodland terrain.
- Visibility is limited.

- Antiarmor fire cannot be bypassed or suppressed by fire.
- Significant obstacles or fortified positions are encountered that may prevent mounted movement and cannot be bypassed.
- Damage to local infrastructure is a concern or there is a desire to reduce the psychological impact on civilians.

Dismount Points. The mechanized force commander chooses when and where the infantry dismounts with the advice of the AA unit leader. Commanders normally stay well forward to judge the situation and make an appropriate decision whether or not to change the dismount point. Timing is critical; dismounting too early will slow down the force's momentum and unnecessarily expose the infantry to hostile fire. Speed can provide for the security of a mechanized force already committed to the final assault.

Ideally, the infantry is dismounted after forward defensive positions have been breached. The dismount point should provide good cover and concealment, yet be as near the objective as possible. The AA unit leaders must ensure that their vehicles do not halt in the open and are properly dispersed. This practice reduces the amount of time that the dismounted infantry is exposed to fires while closing with the enemy.

Rapid dismount and good vehicle dispersion reduce the mechanized force's vulnerability to enemy fires. Well-understood SOPs and well-rehearsed battle drills provide a foundation for rapid dismount and good vehicle dispersion. The dismount points may be short of the objective, on the objective, or past the objective.

Short of the Objective. Tactical conditions may require seeking a dismount point short of the objective that is usually not within range of small arms and hand-held antiarmor weapons. Ideally, the dismount point should be located on easily recognizable terrain that provides cover for the mechanized force from enemy direct fires.

The advantages of a dismount point short of the objective include the following:

- Dismounted infantry is protected from small arms and observed indirect fires while dismounting.
- Infantry can deploy and be oriented as they approach the objective.
- Organic and supporting fires can suppress the enemy while the infantry is dismounting.

The disadvantages of a dismount point short of the objective include the following:

- Dismounted infantry is exposed longer to enemy small arms and indirect fire while moving forward in the assault.
- Dismount points may be vulnerable to enemy direct and indirect fires.

On the Objective. This dismount point is used when the mechanized force has achieved surprise or the enemy antiarmor defense is weak. The advantages of a dismount point on the objective include the following:

- Greater speed and shock effect are achieved.
- The mechanized infantry remains protected longer by the AAVs' light armor from the fires of enemy small arms.
- Supporting fires can continue while the mechanized force approaches its objective since mounted infantry have greater protection against shell fragments and other small projectiles.

The disadvantages of a dismount point on the objective include the following:

- Mechanized infantry is difficult to orient to specific objectives.
- Control is difficult to establish at the dismount point due to potentially close enemy fires.
- Supporting fires are difficult to direct against enemy positions in close proximity to friendly dismounted infantry.
- AAVs are vulnerable to short-range antiarmor weapons.
- A high volume of suppressive fire is required to support dismounted infantry.

Past the Objective. Dismounting after passing through the objective is employed when a mounted attack on the objective is more effective. It requires detailed information on the enemy capabilities, dispositions, and strength. The capabilities of the enemy's antiarmor defense will dictate whether this method is feasible. The advantages of dismounting after passing through the objective include the following:

- Dismounted infantry fight from an area and direction unexpected by the enemy.
- The shock effect on the enemy caused by a mechanized force moving through its position is likely to be considerable.

The disadvantages of dismounting after passing through the objective include the following:

- This method may conflict with enemy positions employed in depth.
- Enemy indirect and direct fires may target suitable dismount points.
- Turning AAVs around in close proximity to enemy fires can make them more vulnerable to flank shots and may reverse the relative positions of the tanks, AAVs, and infantry.

Attack by Fire. When maneuvering to within close range of the enemy is not required, an attack by fire is made to destroy the enemy from a distance. This task is usually given to the supporting element during the offense and as a counterattack option for the reserve when in the defense. When assigning this tactical task, the commander of the mechanized force specifies the intent of fires by specifying the desired effects.

Fire and Maneuver. Fire and maneuver is the process of one or more elements establishing a base of fire to engage the enemy, while one or more other elements maneuver to an advantageous position from which to close with and destroy or capture the enemy. Supporting fires may be provided from weapons not organic to the maneuver unit. Supporting fires may consist of direct and indirect fires, as well as close air support, which are integrated to produce combined arms effects. Supporting fires should be followed closely by the maneuver element so that the shock effect of fire upon the enemy will not be lost.

Fire and Movement. Once the maneuver element meets enemy opposition and can no longer advance under the cover of the base of fire, it employs fire and movement to continue its forward movement to a position from which it can assault the enemy position. Fire and movement, primarily used in the assault, is where a unit or element advances by bounds or rushes, with sub-elements alternatively moving and providing covering fire for other moving sub-elements. Individuals (i.e., personnel or vehicles) or units may conduct fire and movement attacks.

Assault. The purpose of the assault is to place violent and intensive firepower on the objective and move rapidly across it to destroy or capture the enemy as quickly as possible. The term *assault* refers to the phase of an attack when the attacking force closes with the enemy. Mechanized forces can make a mounted or dismounted assault on an objective.

Mounted. A mounted assault is best used when the enemy is occupying hasty fighting positions, antiarmor fires can be suppressed, and the terrain near the objective allows for rapid movement onto and across the objective. The assault must be carried out rapidly. Tanks normally lead, followed closely by AAVs. As the assault force approaches the objective, the AAVs should move closer to the tanks for added protection from enemy short-range antiarmor weapons.

The movement across the objective must be fast and continuous. A heavy volume of suppressive fires is maintained to keep the enemy down in their positions. Stabilized turrets allow tanks to continue moving while conducting fire and movement. The AAVs must use bounding techniques in order to maintain their rates of fire while moving through the objective; however, AAVs normally stay as close to the tanks as possible to provide protection to their flanks and rear. Once the tanks and AAVs reach the far side of the objective, they occupy hull-down positions if possible. From support by fire positions, the tanks and AAVs can engage retreating enemy forces, continue the attack, or defend against counterattack. If it is necessary to seize the objective, the dismounted infantry is used to clear remaining pockets of enemy resistance and to secure detainees.

Dismounted. A dismounted assault is normally conducted if the enemy is in well-prepared defensive positions, antiarmor fires cannot be suppressed, or the terrain restricts vehicle movement onto the objective. If the attack begins mounted, the infantry should be dismounted in a covered and concealed position that is as close to the objective as possible. The base of fire elements deliver supporting fires, while the dismounted infantry deploys. The dismounted infantry then employs fire and movement through the objective. Elements of the base of fire element normally displace to subsequent support by fire positions in order to continue supporting maneuver units on the objective. When the tanks and AAVs from the base of fire element rejoin the dismounted infantry, the infantry—

- Suppresses any remaining enemy positions as the tanks and AAVs move to the objective.
- Reconnoiters initial support by fire locations and guides tanks and AAVs into the positions when necessary.
- Provides flank and rear security for the AAVs and tanks.

Based on METT-T, tanks may continue through the objective to engage resistance and pursue by fire until the infantry has consolidated the position.

Consolidation and Reorganization

The mechanized force should consolidate and reorganize as soon as it takes an objective. Consolidation and reorganization are not simultaneous. An objective is held until the commander orders further action. At times, the attack may be continued with little or no hesitation to exploit success. In this case, only required reorganization is done and consolidation is unnecessary.

Consolidation. Consolidation consists of the actions taken to secure an objective and prepare to repel an enemy counterattack. In the combat order, the commander normally designates infantry and AA unit positions and their actions to be taken. The AA unit consolidates an objective by—

- Occupying the position designated in the combat order—AAVs are moved into hull-down positions (if available) and assigned specific sectors of fire.
- Establishing local security and mutual support between AAVs and adjacent infantry units.

Reorganization. Reorganization consists of the actions taken to prepare to continue fighting. The AA section leader has the following reorganization responsibilities:

- Receive and pass all pertinent reports.
- Replace key personnel (e.g., vehicle commanders or drivers) who were wounded or killed.
- Assesses damage to AAVs and report to the AA platoon commander and platoon sergeant if assistance is needed.
- Conduct vehicle maintenance and redistribute ammunition as required.

The AA platoon sergeant has the following reorganization responsibilities:

- Oversee the evacuation of casualties.
- Request needed resupply.
- Send enemy prisoners of war under guard to the collection point.
- Oversee the recovery and repair of damaged vehicles.
- Oversee the redistribution of supplies.

- Receive accountability reports from subordinate section leaders.

The AA platoon commander has the following reorganization responsibilities:

- Replace key personnel (e.g., platoon sergeant or section leaders) who were wounded or killed.
- Inform the AA company and/or supported unit commander of the platoon's status.
- Verify the platoon sectors of fire and ensure all positions are tied in with their adjacent units.
- Receive reports from subordinate unit leaders.
- Coordinate with the mechanized unit commander for follow-on tasks.

CHAPTER 4
THE DEFENSE

Defensive operations are conducted to defeat an enemy attack, gain time, economize forces, and develop conditions favorable for transition to offensive or stability actions. Defensive operations alone, however, are not decisive. Their purpose is to create conditions for a counteroffensive that allows forces to regain the initiative and return to the offense. Defensive operations are conducted to—

- Counter a surprise action by the enemy.
- Cause an enemy attack to fail.
- Gain time.
- Economize forces.
- Concentrate combat power elsewhere.
- Increase the enemy's vulnerability by forcing them to concentrate forces.
- Attrite or fix the enemy as a prelude to offensive operations.
- Retain decisive terrain or deny a vital area to the enemy.
- Prepare to resume the offense.

Since the offense is the decisive form of combat, the commander seeks every opportunity to take offensive action while defending. The commander may employ AAVs as part of a mechanized force to—

- Launch spoiling attacks while the enemy is preparing or assembling for an attack.
- Attack with security forces to harass, distract, deceive, and damage the enemy before they reach the main battle position.
- Counterattack to destroy or repulse enemy penetrations.

SPATIAL ORGANIZATION OF THE BATTLESPACE

For more information on these topics, refer to Marine Corps Doctrinal Publication 1-0 and MCWP 3-01. With a spatial battlespace framework, an AAV-equipped force can be employed in the security area, but is typically employed in the main battle area and rear area. Actions in the security area are designed to disrupt the enemy's plan of attack and cause them to prematurely deploy into attack formations. The main battle area is where the decisive battle occurs and where the mechanized force is typically employed. The rear area extends forward from a command's rear boundary to the rear of the area assigned to the command's subordinate units and is provided primarily for the performance of CSS functions (see fig. 4-1).

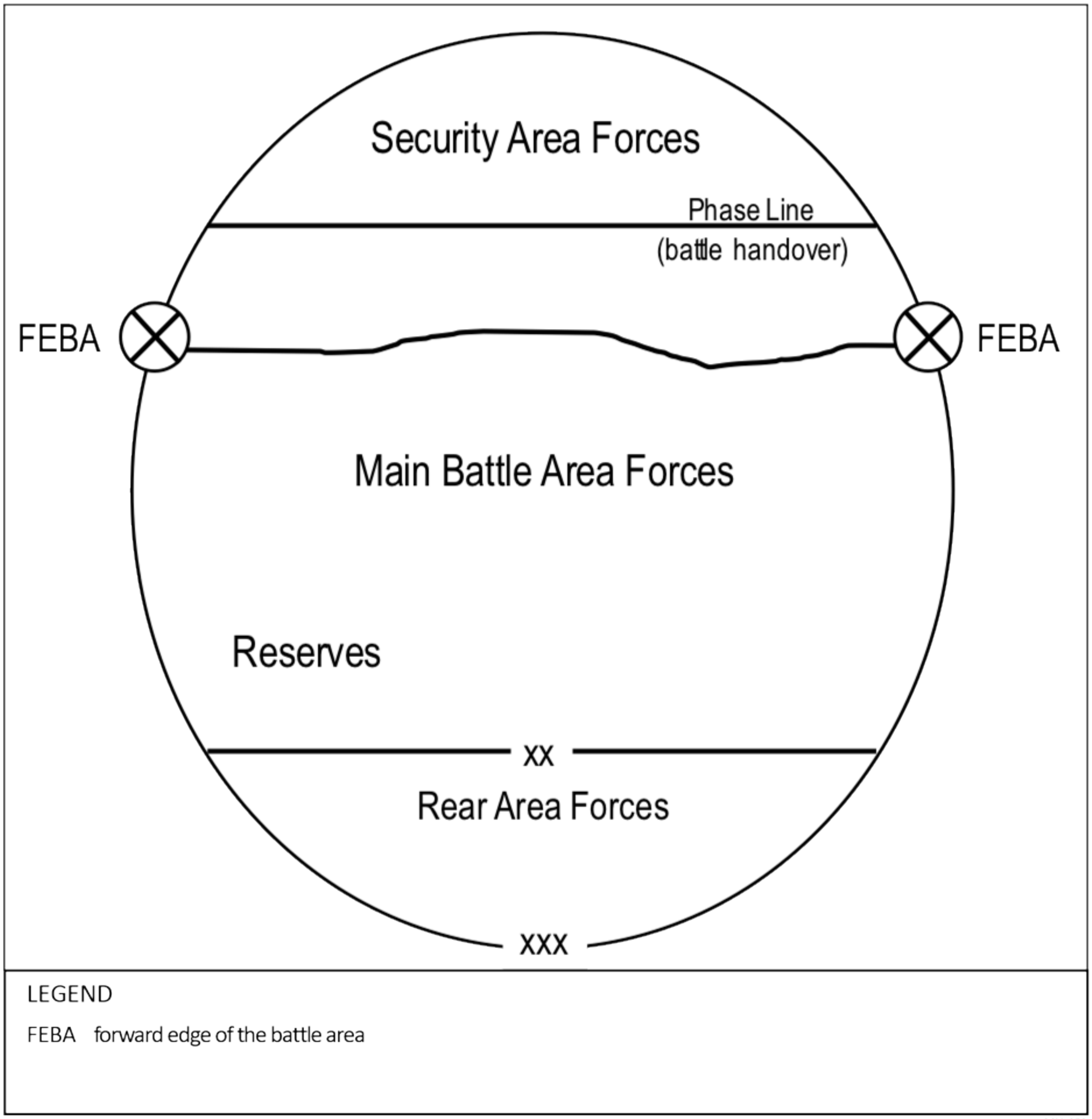


Figure 4-1. Spatial Organization of the Battlespace.

TYPES OF THE DEFENSE

There are three types of defensive operations: the area defense, the mobile defense, and the retrograde. While they are significantly different, provide different opportunities, and pose different problems, each possesses the same characteristics of the defense and contains both static and mobile elements. The organization of the force depends on the type of defensive operation being employed. For a more detailed discussion, see MCWP 3-01.

Area Defense

The area defense is a type of defense in which the bulk of the defending force is disposed in selected tactical positions where the decisive battle is to be fought. It denies the enemy critical terrain or facilities for a specified time. An area defense focuses on retaining terrain by absorbing the enemy into a series of interlocked positions from which, through friendly maneuver and fires, they can be destroyed. The area defense relies on defenders to maintain their positions and to control the terrain between them. This defense uses battle positions, strong points, and obstacles to slow, canalize, and defeat the enemy attack. The commander organizes forces for an area defense into a security area force, a main battle area force, and a reserve. In an area defense, mechanized forces are normally assigned to provide security, defend in sector, defend a battle position, or defend a strong point, as well as the reserve and counterattack missions (see fig. 4-2).

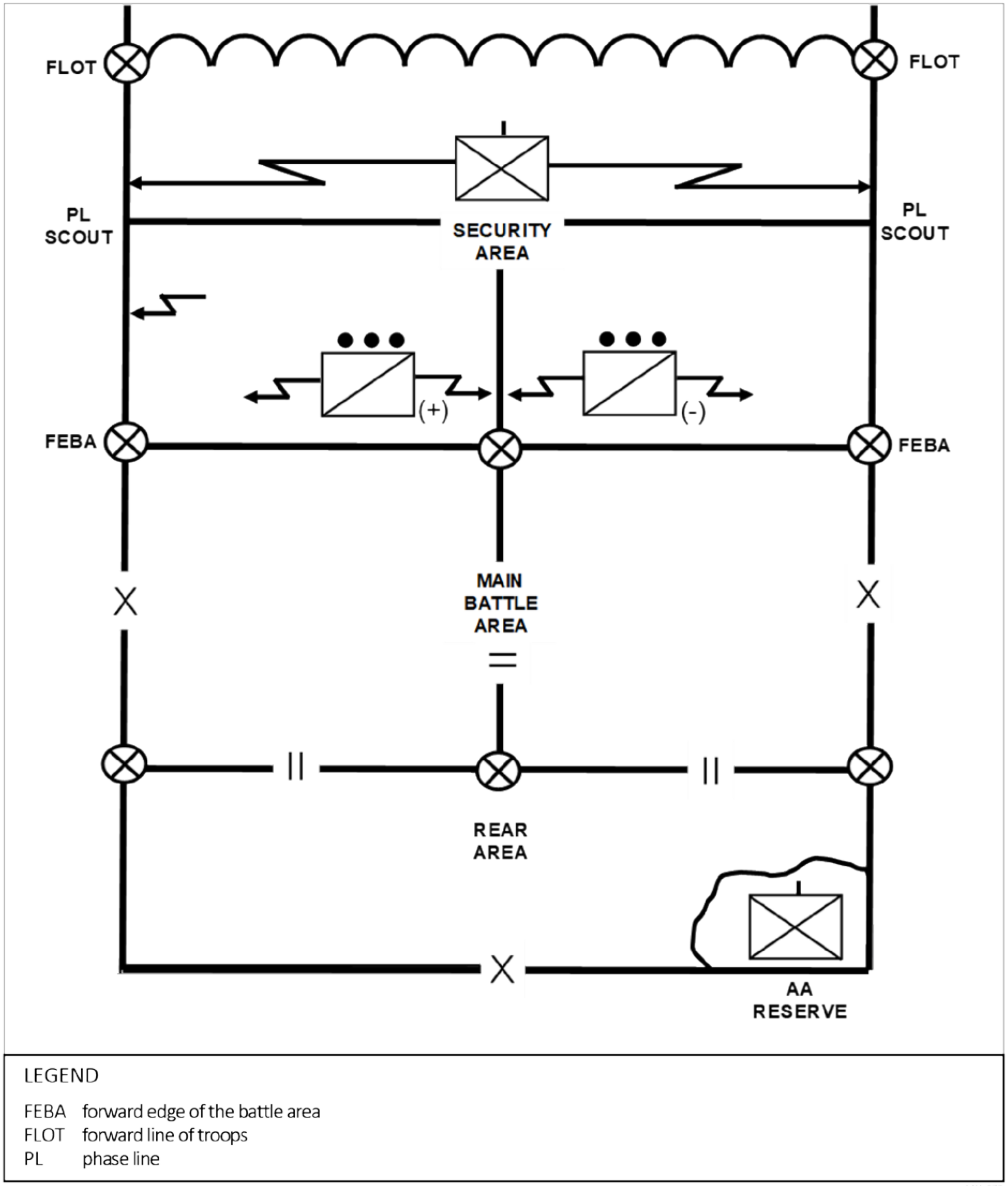


Figure 4-2. Organization of the Force.

Mobile Defense

A mobile defense uses maneuver and fires with terrain to seize the initiative from the enemy. The mobile defense destroys the attacking enemy through maneuver and offensive action. It defeats the enemy by allowing enemy forces to advance to a point where they are exposed to a decisive counterattack by the reserve. Open terrain or a wide sector favors a mobile defense, which is normally employed by regiments and larger-sized units. A commander organizes forces for a mobile defense into a security area force, a fixing force, and a reserve. Mechanized forces are ideally suited for a mobile defense due to the advantages afforded by their organic firepower and mobility. A mobile defense orients on the destruction of the enemy force by employing a combination of fires, maneuver, offensive and defensive actions, and delay to defeat the enemy attack.

Retrograde

A retrograde is a command's movement or maneuver to the rear or away from the enemy. It may be forced by the enemy or may be made voluntarily. A commander organizes forces for a retrograde into a security force, a main body, and a reserve. The five forms of retrograde are the delay, withdrawal, retirement, denial measures, and stay-behind operations. Retrogrades are conducted to improve an operational or-tactical situation or to prevent a worse one from developing by—

- Reducing the enemy's offensive capabilities.
- Drawing the enemy into an unfavorable situation.
- Enabling combat under conditions favorable to friendly forces.
- Gaining time.
- Disengaging from contact with the enemy.
- Repositioning forces for commitment elsewhere.
- Shortening lines of communications (LOCs).

The three methods of retrograde most relevant to AA units are delay, withdrawal, and retirement. Denial measures and stay-behind operations are used only in unique circumstances. For more information on retrogrades, refer to MCWP 3-01.

Delay. A delay is an operation during which a force under pressure trades space for time by slowing down the enemy's momentum and inflicting maximum damage on the enemy without becoming decisively engaged. An area of sufficient depth is required for a delay. Delaying forces must remain in constant contact with the enemy to ensure that the enemy experiences continuous pressure and to prevent delaying units from being bypassed by the enemy. Mechanized units are ideally suited for delaying because their long-range weapons and mobility allow the enemy advance to be slowed or countered while the forces conducting the delay gain time. The AAVs in a mechanized force may also be retained in a reserve to extricate forces that become decisively engaged or to counterattack. Delays are conducted—

- When the force's strength is insufficient to defend or attack.
- To reduce the enemy's offensive capability by inflicting casualties.
- To gain time by forcing the enemy to deploy.
- To determine the strength and location of the enemy's main effort.
- When the enemy intent is not clear and the commander desires intelligence.
- To protect and provide early warning for main battle area forces.
- To allow time to reestablish the defense.

There are two methods of delaying: delaying from alternate (i.e., successive) positions and delaying from subsequent positions. In either technique, it is crucial that the delaying force maintains contact with the enemy between delay positions.

Delay from Alternate Positions. Delaying from alternate (i.e., successive) positions involves two or more units in a single sector occupying delaying positions in depth. As the first unit engages the enemy, the second occupies the next position in depth and prepares to assume responsibility for the operation. The first force disengages and passes around the second. It then prepares to re-engage the enemy from a position in greater depth, while the second force takes up the fight. Delaying from alternate positions is useful on particularly dangerous avenues of approach because it offers greater security than delaying from successive positions. However, it requires more forces and continuous maneuver coordination. Additionally, there is a risk of losing contact with the enemy between delay positions (see fig. 4-3).

Delay from Subsequent Positions. Delaying from subsequent positions is suitable when the sector is so wide that available forces cannot occupy more than a single tier of positions. Delaying units are positioned forward in a single echelon. Maneuver units delay continuously on and between positions throughout their sectors. As a result, this method is simpler to coordinate than a delay from alternate positions. However, delaying from subsequent positions is easier for the enemy to penetrate than a delay from alternate positions because the force has less depth and less time to occupy subsequent positions. To facilitate the rapid occupation of positions, units normally perform reconnaissance on subsequent positions before occupation and post guides on one or two subsequent positions. In restrictive terrain, where infantry conducts the primary action, successive positions may be close together; in more open terrain, delay positions are often farther apart.

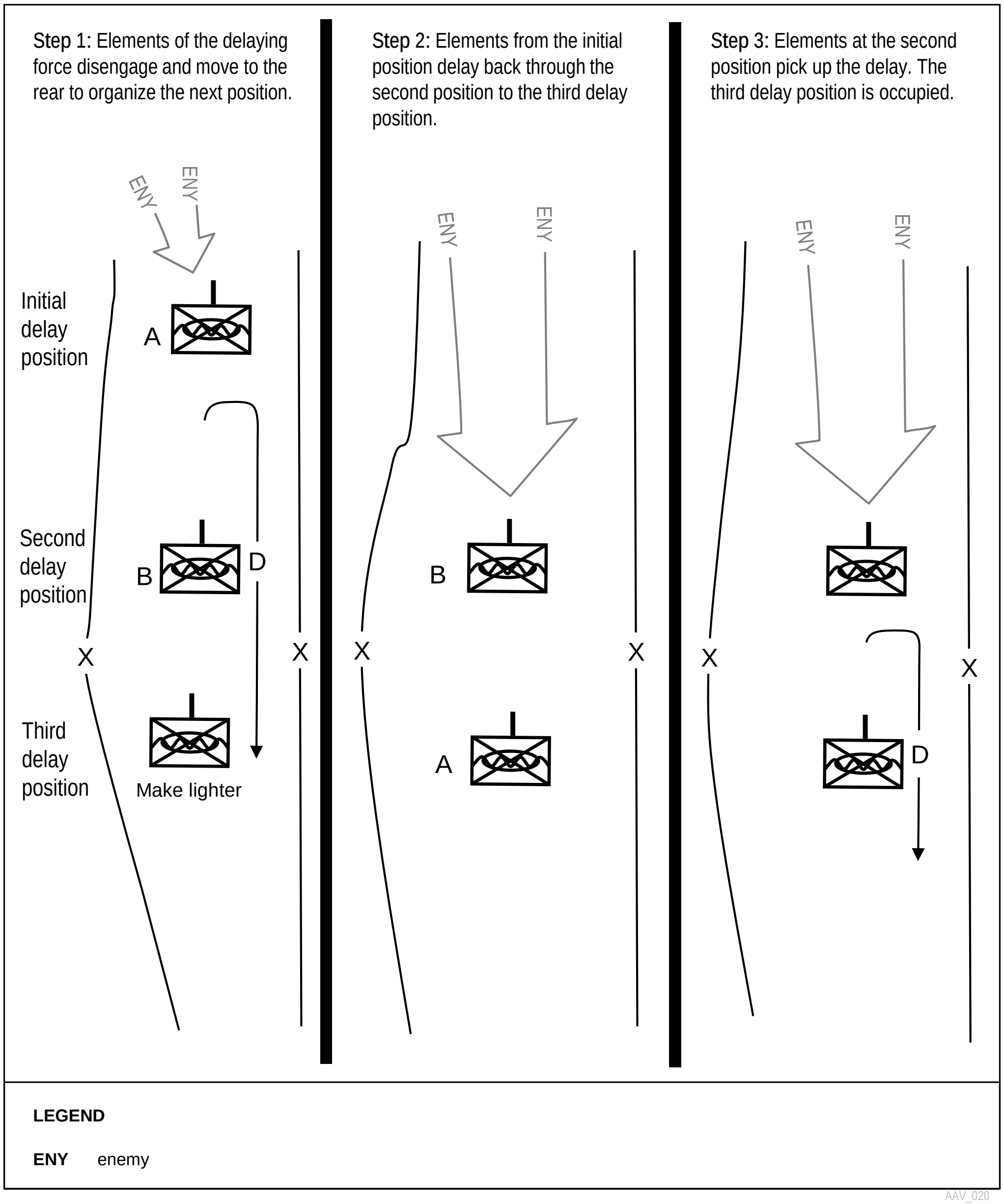


Figure 4-3. Delay from Alternate Positions.

Withdrawal. A withdrawal is a planned operation during which a force in contact disengages from an enemy force. Ideally, a withdrawal is done without the enemy's knowledge or before they can prevent or disrupt it. A withdrawal is conducted—

- If the force is in danger of being defeated.
- To avoid battle under unfavorable conditions.
- To draw the enemy into terrain or a position that facilitates friendly offensive action.
- To allow for the repositioning or redeployment of the force for employment elsewhere.

There are two forms of withdrawal, based on the enemy's reaction to the withdrawal: ***withdrawal under enemy pressure***, where the enemy tries to prevent the disengagement by attacking; and ***withdrawal without enemy pressure***, when the enemy does not or cannot try to prevent the withdrawal.

Regardless of the type of withdrawal, the planning considerations are the same. A prudent commander always plans to execute the withdrawal under enemy pressure. The commander should anticipate enemy interference by fires, direct pressure, and envelopment. If the enemy interferes, security forces delay as the main body moves to the rear. If the enemy does not interfere, security forces disengage and withdraw on order. The more closely a unit is engaged with the enemy, the more difficult it is to withdraw. In any withdrawal, the commander should attempt to deceive the enemy about their intention to withdraw. Emphasis is placed on speed and surprise. Withdrawing during periods of reduced visibility facilitates disengagement from the enemy and conceals movement to a degree; however, such conditions may make control more difficult. The AAVs' speed and armored-protected mobility make it suitable to support a withdrawal.

Retirement. A retirement is a maneuver in which a force out of contact moves away from the enemy. A retirement may immediately follow a withdrawal. While a covering force normally protects a retiring force, this does not preclude the commander from having to establish adequate security during the movement. A retirement is largely an administrative movement. Retirements are usually conducted as tactical road marches where speed, control, and security are the most important considerations. Commanders retire units to—

- Position forces for other missions.
- Adjust the defensive scheme.
- Prepare to assist the delays and withdrawals of other units.
- Deceive the enemy.

DEFENSIVE METHODS

As in all operations, the employment and arrangement of forces to solve the tactical problem is up to the commander. The defensive methods provide the tools needed—in the combinations required—to execute the area, mobile, and retrograde types of defense. Each method has its own purpose and unique considerations. The following section addresses the purposes and unique considerations associated with sectors, battle positions, strong points, linear, perimeter, and reverse slope defensive methods.

Sector Defense

Assigning defensive sectors to subordinate units provides them with the maximum latitude to accomplish assigned tasks. The mobility and firepower of AAVs provide tactical options to the commander executing a sector defense. Within the sector, the commander of a mechanized force may assign subordinate sectors, battle positions, strong points, or a combination of these (see fig. 4-4). Commanders usually defend in sector when—

- Avenues of approach are not easily defined.
- Dominating terrain is not available.
- The area of operations is wide or large.
- Mutual support is not easily achieved.
- The commander's ability to control is degraded.

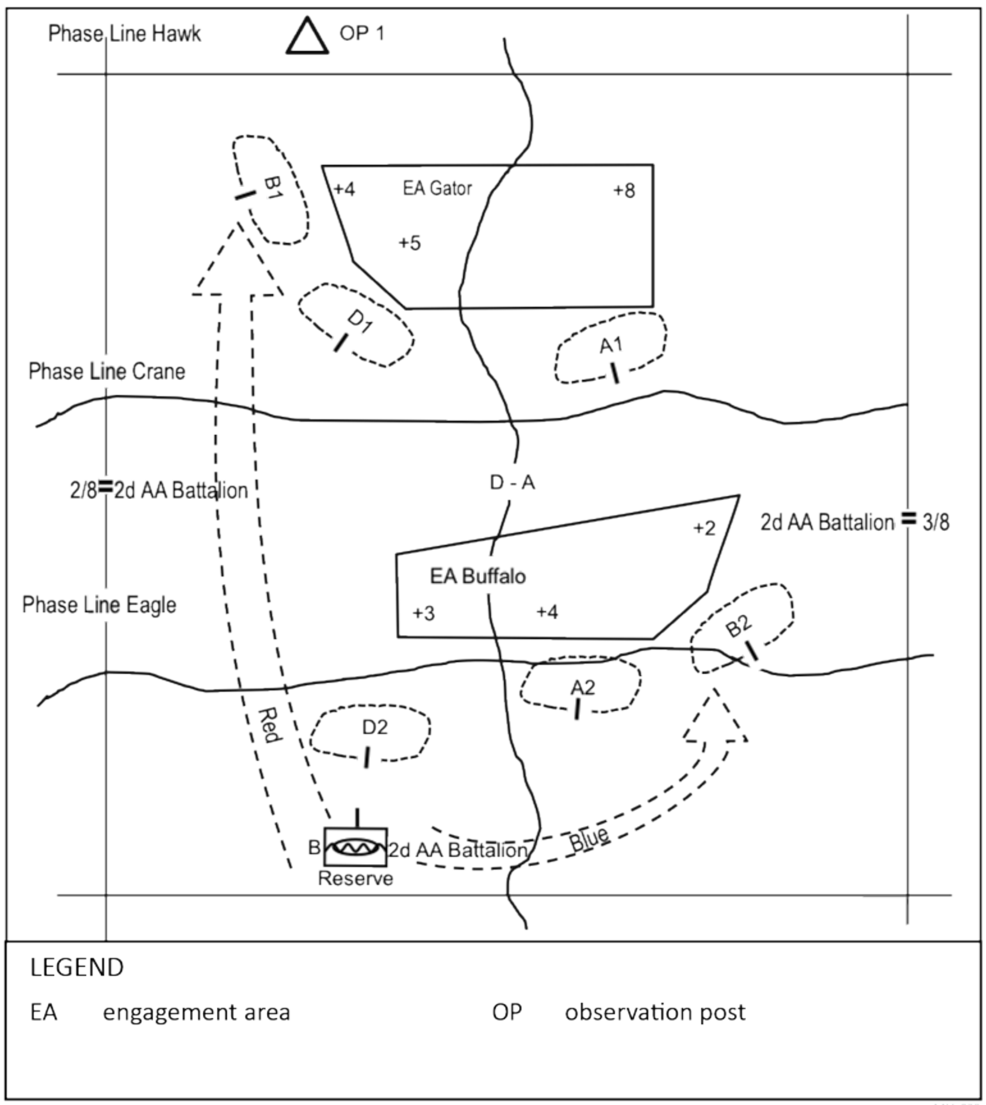


Figure 4-4. Defending in Sector.

Linear Defense

A linear defense is a variation of a defense in sector that requires maximum employment of forces forward with a small reserve. It is characterized by strong mutual support between forward units, limited depth, and minimal flexibility. This type of defense is characterized by a large concentration of firepower to the front. The linear defense is employed when defending a wide area and is a suitable variation for company and larger sized units. The main concern when fighting a linear defense is the lack of flexibility and the difficulty of both seizing the initiative and seeking out enemy weaknesses. When the enemy has a mobility advantage, a linear defense entails accepting extreme risk. Obstacles, indirect fires, and contingency plans are critical to this maneuver due to the exposed nature of the units' flanks.

Perimeter Defense

A perimeter defense is designed to defeat attacks from any direction. The majority of the force forms the perimeter and a reserve is established to provide depth. The perimeter consists of a series of mutually supporting positions that take advantage of the observation and fields of fire afforded by dominating terrain.

Reverse Slope Defense

A reverse slope defense is organized on that part of a slope that is masked by the topographical crest from enemy direct fire and observation. The defender can deliver surprise fires on the enemy once they cross the crest of the forward slope or when significant enemy forces are exposed on the reverse slope (see fig. 4-5).

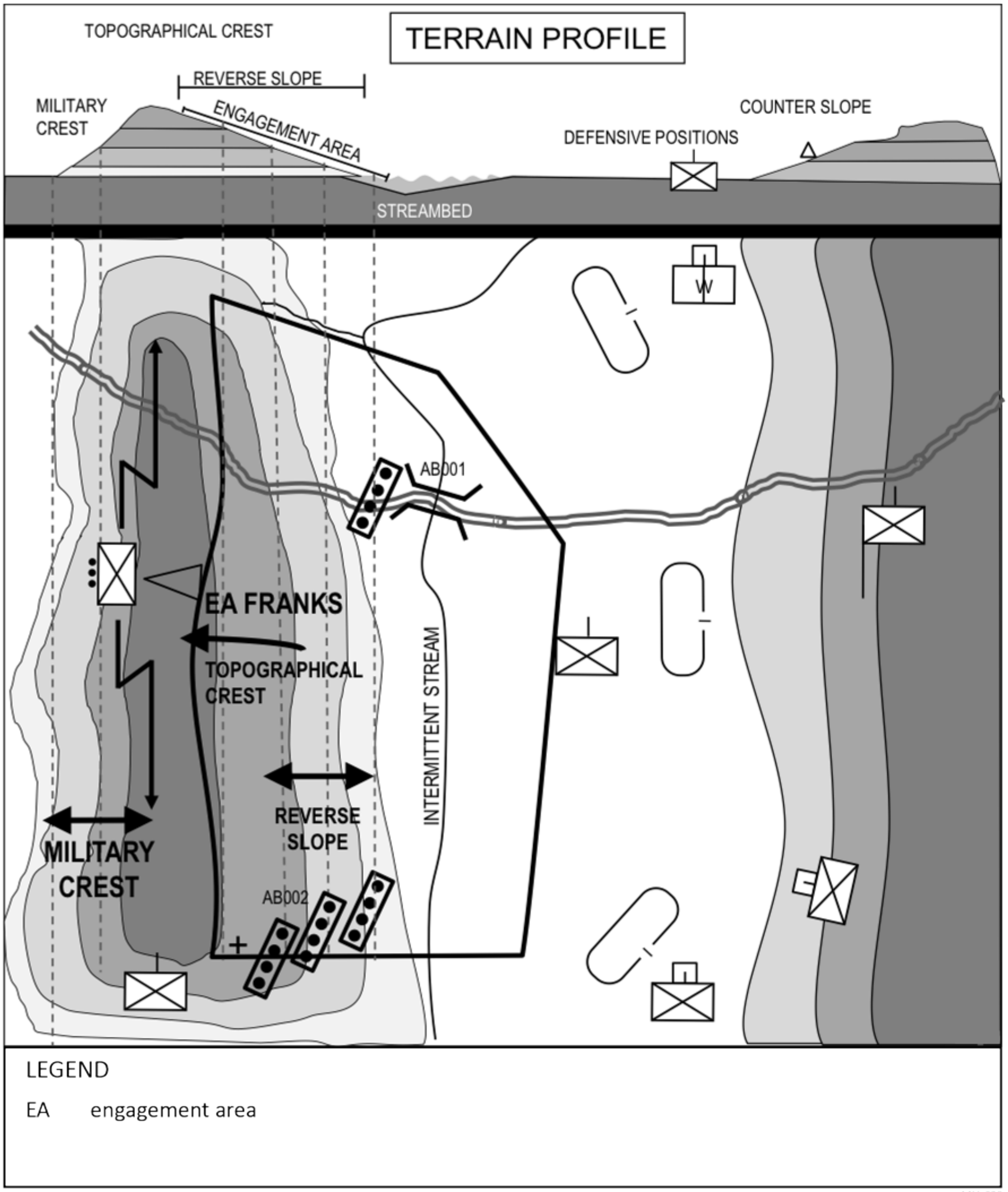


Figure 4-5. Reverse Slope Defense.

Battle Position and Strong Point Defenses

Battle Position. A defense from a battle position requires a mechanized force to occupy a general location where it can block an avenue of approach, fire into an assigned area, retain key terrain, or perform other tasks. Battle positions are hastily occupied but continuously improved. Commanders defend in battle positions and blocking positions when—

- Avenues of approach are well defined and the enemy can be canalized.
- Key terrain dominates the avenues of approach.
- The area of operations is narrow or small.
- Mutual support is achievable.
- The commander's ability to control is good.

An AA unit defending in a battle position can be deployed with its supported infantry mounted, with the infantry and AAVs in the same battle position, or with the infantry and AAVs in separate battle positions.

Infantry Mounted. This method of defending a battle position is used when the battle position is occupied temporarily and the unit may be required to quickly relocate. Although this method simplifies the control and coordination between the infantry commander and supporting AA unit and improves the unit's ability to react and move quickly, the unit has less firepower than it would if its Marines were dismounted. This deployment method is normally used when—

- Enough firepower can be employed from the AAVs.
- Increased local security or observation is not needed.
- A short-notice move may be required.
- There is a significant indirect fire threat.

Infantry and Amphibious Assault Vehicles on the Same Battle Position. Either the decentralized or centralized control method is used when the infantry and AA unit deploy on the same battle position. Using the decentralized method, some or all of the infantry dismount under the control of their platoon commander, who also retains control of their respective AA section. The platoon commander gives orders to the AA section leader, who instructs respective AAV crews. This method is used when the infantry cannot stay mounted but must temporarily occupy a battle position and be ready to quickly relocate.

The centralized method of control is used when the mechanized unit must occupy a battle position and be prepared to repel an attack. The infantry dismounts and positions themselves away from the AA unit. The mechanized unit commander controls the AAVs through the AA unit commander. This method is effective when the battle position has multiple avenues of approach with both long and short-range fields of fire. Centralized control enables each AAV and infantry element to be positioned on terrain suited to their own capabilities.

The infantry is usually positioned in close terrain that limits vehicle movement and firing positions. The AA sections take up positions on terrain that offer movement and good firing positions with long fields of fire. The AAVs may be positioned forward of, on the flanks of, or behind the infantry.

The positions of the units must allow the infantry to quickly remount. To do this, the AA unit commander plans linkup points where the AAV elements rejoin the infantry units. In addition, the AA unit commander designates routes that allow covered but fast movement to the linkup points.

Infantry and Amphibious Assault Vehicles on Separate Battle Positions. This deployment is used when the supported mechanized commander needs dismounted infantry in one location and AAVs in another. The AA unit commander controls fires and maneuver as required by the mechanized commander. The AA and infantry units may be separated if the infantry is ordered to occupy positions in heavily wooded or rugged terrain where AAVs cannot go; the AA unit may be located in a concealed position near the infantry or is assigned a battle position in suitable terrain.

Strong Point. A strong point is a defensive method that is employed by commanders whose mission requires the retention of terrain indefinitely and when the defending force may be isolated for periods of time by enemy action. A key point in a defensive position, a strong point is usually fortified and is often designed to defeat enemy armor and mechanized attacks. Located on a terrain feature that is critical to the overall defense, a strong point is intended for permanent or extended occupation.

Defending a strong point is the most labor-intensive mission a mechanized force may execute. While the defense is static, it requires built-in flexibility using direct and indirect fire plans and properly constructed positions. When supporting a strong point defense, AA units are most often assigned as part of the reserve. The reserve is usually tasked with being prepared to counterattack in a strong point defense. Ideally, the reserve should attack the enemy's flank, isolate the penetration force, and seal the gap in the position. This action should be rehearsed and synchronized with the fire support and obstacle plan over the main enemy avenue of approach to determine the most probable penetration points.

> **Warning: If infantry is positioned in front of tanks, the infantry should have overhead cover and hearing protection to shield them from the blast, overpressure, and discarding sabot from the tanks. If infantry is positioned in front of AAVs, the AA unit leader must ensure that the infantry establishes a route back to the AAVs that does not inhibit the up-gunned weapons station (UGWS) fields of fire.**

When conditions permit, mobile assets like mechanized infantry may remain outside the defensive perimeter to provide early warning and to delay or confuse the enemy. Once these mobile assets are inside the strong point, the mission becomes holding the defensive perimeter against the enemy. Interlocking direct fires must be planned over the entire strong point along with counterattack by fire positions and external direct fire control measures.

PREPARATIONS FOR THE DEFENSE

When not engaged in the attack, the commander must initiate preparations for the defense, including establishing positions, obstacle planning and construction, and logistics. Defenses may be conducted either deliberately or hastily, depending on the preparation time available.
A deliberately organized defense is normally employed when out of contact with the enemy or when contact with the enemy is not imminent and time for organization is available. A more deliberate defense includes fortifications, strong points, extensive use of obstacles, and fully integrated fires. The commander is normally free to make a detailed reconnaissance of the sector, select terrain to defend, and decide the best tactical deployment of forces.

A hastily organized defense is normally organized while in contact with the enemy or when contact with the enemy is imminent and time for organization is limited. Reconnaissance of the sector may or may not be detailed and the defense may be assumed directly from the current positions of units. Depending on the situation, the commander may initiate a hasty attack to seize terrain suitable to the defense. The commander may employ a security force to delay the enemy while deploying the bulk of the force to more suitable defensive terrain. A hasty defense is improved continuously as the situation permits and may eventually become a deliberate defense.

Commands must prepare simultaneously; actions and priorities of work must be established to comprehensively provide a strong defense. Priority of work considerations for AA units include the following:

- Posting security (i.e., turret watch for AAVs).
- Planning and developing fire control measures, such as sectors, target reference points, or engagement areas. The AA unit leaders ensure that range cards are created and integrated with the unit fire plan.
- Designating alternate positions, ensuring their ability to engage the primary avenue of approach.
- Designating supplementary positions, ensuring their ability to engage the secondary avenue of approach.
- Designating hide positions.
- Constructing primary fighting positions for anticipated fighting conditions.
- Achieving mutual support and concentration of fires with other weapon systems.
- Emplacing obstacles.
- Clearing fields of fire.
- Establishing coordination or contact points.
- Emplacing wire for communications.
- Replenishing, pre-staging, and/or digging in ammunition and other supplies.
- Designating observation posts/listening posts and patrol routes.
- Marking and preparing routes.
- Rehearsing movement back to and into alternate and supplementary positions (the AAVs must practice getting to their firing positions during all visibility conditions with or without ground guides; steps must be taken to mitigate accidents with dismounts).

- Using back-briefs to ensure the mission and intent are understood.
- Installing chemical agent detectors and preparing the appropriate mission-oriented protective posture (MOPP).
- Installing intrusion sensors.
- Enforcing camouflage and concealment measures to counter the enemy's use of unmanned aircraft systems.

Engineering

Commanders should involve combat engineers as early as possible in planning the defense since countermobility tasks such as the construction of obstacles (e.g., command-detonated mines, ditches, or hedge-hogs) and survivability tasks such as the preparation of fighting positions for large equipment (e.g., AAVs or tanks) can require lead time and planning to mobilize equipment, supplies, and personnel. The necessary mobility, countermobility, survivability, and general engineering tasks must be prioritized. Survivability and countermobility are the primary engineering efforts associated with developing a defense. Amphibious assault vehicles may be used to assist combat engineers and infantry in these tasks because of their mobility and ability to carry large amounts of demolitions, mines, wire, and other engineering materials.

Countermobility. Obstacles are employed in depth to support the scheme of maneuver and are integrated with the fire support plan to maximize the effects of fires. For more information on countermobility, refer to MCTP 3-34B. The following are some key countermobility measures in the defense:

- Preparing protective obstacles to prevent being overrun by the enemy.
- Emplacing tactical obstacles at optimum weapons range for their intended obstacle effects.
- Planning and coordinating for the employment of non-persistent mines as tactical obstacles.

Survivability. Survivability measures protect Marines from the effects of enemy fire and weapons. For more information on survivability, refer to MCTP 3-34C. The following are some key survivability measures in the defense:

- Assisting in building infantry fighting positions and CPs.
- Preparing hull or turret defilade fighting positions for AAVs, tanks, and other combat vehicles.
- Emplacing sandbags to protect Marines mounted in AAVs.
- Constructing protected routes between positions.

Logistics

When planning for logistics in the defense, the commander positions the CSS elements away from locations that may be targeted by the enemy, while remaining close enough to ensure the rapid resupply of the mechanized force's assets. A CSS traffic control plan must be developed and known by the AA unit leadership to ensure that supplies, personnel, and casualties are delivered to the right locations.

Combat trains and contact teams normally plan multiple routes to defensive positions and rehearse their movement to minimize confusion during the battle. Defenders often employ pre-planned contact teams to conduct emergency resupply or repair as far forward as possible to reduce turnaround time. Pre-packaged ammunition and other classes of supply reduce reliance on emergency resupply and minimize movement within defensive positions, which might be observed or detected by the enemy.

Amphibious assault vehicles may be used to supplement the vehicles in the combat trains. The AAVs assigned to support CSS units may be used to carry fuel bladders, pre-packaged ammunition, and other supplies, or as an ambulance when fitted with litter carriers.

Command and Control

The commander and key staff normally command and control the defensive battle from the forward headquarters echelon. Its positioning allows the commander to remain close to decisive actions or critical events. Located to the rear of the frontline units, the main headquarters echelon maintains contact with subordinate units and the forward echelon. The main echelon focuses on monitoring the progress of the battle, forwarding information and support requests, and coordinating the activity of supporting units. The commander may choose to mount the forward headquarters echelon and control their forces utilizing the C2 systems inherent in the AAVC7A1 variant. For more information on this, see appendix B.

CHAPTER 5
LOGISTICS OPERATIONS

Logistics is the science of planning and carrying out the movement and maintenance of forces. For the AA battalion, logistics refers to the science of planning and affecting the development, deployment, and sustainability of the battalion's resources. Since CSS generates and sustains combat power for the AA unit, CSS planning must be integrated into every phase of planning for AA unit operations in support of infantry. Sustainability is the ability to maintain the necessary level and duration of operational activity to achieve military objectives by providing for and maintaining levels of ready forces, material, and consumables necessary to support the military effort. At the AA battalion level, sustainability means accurately using organic assets and coordinating logistic support with the LCE to accomplish the mission.

Commanders ensure logistics are integral to the planning process and the allocation of resources. Effective logistics operations are the result of a thorough analysis and framing of the problem in order to identify the capabilities required to accomplish the mission. Logistics planning is an ongoing iterative process from the receipt of the mission until all objectives are achieved and all forces are returned to home station.

COMMAND AND CONTROL

The positioning and employment of supply trains through the chain of command are driven by factors such as METT-T, the seven principles of logistics support, and the six functional areas of Marine Corps logistics—supply, maintenance, transportation, general engineering, health services, and other services. The principles of logistics support include the following:

- **Responsiveness.** Providing the right support at the right time and in the right place. Among the principles of CSS, the principle of responsiveness is the most critical.
- **Simplicity.** The avoidance of complexity fosters efficiency in both the planning and execution of CSS operations. Mission-type orders and standardized procedures contribute to simplicity.
- **Flexibility.** This refers to the ability to adapt CSS structures and procedures to changing situations, missions, and concepts of operations.
- **Economy.** This is the provision of support at the least cost in terms of the resources available and necessary to accomplish the mission.
- **Attainability.** This refers to the ability to provide the essential supplies and services required to begin combat operations.
- **Sustainability.** Sustainability is an element of military capability, and refers to the ability to maintain support throughout the operation.
- **Survivability.** This refers to the inherent capacity of the organization and its capabilities to prevail in the face of potential destruction.

The following section describes the roles and responsibilities of key personnel in providing logistics support to an AA battalion. For more information on the functions, principles, and general organization of tactical-level logistics, refer to MCWP 3-40, *Logistic Operations* and MCTP 3-40B, *Tactical-Level Logistics*.

Logistics Officer

The logistics officer, or S-4, controls the battalion combat trains and coordinates their location with the operations section. To best control the train, the S-4 officer travels or operates with an appropriate communications platform that allows the monitoring of multiple nets. The combat trains normally monitor the battalion tactical radio frequency.

Supply Officer or Headquarters and Service Company Commander

The H&S company commander or supply officer normally controls the battalion field trains. The battalion S-4 may direct the field train if it is collocated with the regiment or battalion.

Tactical Logistics Operations Center

The tactical logistics operations center may be collocated with the supported regiment or battalion field trains. The tactical logistics operation center monitors designated nets when coordinating direct support missions (i.e., transporting supplies directly to the combat train).

> Note: The tactical logistics operation center should provide liaison to the supported units (i.e., regiment or battalion). The liaison officer should arrive with communication assets and pass coordinating traffic from the CSS unit to the supported unit on the CSS request net. Additionally, the mission may require the AA battalion to request a liaison team from the LCE.

BATTALION SUPPORT AREA

The maintenance contact teams (MCTs) and supply trains must be protected to maintain the sustainability of forward units. The location of the battalion support area depends on the situation. The MCTs in direct support roles may be collocated in battalion support areas or where they would be most responsive, yet survivable. The MCTs can be collocated with the battalion field trains or regimental trains, except when providing direct support to maneuver units.

> Note: Traditionally, the battalion support area is controlled by the supported unit. The AA battalion manages AAV operations out of the battalion support area through the supported unit's headquarters company.

Positioning Considerations

To satisfy the CSS principles of responsiveness and survivability, the unit/battalion trains or MCTs in direct support should be located—

- On defensible terrain and outside of enemy artillery range.
- In an area with enough space to permit the dispersion of both vehicles and activities.
- Where there is good cover and concealment from aerial and ground observation.
- On firm ground that supports continuous vehicle traffic.
- Near a suitable landing zone for medical/casualty evacuation and resupply.
- Close to main supply routes forward and rearward.
- Near good communications with forward elements and supporting CSS units.

Force Protection. The security of the battalion support area is a joint effort between the supporting LCE unit commander and the AA units. Force protection considerations include, at a minimum—

- Using observation posts to provide early warning.
- Establishing a perimeter defense if expecting to be stationary for an extended period.
- Establishing quick reaction forces and assigning positions and sectors of fire.
- Using vehicles with heavy machine guns to cover likely avenues of approach.
- Establishing internal communications by wire.
- Fire support planning.
- Seeking positions that offer overhead cover and concealment.
- Positioning near the reserve.

Displacement. When repositioning the trains, the commander or S-4 officer selects the displacement technique that best complements the supported unit's concept of operations. The trains may displace as a whole or by echelon. Displacement by echelon permits continuous CSS and enhances survivability.

Logistics Trains

The LCE provides sustained CSS. Task-organized CSS units replenish the AA unit trains, which replenish their companies or separate detachments using combat and field trains. Regimental and unit trains provide logistic support and link forward tactical elements with the supporting LCE.

Regimental. The regimental train provides CSS to sustain the regimental headquarters and consists of organic or attached units under the direct control of the regiment. The regimental commander may choose to consolidate the battalion field trains in one location for security, control, and resource pooling. The CSS that is of immediate need to combat units should be allocated to the battalion trains, but the CSS that is not time critical can often be consolidated at the regimental level. The AA unit MCT may collocate with the regimental train.

Unit. Unit trains centralize the organic CSS assets of the supported unit in a single location under the direct control of the unit commander. Unit trains are most appropriate in defensive, slow moving, or static situations.

Battalion Trains. Battalion trains operate under the control of the battalion S-4 and are normally echeloned into combat and field trains. Battalion trains should provide their own security while simultaneous resupplying each maneuver element. Combat trains must be located far enough forward to remain responsive, normally not more than three to five kilometers behind the tactical units. The field trains must be readily accessible to the LCE to improve coordination. The following is a sample composition of a battalion train:

- 2 high mobility multipurpose wheeled vehicles (HMMWVs).
- 1 Logistics Vehicle System (LVS) and/or medium tactical vehicle replacement (MTVR) with fuel containers.
- MTVR cargo.

The following is a sample composition of a battalion battle damage assessment team:

- 2 HMMWVs.
- 1 AAVR7A1.
- 1 AAVP7A1.

Combat Trains. Combat trains are organic assets that usually include the following:

- Supply classes I (rations), III (POL), V (ammunition), and selected class VIII (medical) and XI (repair parts) to last for a specified period (usually not more than 24 hours).
- The forward battalion aid station with supporting ambulance teams.
- MCTs with a limited number of maintenance and recovery vehicles.
- Other anticipated critical CSS.
- Organic or attached firepower for local and anti-air/anti-armor security, as required.

Field Trains. Field trains consist of the organic CSS capabilities not located in the combat trains. The field trains usually include the following:

- The remainder of the battalion aid station.
- The supply section, with organic or attached motor transport (not in the combat train).
- Remaining CSS not in the combat train.

The field trains can also include the following:

- CBRN MOPP exchange/decontamination (see appendix M for more information).
- Ammunition.
- Additional water and fuel.

The following is a sample composition of a field train:

- 13 LVSs.
- 13 MTVRs.
- 27 HMMWVs (mixture of ambulance and communication variants).
- 14 AAVP7A1s.
- 2 AAVC7A1s.
- 2 AAVR7A1s.

Company. Company trains consist of the immediate support that the commander requires to distribute critical supplies or evacuate casualties. These trains include the company recovery vehicle, the company medical section, and attached CSS. A company operating independently or at some distance from the battalion will have a portion of the battalion's organic CSS attached, including vehicles for resupply. Company trains, normally no more than a few vehicles, move with the company under the control of the company logistics chief or AAV leader, gaining security from its proximity to the platoons. The company trains move one terrain feature in trace of the company. Organic or attached CSS of a less time-critical nature is normally located with the battalion trains.

The following is a sample composition of a company train:

- Battlefield damage and repair team in one AAVP7A1 with one AAVR7A1.
- Communications vehicle for communications relay.
- 3 HMMWVs.
- 2 MTVRs with cargo or water trailers.
- 1 cargo LVS.
- 1 LVS with fuel storage.

Replenishment Methods

The service station and tailgate issue methods are the two most common methods used to replenish the unit trains.

Service Station Method. When using the service station method (see fig. 5-1 on page 5-6)—

- Tactical vehicles enter the resupply point following a one-way traffic flow.
- Vehicles requiring immediate unit-level or higher maintenance stop in the maintenance holding area before conducting resupply.
- Personnel rotate individually to eat, pick up mail and supplies, and refill or exchange water cans.
- Vehicles that complete resupply move to the holding area where pre-combat inspections are completed.
- AAVs pull out of their positions in rotation, resupply, and return.

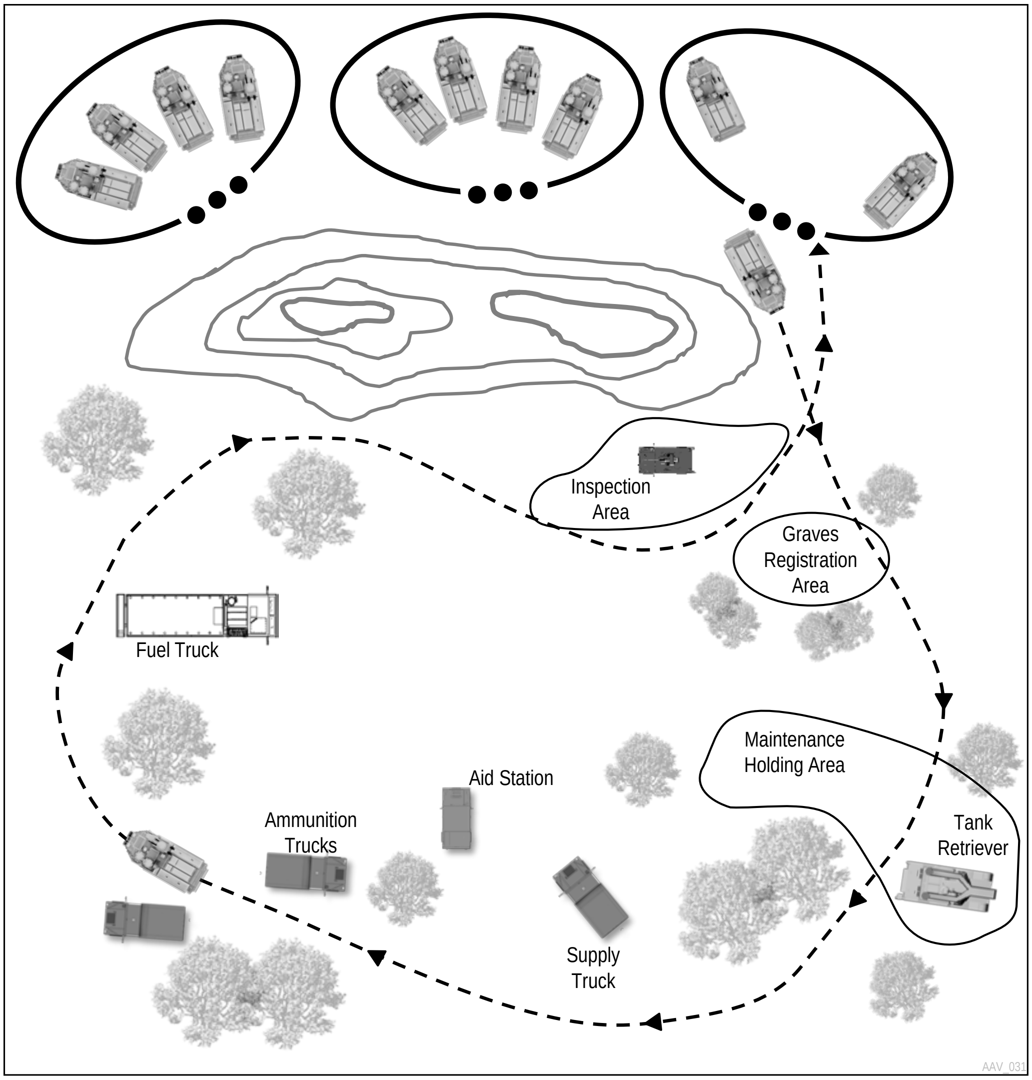


Figure 5-1. Service Station Method.

Tailgate Method. The tailgate issue method (see fig. 5-2) is normally conducted only in an assembly area; however, this method may be used where it lends itself to the efficient replenishment of the unit. Combat vehicles remain in place while POL and ammunition trucks go to each vehicle position in turn. If it is employed in forward positions, the terrain must mask the resupply. This procedure takes much longer than the service station method and places the resupply vehicles at greater risk. When using the tailgate method of replenishment—

- Platoon personnel deliver the remains of Marines killed in action and their personal effects to the holding area.
- Enemy prisoners of war are centralized and guarded.
- Pre-combat inspections are completed at each vehicle position.

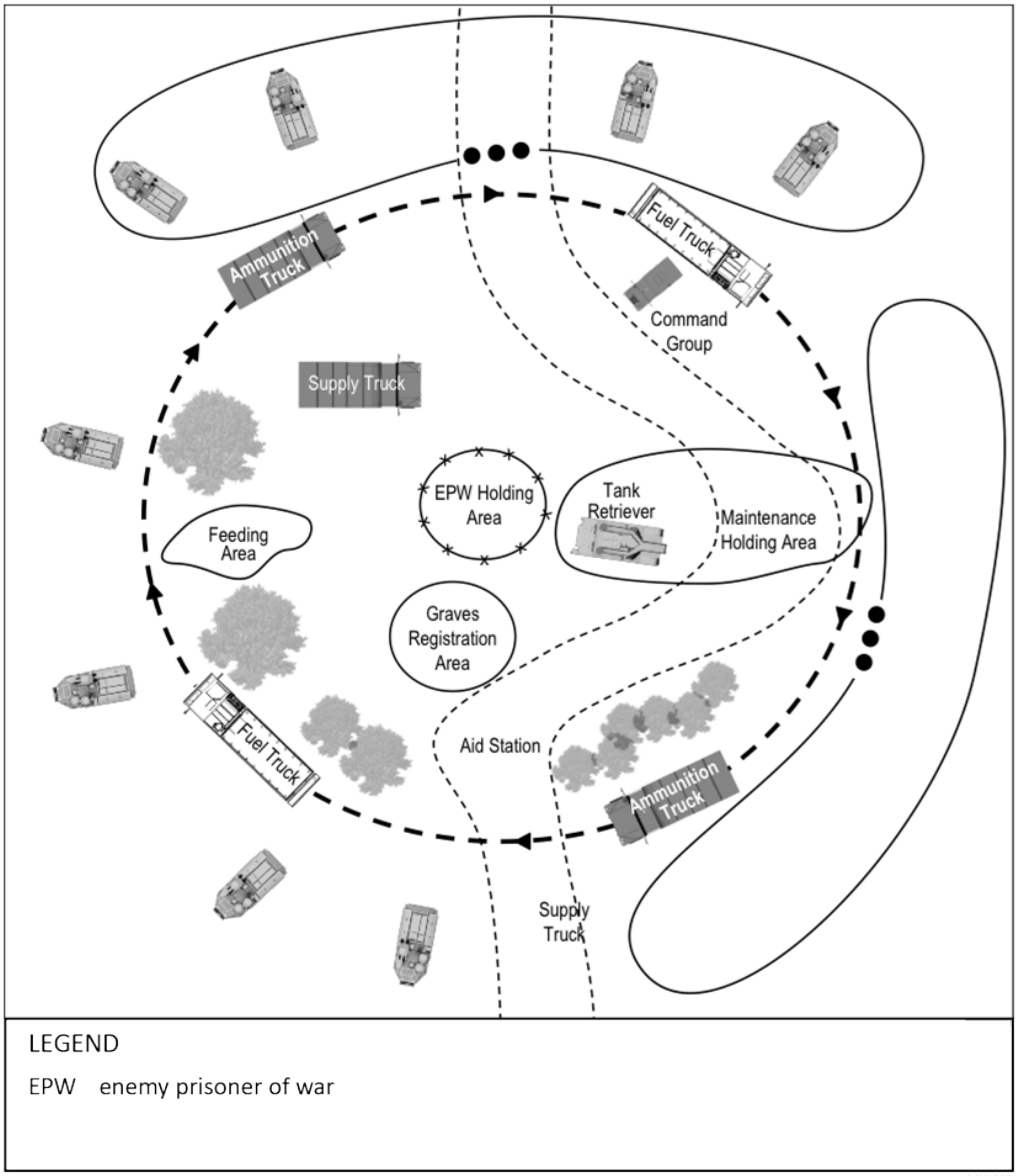


Figure 5-2. Tailgate Method.

Recovery and Repair

Recovery and repair are accomplished as far forward as possible. When equipment cannot be repaired on site, it is moved to the maintenance area, which should only be as far as necessary for repairs. When the maintenance requirements of the force cannot be met, the commander determines the maintenance support priorities for subordinate units based on the S-4's recommendations and tactical requirements.

It may be necessary to selectively interchange or cannibalize parts from damaged vehicles that cannot be immediately repaired to return other equipment to combat. The commander should establish guidelines to prevent uncontrolled selective interchange and cannibalization.

Commanders with organic or attached maintenance sections should task-organize MCTs to inspect, diagnose, assist with recovery, and repair equipment at forward sites. Maintenance contact teams typically operate with combat trains. Based on guidance from the commander, the S-4 task-organizes the contact teams to meet each specific requirement. Based on the tactical situation, a contact team determines whether a damaged item is repairable at the recovery site. If the item is repairable, then the MCT fixes it or obtains parts, additional tools, and personnel from the rear. If the item is not repairable at the recovery site, then the MCT supervises the evacuation of the equipment to a designated maintenance collection point.

Company maintenance personnel recover disabled vehicles and attempt to repair them on site. If company personnel cannot repair the vehicle, then it is repaired on site by battalion maintenance personnel or moved by company personnel to a unit maintenance collection point to await repairs. If battalion personnel cannot repair the vehicle, then it is repaired onsite by an MCT from the supporting LCE unit or moved to a repair and replenishment point operated by the LCE.

Based on the situation, the crew may remain with the vehicle being evacuated to return it or a replacement to the unit. The crew's personal equipment should be transferred to other vehicles before evacuation. During fast-paced operations, rather than establishing specific collection points, the commander may direct that vehicles be towed to the main supply route and secured to await maintenance support from MCTs advancing along it. If vehicles cannot be repaired or evacuated quickly during retrograde, they must be destroyed in place to prevent them from falling into enemy hands.

ASSAULT AMPHIBIAN BATTALION LOGISTIC SUPPORT

The AA battalion has a large organic logistic capability with robust supply and maintenance capabilities. Additionally, the battalion has a large motor transport section for transporting its logistic needs and can provide some of its own engineering, health services, and services requirements. These capabilities ensure the battalion can operate continuously.

The AA battalion S-4 directs the battalion's logistics. The AA battalion's logistic personnel support forward deployed AA units with AAV-unique sustainment of parts, materials, and field level maintenance. The AA battalion, because of its extensive organic maintenance capability, generally creates MCTs to operate in direct support of forward units. An MCT normally supports a company, but may be created to support a reinforced platoon operating independently. The battalion should maintain close liaison with the supported unit (i.e., infantry regiment) and the supporting LCE unit. The AA battalion is the focal point for AAV support and sustainment.

Supply

The AA battalion supply section uses a combination of unit distribution and supply point methods to support the battalion and its subordinate units. The battalion supply section is capable of providing organic supply support for the battalion.

Assault amphibian companies may maintain repair parts if requested and authorized. Companies may also maintain a 30-day stock of common repair parts. The company is organized to handle the internal distribution of supplies and to carry a basic load. The AA battalion or the supported unit provides additional supplies. The following are the nine classifications of logistical supplies relating to mechanized operations:

- Class I—Subsistence.
- Class II—Clothing, individual equipment, tools, and administrative supplies.
- Class III—Bulk fuel and POL.
- Class IV—Construction/barrier materials.
- Class V—Ammunition and explosives.
- Class VI—Personal demand items.
- Class VII—Major end items.
- Class VIII—Medical supplies.
- Class IX—Repair parts.
- Class X—Non-military requirements not included in classes I-IX.

Maintenance

Assault amphibian companies are capable of conducting organizational maintenance on AAVs and are assigned table of equipment weapons, motor transport vehicles, and communications-electronics assets. Companies are provided with sufficient tools and test equipment to troubleshoot and diagnose mechanical and electrical systems faults to the repairable component level on organic equipment. Limited intermediate-level field maintenance may be authorized by higher headquarters to support mission requirements.

Assault amphibian platoons are task-organized with organic assets and personnel. At a minimum, a platoon is capable of conducting organizational maintenance on AAVs. A platoon may be staffed with a company armorer, motor transport mechanics, communications-electronics technicians, or a welder. Maintenance capabilities on other equipment depend on the attachment of Marines with the appropriate military occupational specialties and equipment. Limited intermediate-level field maintenance may be authorized by higher headquarters to support mission requirements.

Recovery and battlefield damage and repair are separate subsets of the maintenance effort. The unit is responsible for these efforts to return combat assets to the battlefield as quickly as possible.

Recovery. Recovery is retrieving or freeing immobile, inoperative, or abandoned material from its current position and returning it to operation or to a maintenance site for repair. These actions typically involve towing, lifting, and winching.

Towing is typically limited to moving vehicles to the nearest collection point. Recovery consists of self-recovery, like-recovery, and dedicated-recovery actions. Self-recovery actions use only the equipment's own assets. Like-recovery actions involve the assistance of a second, similar vehicle. Dedicated-recovery actions require the assistance of a vehicle that is specifically designed and dedicated to recovery operations. Operators of AAVs are specifically trained in self-recovery and like-recovery actions. Each AA company and each deployed AA platoon has one AAVR7A1.

Battlefield Damage and Repair. Battlefield damage and repair is the procedure used to rapidly return disabled equipment to the operational commander by expediently repairing, bypassing, or replacing components. Battlefield damage and repair restores the minimum essential combat capabilities necessary to support a specific combat mission or to enable the equipment to self-recover. Depending on the repairs required and the amount of time available, these repairs may be temporary and may not restore the vehicle to full mission-capable status. Performed by the crew, maintenance teams, maintenance support teams (MSTs) or recovery teams, battlefield repairs are usually not permanent and should be replaced with permanent repairs as soon as possible.

Transportation

The battalion possesses LVS container haulers, MTVRs, and HMMWVs that provide transportation for supported units, equipment, and weapons, and support administrative and logistical functions. Based on the situation, AA companies can receive a limited number of motor transport vehicles from the AA battalion.

Engineering

The battalion possesses limited quantities of engineering equipment, such as generators, decontamination systems, air conditioners, fuel and water storage modules, and rough terrain forklifts. These assets are designed to support battalion-level operations and are not generally deployed below that level.

Health and Other Services

The AA battalion possesses a battalion aid station that requires several AAVs with litter kits to mechanize. Other services available at the AA battalion include—

- Personnel administration.
- Religious ministry.
- Billeting.
- Financial management.
- Messing.

> Note: During combat operations, food service resources may be centralized within the MAGTF.

LOGISTICS COMBAT ELEMENT SUPPORT REQUIREMENTS

At the company and platoon level, AA elements carry minimum levels of fuel, POL, and supplies to preserve their ability to rapidly displace or maneuver. The LCE must plan to resupply the AA unit element, normally using logistic trains. The AA unit leader must coordinate frequently with the LCE to identify changes in supply, maintenance, and transportation requirements.

Supply

The LCE unit commander establishes issue points for classes of supply. Ideally, repair part issue points are located near intermediate maintenance sites. The AA commanders should tailor repair part blocks to their anticipated needs. Supply point and unit distribution are the two normal methods of distributing supplies. Under these methods, the using unit is responsible for internal distribution.

Supply Point Distribution. The supply point distribution method requires the using unit to be issued supplies at a supply point established by the LCE. The advantage of supply point distribution is that, while it requires the use of organic transportation, the AA unit can request a desired time for the resupply, even if it is only for a single critical repair part.

Unit Distribution. Because the LCE delivers supplies to the using unit, these deliveries are prioritized based on the MAGTF mission; however, the unit requiring supplies may not receive them at the desired time. The advantage of unit distribution is that AA units do not allocate organic transportation assets except to distribute supplies internally.

Distribution Considerations. While unit distribution is preferred, the commander often uses a combination of methods. In most cases, the main and supporting efforts should be on unit distribution. However, if that is not possible, the commander should—

- Consider the main effort for unit distribution.
- Ensure that supplies are delivered forward to the combat units to maintain momentum.
- Avoid combat units having to move rearward to be replenished.
- Prioritize engaged units with limited organic transportation first for unit distribution.
- Prioritize units not in contact with the enemy last for unit distribution.
- Provide sufficient vehicles to units for internal resupply.

Because AAVs rely heavily on class III and V supplies to complete their missions, combat loads are prescribed by the AA vehicle commander in concert with the supported unit's SOP and METT-T. The *Capabilities Baseline Document for the Amphibious Assault Vehicle (AAV7A1) Family of Vehicles* lists the AAV combat load. Generally, each AAV carries the following:

- 200 ready rounds for the M2 (1,000 rounds stowed in 10 ammunition boxes).
- 96 ready rounds for the MK-19 (768 rounds stowed in 24 ammunition boxes).
- 8 smoke grenades loaded in two M257 launchers.
- One 5-gallon can of lubrication oil.
- Two 5-gallon cans of potable water.
- One 5-gallon can of coolant.
- Four 1-quart cans of hydraulic fluid.

Maintenance

The LCE is responsible for intermediate field-level maintenance. The focus of effort is timely repair as far forward as possible. Intermediate maintenance includes diagnosis, adjustment, direct exchange, and technical assistance. The LCE intermediate maintenance elements augment the capabilities of MCTs from the AA unit. The LCE MSTs operate in a general support role while the AA unit MCTs operate as a function of their organic maintenance responsibility.

The MSTs normally work on equipment in the CSS area until called forward for a specific repair. This arrangement permits better use of maintenance and transportation assets and allows the MST to draw and bring needed parts when called forward. The LCE unit commander may position MSTs forward if enough work is anticipated to justify the move. When moved forward, the MST should carry a repair parts block and only remain forward for as long as the workload demands.

Transportation

The CSS transportation assets provide support at the proper locations and times to initiate and maintain operations. The AA unit should develop a requirements list that identifies personnel, supplies, and equipment that must be moved; requirements that can be supported with organic assets; and requirements that must be requested from an LCE transportation element.

CHAPTER 6
OTHER OPERATIONS

The AA unit is a force multiplier for the MAGTF across a wide range of tactical activities. The amphibious capabilities of the AAV present unique opportunities for a commander to leverage in most operational environments. Many common tactical activities can be enhanced with the ability to integrate the AAV's cross-country and waterborne movement abilities.

PASSAGE OF LINES

A passage of lines occurs when a force moves through another force's combat positions to move into or out of contact with the enemy. A commander conducts a passage of lines to continue an attack or conduct a counterattack, retrograde security or main battle forces, and anytime one unit cannot bypass another unit's position. The conduct of a passage of lines involves two forces: the stationary force and the moving force. Passages of lines are conducted to—

- Sustain the tempo of an offensive operation with fresh forces.
- Maintain the viability of the defense by introducing fresh forces.
- Free a unit for another mission, reconstitution, routine rest, resupply, refresher/specialized training, or maintenance.

LINKUP

A linkup is a coordinated meeting between two friendly ground forces in the general presence of the enemy. The purpose of the linkup is to establish contact between two ground forces. A linkup may occur between an air assault force having secured an objective and a force on the ground, between two converging forces, or in the relief of an encircled force. The commander directing the linkup establishes the command relationships and responsibilities of the two units during and after the linkup to include responsibility for fire support coordination.

The coordination associated with a linkup usually requires one element to be stationary. If both units are moving, one element should halt, becoming stationary—if only temporarily—to affect linkup. The commanders involved must coordinate their schemes of maneuver. They agree on primary and alternate linkup points where physical contact between the advance elements of the two units will occur. Linkup points must be easily recognizable to both units and located where the routes of the moving force intersect the security elements of the stationary force. Commanders must carefully coordinate fire support for the safety of both units.

Linkup with Stationary Unit

Linkup when one unit is stationary is the preferred linkup method when the moving force or forces have an assigned limit of advance near the other force. When one of the units involved is stationary, linkup points are usually located near the limit of advance. It is also near the stationary force's security elements. Alternate linkup points are also designated, since enemy action may interfere with linkup at primary points. Stationary forces assist in the linkup by reducing obstacles to create lanes, furnishing guides, and designating assembly areas. A restrictive fire line is established between the two forces and a restrictive fire area may be established around one or both forces linking up. A fire support coordination line is established beyond the area where the two forces are linking up. When a moving force is coming to relieve an encircled force, it brings the additional logistical assets required to restore the encircled unit's combat effectiveness to the desired level.

Linkup Between Moving Units

Linkup between two moving units is used during highly fluid, mobile operations when an enemy force is escaping from a potential encirclement or when one of the forces affecting the linkup is at risk and requires reinforcement immediately. In this case, the moving force or forces continue to move and conduct long-range recognition via radios or other communications means, stopping only when they make physical contact. Since a linkup between two moving or converging units is one of the most difficult operations, limits of advance are established to prevent fratricide. Primary and alternate linkup points for two moving forces are established in the vicinity of the limit of advance. Fire support considerations are similar to when a stationary and moving force linkup. The leading elements of each force should exchange liaison teams and be on a common radio net.

RELIEF IN PLACE

A relief in place is an operation in which, by direction of higher authority, all or part of a unit is replaced in an area by the incoming unit and the responsibilities of the replaced elements for the mission and the assigned zone of operations are transferred to the incoming unit. The relief must be executed in an expeditious and orderly manner. Every effort must be made to affect the relief without weakening the tactical integrity and security of the assigned area. The outgoing commander is responsible for the defense of their sector until command is passed. The moment when command is to pass is determined by mutual agreement between the commanders involved, within the direction of higher headquarters. Both commanders should be collocated throughout the operation to facilitate the transfer of command and control.

Following this transfer, the incoming commander assumes OPCON of the elements of the outgoing force that have not yet been relieved.

The relief can take place simultaneously over the entire width of the sector or it can be staggered over time. If forces are relieved simultaneously across the sector, less time is required, but greater congestion may be created—the readiness of the defense is reduced and the enemy is more likely to detect the greater level of movement. By contrast, a relief staggered over time takes longer, but a larger portion of the force is prepared to conduct operations.

ASSURED MOBILITY

Assured mobility is a framework of processes, actions, and capabilities that assures the ability of a force to deploy, move, and maneuver where and when desired, without interruption or delay. It includes mobility, countermobility, and survivability tasks to accomplish the mission. For more information on assured mobility and mobility tasks, see MCTP 3-34A. For more information on countermobility and survivability tasks, see MCTP 3-34B and MCTP 3-34C. Commanders and staffs apply the assured mobility fundamentals—*predict*, *detect*, *prevent*, *avoid*, *neutralize*, and *protect*—when planning operations, as described in the following:

- *Predict* potential obstacles to mobility by analyzing enemy TTP, capabilities, and likely countermeasures; the effects of terrain; and civil considerations in terms of vehicular traffic, dislocated civilians, etc.
- *Detect* the location of avenues of approach, natural and man-made obstacles, and enemy obstacle resource capabilities.
- *Prevent* negative effects on friendly mobility through shaping actions such as eliminating enemy countermobility capabilities, preparing to mitigate natural obstacles, and destroying terrorist networks implanting improvised explosive devices and mines. Prevent also includes denying the enemy the ability to disrupt or destroy friendly mobility capabilities – such as protecting breaching assets until they must be committed.
- *Avoid* likely impediments to mobility, whether in terms of enemy action, natural features, friendly shortfalls, or combinations of all three—even if this results in the selection of less favorable, but unexpected routes.
- *Neutralize*, reduce, or overcome obstacles and impediments as soon as possible to allow the unrestricted movement of forces. The TTP available to do this are factors of METT-T, the rules of engagement, and the type of military operation being conducted. For example, how an urban minefield would be cleared in a major combat operation would be different than how it would be mitigated in a peacekeeping operation.
- *Protect* by implementing survivability and other force protection measures that will prevent the observation of friendly forces and degrade or eliminate the effects of enemy actions. This can include actions from creating new routes that allow forces to move unobserved and unmolested, to the employment of mine rollers, to the use of electronic warfare systems to disrupt improvised explosive devices.

Two key activities related to assured mobility are obstacle breaching and gap crossing. Both involve the employment of combined arms to achieve the desired effects and minimize the obstacle's impact on the momentum of attack.

Breaching

Marine Corps forces in the offense can expect to encounter numerous natural and man-made obstacles. The assured mobility fundamentals suggest that obstacles should be *avoided* (i.e., bypassed) when possible. When they cannot be avoided, however, they must be *neutralized* through a combined arms breach. While the preponderance of the Marine division's obstacle breaching/reduction capability is in the combat engineer battalion (CEB), the mobility/countermobility platoon in the H&S company of the AA battalion has its own explosive breaching capability.

The mobility/countermobility platoon consists of 24 total AAVP7A1s, 12 of which are equipped with Mk-154 mine clearance line charge systems. The smallest unit used for breaching is normally a breach team consisting of four AAVs, two of which are Mk-154 Mod 1 vehicles. The AAVs without mine clearance capabilities carry combat engineers who are prepared to debark to conduct mechanical or secondary explosive breaching and to proof and mark the breached lanes when no other engineer breaching/proofing equipment (e.g., assault breaching vehicle or medium crawler tractor with mine rake) is available. Table 6-1 shows the organization of mobility/countermobility elements. The significant limitation of the mobility/countermobility platoon's AAVs is their vulnerability to anti-vehicle mines and other significant explosive ordnance, making them unsuited to proofing the lanes they breach and requiring external support or dismounted proofing by combat engineers, who may be exposed to enemy fire. The commander should consider the following factors when planning for the employment of the mobility/countermobility platoon:

- The mobility/countermobility element must maintain a separate assembly area at least 1,000 meters away from populated areas, to include larger unit assembly areas. The mobility/countermobility unit leader coordinates with the supported unit to determine a suitable assembly area for mobility/countermobility and breach force units.
- Radio communications should be kept to a minimum around line charge ammunition and fuses due to the possibility of unintended detonation caused by significant HF [high frequency], VHF [very high frequency], and UHF [ultrahigh frequency] transmissions.
- Mk-154 Mod 1 AAVs never operate alone and require the security of the supported unit.
- The smallest mobility/countermobility unit employed for an operation is a breach team consisting of two Mk-154 Mod 1 AAVs and two AAVP7A1 security vehicles. This configuration maintains 100 percent redundancy, which is essential at the breach site. Fifty percent losses should be anticipated during obstacle reduction.
- The Mk-154 Mod 1 AAV cannot transport troops or equipment due to the ordnance occupying the entire troop compartment and the restricted ability to evacuate embarked Marines.
- The security AAVP7A1 that operates with the Mk-154 Mod 1 vehicle is required to transport combat engineers in support of the breaching effort.

For information on breaching equipment and the types of obstacles, see MCWP 3-34, *Engineering Operations*. See MCTP 3-34A for an in-depth analysis of the TTP for breaching. Breaching may be required in either amphibious operations or in operations ashore.

Table 6-1. Mobility/Countermobility Organization.

Mobility/Countermobility Unit	Equipment
Platoon	12 Mk-154 Mod 1, 12 AAVP7A1 security vehicles
Section	6 Mk-154 Mod 1, 6 AAVP7A1 security vehicles
Breach team	2 Mk-154 Mod 1, 2 AAVP7A1 security vehicles
Breach element	1 Mk-154 Mod 1, 1 AAVP7A1 security vehicle

Amphibious Breaching. The primary mission of the mobility/countermobility platoon is to provide support in the clearing of lanes through minefields and other obstacles during amphibious operations and in support of subsequent operations ashore. Because of this specialized mission, the mobility/countermobility platoon is considered a division asset and should establish a special working relationship with the division's CEB. Operational proficiency in the employment of mobility/countermobility assets requires an understanding of the mine clearance line charge kit (see appendix B) used to reduce obstacles, the organization of mobility/countermobility assets, the breaching fundamentals (i.e., suppress, obscure, secure, reduce, and assault), and amphibious breaching operations.

The amphibious landing and amphibious breaching operations must be synchronized. The lane requirements of the landing force and mines and other obstacles dictate the size and composition of the amphibious breach force. The Joint Direct Attack Munition (JDAM) Assault Breaching System, planned and employed by the CATF and specific subordinate commanders, is the primary means of breaching lanes through the surf zone and beach up to the clearance coordination line (which delineates the responsibility for obstacle reduction between the CATF and the CLF) in an amphibious forcible entry operation (see fig. 6-1 on page 6-6). However, if the JDAM Assault Breaching System is ineffective, the AA battalion's mobility/countermobility platoon (or its elements) should be prepared to serve as a secondary or supplemental mean of breaching lanes. When planning to employ the Mk-154 Mod 1 AAV in an amphibious breach, the commander must consider embarkation factors and develop a launch plan that accurately reflects the employment of the Mk-154 Mod 1 AAV during the breach. For more information on amphibious operations, refer to JP 3-02. For more information on naval mine countermeasures (MCM) and amphibious breaching, refer to MCTP 13-10J, *Naval Mine Warfare, Volume I* (designated Navy Warfighting Publication 3-15 by the US Navy) and MCRP 13.10J.1.

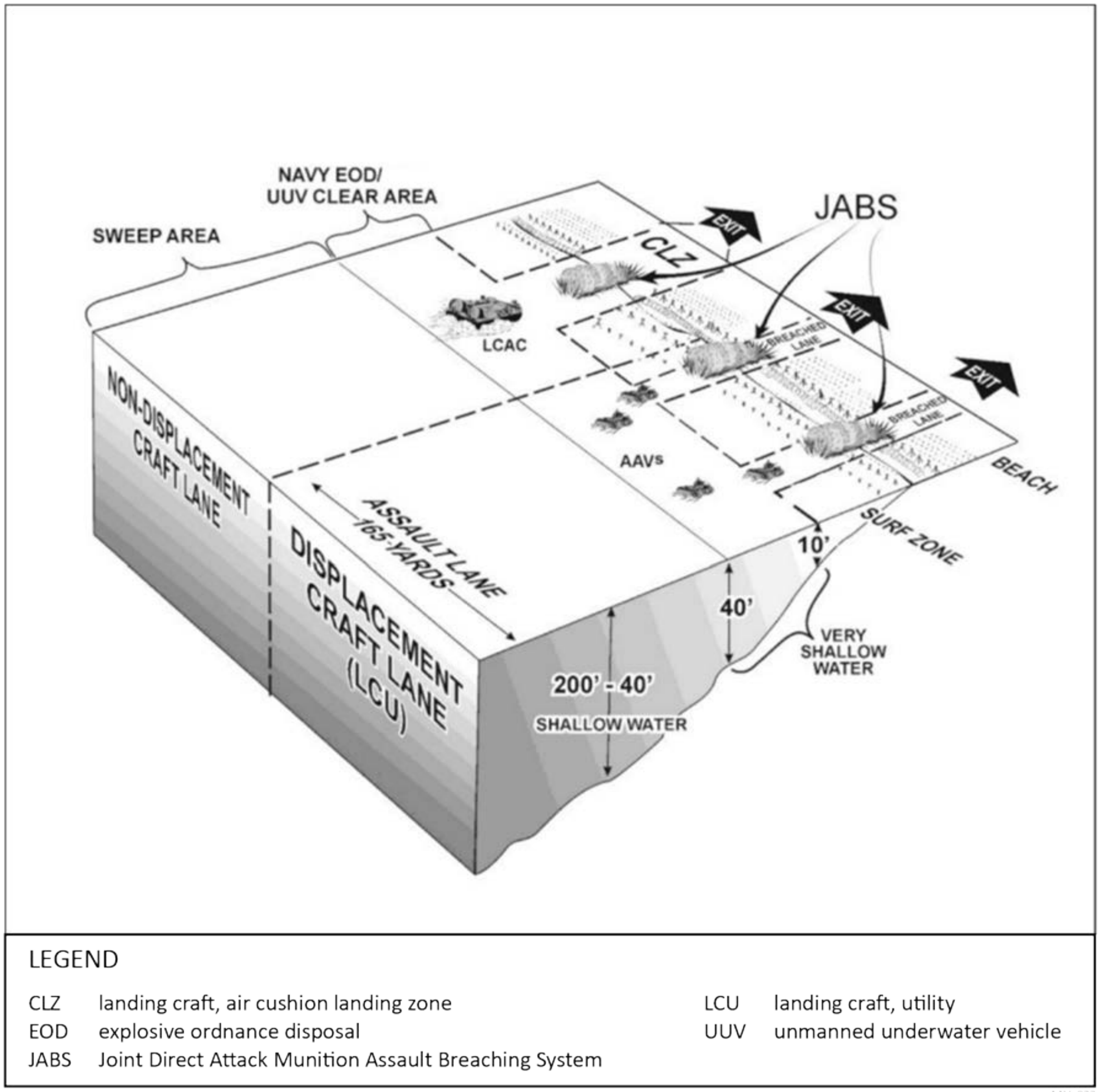


Figure 6-1. Amphibious Assault Breaching and Clearing.

Planning Factors. Because of the size of the Mk-154 shipping container and the difficulty of installation, the AAV should embark the amphibious ship either pierside or offshore with the Mk-154 launcher installed. Planners should also consider the following:

- The breach element equipment should be combat loaded to ensure the element is in the first assault wave.
- Extra space is needed for loading ordnance aboard the Mk-154 Mod 1, with at least 10 feet of overhead clearance for the elevation of the launcher platform.
- Vehicles need to be staged on a flat, level surface to conduct operational checks of the electrical system. Ordnance must not be loaded aboard the Mk-154 Mod 1 AAV during operational tests.

- The vessel must have adequate magazine storage for the ordnance. An arming plan must be developed so the Mk-154 Mod 1 AAV can be armed aboard ship before deployment.
- High-speed underway launches of Mk-154 Mod 1 AAVs are conducted in the same manner as AAVP7A1 high-speed underway launches.
- The combat engineers embarked with the breaching element should be prepared to assist in lane marking on the beach and to assist in obstacle reduction once ashore, including follow-on clearance.
- The AAVP7A1 can provide direct fire support with the UGWS from the water onto the objective.
- In conjunction with the JDAM Assault Breaching System, Mk-154 Mod 1 AAVs can explosively proof lanes from the clearance coordination line to the beach exits.

Launch Plan. Underway launches for the Mk-154 Mod 1 AAVs are the same as for other AAVs. When developing the launch plan, the commander must consider that the fuel usage with the Mk-154 Mod 1 AAV is approximately twice the rate of the standard AAV in the water and on land.

Command Relationships. The CATF provides the overall control and support for the ship-to-shore movement. When an amphibious assault requires an amphibious breach, the CATF coordinates the development of the breaching plan with the CLF and the Navy MCM commander. For more information, refer to JP 3-02, MCTP 13-10J, and MCRP 13-10J.1. The basic descriptions of the naval and landing force organizations involved in an amphibious breach are as follows:

- **Navy Mine Countermeasures Commander.** The Navy MCM commander reports to the mine warfare commander (if designated) when MCM operations are in support of amphibious operations. The Navy MCM commander will control the activities conducted by task-organized Navy MCM units.
- **Airborne Mine Countermeasures.** The airborne MCM units conduct mine clearance from deep water into shallow water and include minesweeping helicopters.
- **Surface Mine Countermeasures.** The surface MCM units conduct mine clearance operations between deep water and shallow water to the 30-foot depth for the passage of the ATF to the sea echelon areas. During ship-to-shore movement, surface MCM elements breach minefields or enlarge gaps in fields to enable assault craft to move to shore.
- **Underwater Mine Countermeasures.** The underwater MCM units are responsible for mine neutralization and obstacle clearance and hydrography in very shallow water and shallow regions of the boat and transit lanes.
- **Marine Corps Forces.** Marine Corps forces, to include CEB elements, AA battalion mobility/countermobility platoon elements, and reconnaissance elements, will reconnoiter and proof lanes to the clearance coordination line. The CLF will also employ organic assets to breach beyond the clearance coordination line and perform follow-on clearance of mission-essential portions of the landing beach.

Breaching During Subsequent Operations Ashore or Land Operations. The mobility/countermobility platoon's assets may be task-organized into a maneuver unit's breach force during operations ashore, though as previously noted, they are not suited to proofing breached lanes. For detailed information on breaching in land warfare, refer to MCTP 3-34A.

Gap Crossing

A *gap* is a mountain pass, ravine, river, or other terrain feature that presents an obstacle that may be bridged. Gaps present a significant challenge to movement and maneuver. A *gap crossing* is the projection of combat power across a linear obstacle (i.e., wet or dry gap). A gap crossing, similar to a breach, is a combined arms operation requiring the application of the breaching fundamentals. However, it has the potential to be even more complicated due to vehicles' mobility restrictions and the specialized engineer support typically required. This section focuses on wet gap crossings—rivers and similar bodies of water—due to AAVs' unique capabilities to bypass bridges and cross wet gaps by fording or swimming.

A wet gap crossing permits the force to quickly project and sustain combat power across a water obstacle to continue the mission. Similar to a breach, the force is vulnerable while moving through a lane or across a gap. The specific procedures and equipment required to cross the water obstacle are based on the size and composition of the water obstacle and both the friendly and enemy situation. Although mechanized infantry mounted in AAVs possess an amphibious capability, pre-existing bridges or military bridging employed by engineers are needed for tanks and wheeled vehicles to cross wet gaps. See MCTP 3-34A for more detailed information on gap crossings.

Planning Factors. Wet gap crossings are difficult to plan and require an intimate knowledge by MAGTF planners and AA unit commanders to execute. The AA unit commander or a designated representative should be assigned to the party that conducts a physical reconnaissance of potential crossing sites. For more information on the reconnaissance of wet gaps, see MCRP 3-34.3, *Engineer Reconnaissance*. Multiple crossing sites may be used. If AAVs are used to ford or swim the gap, they will likely use one or more separate crossing sites from the sites used for bridging or rafting operations in support of tanks and wheeled vehicles. The following resources can be used to narrow the choice of potential sites before a reconnaissance is made:

- Maps, nautical charts, and aerial photography.
- Imagery intelligence.
- Intelligence collected from indigenous people.

The following subsections outline some of the required information and details that benefit from a good reconnaissance. Appendix A contains information and formulas for determining the information necessary to evaluate the feasibility of a wet gap crossing in AAVs—current velocity, slope angles, river/gap width, amphibious drift, sideslip, aim point, and heading.

Assembly Areas. The assembly area is used to conduct pre-water operations checks before the crossing to minimize congestion and delays at the entry points. The time spent in the assembly area should be minimized for security purposes. The AA unit commander advises the supported unit commander in determining whether the assembly area is large enough to allow tactical dispersion, offers concealment, is close enough to the crossing site to allow for responsive reaction in case of a surprise attack on the crossing elements, and is far enough away to be outside the effects of enemy indirect fire on the crossing site.

Approaches to the Gap. As many approaches as practical should be considered. By approaching from many avenues, the mechanized force commander is better able to conceal the exact points of crossing from the enemy for as long as possible. This technique also gives the commander the opportunity to deceive the enemy by a feint crossing to draw the enemy away from the intended points of crossing. The commander can also disperse the force and maintain the flexibility of selecting from multiple potential crossing sites.

Entry/Exit Points. The AA unit commander should advise the mechanized force commander on the suitability of the entry and exit points when AAVs are used to traverse the water obstacle. The unit commander must consider the degree of slope and the soil composition of the banks to ensure they are trafficable by AAVs. When choosing an exit point, the soil composition must allow for multiple vehicle passes to avoid an impassable condition as a result of erosion.

Hydrography. The navigability of many rivers or other water features can be estimated based on existing charts; however, the only way to obtain certainty is from an on-site examination. Hydrographic information can be obtained from a combination of sources ranging from aerial observation platforms to underwater swimmers' reports. The bottom composition is also essential hydrographical information for planning AAV crossings to determine if the bottom is firm enough to prevent the vehicles from getting mired. The reconnaissance should also include existing and man-made obstacles, vegetation types and density, and depths of the crossing areas.

Currents. Current effects must be considered when the water depth is great enough to cause the vehicles to float. Greater care is needed in calculating the speed and angle of travel when the river is wide and the current is strong. A strong current may necessitate changing the entry point to a site upstream from the chosen landing site (see appendix A).

Fire Support. Planned fire support during a wet gap crossing provides cover for the mechanized force during the vulnerable period while it has elements in the water or on both banks. Fire support helps compensate for the fact that the wet gap splits the mechanized force so that elements on each bank will not be able to reinforce one another in case of an enemy counterattack. The following considerations apply:

- Fire support should be planned and directed to limit damage to the exit points. The use of heavy ordnance should be used inland away from the landing sites.
- The extensive use of aviation as aerial observation platforms for forward observers and forward air controllers should also be planned because the flat terrain and dense vegetation associated with rivers and other water features frequently restrict ground observation.
- Smoke should be planned to provide concealment from enemy observation and attack. The skillful use of smoke can confuse the enemy and may cause them to shift fires to unimportant targets and commit reserves away from the main crossing. The commander must control the use of area obscuration. The area covered by the smoke should exceed that actually required for the preparation of the assault. Covering too small an area

permits the enemy to mass aerial and indirect fires on likely crossing sites. The area covered should include several potential crossing sites, likely assembly sites, and suitable access roads. When wind conditions permit, AAVs may use their inherent smoke generation capabilities to intensify the smoke density and effects at the crossing sites just before they land.

Security. Because a unit crossing a wet gap is extremely vulnerable, prudent security precautions must be taken to protect it. The far side of the crossing site must be secured. Until troops and equipment are actually on the far side to provide security for the crossing force, supporting arms is the primary means of achieving security and isolating the crossing sites. The AAVP7A1s can serve as key elements in the initial security force for the far side by supporting with their heavy machine guns.

Formations and Speed. The commander should plan to cross at as many points as the terrain, enemy situation, and equipment availability will allow. Generally, wet gap crossings by AAVs should be conducted in column formation due to the limitations of suitable crossing sites. The vehicles should hastily resume their land movement formation once the far shore is reached. Speed during crossing should be as fast as conditions will permit; however, for security purposes, the same interval should be maintained between vehicles as on land.

Types of Crossings. The three types of gap crossings are hasty, deliberate, and covert. A retrograde crossing is not a fourth type, but is merely a variation of a deliberate or hasty gap crossing. Refer to MCTP 3-34A for more detailed information.

Hasty. A hasty crossing is the crossing of an inland water obstacle or other gap using the crossing means at hand or those readily available without pausing for elaborate preparations, allowing the force to maintain momentum. While hasty crossings are generally preferable to deliberate crossings, the ability to conduct one depends on the characteristics of the gap and the task organization. A hasty gap crossing is typically made when the gap is narrow enough for the use of an assault bridge (e.g., an armored vehicle-launched bridge). A hasty river crossing is a decentralized operation that is predominantly guided by SOPs. The commander should seize intact crossing sites or sites of opportunity. When the gap can be forded or swam by AAVs and the commander determines a crossing will be conducted, the following sequence of events transpires:

- The AA units (and other elements designated to support by fire) establish overwatch positions on the near side of the river to cover the crossing by infantry in AAVs.
- Infantry in AAVs cross on as broad a front as possible, depending on the characteristics of the exit bank, in order to maximize firepower toward the threat.
- As the assault wave crosses the gap, tactical bridging is employed to allow tank and antitank units across the river as soon as possible.

Deliberate. A deliberate crossing is required when a hasty crossing is not feasible or has failed. A deliberate crossing requires extensive planning and detailed preparations. It requires detailed reconnaissance, detailed planning, the coordination of fire plans, and significant engineer assets.

While AAVs are an excellent means of transporting assault forces across a water obstacle, tanks and wheeled vehicles generally require bridges or rafts/ferries. When possible, tanks support the crossing by fire until bridging is available. Consideration should be given to crossing at night if the security risk is high. A deception plan should also be considered to prevent the enemy from determining the actual crossing site. Limited bridging assets are located in the Marine logistics group's engineer support battalion, including float bridging for larger wet gap crossings. In addition to Marine Corps bridging, additional assets may be required from the US Army or coalition/allied nations.

Planning must include traffic control measures, assembly areas for bridging assets, and dispersed holding areas for forces waiting to cross. Exit point objectives are planned for the mechanized force. The rally points across the gap are selected, as are bridgehead objectives—areas on the hostile side of the gap to be seized and secured by assault elements to prevent the enemy from being able to influence the crossing. In addition, sites for artillery, mortars, low altitude air defense, and CSS units must be selected. The deliberate gap crossing is then conducted in the following five phases:

- Advance to the gap.
- Assault across the gap.
- Advance from the far side.
- Secure the bridgehead line.
- Continue the attack.

> Note: The phases of a gap crossing are for planning purposes only. No intentional pauses should occur during execution.

Covert. The primary purpose of a covert crossing is to facilitate undetected infiltration of the far side of a gap. A covert crossing is normally conducted by battalion and smaller forces when surprise is essential to infiltrate over a gap and when limited visibility and terrain present the opportunity to defeat the gap without being seen. Assault amphibian units will not typically be used in the assault force for a covert gap crossing due to their size, noise, and signature. However, they may be used as a reserve to be employed if surprise is lost or cross once the bridgehead line is secured to continue the attack past the bridgehead line.

ENCIRCLEMENT OPERATIONS

An encirclement is the loss of freedom of maneuver resulting from enemy control of all ground routes of evacuation and reinforcement. (MCRP 1-10.2) A unit can conduct offensive encirclement operations designed to isolate an enemy force or defensive encirclement operations as a result of the unit's isolation by the actions of an enemy force. They can vary in scale and be used in both traditional and irregular warfare. Encirclements occur because modern combat operations at all levels are often chaotic, extend across large areas relative to troop density, and involve continual maneuvering to obtain positional advantage. Encirclements can include or involve the following operations or activities:

- Offensive encirclement.
- Defending encirclement.
- Breakout from encirclement.
- Exfiltration.
- Attacking deeper into enemy territory.
- Linkup.
- Cordon.

For more information on encirclements, refer to MCWP 3-01.

TACTICAL ROAD MARCH

When not in enemy contact, mechanized units may have to move long distances to position for future operations. These movements (i.e., road marches) are planned at the battalion, company, and platoon level. The purpose of a road march is relocation, not to gain contact with the enemy. The road march is planned and conducted at a prescribed rate of speed with a prescribed interval maintained between vehicles. The primary consideration for this operation is the rapid movement of units from one area to another. The AA unit leader should plan and control the movement of the unit conducting a road march. Vehicle recovery, maintenance plans, refueling stops, and frequent halts to inspect vehicles must be incorporated into the plan in order to ensure arrival at the objective with maximum combat power. The success of a road march depends on the method of movement, organization, preparation, and thorough planning.

RIVERINE OPERATIONS

Riverine operations are conducted by forces organized to cope with and exploit the unique characteristics of a riverine area, to locate and destroy hostile forces/to achieve or maintain control of the riverine area. Joint riverine operations combine land, naval, and air operations, as appropriate, and are suited to the nature of the specific riverine area in which operations are to be conducted.

Riverine operations integrate and employ various types of ships, craft, aircraft, weapons, and both conventional and special warfare forces in a concerted effort to achieve/maintain control of riverine, coastal, or delta areas. Riverine operations are conducted under the command of a single mobile riverine force (MRF) commander designed to accomplish the objectives of a riverine campaign. Riverine operations are conducted to control the military aspects—communications, traffic, and commerce—of an area dominated by inland bodies of water. The objective of riverine operations is to prevent an opposing force from using the waterways for its own purposes while permitting their use by friendly forces.

Many of the techniques applicable to an amphibious assault are applicable to the riverine environment. Riverine operations may be initiated from amphibious ships or be conducted in coordination with amphibious operations. The tactics and techniques set forth here apply to riverine operations conducted under any circumstances. Riverine operations require a tailored organizational structure and selection of equipment particularly suited for the environment. Riverine operations may be conducted in conjunction with other Service forces or as combined operations with allied forces.

For more information on riverine operations, see NTTP 3-06.1, *Riverine Operations*. This section supplements this publication by emphasizing the unique capabilities of AAV employment in support of MAGTF riverine operations.

Environment

The physical environment assumes vital importance in planning and conducting riverine operations since sharply contrasting riverine environments are found throughout the world and their impact on riverine ground force techniques vary. Major drainage areas that can affect riverine operations are generally divided into three longitudinal sectors: the upper sector or headwaters, the middle sector or central valley, and the lower sector or delta.

Upper Sector or Headwaters. The upper sector or headwaters is often a mountainous region drained by numerous large and small tributaries that merge to form a river system. These regions contain waterfalls, rapids, high banks, steep gradients, and local variations in water depth, making navigation by conventional watercraft challenging.

Middle Sector or Central Valley. The middle sector or central valley is generally a broad river valley fed by numerous smaller tributaries. The middle sector is wider and slower than the upper sector and is often interspersed with obstacles.

In the upper part of the middle sector, the erosion process is dominant, but the deposition process becomes progressively more active downstream. Navigation is influenced in the upper part by river bedrock formations and often approaches conditions similar to those of the headwaters. In some parts of the middle sector, braiding or multiple channeling can occur, making successful navigation dependent on determining the principal channel. Deep channels are usually scarce in braided middle sectors; consequently, navigation is often a severe problem. In addition, braided channels constantly change their course and characteristics.

In the meandering part of the middle sector, river channels change gradually and are more predictable than channels in braided streams. At low to average river stages, the location of maximum water depth is usually close to the location of the maximum current.

Lower Sector or Delta. The lower sector is generally the widest of the sectors, and the speed of the current may change or even reverse with the tide. This sector is usually navigable by ships in natural or artificial channels. When a delta is formed, it is usually characterized by a flat deposition plain formed by a number of river tributaries that disburse sediment and water into a gulf, bay, or ocean. When planning riverine operations, the commander should consider the following delta characteristics:

- Dominant watercourses in the delta are relatively straight tributaries, which assists in the identification of navigable channels.
- Bottoms of tributaries normally slope up to a crest at river mouths and form a critical dimension that require the use of high tides for watercraft of marginal drafts.
- Water depth throughout the delta area is often predictable at various river and tidal stages.
- Tidal activity can influence the velocity and direction of currents radically. Tidal activity frequently results in saline invasion, making the water in rivers and canals too brackish for human consumption. This saline invasion may extend inland up to 30 miles or more from the seacoast.
- Delta areas located in favorable climates are extremely productive agricultural areas. Natural levees, river flood plains, flat terrace land, and distributary levees are converted to productive croplands in many of the world's major river deltas. In addition, large areas of land are reclaimed from natural swamp or marsh conditions and converted into productive wet and dry crop fields.

Classification

Because of the broad range of environmental conditions, a classification of riverine environments is necessary to provide a basis for planning operations and facilitating discussion. The range has been divided into Type I, Type II, and Type III environmental categories. These environments generally affect the extent of waterborne operations in riverine operations, with waterborne operations increasing in significance as the categories progress from Type I to Type III.

Type I. Type I is the least significant type of riverine environment. Operations are conducted according to established procedures with only minor modifications. To obtain intelligence and deny the enemy use of the waterways, extensive patrolling of rivers with watercraft is required.

A Type I environment contains only minor rivers, usually not navigable by medium or deep draft boats except in their lower reaches, but too deep to be forded without difficulty. As a result, the waterways are primarily obstacles as opposed to LOCs.

Only small, shallow draft boats can be used in the Type I environment. The rigid raiding craft and combat rubber raiding craft are ideal boats for use in this environment. The MAGTF's AAVs can be used extensively where conditions permit. In addition, small boats can be procured locally for use in this environment.

Type II. Riverine operations will be essentially normal in Type II environments, but the waterways will be exploited significantly. Waterborne operations may augment or support land operations whenever advantageous. Major waterways permit the use of larger watercraft that can be employed in both tactical and logistic operations. Sufficient dry land areas exist to permit normal positioning of ground force installations.

A Type II environment contains one or more major rivers and may have numerous smaller streams, canals, and paddies. These waterways may present serious obstacles, but may also be useful as LOCs.

This environment permits the extensive use of AAVs. Typically, amphibious landing craft and modified local craft that are larger than craft organic to the MAGTF are used for operational support. These boats are typically not manned by Marines, but require crews and support from the Navy or indigenous sources.

Type III. A Type III environment affects MAGTF operations significantly. Waterways must be exploited to exercise control over the area of operations. Extensive support by Navy elements is required. The unavailability of land sites for installations and the possible limitations of wheeled and tracked vehicles are major considerations in planning operations in this environment. Facilities for command and control, combat support, and CSS must be waterborne, and aircraft play a major role in the transportation of personnel and logistics.

A Type III environment is dominated by water. There may be several major waterways in the area in addition to an extensive network of lesser waterways, canals, and irrigation ditches. In tropical and subtropical areas, the banks may be covered with a dense growth that precludes visibility inland from the water. The generally flat terrain and lush vegetation severely limit ground observation. Waterways are the predominant LOCs and usable roads are scarce. Cross-country mobility is drastically curtailed and suitable land area for command, control, fire support, logistics, and air installations is frequently not available.

This environment accommodates watercraft from small local craft to larger ships. Barges can be used as floating helicopter pads and AAVs can be used selectively, depending on the currents, though they may have limited mobility through soft paddies and swamps.

Concept of Operations

The concept of operations associated with riverine operations is derived from the joint doctrine for riverine operations, considerations based on environmental effects, and lessons learned from combat experience. Amphibious assault vehicles provide the mission commander with an excellent platform to conduct riverine operations. Because the AAV is amphibious, it provides flexibility and mobility in the riverine environment.

The AAV provides the MAGTF with an organic, armor-protected vehicle capable of a protracted riverine operation. The design characteristics allow the vehicle's effective operation on the open sea, in rough surf, and in riverine environments. The AAV provides the commander the flexibility to exploit both the water and land. By moving the vehicle from solid land to the riverbed, and to the channel and back, the AAV can operate in a wide range of terrain, optimizing the unit's speed and maximizing the use of maneuver space.

The tracks, water-jet drive, and armor of the AAV are less vulnerable to underwater obstructions and debris than the traditional propellers, rudders, and light construction of most watercraft. The AAV's speed and range are significantly affected by the river current, water depth, and condition of the riverbed. Speed and range will increase when the AAV is swimming with the current but decrease when swimming against it. In shallow water, the AAV may be able to operate at high speed in the water tracks mode, which increases its range of operation.

Effects on Operations. Each riverine area is different. Even within a given riverine area, the effect of the environment on operations will vary with seasonal changes in rainfall, temperature, and other climatic conditions. An area trafficable to tracked and even wheeled vehicles in the dry season may be nearly impassable to foot troops in the wet season. The tactics employed will vary according to the nature, armament, and effectiveness of the enemy. Nevertheless, the command and control, command relationships, intelligence, logistics, and mobility principles for successful riverine operations remain valid in all riverine areas.

Command and Control. The maximum use of ship-based command facilities and AAV command vehicles is essential in a riverine environment. The lack of adequate land area and the general absence of roads limit the use of wheeled vehicles containing CP equipment and communications facilities, normally displaced by helicopter or boat. Ground observation posts are of little use and forward air controllers, naval gunfire spotters, and artillery forward observers are frequently unable to control fire missions from the ground because flat terrain and lush vegetation will severely restrict ground observation. Commanders at the battalion level and above must consider the employment of alternative platforms to observe and control maneuver and supporting arms employment.

Command Relationships. When Navy and Marine Corps forces conduct riverine operations, an MRF is formed. When riverine forces are introduced into an area through an amphibious operation or when riverine operations are conducted as an adjunct to an amphibious operation, the command relationships established in JP 3-02 apply until the termination of the amphibious operation. The CATF normally establishes an MRF as a subordinate element of the ATF to provide unity of command of riverine operations. Task organization within the MAGTF for riverine operations will emphasize the use of attachment and direct support.

Intelligence. Waterways assume great importance in intelligence planning. Since the enemy will normally use the waterways as natural highways and LOCs, the study of waterway traffic patterns will frequently reveal enemy troop movements, logistic routes and installations, and communications systems. In areas subject to saline invasion, the location of fresh water springs becomes important. Accurate intelligence of hydrographic conditions must include—

- The width and depth of waterways at high and low tides.
- The shape and composition of river and canal banks.
- The direction and velocity of currents and the effects of tide on currents.
- The presence of sandbars or artificial obstacles in waterways.
- Under-bridge clearance for boat traffic at high and low tides.
- Points of ingress and egress suitable for use by AAVs.
- Accurate tide tables.

Logistics. Land suitable for large-scale logistic installations may be virtually nonexistent since the civil populace will normally occupy and develop areas that allow ready access to waterways. Because of the constraints on positioning logistic support forward, maximum use of ship-based logistic installations and aviation support may be mandatory to minimize the adverse effects of environment on the sustainability of the MAGTF. The space in the shallow-draft ships and craft used to form mobile riverine bases is always limited and must be used with maximum efficiency. The potential lack of adequate road networks requires dependence on a combination of aviation and watercraft transportation for logistical movements. Generally, CSS actions are decentralized in this type of environment in order to facilitate adequate support. A greater degree of task-organization and attaching specific CSS assets to the supported units for specific missions aid in this effort.

While transportation over waterways is normally more economical and efficient for the movement of large quantities of supplies, assault support aviation must be maintained to support units operating in areas that are difficult to reach by watercraft. These challenges must be adequately addressed since AAVs are maintenance and supply-intensive assets that will not operate effectively for long periods without the required logistic support.

One such consideration for AAVs is the storage of Class III supplies (bulk fuel and packaged POL). Aboard ships, Class III supplies must be stored in air-transportable containers that are suitable for use ashore. However, other fuel storage means are available for transport by landing craft, assault support aviation, or AAV. The AAVP7A1 can transport two 500-gallon bladders with hose and pump unit. Required greases, lubricants, and preservatives can be stored in their standard packages. Measures must be taken to reduce spilling Class III supplies to control the danger of fire.

Mobility. Foot mobility is impeded by the unstable soils, the generally soggy nature of the terrain, and the presence of numerous waterways that are obstacles to infantry. In addition, high temperatures and humidity can limit the load-carrying capability of the individual Marine and cause slow movement rates. To keep the prescribed load to the absolute minimum necessary to accomplish the mission, the infantry unit commander may plan to have extra ammunition, rations, and water carried on the AAVs operating in the forward areas or have assault support aviation resupply them as necessary. The lack of an adequate road network and the poor trafficability of soils also severely limit the use of wheeled and tracked vehicles. The AAVs will be less susceptible to running aground than conventional watercraft. Sandbars and shallow water with a firm bottom may enable AAVs to move along the riverbed at relatively high speed.

Combat Service Support Employment. The principles and fundamentals of logistics, operational logistics, and CSS remain valid in the riverine environment. However, the nature of the terrain and the type and duration of operations being supported place greater demands on the organic CSS capabilities of MAGTF elements and the LCE. Though AA units can help alleviate the MAGTF’s CSS burden in Type I and II riverine environments, AAVs in the Type III environment require the widest variation from normal CSS supply and maintenance techniques because of strong river currents and marshy areas.

Storage and maintenance space will be at a premium whether the riverine base is on land or afloat. Space in the shallow-draft ships and craft used to form mobile riverine bases is always limited and must be used with maximum efficiency. The MAGTF, including the AA unit and supporting Navy boat elements deployed in forward areas, require the resupply of many common items, such as ammunition, rations, and water. Consequently, the logistic/CSS operations of the MAGTF and Navy components of the riverine force must be coordinated and integrated to an unusual degree. The following situations require variations in the logistic/CSS techniques for AAVs in riverine operations:

- Increased decentralization in execution of CSS tasks, requiring a greater degree of task organization and attachment of specific LCE assets to the supported units for specific missions.
- Lack of suitable sites for logistic/CSS installations.
- Increased maintenance demand required by the effects of climate and terrain (e.g., mud, sand, vegetation, and salt water in lower delta areas).
- The absence of roads and the lack of suitable land sites for logistic/CSS installations.

Supply. Careful planning can minimize the supply challenges for embarked Marines and AAVs in riverine operations by ensuring prescribed loads, storage sites, distribution, and supplies are mission based. In a Type III environment, MAGTF supplies are likely maintained aboard support ships. One ship might be capable of providing support to more than one area of operations by moving from place to place.

Unit distribution is the preferred resupply technique for units deployed on waterways. Assault support aviation is normally used for this task when units are operating away from the waterways; however, boats should be used for routine resupply missions along waterways. The AA units are normally the recipients of resupply and not the suppliers, but may be used to transport supplies if necessary.

Maintenance. Field maintenance at both the organizational and intermediate levels performed by AAV crews and organic MCTs requires unique techniques in a riverine environment. It is vital because the severe climate and likelihood of frequent immersion of equipment demand the execution of a rigorous preventive maintenance program. Maintenance support beyond the organic capabilities of the AA unit is complicated by limited mobility and the isolation of deployed units from CSS installations and maintenance facilities.
For intermediate maintenance, organic MCTs should be employed to replace components on inoperable AAVs. When land-based, field maintenance units should use available tools and equipment. When based on ship, such equipment must be adapted to the establishment of integrated floating workshops on well decks.

Transportation. Amphibious assault vehicles offer commanders a greater degree of flexibility by being the single transportation mode with the greatest utility or versatility. The AAV crews can expect to be employed in a variety of transportation tasks, including retrieval. The AAV's towing capability is often used extensively to retrieve grounded or inoperable water and land vehicles. The AAV MCT may require the use of Navy/Marine Corps boat assets to reach disabled AAVs and to support maintenance and logistical requirements.

Missions. Depending on the situation, AA units may conduct assault troop movement; direct fire support; riverine control, waterway patrol, interdiction, and surveillance; blocking force; resupply and evacuation; command and control support; obstacle/mine clearance; or river crossing missions.

Assault Troop Movement. To ensure surprise, assault troop movements should be conducted at night and should take advantage of trafficable riverbeds and road networks along the axis of advance to maximize speed and shock and to conserve fuel. Vehicle ingress/egress points, potential obstacles, and mines along the river should be identified. If suitable exits from the river cannot be located, the embarked Marines can be offloaded along the bank in shallow water or over the bow onto the bank if conditions permit.

Direct Fire Support. The firepower of the AAV's MK-l9 and M2 machine guns, along with its smoke-generating capabilities and low silhouette in the water, enable AA units to provide effective direct fire in support of assault operations ashore, other elements of the MAGTF, or riverine assault squadron afloat. The MK-19 is extremely effective against ground forces. The MK-19 provides an excellent overhead burst effect in forested areas around rivers. However, close coordination of supporting fires is critical to preclude friendly casualties, since visibility on the shore can be severely limited due to vegetation.

Riverine Control, Waterway Patrol, Interdiction, and Surveillance. The AA units, operating with or without supporting infantry, may be employed to destroy enemy naval and land forces operating in their assigned zone of action. Working in cooperation with air/land forces and the riverine assault squadron, AA units can suppress enemy commerce, protect vital river and sea LOCs, and assist in establishing local military or civil authority. The AAVs can be effectively employed from ships and shore patrol bases and can actively participate in the security and defense of land and floating bases.

Blocking Force. The AAVs operating afloat in shallow water or ashore may provide a significant capability to prevent the escape of hostile forces along waterways. The AAVs may be employed as a blocking force in waters too narrow or shallow for the employment of naval craft.

Resupply and Evacuation. With the AAVP7A1's cargo capacity, AA units can support many of the MAGTF's CSS efforts. Outfitted with the litter kit, the AAV can transport six litter cases and a corpsman. The AAVR7A1 can recover mired AAVs, other wheeled and track vehicles, and beached or grounded watercraft.

Command and Control Support. The AAVC7A1 provides a highly mobile C2 platform in support of the MAGTF. The vehicle, along with other AAVs, can provide direct communication and retransmission capabilities.

Obstacle and Mine Clearance. The Mk-154 Mod 1 AAV is the primary asset organic to the AA battalion for explosive mine reduction ashore. Using grappling hooks, tow rope, or the recovery winch on the AAVR7A1, AAVs can also support the mechanical reduction of obstacles.

Mobile Riverine Force. At a minimum, an MRF will include a commander, a MAGTF, and a Navy force. The riverine Navy force normally includes landing craft or watercraft organized into one or more riverine assault squadrons, ships, and craft comprising a riverine base element as well as Navy aviation units and naval logistics elements. The AA unit commander performs duties as a special staff officer to the MRF commander.

If only a segment of the MRF is required to accomplish a specific operation, the MRF commander may elect to form a subordinate organization. The MRF commander designates a commander of the subordinate task organization, assign Marine Corps and Navy forces, prescribe responsibility for combat support and logistic support, and assign specific missions to the force. The commander of the subordinate task organization normally exercises OPCON of assigned forces.

Organization of Forces. Normally, a section of three AAVs is the smallest unit capable of independent riverine operations. Operating from a centrally located AA platoon battle position, the AA section can support a variety of missions over a greater area. When designated, an AA company may be assigned an area of operations. In this situation, the AA company commander conducts and coordinates operations among the AA platoon battle positions and patrol areas. In addition, the AA company commander coordinates the required unit resupply, recovery, maintenance, and refueling with the LCE.

Plan of Attack. The plan of attack for a riverine assault operation includes a scheme of maneuver, a landing/assault plan, and a fire support plan. The landing/assault plan is developed to support the scheme of maneuver and the fire support plan. Waterborne and air assault movement plans are developed to support the landing/assault plan.

Control Measures. The following control measures are useful for riverine operations:

- Routes of advance should be named and prescribed for waterborne movements.
- Start point and checkpoints should be located at easily identifiable locations along the waterways to help control and report the progress of waterborne movements.
- H-hour for the landing of the first waterborne wave should be designated to simplify the coordination of scheduled fire support and to regulate waterborne movement.
- River landing sites should be identified by color; landing points within a landing site should be numbered.

A reference system for identifying terrain locations should be employed. To be effective, identical reference systems must be used by Marine Corps and Navy units and the meaning of such reference points must be intelligible to participating fire support and air agencies. The generally flat terrain may require that waterway junctions or other terrain features identifiable from air and ground be used as the principal reference points.

Movement Techniques. The AAVs should be positioned to cover strategic locations along waterways during the conduct of riverine operations, waterway patrols, and interdiction and surveillance operations. Because of its low water speed, the AAV should be positioned to allow maximum travel with the current. When this is not possible, a review of the river’s hydrography may indicate areas where AAVs may travel in the water-track mode. Areas of shallow water with less than 68 inches of depth should be identified and charted in trafficability analysis studies. Positions should allow good fields of fire and existing and reinforcing obstacles to canalize the enemy into kill zones. The AAVs should be camouflaged along the riverbanks or on sandbars to conserve fuel and provide a stable platform for the employment of their weapon systems. Natural camouflage should be used to help mask the vehicle's thermal signature at night. Night vision devices and sensors should be used to enhance the early detection of enemy activity. Once contact is made, illumination may be requested or the vehicle's searchlights used to illuminate suspicious watercraft for boarding/destruction.

Tactics. It is best to employ mechanized forces at night in conjunction with observation craft, unmanned aircraft systems, or helicopters equipped with night vision capabilities. Mechanized units generally operate with two elements. The first element, or the point, usually consists of one-third of the force. For a mechanized platoon, the point is usually two AAVs with embarked infantry; for a mechanized company, the point is an AAV section with embarked infantry. The point generally travels 200 to 500 meters forward of the second element, or main body, which consists of the remaining two-thirds of the force. Since the main body comprises the bulk of the combat power, it must be close enough to support the lead element by fire, but not close enough to become decisively engaged or ambushed.

The primary mission of the point is to provide security and identify the best route along the axis of advance. The point searches for signs of the enemy and identifies obstacles to navigation. In the event of enemy contact, the point develops the situation. The main body supports the point by landing infantry to envelop the enemy or suppress them by fire, allowing the point to disengage. When operating along a wide waterway, units may travel along opposite shorelines (see fig. 6-2 on page 6-22). In this case, each unit uses a point and main body on its assigned shoreline during movement. At the same time, these units will be prepared to support by fire across the river if required.

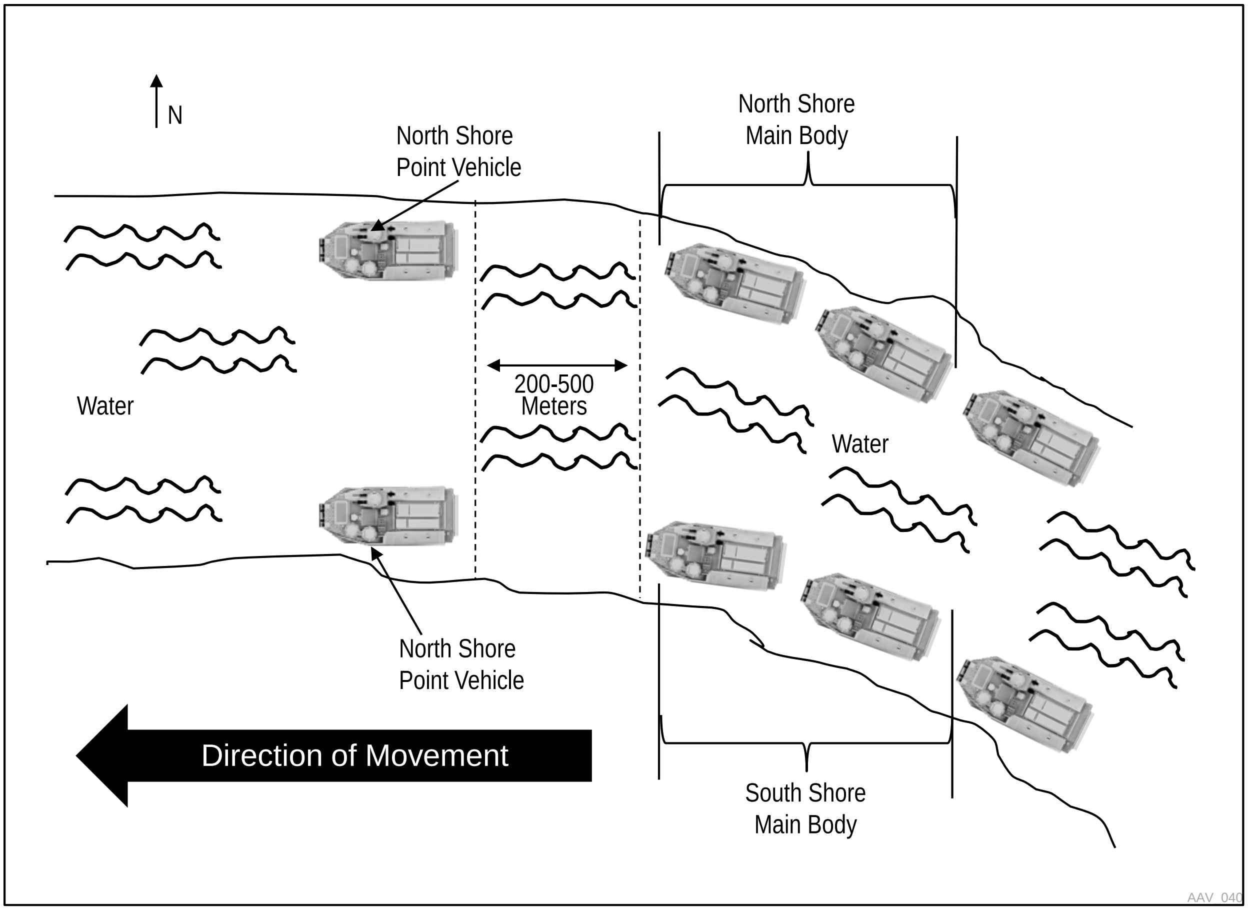


Figure 6-2. AAVs Moving Along Shorelines.

CHAPTER 7
STABILITY

Stability is a core military mission that is conducted in coordination with other instruments of National power to maintain or re-establish a safe and secure environment, provide essential governmental services, emergency infrastructure reconstruction, and humanitarian relief. Stability actions capitalize on coordination, cooperation, and integration among military and non-military organizations. These complementary civil-military efforts aim to strengthen legitimate governance, restore or maintain the rule of law, support economic and infrastructure development, and foster a sense of national unity that enables the host nation government to conduct civil administration. For more detailed information on stability beyond the scope of this chapter, refer to MCWP 3-03, *Stability Operations*.

STABILITY TENETS

Host Nation Involvement

To the maximum extent possible, countries experiencing instability must actively participate in defining objectives, conducting assessments, planning, coordinating, and executing stability actions that lead to the resumption of their authority and effective governance.

Joint Operations

Stability actions usually require unified action from across the Services to re-establish security, perform interim governance functions, repair critical infrastructure, and enable the early resumption of host nation economic and governance activities.

Assessment

Understanding the uniqueness of the operational environment and continually updating information through assessment is vital to the planning and execution of stability actions. It begins with a broad understanding of political, social, economic, cultural, regional, and historical factors.

Comprehensive Approach

Stability actions generally include interagency participation from a large number of US Government departments and agencies. Most important is the Department of State, since stability actions are often conducted under the authority of the US ambassador. Potential inter-organizational partners outside the US Government include intergovernmental organizations, nongovernmental organizations, other nations, and multinational forces. Achieving unity of effort among many organizations and activities, some with incongruent interests, requires early and continuous coordination and integration.

Magnitude and Duration May Vary

Stability activities may be the main effort of an operation (e.g., peacekeeping, FHA, or counterinsurgency), a major line of effort of an operational phase (e.g., stabilization after decisive combat operations), or supporting actions during a limited contingency operation or major combat operation. Consequently, the duration will vary based on the mission and its requirements.

Security

Establishing security is a key element for stability activities, which require a range of defensive and offensive actions to create a safe environment for stability-related efforts.

Transition Lead Responsibility

Since the Department of Defense has expeditionary capabilities and capacity in the areas of command and control and logistics, it is often the lead agency within the US Government on certain aspects of stability actions. However, early and continuous coordination and planning with the Department of State will better shape both the execution of the operation as well as assist in the transition to the host nation.

THREE PHASES OF STABILITY ACTIONS

Initial Response (Short-Term)

The tasks Marines conduct in support of stability occur in crisis situations (e.g., a natural disaster or an act of war or terrorism) in which time-sensitive issues must be addressed to prevent additional crises and/or escalation of conflict. The focus of these early, urgently needed actions is often related to establishing security, filling the critical needs of the population, and restoring key infrastructure. This phase of response is like triage—Marines “stop the hemorrhaging” in the operational environment through initial stability tasks, thereby setting conditions for the subsequent phases of “treatment.”

If resources are available to address multiple critical issues at the same time, initial response activities can occur concurrently—while some units or agencies conduct actions to establish and maintain security, others work with actors and institutions to enable the delivery of electricity and potable water; meanwhile, another conducts tasks associated with the appropriate care and management of internally displaced persons, while yet another clears explosive ordnance or enables freedom of movement for humanitarian aid organizations. This multi-pronged approach is an example of how, once a degree of security is established, tasks associated with governance and humanitarian functions can occur simultaneously with ongoing security actions. The duration of the initial response phase can vary. It may be relatively brief, such as following a natural disaster, or longer, such as following major conventional combat.

Transformation (Mid-Term)

This phase represents a broad range of reconstruction, stabilization, and capacity-building activities. It may or may not be associated with post-conflict operations and may occur in either failed or failing states. The objective during transformation is to develop and build enduring capability and capacity in the host nation government and security forces.

As civil security improves, the focus expands to include the development of legitimate governance, the provision of essential services, and the stimulation of economic development. As a result of this expanded focus, stability actions have the potential to strengthen positive and lasting relationships between the host nation, the populace, and the US Government.

Fostering Sustainability (Long-Term)

This phase encompasses long-term efforts that capitalize on capacity building and reconstruction activities (from earlier phases) to establish conditions that enable sustainable development and enduring security. This phase emphasizes capacity building with the goal of transitioning responsibility to the host nation leadership and security forces.

SIX CORE ESSENTIAL STABILITY TASKS

The six core essential stability tasks for Marine Corps forces include the following:

- Establish civil security.
- Provide humanitarian assistance.
- Support and/or provide restoration of essential services.
- Support the establishment of civil control.
- Support economic and infrastructure development.
- Support to governance.

None of these primary tasks occur in isolation, and each contains a number of related sub-tasks (See fig. 7-1 on page 7-4). Stability tasks are conducted concurrently with the offensive and defense tasks necessary to achieve the operation’s end state.

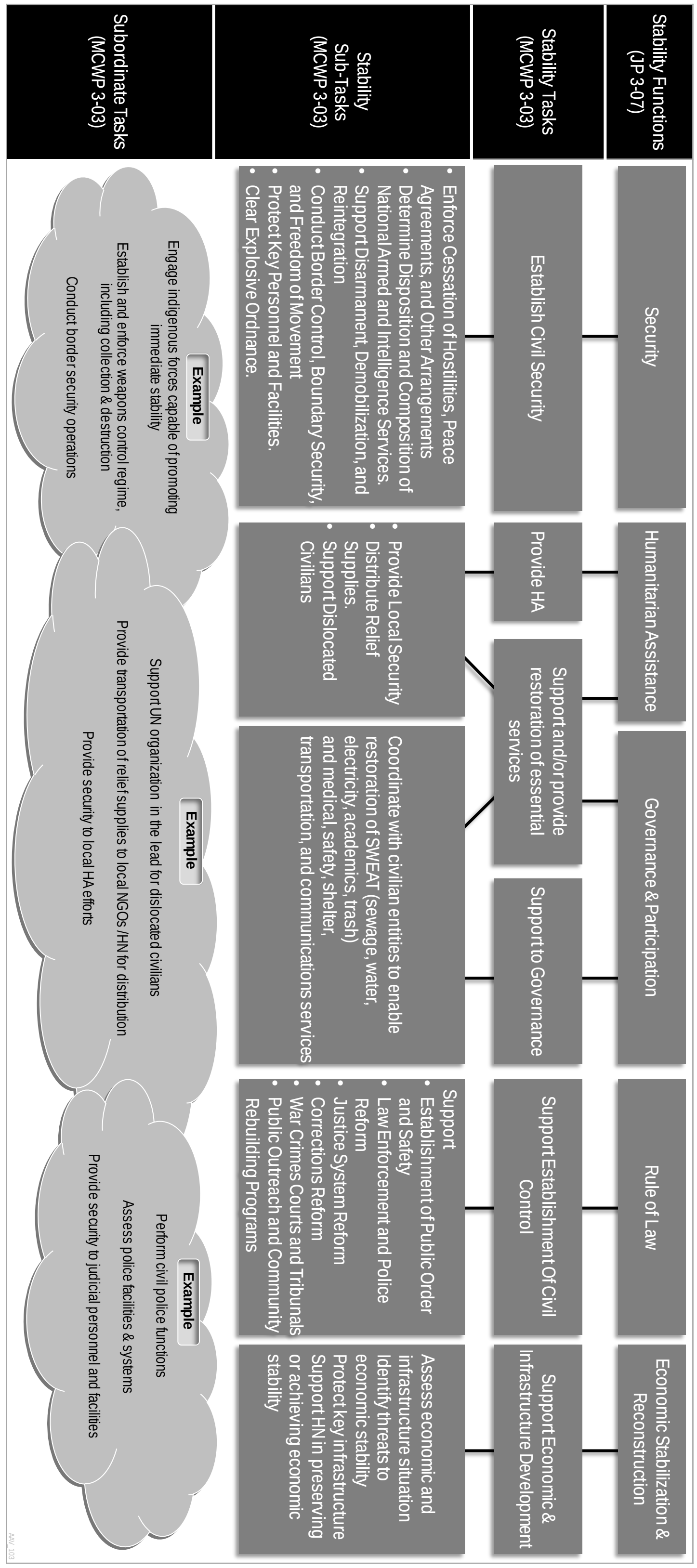


Figure 7-1. Stability Functions, Tasks, and Sub-Tasks.

Establish Civil Security

Civil security is the provision of security for state entities and indigenous populations and institutions, including protection from internal and external threats. Establishing a safe, secure, and stable environment helps obtain support for the overall operation. As soon as the host nation security forces can perform this task, Marine Corps forces transition civil security responsibilities to them. Civil security helps set the conditions for enduring stability. This task involves the following potential tasks:

- Protect the civilian population from violence.
- Establish transitional public security.
- Conduct identity activities to counter combatants and criminal elements by removing anonymity and/or positively identifying persons of trust.
- Conduct border control and boundary security to facilitate freedom of movement.
- Protect key personnel and facilities.
- Establish, reform, or strengthen relationships with host nation armed forces and intelligence services through security cooperation.
- Enforce the cessation of hostilities, peace agreements, and other arrangements.
- Conduct the disarmament, demobilization, and reintegration of belligerents.

Several of these tasks involve decisions, enabled by intelligence, to partner with friendly networks, engage neutral networks, and/or counter threat networks (i.e., network engagement). For more information on network engagement, refer to MCTP 3-02A, *MAGTF Network Engagement Activities*.

Support Establishment of Civil Control

Civil control is the ability for sanctioned leadership to manage disputes and conflicts within the population and foster the rule of law. The rule of law refers to a principle of governance in which all persons, institutions, and entities (i.e., public and private, including the state) are accountable to laws that are publicly disseminated, equally enforced, and independently adjudicated, and are consistent with international human rights norms and standards.

Provide Humanitarian Assistance

Humanitarian assistance refers to efforts to reduce human suffering and save lives. This typically involves addressing acute shortages of water, food, shelter, clothing, bedding, and medical aid. Marine Corps forces, in an initial response, may support host nation and/or other relief organizations' efforts to provide humanitarian assistance with logistics, distribution, communication, and other relief capabilities and supplies. Depending on the situation, providing humanitarian assistance may include a combination of providing security, distributing relief supplies, and supporting dislocated civilians.

Support and/or Provide Restoration of Essential Services

Restoring essential services to expectations of normalcy prevents further destabilization. Essential services are often grouped under the acronym, SWEAT—sewage, water, electricity, academics, and trash—as well as medical, safety, and other considerations (e.g., shelter, transportation, and communications). Marine Corps forces must be prepared to conduct necessary coordination with civilian entities to ensure progression in or restoration of these essential services.

Support to Governance

Governance is the state's ability to serve the citizens through the rules, processes, and behavior by which interests are articulated, resources are managed, and power is exercised in a society. Effective, legitimate governance ensures these activities are transparent, accountable, and involve public participation.

Support Economic and Infrastructure Development

The goal is to establish conditions so that a given host nation can generate its own revenues, provide for its citizens, and become less vulnerable to destabilizing forces. In some cases, Marine Corps forces may support efforts to assist the host nation begin the process of achieving or preserving sustainable economic development. A key aspect of this may be the protection of key infrastructure and economic institutions in the operational environment.

Assault Amphibian Capabilities in Support of Stability Activities

Amphibious assault vehicles are employed in stability actions based on their logistical carrying capacity, mobility, firepower, armor protection, amphibious capability, and shock/intimidation value.

Logistical Capability

When employed in a logistical role, the AAV provides the following advantages:

- **Armor Protection.** The AAV has a large personnel-carrying capacity protected by armor, which is especially important when carrying noncombatants, critical supplies, or nongovernmental organization workers though potentially hostile terrain, as well as when supporting a mobile CP.
- **Armored Ambulance Capability.** The AAV with a litter kit can transport up to six personnel on stretchers under armor protection.
- **Large Logistical Capacity.** The AAV can carry large quantities of food, water, and supplies over varied terrain and under armor protection. The AAVR7A1 recovery variant's winch can also provide limited material handling support when removing debris.

Mobility, Firepower, and Armor Protection

When conducting convoys, convoy security, and checkpoints, the AAV's mobility, firepower, and armor protection are important. The AAV can provide fire support, armor protection, and mobility to the supported unit in diverse and difficult terrain.

Amphibious Capability

Amphibious assault vehicles can provide logistical support between a littoral area and amphibious warfare ships. These might include operations where combat is not expected, such as a NEO or FHA operation. Amphibious assault vehicles are particularly useful when existing infrastructure, such as sea ports, are damaged from a natural disaster, war, or an act of terrorism.

Shock/Intimidation Value

When employed in crowd control, patrolling, convoys, or checkpoints, the AAV's size and appearance can intimidate both combatants and noncombatants.

EMPLOYMENT CONSIDERATIONS

The commander must consider that while the AAV's shock and intimidation value can be useful in stability missions, they can be disadvantages in a volatile situation. The appearance of AAVs or other armored vehicles may incite fear and violence, or otherwise destabilize a situation. Additionally, the commander must plan for the AAV's large logistical requirements.

MARITIME STABILITY OPERATIONS

Due to their amphibious capability and logistical capacity, AAVs may support maritime stability operations in coordination with domestic and foreign partners. For a complete list of maritime stability operations, see MCWP 3-03.

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CHAPTER 8
OPERATIONAL ENVIRONMENTS

Different operational environments (e.g., jungle, desert, mountain, cold weather, and urban) present unique operational and logistical considerations. When planning for operations in unique operational environments, the commander must consider the full range of equipment capabilities and limitations when employing AAVs.

JUNGLE OPERATIONS

Jungle operations limit the mobility of AAVs and other armored assets. The terrain and topography of jungle areas can radically change within only a few miles from flat rice paddies to steep-sided mountains or triple-canopy jungle. Many jungles have rivers and tributaries that are a significant means of transportation for the population and offer avenues of approach or maneuver space for AAVs. Jungle areas traditionally have two wet seasons throughout the year. During these periods, vehicular mobility may be constrained if roads and trails wash out. During the dry seasons, armor is confined to established roads and trails. These changes in the jungle environment challenge such efforts as intelligence collection, CSS, tactical planning, logistical support, and engineer support. For additional information on general operations in the jungle environment, refer to MCTP 12-10C, *Jungle Operations*.

Intelligence

The supported unit's intelligence section should provide the following information to the S-3 and S-4 sections for planning operations in a jungle environment:

- Weather, type of vegetation, and topography in the operational area.
- Avenues of approach and their trafficability during the wet and dry seasons.
- Additional maps—one map of the area of operations should be maintained in each vehicle.
- Enemy engineering capabilities—mines or other explosive hazards, can halt an operation in areas where roads/trails are only one vehicle wide.
- Enemy antiarmor and recoilless rifle capabilities

> Note: Wire-guided missiles are generally ineffective in a jungle, but rocket-propelled grenades and recoilless rifles can be devastating when armor contact ranges are 15 to 25 meters.

Logistics and Combat Service Support

Moving in a jungle environment presents numerous logistics and CSS challenges, including the following:

- Considerations should be taken to push supplies forward as rapidly as possible since resupply of Classes III (bulk fuel and POL), V (ammunition), and IX (repair parts) is essential to maintaining combat momentum. Concurrent plans should be made when terrain becomes impassable during the wet season, including for transferring supplies from wheeled vehicles to tracked vehicles.
- Plans should consider the availability of aerial resupply for supported units and trained personnel to operate landing zones.
- Troops require more water, placing a greater demand on water purification equipment and transportation.
- The wet and humid nature of a jungle environment accelerates corrosion; additional maintenance for vehicles and weapons must be considered.
- Seals deteriorate faster.
- Battery life is shorter than normal.
- Electrical connections corrode more quickly.
- Lenses and dials become fogged because of internal moisture.
- Working parts must be lubricated more frequently.
- On-site maintenance and repair are essential because evacuation is often difficult or impossible.

Planning Considerations

Due to the close nature of jungle operations, AAVs and their embarked infantry should modify their tactics and equipment to facilitate close combat. Generally, AA units are placed in support of infantry operations at the platoon and company levels. The following tactical considerations should be factored in when planning for jungle operations:

- Individual indirect fire weapons and additional hand-held munitions (i.e., rockets and hand grenades) should be issued to vehicle crews and embarked personnel.
- Embarked personnel may maintain watch from open cargo hatches and the open rear personnel door of a moving AAV, which allows for 360-degree security. The rear personnel door and cargo hatches being open will also limit the effects of high explosive antitank warheads or mines if the vehicle is struck.
- Massing fires may be more difficult due to the restricted nature of the terrain.
- The AAV may be used to overrun and crush enemy bunkers and trench systems.
- High humidity and rainfall in jungles may reduce the effectiveness of infrared and thermal capabilities.
- Dismounted patrols and observation posts should be employed when halted, ensuring that enemy infiltration routes are targeted.
- Units should be prepared to employ dismounted infantry where the enemy situation is unclear.
- Early warning sensors should be employed to provide a more integrated defense.

- AAVs should not be used in a static position for an extended length of time—this will be an invitation to infiltrating enemy infantry to single them out for attack/destruction.

Engineer Support

Engineers are invaluable assets to offensive, defensive, and support operations in a jungle environment. If properly equipped, engineers can improve existing roads and trails and construct or improve landing zones to support operations and logistical resupply. While the jungle traditionally provides excellent concealment, engineers can enhance that concealment (and provide cover) by creating covered positions for the AA unit on forward operating bases (e.g., bunkers, trenches, and hull or turret defilade positions).

DESERT OPERATIONS

The speed, firepower, and shock action of mechanized forces make them especially effective in desert operations. Desert terrain is usually advantageous for wide, rapid envelopments. Most desert terrain allows the commander broad freedom in developing a scheme of maneuver. Desert operations present maintenance challenges and unique tactical employment of AA units. For additional general information on operating in the desert environment, refer to MCTP 12-10D, *Desert Operations*.

Maintenance Considerations

While dust and sand are probably the greatest danger to the functioning of the AAV in the desert, the following factors should also be considered:

- Air cleaners and pre-cleaners must be inspected more frequently and cleaned with compressed air.
- The fuel strainer must be used when refueling and the fuel inlet should remain covered.
- Oil filters require frequent replacement and spare oil cans and filler cans should be cleaned of sand before use.
- Cables should be protected with tape before insulation becomes worn because wind-blown sand will damage electrical harnesses over time.
- Radios should be cleaned more frequently.
- Weapons should be cleaned more frequently and excess lubrication minimized.
- Optics should be protected from blowing sand or abrasive wear.
- The short fan drive shaft and hydrostatic steering unit bearings should be greased frequently.

Refer to Technical Manual (TM) 09674A-10/3D with Change 1, *Amphibious Assault Vehicle 7A1 Family of Vehicles (with Special Mission Kits)* for environmental considerations affecting vehicle maintenance.

Tactical Planning Considerations

The following basic tactical considerations are applicable to mechanized forces:

- Desert operations are normally characterized by freedom of maneuver, long-range observation, direct fires out to maximum effective range, wide envelopments, extensive use of mines, and rapidly shifting fronts.
- Sparse vegetation offers minimal natural camouflage, resulting in an increased importance on concealment techniques.
- Rapid vehicular movement may create a heavy dust signature, compromising the element of surprise by making the element more visible to the enemy while simultaneously decreasing visibility within a column.
- Increased observation and limited natural camouflage facilitate target acquisition and engagement with direct fire weapons.
- Heat distortion (i.e., shimmer) lessens the ability to effectively make positive identification and degrades depth perception.

Logistical Considerations.

In desert operations, the following environmental effects should be considered for logistics planning:

- Troops require more water, placing a greater demand on water purification equipment and transportation.
- Dust and sand damage equipment mechanisms.
- Vehicles require more oils and lubricants due to dry conditions and excessive temperature.
- Batteries do not hold their charge because of the intense heat.
- Blowing sand can damage optical equipment, such as vision blocks and sight glass.
- Maintenance requirements increase.
- Air filters and pre-cleaners must be frequently inspected and cleaned with compressed air.
- Fuel strainers must be used when refueling and the fuel inlet should be covered.
- Oil filters require more frequent replacement.
- Oil filler cans and extensions should be cleaned of sand before filling reservoirs.
- Evacuation is usually difficult and on-site maintenance is essential.
- Critical repair parts (e.g., water pumps, belts, hoses, clamps, and replacement filter elements) should be positioned forward.

MOUNTAIN AND COLD WEATHER OPERATIONS

Mountain warfare may involve operations in high-altitude areas subject to extreme changes in weather, as well as degraded communications capabilities, snow-covered slopes, and few roads, most of which are narrow and twisting. Operations in mountainous terrain are generally characterized by restricted maneuver, reduced weapons employment due to terrain or vehicle limitations, and difficulty in resupplying armored units. The AAV can negotiate 40 percent side slopes and ascend 60 percent grades; however, conditions such as the effects of weather on terrain can have an effect on these capabilities. Mountainous routes can include bridges and tunnels, requiring knowledge of the military load classification and clearance restrictions before use by AAVs. Combat engineers can perform engineer reconnaissance to assess a route's limitations as part of a route reconnaissance mission. In cases where bridges do not support military load classification for AAVs, combat engineers may support a gap crossing (i.e., emplacing tactical bridging or constructing a bypass).

If the roads are trafficable, the employment of AAVs in mountain operations to transport troops and equipment is possible. Operations in steep terrain require frequent halts to alleviate increased transmission temperatures. The commander should choose multiple routes and position maintenance personnel and recovery vehicles throughout the column to provide rapid recovery and maintenance support. When operating in deep snow and extreme cold weather, the commander must consider mobility, logistics, vehicular modifications, tactics, and individual equipment to offset the characteristics of the environment when employing AAVs. For additional general information on mountain warfare and cold region operations, refer to MCTP 12-10A, *Mountain Warfare Operations* and MCRP 12-10A.4, *Cold Region Operations*.

The commander must consider the mobility restrictions encountered when employing AAVs in operations during deep snows, springtime, freezes, and ice crossings. These conditions can severely limit the use of mechanized forces to accomplish the mission and present both operational and safety challenges.

Deep Snow Maneuverability

When employing AAVs in deep snow, the commander must consider the following:

- Generally, the ground pressure to assure flotation on deep snow is 3.5 pounds per square inch. The AAV's normal ground pressure is 9.7 pounds per square inch when cargo loaded.
- Establishing definitive rules for deep-snow operations is difficult because conditions vary. While experience in the various conditions is necessary to accurately predict snow trafficability, reconnaissance must be conducted to determine the snow conditions.
- Most tracked vehicles are slowed by 24 to 29 inches of wet snow. Heavy tracked vehicles may negotiate fine dry snow of three to six-foot depths. The AAV can negotiate snow depths up to 35 inches with little difficulty, depending on the type of snow.
- Normal speeds may be maintained after a packed snow trail has been formed by the passage of several vehicles, but proper driving techniques must be used to prevent vehicles from sliding or becoming mired.
- Heavy wet snow in above freezing conditions compacts quickly and results in decreased vehicle traction. Negotiating terrain becomes difficult in these conditions. When temperatures drop below freezing, the heavy wet snow will freeze into ice and severely reduce mobility.
- Wet clinging snow tends to accumulate on the tracks, suspension idler wheels, and sprockets, and may require occasional halts for removal.
- Removing every fifth track pad of the vehicles increases traction in heavy and wet snow.
- Dry snow in below freezing temperatures can be negotiated with reduced traction.

- If available, installation of the winterization kit, while time consuming, should be planned for accordingly.

Springtime

When employing AAVs in a mountain environment during the springtime, commanders must consider the following:

- The AAVs should be parked on high dry ground, unthawed snow, or brush/logs to prevent freezing. Special recovery techniques are required when vehicles are mired in deep frozen mud or ice.
- Traction is poor when the active frost layer begins to melt and the ground becomes soft and marshy; however, AAVs can penetrate the mud and find footing on the frost layer below.
- The AAVs may sink deeper into the mud, become immobile, or turn over as the season progresses and the frost layer thaws. To provide greater mobility under these conditions, vehicles should not follow in the tracks of preceding vehicles.
- Movement is possible in areas where permafrost is near the surface. Such places include on the shaded side of woods, on ground with a good moss cover, and on the shaded slopes of hills.
- Limited operation may be possible on crests where drainage is best when the valleys become impassable.

Freezes

Freezes frequently follow thaws and produce glare ice that makes roads practically impassable to tracked vehicles, particularly on slopes of 35 percent or greater. Proper driving techniques must be emphasized in order to avoid collisions. When employing AAVs during freezing conditions, commanders must consider the following:

- Conditions during the early freeze are much the same as those that occur in the spring.
- Ground thaws in the daytime and freezes at night.
- AAVs can experience high mobility when the frost comes to the surface and the ground is completely frozen.
- The frozen ground offers good traction and shallow snow does not effectively reduce the speed of the AAV.
- Frozen ruts are a hazard, especially during early fall.
- Stream and lake ice cannot be used for crossing; however, AAVs can ford or swim across by breaking through the thin ice.
- Late freeze season offers the best opportunity for AAV employment in areas with few streams.

Ice Crossings

In addition to the guidance in MCRP 12-10A.1, *Small Unit Leader's Guide to Mountain Warfare Operations*, the commander must consider the following factors when employing AAVs for ice crossings:

- Lakes and streams may be crossed on the ice during the winter months if ice is of sufficient thickness and reasonable precaution is exercised.
- Crossing sites must be inspected for cracks, pressure ridges, and thin spots before placing vehicles on the ice.
- Extreme caution is necessary in crossing large streams and lakes early and late in the cold season. Table 8-1 lists the acceptable freshwater ice layer thickness for the AAVP7A1, AAVC7A1, and AAVR7A1. It also gives the safe minimum distance allowed between vehicles under those conditions. Measurements have been rounded off to the nearest one-half. Risk ice measurements can be used for individual crossings with safety. The normal ice measurements are for repeated loadings.

Table 8-1. Freshwater Ice Crossing.

Vehicle Types	**Minimum Thickness**		**Optimal Thickness**		**Vehicle Interval**	
	Centimeters	Inches	Centimeters	Inches	Meters	Yards
AAVP7A1	45	17.2	65	25.5	70	16.5
AAVC7A1	40	15.5	49	19	39	43
AAVR7A1	40	13	48	19	30	33

Logistics Considerations

Weather conditions and terrain in cold regions can make the resupply and maintenance of AAVs difficult. Frequent operation checks, properly winterizing vehicles, and an aggressive preventive maintenance program help minimize breakdowns. The AAVs deploying to cold regions must be winterized with the proper coolant, POL, and appropriate arctic grade fuel to be operational when they arrive. When planning logistic support for operations in cold weather, commanders should consider the following:

- Additional coolant, POL, and repair parts will be necessary.
- Maintenance can take significantly longer than normal when temperatures fall to -40 °F. Equipment must be allowed to warm up before repairs can be accomplished.
- Bare hands performing maintenance in extreme cold will stick to cold metal in seconds. Hands in contact with fuel can be frozen due to super cooling caused by evaporation.
- Vehicle starting and warm-up time may take two hours in temperatures of -50 °F.
- Warming tents are required to keep water and oil cans in a usable state.

Vehicle Operating Considerations

When planning to operate AAVs in extreme cold weather, the commander must consider the vehicle's suspension and propulsion system, carbon monoxide hazard, main engine, batteries, winterization kit, winter visor kit, and fuel cells.

Suspension and Propulsion System. Wet snow and ice may become packed in the water jets and deflectors of AAVs, temporarily restricting or immobilizing them. Salt water freezes and may cause problems with plenum operation or water jets; therefore, as part of their pre-water operational checks, AAVs should be exercised by operating them in water tracks or water jets, or by running the vehicle's engine and turning on its operating systems. Tracks may freeze to the ground in moderately cold weather to the extent that tools may be required to extricate the vehicles if dunnage is not employed.

Carbon Monoxide Hazard. Intense cold, strong winds, and heavy snowfalls require personnel to seek whatever shelter is available in arctic regions. The interior of the AAV offers warmth and protection from the elements when heaters are operational. Care should be exercised to ensure that persons seeking this shelter do not suffer carbon monoxide poisoning. The vehicle does not offer protection from the elements when the heaters cannot be operated. Personnel should avoid using the vehicle under these conditions as the vehicle interior can become colder than the outside temperature.

Main Engine. A problem inherent in cold weather engine operation is the lack of engine lubrication. Cold weather starting considerations for the AAV are as follows:

- A vehicle's engine should be properly lubricated and exercised frequently to prevent the power train from freezing.
- Towing attempts to start extremely cold vehicles easily damages frozen power trains and engines.
- Metal tow cables, final drives, or push bars become brittle in extreme cold and may fail under shock loads.

Batteries. Battery power decreases rapidly during cold weather and batteries cannot be satisfactorily charged once the electrolyte temperature is less than 0°F. Extended hours of darkness and low temperatures create increased demands on batteries and electrical systems. Batteries should be serviced and cleaned frequently and must be heated before recharge and use during cold weather.

Fuel Cells. Fuel cells should be topped off with fuel regularly to avoid condensation in the cells. Frozen water in the fuel system, particularly within fuel filters, will cause fuel starvation.

Tactical Planning Considerations

Although the principles of tactics remain the same, they are affected by the conditions peculiar to cold climates. The conditions require that the commander use TTP that may be considered inappropriate in temperate climates. Waterways in cold weather areas provide excellent avenues of approach for AAVs, but formidable obstacles for other units. These waterways must be secured for use by friendly forces, and the use of these waterways must be denied to enemy forces. Adjacent land areas, such as narrow strips of the coast, could be included in the AA unit's assigned sector/zone. Mountainous terrain in cold weather areas restricts the movement of AAVs to roads and prepared surfaces. The employment of AAVs in the assault is more restricted than in other environments. An AAV moving on a narrow, plowed road within range of enemy antiarmor weapons is a target that is hard to protect. Finally, terrain and trafficability studies may help minimize problems when employing AAVs.

If the terrain or enemy situation does not permit a mechanized assault, the AAV can be assigned a mission to support the extensive logistic effort required to operate in cold weather. The AAVs can move supplies, ammunition, and equipment along prepared routes from rear logistic areas to unit supply points where specialized over-the-snow vehicles can handle transportation requirements for the infantry units.

Individual Equipment Considerations

The bulkiness of certain cold weather equipment can take up much of the interior space of AAVs and should be carried outside it. The following equipment should be included for AAV crews operating in cold weather environments:

- Squad stove.
- Contact gloves.
- Insulated water can covers.
- Specialized clothing, to include balaclavas.

URBAN OPERATIONS

Urban operations, also called military operations on urbanized terrain (MOUT), are conducted in areas such as cities, towns, villages, and concentrations of industrial installations. Because of the increasing amount of population levels living in these areas worldwide, particularly in the littorals, TTP for operating in urbanized areas are becoming increasingly important. Two key elements that complicate the urban environment are its three-dimensional nature and the unavoidable presence and proximity to civilian populations. Though critical elements of urban operations, this chapter concentrates on offensive and defensive combat tasks most relevant to AA units. More detailed discussion related to engagement of friendly, neutral, and threat networks found within civilian populations may be found in MCTP 3-02A. For more information on the urban environment, refer to MCTP 12-10B, *Urban Operations* and MCRP 12-10B.1, *Military Operations on Urbanized Terrain (MOUT)*.

Urbanized terrain presents restrictions on maneuver, command and control, logistics, and force protection. It exponentially increases the burden on intelligence collection and analysis, demands more precision fires with less collateral damage, and increases the demand for an information narrative in competition with the connected population and all adversarial forces attempting to influence the population. Urbanized areas limit fields of fire and observation while affording the threat excellent cover and concealment. The close quarters fighting involved often increases the vulnerability of vehicles to attack at short range, and—coupled with the presence and concern for the civilian population—may significantly restrict tactical operations. In addition, fratricide is a greater risk due to limited fields of view and the close proximity of friendly forces. Command and control of decentralized actions is often complicated by distance in urbanized areas and the challenging electromagnetic spectrum (EMS) conflicts caused by dense infrastructure and competing signals.

The urban battlespace is divided into six basic levels: surface (interior and exterior), subsurface, airspace, space, cyberspace, and maritime. Urban activities can be conducted from above ground (on the exterior of buildings or in the airspace), on ground level, inside buildings, below the ground, in the information environment, and in space. Operations may include fighting on all levels simultaneously.

Built-up structures make strong defensive positions. Additionally, the operating tempo in urban areas is slow and the attacker requires a disproportionately high number of combat forces. An obstacle to movement, the built-up areas cannot be bypassed or isolated easily, but can delay operations, forcing the attacker into a time-consuming attack. The rubble and debris caused by fires can make the area impassable and separate units, hindering mobility, command and control, logistics, force protection, and mutually supporting fires.

While dismounted infantry assumes the lead role during combat in urban areas, AA units and infantry continue to work closely as a team. Typically, when working with tanks and infantry together, tanks will move down streets after the infantry has cleared the street of any suspected antiarmor positions, followed by AAVs. Tanks and AAVs, in close coordination, support the infantry with direct fires and CSS. The primary role of the AAV during combat in urban areas is to provide mobility, force protection, and direct fire support as directed by the dismounted infantry, as well as to provide CSS when required. Crews can use the vehicle's thermal sight to engage targets in low illumination and limited visibility conditions, which often accompanies urban fighting environments.

Mechanized Units in an Urban Environment

The AAV is a combat multiplier and can provide a tremendous advantage to combined arms forces engaged in urban combat. Urban terrain can create mobility restrictions for AAVs, as the terrain that is easily trafficable by the infantry may be impassable by an AAV. Furthermore, the three-dimensional nature of the terrain may make it easier for enemy elements concealed in elevated or subterranean positions to target AAVs with antiarmor fires. This risk is mitigated in part by early integration and close cooperation between the AA elements and their supported infantry. Dismounted infantry elements provide increased situational awareness for AAV elements. Marine Corps AA units support infantry in urban areas by—

- Providing supporting fires and shock effect using heavy machine guns.
- Isolating objectives by direct fire to prevent enemy withdrawal, reinforcement, or counterattack.
- Neutralizing, suppressing, or obscuring enemy positions with smoke, high explosive, and automatic weapon fire, allows infantry to close with and destroy the enemy.
- Assisting opposed entry into buildings when debris, obstacles, or enemy fire block doorways by breaching holes into buildings or compounds by fire or by driving through them.

- Providing access to upper levels of buildings for the infantry to clear from the top down.
- Using the AAV's limited ability to reduce obstacles.
- Attacking by fire any other targets designated by the infantry.
- Establishing roadblocks.
- Suppressing identified sniper positions.

Marine Corps infantry facilitates AAV employment in urban terrain by—

- Providing local security for AAVs.
- Locating targets for engagement by AAVs.
- Suppressing and destroying antiarmor weapons with mortars, automatic weapons, and grenades.
- Assaulting positions and clearing buildings.

Employment Considerations. Marine Corps infantry/vehicle commanders should consider the following:

- Heavy machine gun fire is an effective method of eliminating a sniper in a building; however, it entails significant collateral damage to the infrastructure, as well as a psychological impact on the local population, whose support is typically needed.
- Streets and alleys constitute ready-made fire lanes and firing zones that can greatly restrict and canalize vehicular traffic.
- Typically, an AAV and an infantry squad work in intimate support of each other. The infantry furnishes local security and designates targets for the AAV.
- Single-channel radios and visual signals are utilized for inter-vehicular communications and can facilitate communications between the infantry and the vehicle commander.
- AAVs should avoid stopping or moving slowly near non-secure buildings due to the threat of possible enemy close-range antiarmor fires.
- Engineers should check all bridges and overpasses for mines, improvised explosive devices, and unexploded ordnance and determine bridges' military load classification.
- When buttoned up, AAV crews have limited visibility. Infantry must help AAV Marines "see" by communicating to them possible targets relative to the vehicle's position and orientation.
- Generally, when operating with an infantry squad, no less than a fire team should remain with the vehicle to provide security.

Planning. Compared to combat in open terrain, urban operations are compressed in space and time. This compression limits observation distances, engagement ranges, weapons effectiveness, mobility, and time to maneuver. The restricted space requires the generation of more fires, detailed anticipation of enemy actions and capabilities, more detailed planning to conduct operations, and faster responses to enemy actions. These limitations tend to force extremely close combat, with Marines fighting from building to building and from room to room. Command and control is difficult as small unit leaders cannot always see their Marines and communications are subject to interference caused by the presence of dense structures and electromagnetic interference. Historically, urban combat has required a high degree of initiative by small unit leaders who directed the employment of task-organized special assault teams, of which mechanized vehicles were a part.

It is vital that AA unit representatives be integrated into the planning process as early as possible. Familiarity with unit SOPs must be achieved down to infantry squad and section levels for effective mechanized infantry employment in MOUT. The addition of mechanized vehicles creates the following planning considerations for the infantry commander:

- Conducting full dress rehearsals using AAVs whenever possible.
- Standardizing reporting formats for all elements of the mechanized unit.
- Establishing SOPs that emphasize the safety of friendly infantry, signals between vehicles and infantry, marking cleared buildings and subterranean areas, rules of engagement, and mutual security.
- Determining AAV maintenance and logistical support requirements to the supported unit.

Control Measures. Maneuver in urban areas requires control measures with which all Marines must be familiar. Buildings and roads can be sectioned off and labeled alphanumerically. Control measures must be universally used to synchronize supporting and supported elements during MOUT. The common control measures used include objectives, phase lines, boundaries, checkpoints/contact points, attack positions, the LD, and time of attack. For more information on control measures used in MOUT, see MCRP 12-10B.1.

The Offense

Due to the nature of the terrain, offensive urban operations are typically conducted by dismounted infantry and attached combat engineers. Amphibious assault vehicles may be employed in close support of dismounted infantry to provide direct fire support. The mechanized unit travels with dismounted infantry clearing buildings along the route and providing continuous security to the vehicles. Once enemy contact is made, expedient coordination is made to employ the proper weapon system to engage the enemy.

Attacking in an Urban Environment. A detailed study of the urban area, the population, and the threat in and around it forms the basis for planning the attack and seizure of an urban area. Planning may include AAVs to support both maneuver and fire support.

Amphibious Assault Vehicle Weapons Station Inhibit Zone. The AAV has limited weapon station elevation in an urban environment; it can elevate the weapon station 45 degrees and depress it -8 degrees off the side of the AAV. This lower depression limit creates dead space around an AAV (see fig. 8-1). There is also a zone overhead in which the vehicle cannot fire (see fig. 8-2 on page 8-14). This dead space offers ideal locations for short-range antiarmor weapons and must be protected by dismounted security. Infantry must move ahead, alongside, and to the rear of AAVs to provide close protection. Further, the increasing availability and ability of small unmanned aircraft systems presents an overhead threat that must be countered.

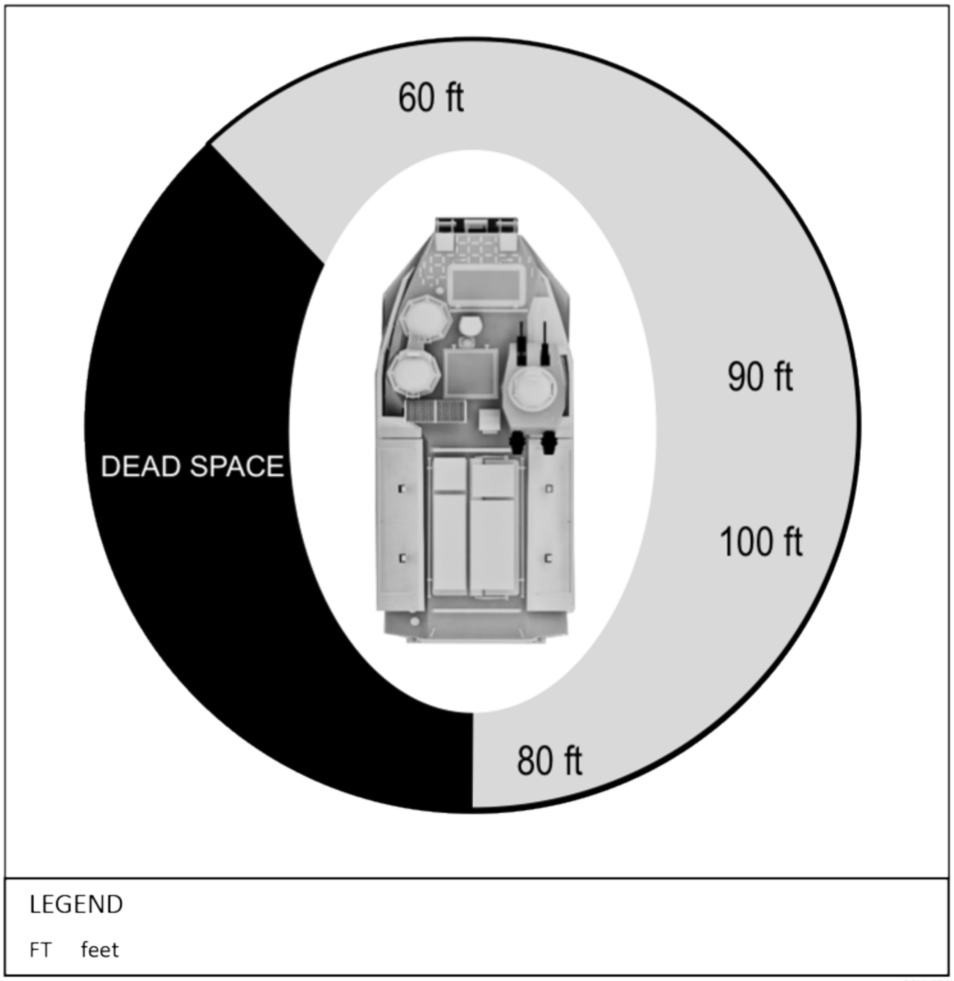

Figure 8-1. Amphibious Assault Vehicle Dead Space.

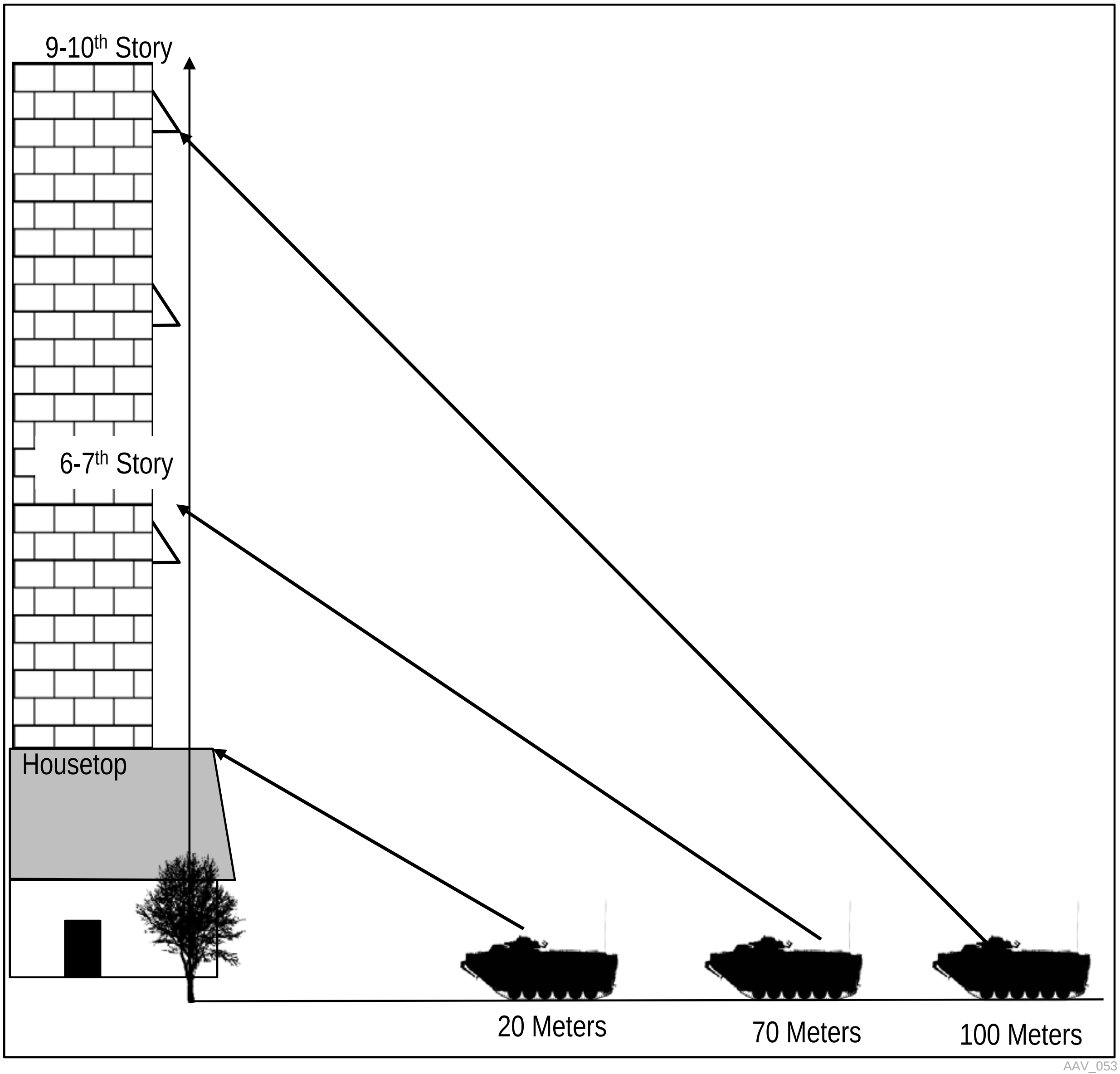

Figure 8-2. Amphibious Assault Vehicle Overhead Dead Space.

Amphibious assault vehicles are equipped with thermal sights that can be used to detect the enemy. Dust, fires, battlefield heat clutter, and thick smoke can degrade the sights' capabilities. The turret-mounted grenade launchers of the UGWS use a bursting charge and burning red phosphorous particles to create a smoke screen. While useful for obscuration, this also further degrades the effectiveness of the thermal sights. Burning particles can easily start uncontrolled fires and are hazardous to dismounted Marines, as well as the local population. The vehicle's size and armor can provide dismounted Marines with cover from direct fire weapons and fragments, while also attracting indiscriminate fires. With coordination, AAVs can provide moving cover for Marines as they advance across small open areas; however, enemy fire that strikes but does not penetrate is a major threat to nearby Marines.

Phases of Attack. The five phases of attack in MOUT are *reconnoiter the objective*, *isolate the objective*, *gain a foothold*, *seize the objective*, and *consolidation and reorganization*. See MCRP 12-10B.1 for more information.

Phase I: Reconnoiter the Objective. Reconnaissance and surveillance are critical to planning an urban attack. Avenues of approach for infantry and vehicles, observation posts, supply routes, antiarmor firing positions, and the firing positions of direct and indirect fire weapon systems are all examples of information that can be obtained during reconnaissance. The composition and structure of buildings and roadbeds, cover and concealment opportunities for vehicles, and other items of information that are not apparent in a map study have a significant impact on the plan when employing mechanized assets. Host nation resources may greatly assist in understanding the composition of structures, subterranean features, the use of existing infrastructure systems (e.g., passageways), and hazardous material storage concerns (e.g., chemical, petroleum, flammable, or toxic substances) that pose threats to Marines and to the local population.

Phase II: Isolate the Objective. The attacker isolates the objective by using supporting arms, seizing terrain features, and dominating the likely avenues of approach. If AAVs are of limited use within an urban area due to the inability to maneuver, they may be able to be employed to isolate the objective area and deny enemy forces from entering or withdrawing. The tactics and techniques for this phase are similar to those used in an attack against an enemy strong point.

Phase III: Gain a Foothold. Once the objective is isolated, a foothold should be secured as quickly as possible to maintain tempo. Areas above, at, and below the street level (e.g., cellars, buildings, sewers, and subways) must be cleared before AAVs move through the area to ensure that enemy antiarmor teams are not able to move around the attacker and engage the vehicles. The mechanized unit commander may employ variations of the column formation to better maneuver into urban areas. The AAV's mobility affords the infantry rapid movement across open areas while gaining a foothold when covered and concealed routes are not available. An AAV can also provide a base of fire from an overwatch position or act as a mobile CP. The dismount point should be as close to the objective as possible. The infantry maneuvers to suppress or destroy the enemy, and AAVs move forward as soon as possible to support them with fires, resupply, and casualty evacuation. Suppressive AAV machine gun fires can be used to cover the attacking force's exposed flanks.

Phase IV: Seize the Objective. Once a foothold is gained, forces move up to seize the objective. Once the foothold has been established, forward units continue the attack through the objective area. Amphibious assault vehicles' firepower, armor protection, carrying capacity, and speed make them invaluable to securing the objective, supplying needed fire support and reinforcements. The momentum of the assault is continued until the objective area is cleared and controlled. During the assault, the following should be considered:

- Covering movement across open areas with fire and smoke.
- Advancing on parallel streets to allow for mutual support among units.
- Avoiding any element of the advance getting too far forward, as they will become vulnerable to counterattack and isolation.
- Maintaining awareness of adjacent units to prevent fratricide.

Phase V: Consolidation and Reorganization. This phase begins with the immediate deployment of security to repel potential counterattacks. Additionally, preparations are made for follow-on missions. Mechanized infantry can provide rapid movement in cleared areas for reserve forces or serve as evacuation platforms for enemy prisoners of war, civilians, and casualties.

The Defense

Urbanized terrain generally favors the defender. The defender can shape the battlespace to their advantage by maximizing the natural restrictions and obstacles found in the urban environment. Knowledge of the terrain and the time available for preparing defensive positions are advantages that may enable the defender to successfully resist a numerically superior force. Mechanized forces may use strip areas and small towns to create defensive strong points to block enemy advances. If preserving a built-up area is required, the defense may assume the characteristics of a positional defense organized in depth and supported by strong mobile forces.

The commander's defensive scheme of maneuver in an urban environment must always include the employment of a reserve force. The reserve should be centrally located to facilitate easy movement to threatened areas. This force should be prepared to counterattack to regain key positions, block enemy penetrations, protect the flanks of the friendly force, or provide a base of fire for disengaging elements. For combat in urban areas, the reserve has the following characteristics:

- Normally consists of infantry elements.
- Must be as mobile as possible.
- May be supported by tanks, light armored vehicles, and AAVs.

Defensive Techniques. The defense is oriented around a strongly constructed building or group of structures in key locations making up a strong point. In the defense, AAVs provide the MOUT commander with a mobile force that can respond quickly to enemy threats. They should be located on likely enemy avenues of approach in positions that allow them to take advantage of their heavy machine guns. Effective positioning allows the commander to employ AAVs in a number of ways. The following are some examples:

- On the edge of the city in mutually supporting positions.
- On key terrain on the flanks of towns and villages.
- In positions from which they can cover barricades and obstacles by fire.
- As part of the reserve.
- As a quick reaction force to provide immediate assistance or support.

Amphibious assault vehicles should not be employed without the infantry providing the close ground security necessary for mechanized vehicles operating in urban terrain.

Fighting Positions. Fighting positions for AAVs are an essential component of a complete and effective defensive plan in built-up areas. Vehicle positions must be selected and developed to afford the best possible cover, concealment, observation, and fields of fire; they must not restrict the vehicle's ability to move when necessary. Figure 8-3 is an example of an urban AAV defensive position. Defending in depth is essential, along with mutually supporting fortified positions. If forced from one position, the defender merely falls back to another. If fields of fire are restricted to the street area, hull defilade positions should be used to provide cover and to enable the ability to deliver fires directly down the streets. The infantry is usually employed abreast of the vehicles to provide protection toward the expected direction of attack. Too much separation between the vehicles and infantry does not facilitate mutual support.

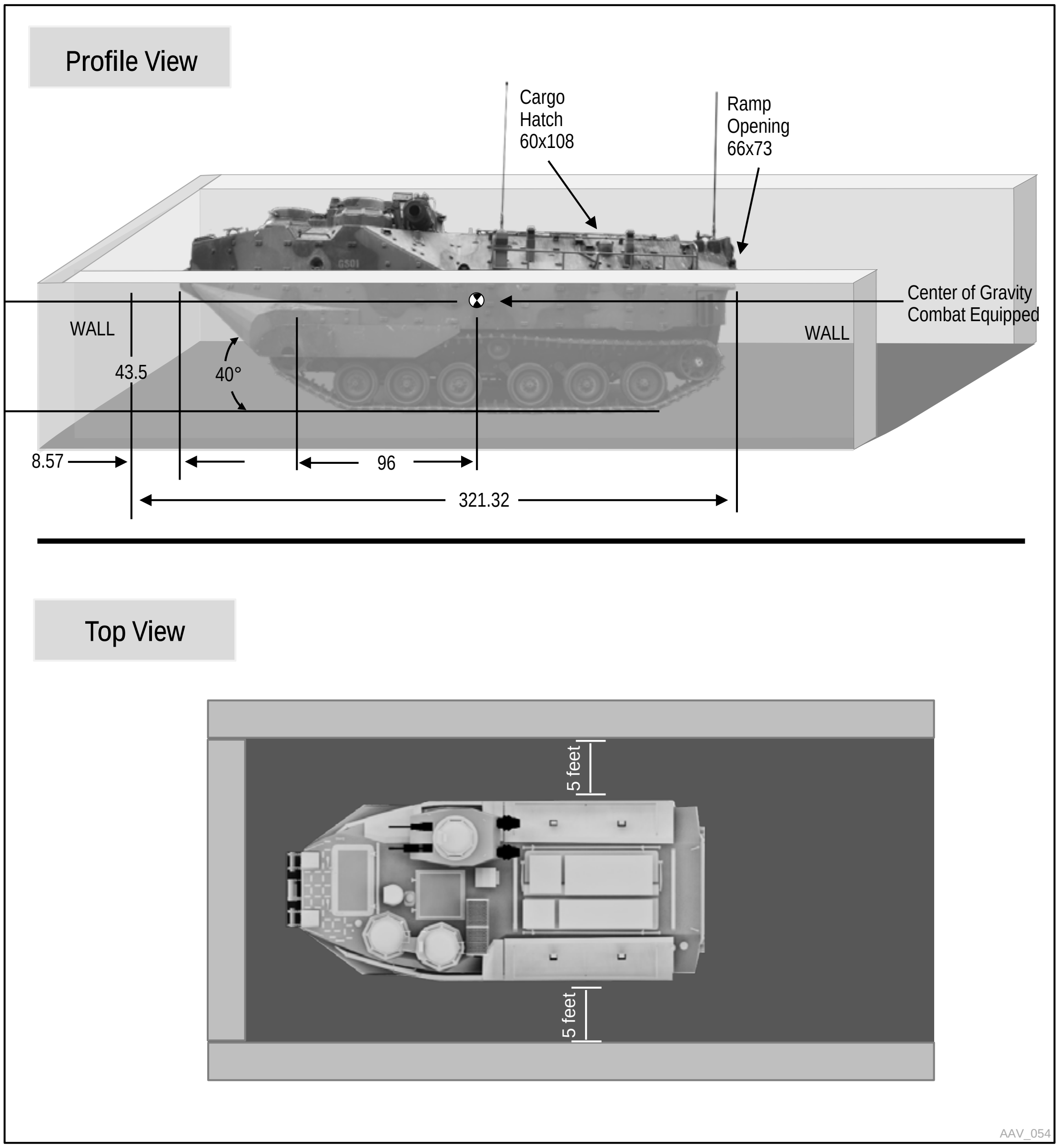

Figure 8-3. Amphibious Assault Vehicle in Urban Fighting Position.

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CHAPTER 9
COMMUNICATIONS

Exercising command and control of a mechanized unit requires effective communications within the supported unit, its AAVs, and with supporting units to send and receive orders, as well as to control and coordinate movement, supporting fires, logistics, and to gather and disseminate information. Assault amphibian units support this through various forms of communication.

FORMS OF COMMUNICATION

Information is communicated using a variety of methods, including radio, wire, visual signals, and messengers.

Radio

The primary method of communications is normally internal and external radio transmissions, with visual signals as a secondary means.

Internal. Assault amphibian units depend on voice radio to control their vehicles when the vehicles are buttoned up. In normal operations, the AA platoon uses the broadcast technique, which is point to multipoint transmission (e.g., from the AA platoon commander to the entire platoon) to pass orders to section leaders and other AAVs. In addition, the platoon and section leaders use the AA platoon command net to transmit fire commands to the unit. Vehicle commanders must limit their transmissions to the reporting of unusual situations; radio discipline must be strictly enforced. Due to the number of stations on the net and the potential for the enemy to conduct intercept and jamming, it is important that all transmissions be kept brief. The following nets are most commonly utilized internally within AA units:

- **Battalion Command Net.** The battalion command net is primarily used for tactical communications. The AA battalion commander uses it for control.
- **Battalion Logistic Net.** The battalion logistic net may be established for coordinating and reporting administrative and logistic requests and reports.
- **Company Command Net.** The AA company commander uses the company command net as a means of coordinating support and controlling subordinate AA units. The company CP, platoon commanders, and AAV maintenance and recovery elements attached to or in support of the company normally use this net.
- **Platoon Command Net.** The platoon commander uses the platoon command net to direct the employment of AA sections in accordance with the supported unit commander's scheme of maneuver. With a minimum of 12 AAVs per platoon, radio discipline must be maintained to ensure that the net is available for mission essential communications.
- **Additional Nets.** In addition to the command and logistic nets, AAV crews monitor their higher headquarters' command/tactical nets and the net of the supported unit. If the

platoon is attached to an infantry battalion and has been placed in direct support of a rifle company, the AAV platoon commander monitors the infantry battalion and supported rifle company tactical nets. In this situation, the section leader monitors the AAV platoon command net and rifle platoon tactical net. Other nets to be monitored will be specified in unit SOPs or in the operation order.

External. The radio communication requirements of the AA unit are dictated in the guard chart located in Annex K (Combat Information Systems) of the higher command's operation order. The communications and information systems officer is responsible for ensuring that the battalion's headquarters echelons and companies have the proper frequencies, net encryption keys, and battalion guard chart. External communication requirements are discussed in MCRP 3-30B.2, *MAGTF Communications System.*

Wire

Wire provides a means of unsecured communication that does not emit an electronic signature. Wire only works in static situations and is time consuming to install and maintain. Extra care must be taken to ensure that tracked vehicles moving into and out of positions do not break wires or have the wire entangled in the vehicles' suspension systems. At the platoon and section levels, wire may be used when the supported unit is in a static situation, such as a defense, or when movement has been halted for an extended period. In these situations, a net or loop circuit would connect the vehicles on a single circuit. Dismounted infantry may also enter this circuit.

Visual Signals

Predominantly used by AAVs at the platoon and section levels, visual signals can include hand and arm signals, flags, flashing light, or pyrotechnics. These signals are particularly useful in ship-to-shore movement. Section leaders transmit orders or information to their individual vehicles using hand and arm signals. Transmitting information by visual signals—

- Provides instant transmission of commands to units within visual range.
- Does not emit an electronic signature.
- Does not impede net transmissions.

COMMUNICATIONS CAPABILITIES OF THE PERSONNEL AND COMMAND AND CONTROL VARIANTS

Each variant of AAV has specific communication assets. The AAVP7A1 (i.e., personnel variant) communication assets are primarily used to command and control the AA units, while the AAVC7A1 (i.e., C2 variant) provides the communications required for a supported battalion or regiment's forward headquarters echelon.

AAVP7A1 Personnel Variant

Each AAVP7A1 comes equipped with two single-channel ground and airborne radio system (SINCGARS) radio suites consisting of two very high frequency radios, each capable of transmitting one high power and one low power radio signal, allowing the monitoring and guarding of two nets per AAVP7A1. The SINCGARS have single-channel and frequency-hopping modes and are capable of internally storing encryption-keying material.

The senior embarked Marine on each vehicle occupies the troop commander hatch located behind the driver's station. A combat vehicle crewmember's helmet permits radios to be operated remotely and provides communications with crew members through an intercommunications system. By using the remote box mounted next to the troop commander's position, the operator can change frequencies rapidly to communicate over the four radio nets. For more information on the AAVP7A1, see appendix B.

AAVC7A1 Command and Control Variant

The primary headquarters communication asset possessed by the AA battalion is the AAVC7A1. It provides a mechanized mobile forward CP as well as the tactical communications and computer capability to enable the embarked commander and limited forward headquarters echelon to function as a COC.

The AAVC7A1 provides a communications suite consisting of a vehicular intercommunications system, computer workstations, a local area network, a high frequency radio, on-the-move satellite communication, fire support systems software and hardware, and power distribution and management.

The AAVC7A1 is a highly capable C2 platform. Its communication systems allow for tactical radio and digital communications while remaining self-contained and highly mobile. The internal configuration (see fig. 9-1 on page 9-4) allows six stations for assigned staff members.

The communications system consists of the radios, computers, and the local area network. Communications equipment is mounted on radio mounts or communication racks throughout the vehicle. The embarked staff remotely accesses communications equipment via the tactical operations center intercommunication system. There is no additional work station for radio operators.

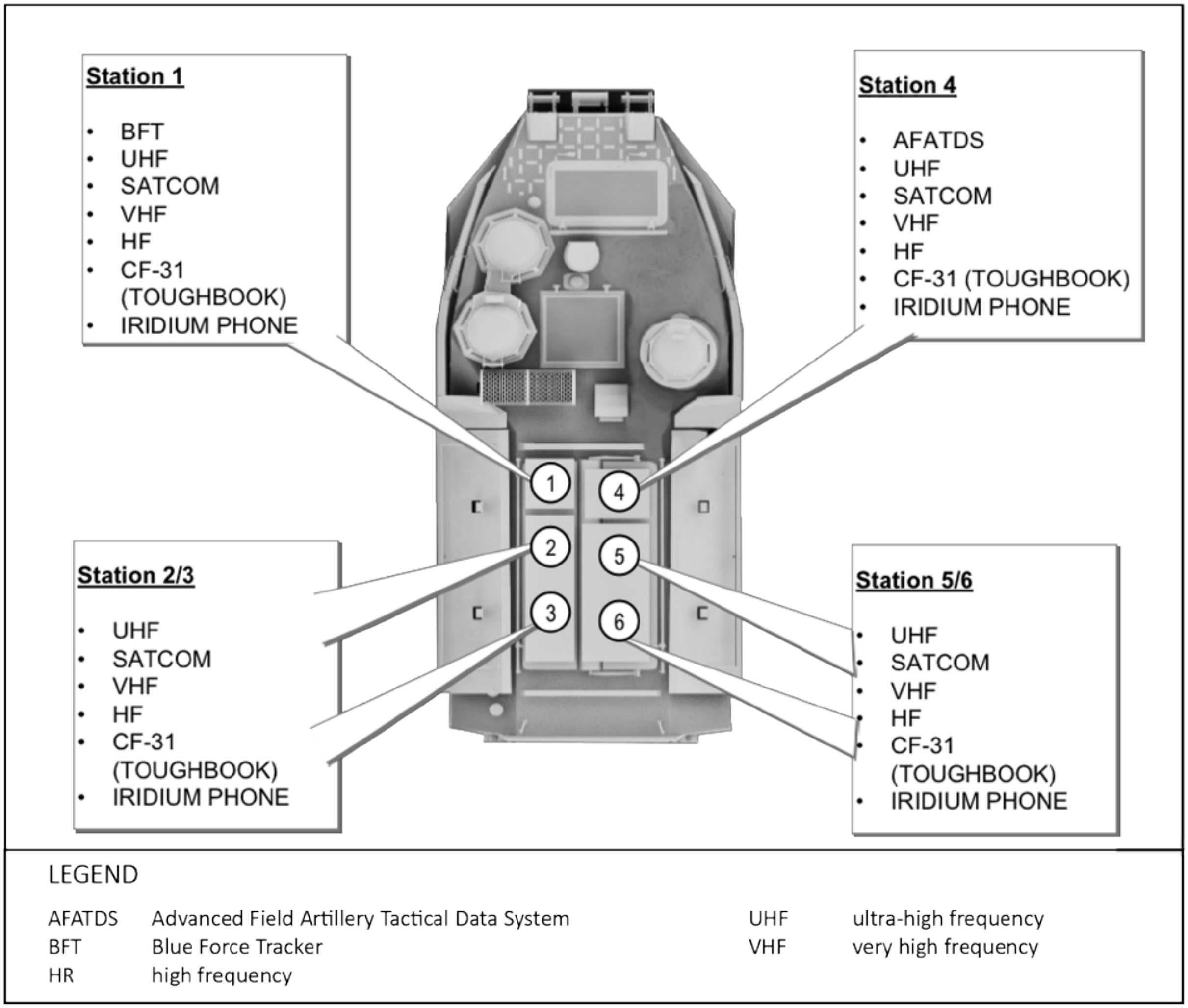


Figure 9-1. AAVC7A1 Internal Layout.

When the AAVC7A1 is deployed as a forward CP for a supported unit, the supported unit staff personnel utilize the C2 systems provided. The AAVC7A1 will always be accompanied by an AAVP7A1 for support. The AAVC7A1 and AAVP7A1 usually support the unit's forward headquarters echelon.

When a halt is anticipated, the AAVC7A1 and AAVP7A1 can be configured to create a CP. For example, an AAVC7A1 and AAVP7A1 may be backed up to one another, the vehicles' ramps lowered, and a weather tarp or camouflage netting draped over the area between the vehicles (see fig. 9-2). This configuration gives the staff increased space, provides light discipline at night, and can allow for rapid displacement of the CP.

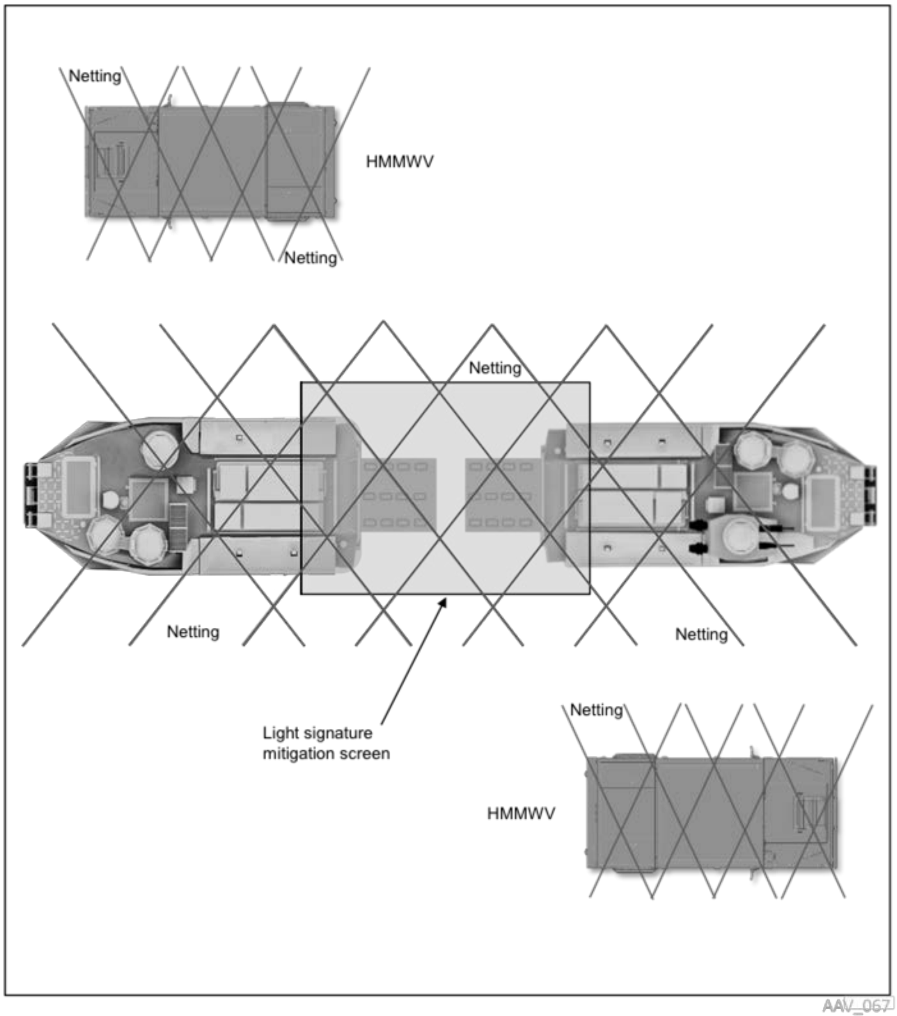


Figure 9-2. Amphibious Assault Vehicles Configured as a Forward Command Post.

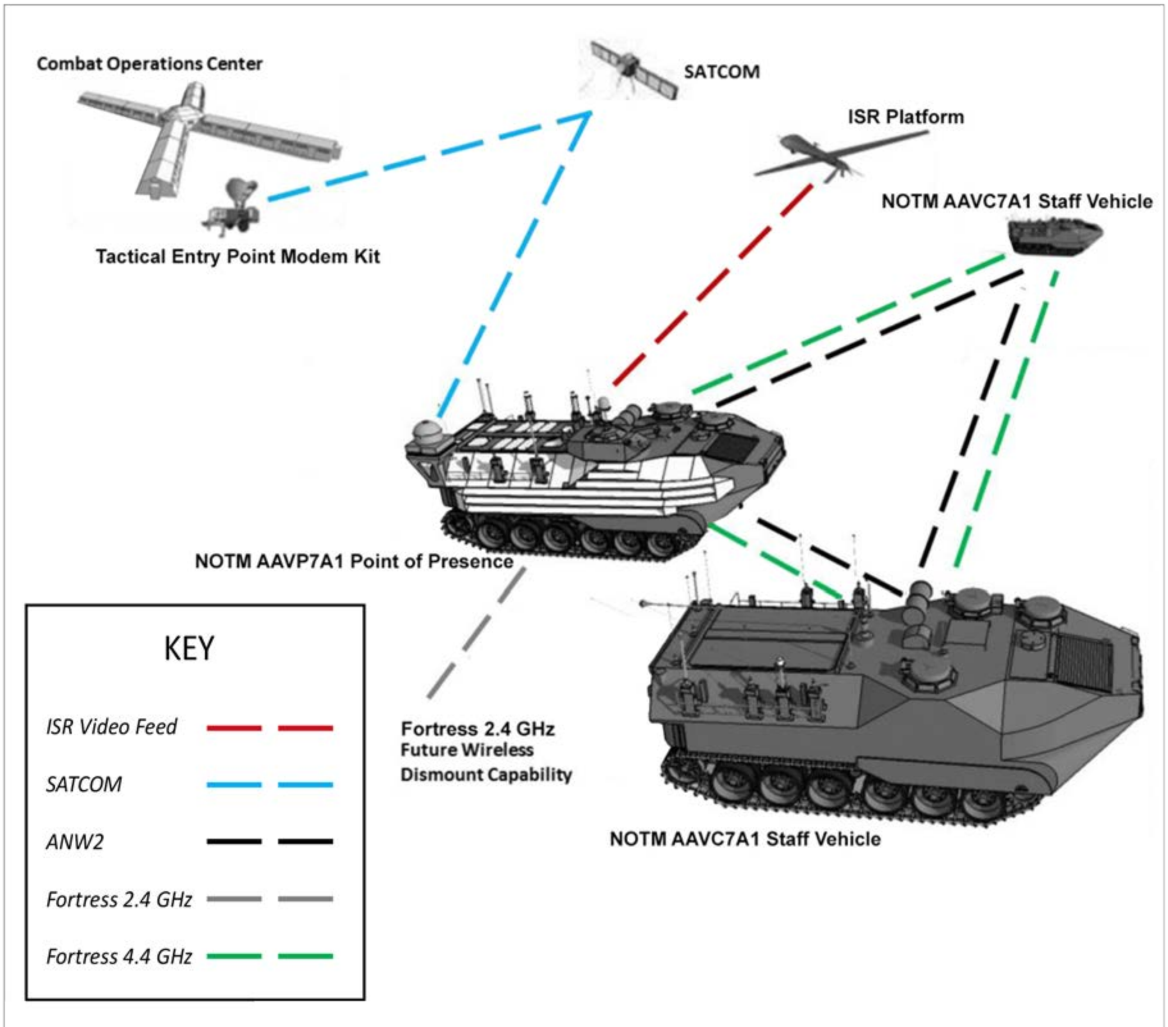
Two command sections (i.e., two AAVC7A1s and two AAVP7A1s) are recommended to support an infantry battalion or regiment. The unit using the AAVC7A1 may be required to monitor more radio nets than one section (i.e., one AAVC7 and AAVP7) is capable of monitoring. There are several options for employing two sections. For example, one command section can be used for the forward headquarters echelon while the second is used for the main headquarters echelon. Less critical nets can then be monitored by the main echelon, which can pass pertinent traffic to the forward echelon. As a second option, the supported unit can use its organic communications assets in its mobile communications vehicles to cover the extra nets. Once the AAVC7A1 and AAVP7A1 are static, the nets from the mobile communications vehicles can be remotely tied into the COC. Adding extra radios to the AAVC7A1 is not recommended because the increased electromagnetic signature is more easily detectable by the enemy, and the extra signals can interfere with the radio signals already transmitting. There is no standard for the radios and nets monitored in the AAVC7A1, as they are determined by the needs of the supported unit. The AAVC7A1 vehicle commander and crew advise the supported unit on the best practices associated with employing the AAVC7A1, thus ensuring the vehicle is employed to its fullest potential.

NETWORKING ON-THE-MOVE

Networking on-the-move (NOTM) is a MAGTF-wide communications system that provides commanders and their staffs beyond line-of-sight (BLOS) on-the-move access to digital C2 applications, voice and data networks (Non-classified Internet Protocol Router Network [NIPRNET], SECRET Internet Protocol Router Network [SIPRNET], and mission-specific networks), and overhead intelligence, surveillance, and reconnaissance (ISR) assets. The system uses a combination of wideband satellite communications (SATCOM) and line-of-sight data radios to establish an Adaptive Networking Wideband Waveform (ANW2) mobile mesh network, facilitating connectivity to higher and supported stationary headquarters during mobile operations. The system consists of kits designed for integration on ground combat vehicles and at unit COCs at the regimental and higher levels.

While the network access facilitated by the NOTM system can undoubtedly be beneficial to command and control, it may also make units and their headquarters echelons more easily identifiable in the EMS. This, in turn, could make them more vulnerable to enemy targeting. Therefore, the decision on whether to include NOTM in a force's C2 system must be balanced with the enemy's capabilities—particularly their ability to detect within and influence the EMS and their subsequent targeting capabilities, the force's own vulnerabilities, and corresponding force protection measures, such as emissions control.

The ground combat vehicle NOTM system is comprised of three end items, which are shown in figure 9-3. They include a point of presence kit for installation on select HMMWVs, military all-terrain vehicles, and AAVP7A1s, which shares ANW2 network service with staff vehicles; a staff vehicle kit for HMMWVs, military all-terrain vehicles, and AAVC7A1s, which receives the ANW2 service shared by the point of presence; and a tactical entry point modem kit for integration with stationary headquarters echelons. The point of presence and staff vehicle kits are fielded at the battalion-level, while the tactical entry point modem kit is fielded at the infantry regiment level and above. The AA battalions are equipped with point of presence and staff vehicle kits.



LEGEND

GHz gigahertz

Figure 9-3. Amphibious Assault Vehicle Employment of Networking On-the-Move.

One AAVP7A1-mounted NOTM point of presence kit is configured to provide ANW2 network service to one or more associated AAVs with NOTM staff vehicle kits. With configuration changes, it is possible for AAV staff vehicles to connect to a HMMWV-mounted point of presence, or for HMMWV-mounted staff vehicles to connect to an AAV-mounted point of presence.

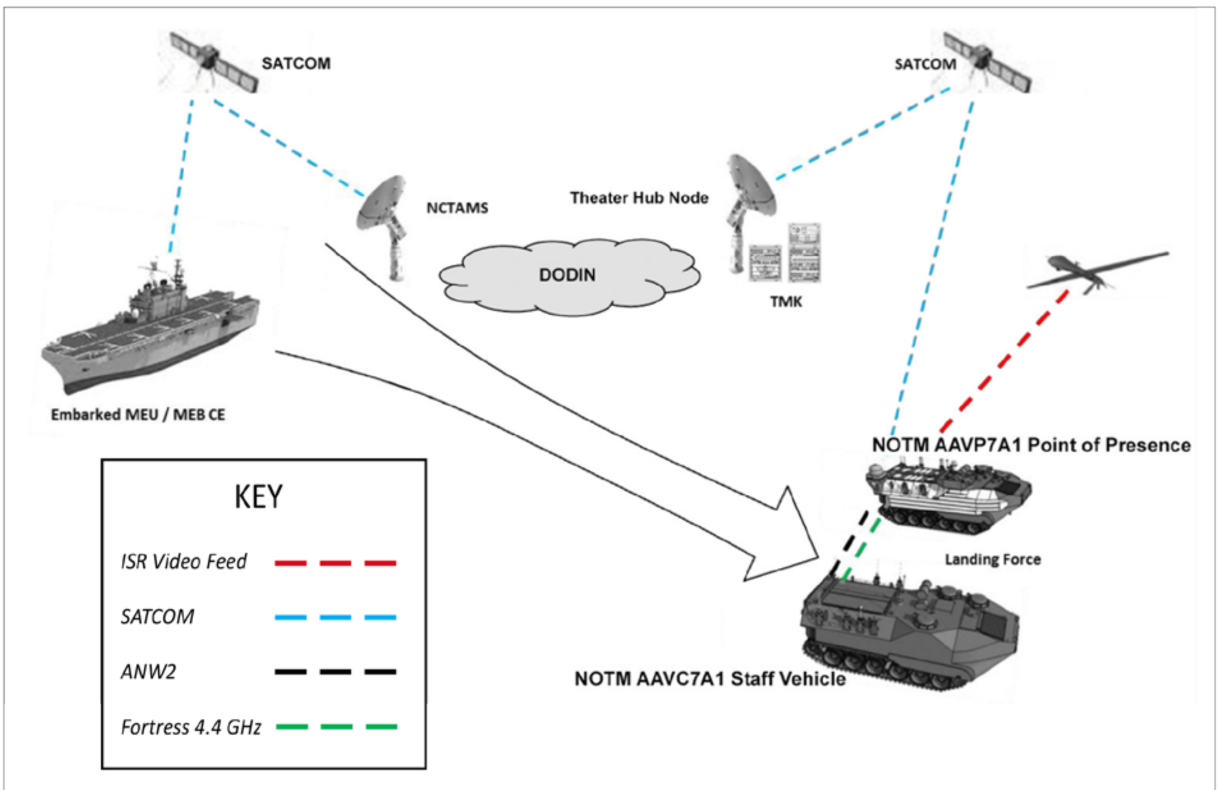
The NOTM AAV staff vehicle kit is integrated on an AAVC7A1 and connects wirelessly to the AAV point of presence over the ANW2 network. This connection provides a supported unit commander and staff operating out of the AAVC7A1 on-the-move access to C2 applications; NIPRNET, SIPRNET, and mission-specific voice and data networks; and streaming ISR resources.

Structure

Within the AA battalion, the AAVs with NOTM kits and assigned crews are organized under the general support platoon in the H&S Company. A single NOTM section is comprised of one AAVP7A1 point of presence, two AAVC7A1 staff vehicles, and one regular AAVP7A1 chase vehicle. In addition to its normal vehicle crews, the section is assigned a NOTM crew in order to plan for, operate, and maintain the system. A NOTM crew is typically comprised of one 0671 Data Systems Administrator, 2841 Ground Electronics Transmission Systems Maintainer, and 2831 Digital Wideband Systems Maintainer.

Support Concepts

A MAGTF's inherent modularity creates numerous scenarios for NOTM AAV support. Though fielded and initially configured in a 1:2 point of presence to staff vehicle ratio, with planning, several support packages can be deployed. Regiment and larger-sized mechanized units require more staff vehicles, while a MEU BLT with limited well deck space necessitates a 1:1 ratio. The network architecture for NOTM support to the mechanized element of an amphibious MAGTF is displayed in figure 9-4.



LEGEND

CE	command element	NCTAMS	Naval Computer and Telecommunications Area Master Station
DODIN	Department of Defense Information Network	TMK	Tactical Entry Point Modem Kit
MEB	Marine expeditionary brigade		

Figure 9-4. Networking On-the-Move Amphibious Assault Vehicles Supporting an Amphibious MAGTF.

Originally fielded for operations at the Marine expeditionary brigade level, AAVs equipped with NOTM have also been deployed in support of MEUs. The capabilities of AAVs equipped with NOTM, particularly the on-the-move downlink and the distribution of ISR feeds and BLOS data/voice communications, enhance a supported unit's traditional means of command and control and sharing situational awareness during ship-to-shore movements and operations ashore. However, the integration of these assets into MEU and BLT communications planning is paramount to successful operations. The relationship and collaboration between the MEU and BLT communications sections and the AAV NOTM crew must be cultivated during predeployment training. Issues such as IP [internet protocol] addressing, frequency assignment/deconfliction, and electronic key management system issues must be addressed prior to operations to ensure seamless employment.

To maintain the MEU AA platoon's well deck footprint, the traditional AAV command section is replaced by one AAV NOTM point of presence vehicle and staff vehicle. The NOTM section can enhance company-level functions, such as fire support and command and control, or can serve as a mobile forward COC for the BLT staff, accompanying the mechanized infantry company. Due to logistics and security, it is recommended to keep the NOTM AAV section at a distance tactically supportable by the AAV platoon, or else to augment it with additional security.

Networking on-the-move AAV support to a tank battalion is similar to current command section support without NOTM. One full NOTM AAV section (i.e., one point of presence vehicle, two staff vehicles, and one AAVP7A1 chase vehicle) can support the battalion forward COC. Because of the firepower organic to a tank battalion, security is less of a concern when operating the NOTM AAV section as part of the battalion's forward headquarters echelon.

Whether discussing a MEU AA platoon's support to a BLT, an AA company mechanizing an entire infantry battalion, or a C2 section augmenting a tank battalion's organic capabilities, the underlying planning issues are similar:

- Is the requisite security available?
- How is the NOTM AAV section supported logistically (e.g., recovery, maintenance, and fuel/POLs)?
- Have the NOTM AAV assets been accounted for in the supported unit's communications plan?
- Are the requisite C2 operators from the supported unit familiar with the system?

Many of these issues are defined by command relationships. However, because of the unique and relatively new capability NOTM provides, explicit coordination with the supported unit is required.

Tactical Considerations

The NOTM SATCOM system utilizes satellites in geostationary orbit, meaning the satellites are in fixed positions over the equator. While the longitude depends on which satellite is being utilized, which can change based on mission parameters, the point of presence vehicle's SATCOM antenna requires an unobstructed view in the direction of the equator for optimal performance. Temporary obstruction can be unavoidable during movements, particularly in canalizing mountainous or urban terrain. However, an unobstructed view toward the equator should be a consideration when halted or when organizing a defense.

The NOTM point of presence enables network connectivity to the staff vehicles through wireless line-of-sight ANW2 connections—primarily through the Fortress Wi-Fi radio, with a multi-band radio configured as a secondary means. The range of the Fortress radio varies by terrain and foliage; however, in optimal conditions, the router in the point of presence vehicle will dynamically change over to the multi-band radio at a range of 800-1000 meters. The multi-band radio has a longer range (10-15 km), but less throughput. When tactically feasible, the point of presence and staff vehicles should be located within Fortress range for optimal performance. This impacts their placement in the defense or battalion support area, as well as their order during movement. However, because both the NOTM's Fortress and multi-band radios are ANW2 mesh radios, each additional node in the network extends the line-of-sight range. For instance, if one staff vehicle is blocked by terrain from the point of presence but has line-of-sight to the second staff vehicle, the second staff vehicle can transmit the signal between the first staff vehicle and the point of presence, and then on to the destination.

Special attention must be paid to ensure that the correct ultra-lightweight camouflage net system is used with the system to avoid interfering with the transmission systems.

Logistics

The NOTM AAV point of presence requires vehicle power. This increases normal fuel consumption and can result in high operating hours. When halted, the tactical power supply, which allows the system to connect to shore power or tactical generators in order to draw power may be used for the additional power demand.

The installation of the NOTM AAV point of presence and staff vehicle kits is performed by the AA battalion S-4's maintenance platoon according to appropriate references. The hosting AAVP7A1 and AAVC7A1 vehicles must have the AAV NOTM special mission kit modification instruction applied prior to installing either of the kits. An AAVR7A1 is required to lift the point of presence network enclosure, which weighs approximately 500 pounds, into the AAVP7A1 that will host it.

The technical references for the NOTM system's use on AAVs are TM 12444B-12&P/1, *Operator and Field Maintenance Manual with Repair Parts List for Command and Control System (Networking On-The-Move (NOTM) Assault Amphibious Vehicle (AAV) Staff Vehicle (SV) Kit* and TM 12445B-12&P/1, *Operator and Field Maintenance Manual with Repair Parts List for Command and Control System (Networking On-The-Move (NOTM) Assault Amphibious Vehicle (AAV) Point of Presence (POP).*

APPENDIX A
RIVER CROSSING CONSIDERATIONS

For AA units, river crossings are at the heart of wet gap crossings and riverine operations, and are also strikingly similar to amphibious operations. However, there are certain considerations AA unit leaders need to be aware of when advising their supported unit commanders. The objective is conducting a safe and efficient river crossing to overcome the limiting effects posed by such obstacles while maintaining momentum. It is imperative that the AAV unit leader is able to recognize those environmental conditions to ensure a safe and successful river crossing.

SITE ANALYSIS

The site analysis is the starting point for determining feasibility. The following information is provided to aid the AAV unit leader in making informed decisions regarding a river crossing.

The selection of entry and exit sites is of great importance. The goal is to choose a crossing site that offers the AAV the ability to rapidly enter the water, swim the width of the river, and exit the opposite bank safely. Figure A-1 on page A-2 provides the basis for crossing site selection.

Current Velocity

Determining the current's velocity is critical to an effective and safe crossing. Comparing the desired maximum current velocity of 1.5 meters per second with a familiar unit of measure may help in estimating the current's velocity. The quick-time march rate in close order drill of 120 steps per minute with a 30-inch (i.e., 76-centimeter) step equates to 1.5 meters per second. Other examples include:

- 5 feet per second.
- 3.5 miles per hour.
- 5.5 kilometers per hour.

River current speed is determined in a similar manner to current speed when conducting a SUROB report. A reasonable estimation involves measuring a distance along the riverbank and noting the time a floating object takes to travel the same distance. Dividing the distance by the time provides the current's velocity. Figure A-2 on page A-3 depicts the graphical representation of the actions performed.

Bank Preparation Time

- Describe the height, slope, and stability of the bank.
- List the amount of time and effort required to overcome significant natural and enemy-emplaced obstacles.
- Include day, night, or other reduced-visibility constraints.

River Conditions

- Specify the width, depth, velocity, and bottom conditions of the river, as appropriate.
- Include variations or unique factors (such as sandbars, turbulence, or water depth at the bank).

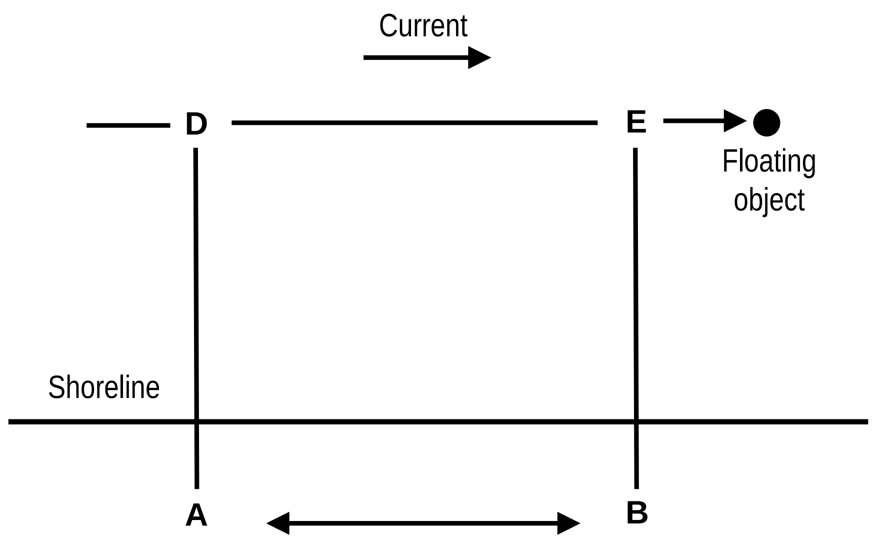
Vegetation

- List areas suitable for work sites and assembly areas and available cover and concealment.

Full Crossing Rate

- Describe foot, wheeled, and tracked movement.
- Capabilities on roads, trails, and cross-country.
- Describe the maximum crossing rate for fording, swimming, or rafting.
- Include the overall assessment of the crossing site's potential.

Figure A-1. Crossing Site Considerations.



Example:

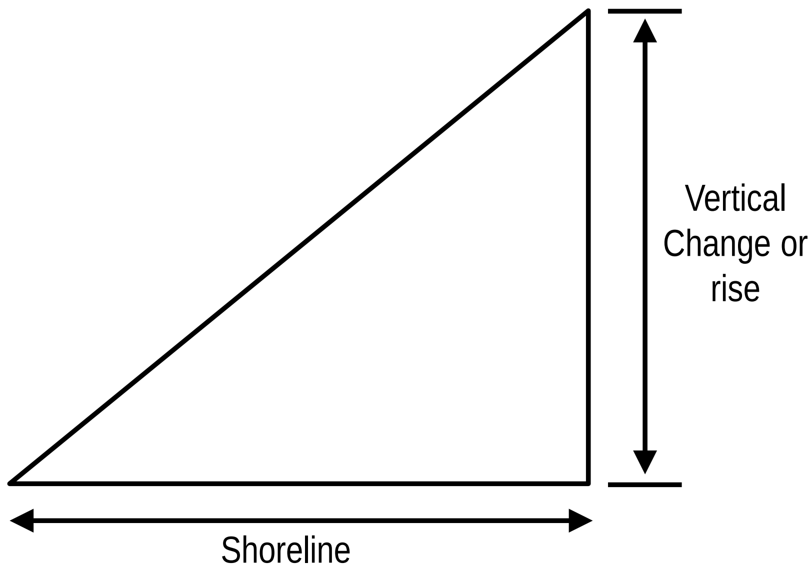
- Measure AB.
- Throw a stick or another floating object upstream of the starting point D.
- Record the time the object floats from D to E.

$$\text{Current} = \frac{\text{Distance AB (meters)}}{\text{Time DE (seconds)}}$$

Figure A-2. Measuring Current Velocity.

Determining Slopes and Degrees

The slope of the bank and its composition must also be considered when assessing river conditions. Slopes are generally expressed as a percentage, which is indicative of the elevation change (i.e., rise or fall) over a horizontal distance. Figure A-3 on page A-4 provides the formula to determine slope.



Formula:
The rise divided by the run multiplied by 100 equals the percent of the slope.

$$(\% \text{ slope} = \text{rise/run x100})$$

NOTE:
The rise and the run are expressed in the same unit of measure (meters or feet).

Figure A-3. Slope Calculation Formula.

There are three methods associated with determining slope percentage.

Clinometer. This device measures the slope angle; however, it is not organic to the AAV community.

Maps. The map method is the preferred method for determining slope percentage, as it is the most accurate. The following steps should be applied when employing this method (see fig. A-4):

- Measure horizontal distance along the desired path.
- Determine the difference in elevation between the starting point and ending point.
- Ensure the same unit of measurement (i.e., meters or feet) is being used.
- Divide the elevation (i.e., rise) by the distance (i.e., run).
- Multiply the result by 100.

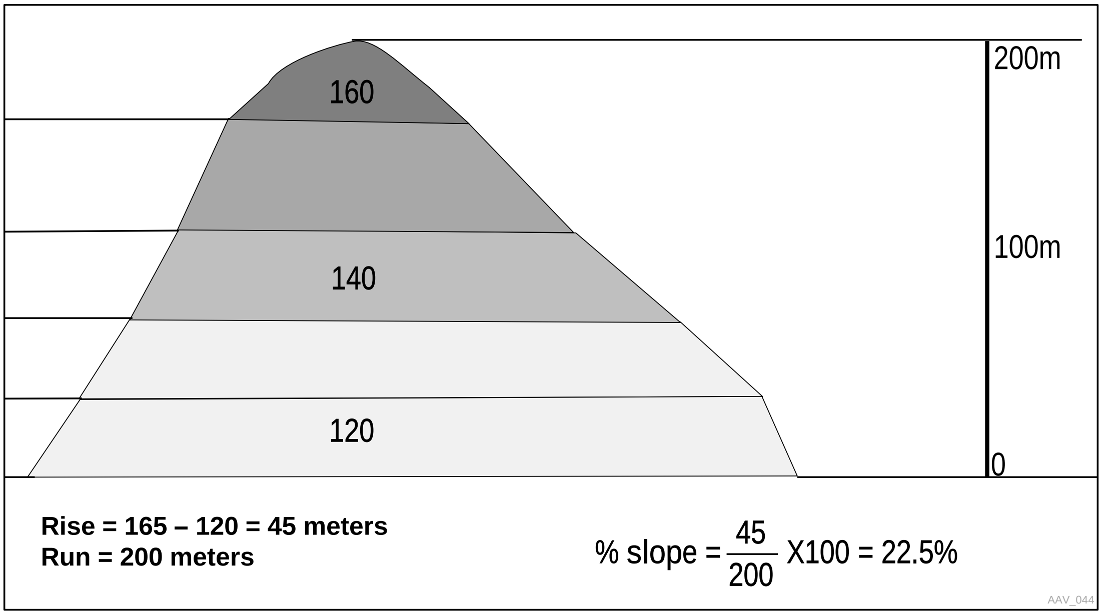


Figure A-4. Terrain Slope Calculation.

Line of Sight and Pace. This method uses eye-level height above ground (usually from 1.5 to 1.75 meters) and the length of standard pace (usually 0.75 meter). The following steps should be completed:

- While standing at the bottom of the slope, a spot should be kept on the slope while the eyes are kept level.
- The distance should be paced.
- The procedure is repeated at each spot.
- The vertical and horizontal distances are added separately to provide the total rise and run.

> Note: A slope may be expressed in degrees; however, this is not common, as the relationships are complex. Table A-1 lists the relationships of degrees and slope percentages.

Table A-1. Relationship of Slope to Degrees.

Slope	**Degrees**
100%	45
60%	31
40%	22
20%	11

Measuring Width

When measuring a gap's width, a map study may be used. The following is a field-expedient means of measuring gap width with a compass:

- While standing at the river's edge, note the magnetic azimuth by citing a point on the opposite side.
- Move laterally up or down the edge of the river (upstream or downstream) until the azimuth reading to the fixed point on the opposite side is 45 degrees different than the original reading.
- The distance from the original point to the final point of observation is equal to the river's width (see fig. A-5).

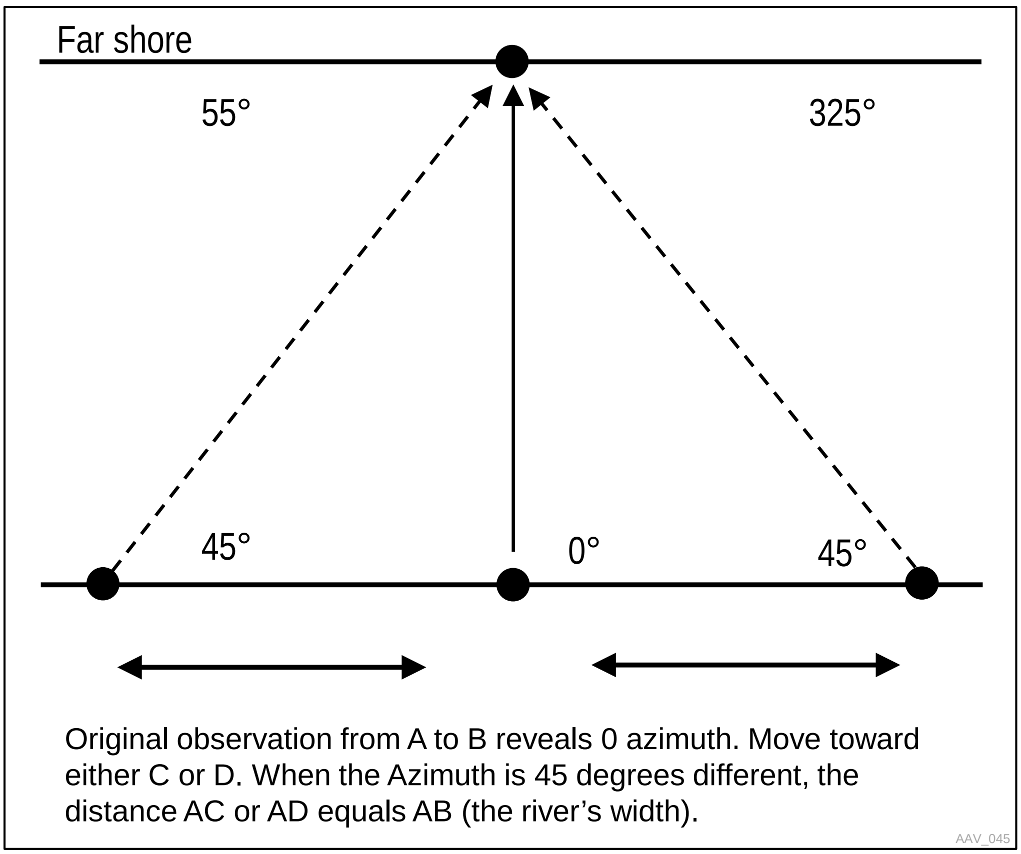


Figure A-5. River Width Calculation.

Amphibious Drift

A current causes all surface craft to drift downstream. Each type of craft has a different formula for calculating downstream drift. Amphibious vehicles and assault boats drift more than powered boats and rafts; the latter have a greater capability to negate the effect of the current's velocity by applying more power.

Amphibious vehicles and non-powered assault boats are generally limited to current velocities of 1.5 to 2 meters per second and 1 meter per second, respectively (see fig. A-6).

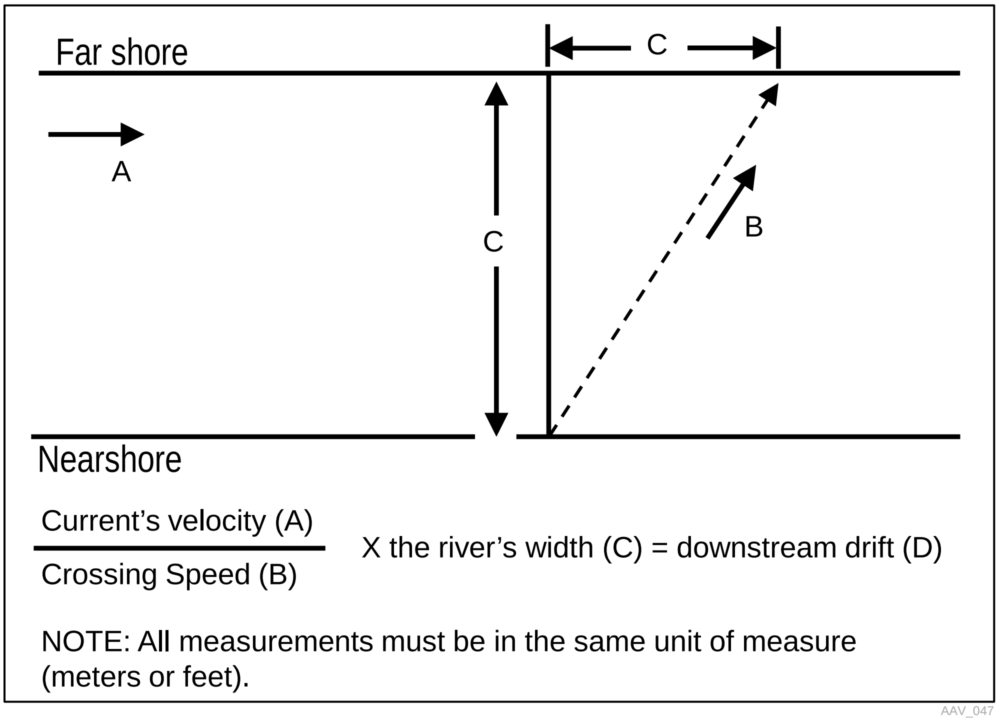


Figure A-6. Amphibious Drift.

Current Compensation

When crossing with amphibious vehicles it is necessary and possible to compensate for the effect of the current. There are three techniques that can be employed by AAVs:

- Downstream sideslip.
- Constant aim point.
- Constant heading.

> Note: These techniques do not ensure the AAV is capable of crossing a body of water. It is imperative that the unit leader understands that the techniques are tools in aiding the decision-making process.

Downstream Sideslip. Entry is usually made upstream of the desired exit point. The vehicle is aligned (i.e., aimed) straight across the river, creating a head-on orientation that is perpendicular to the exit bank. However, the current produces a sideslip, or downstream movement (see fig. A-7 on page A-8). This technique requires operator training in order to make the continual adjustment necessary to reach the objective point on the exit bank.

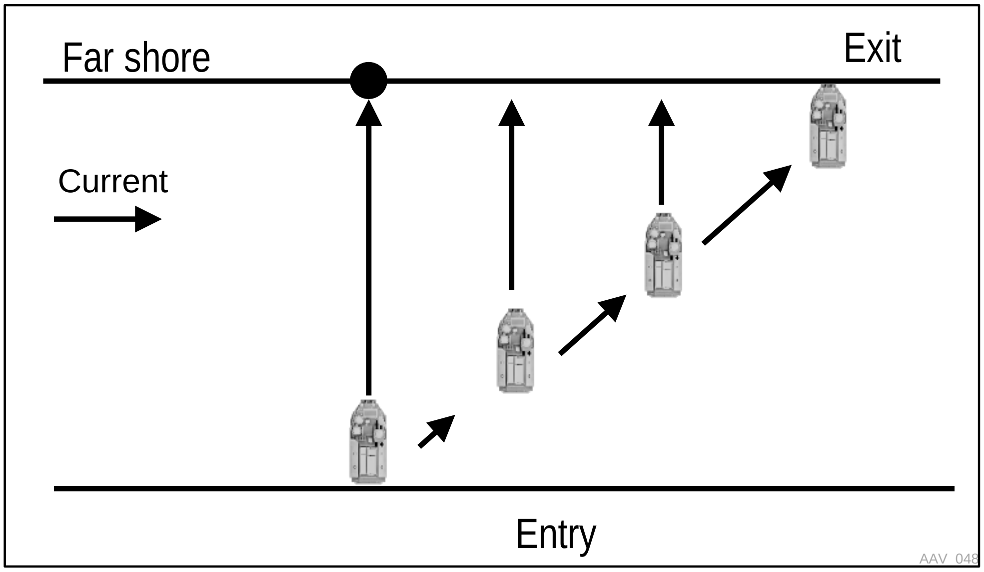


Figure A-7. Downstream Sideslip Technique.

Constant Aim Point. If the operator continues to aim the vehicle at the desired exit point, the orientation of the craft at the exit point will approximate an upstream heading. The craft's path makes an arc in proportion to the current's velocity (see fig. A-8).

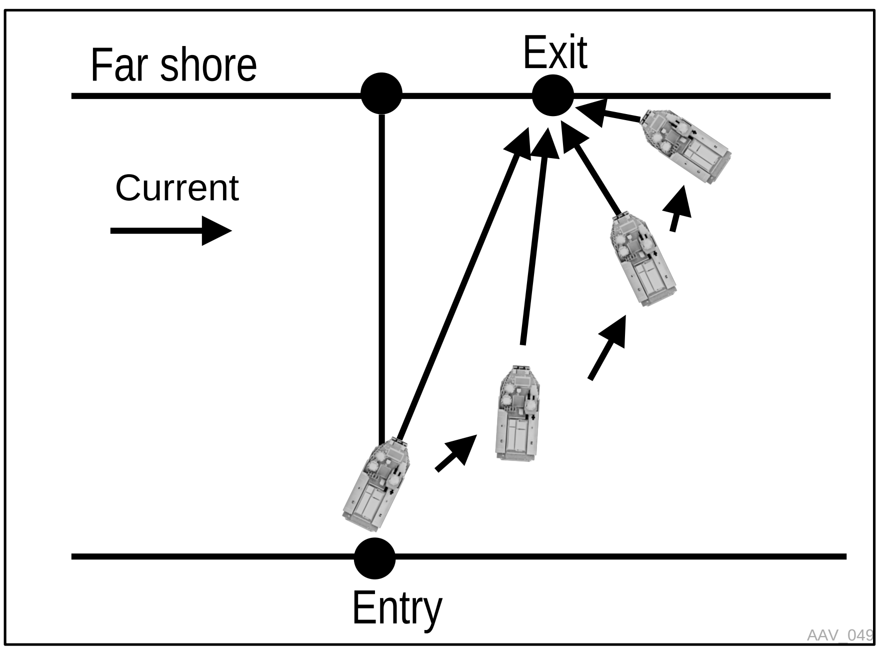


Figure A-8. Constant Aim Point Technique.

Constant Heading. Exiting at a point directly across from the entry point requires an upstream heading to compensate for the current's velocity (see fig. A-9). In all three examples, the craft's speed relative to the current's velocity is constant; assuming the engine RPM (or paddling rate) remains constant. The terrain conditions may restrict the location of entry and/or exit locations. The enemy situation may also require alternate techniques. For example, when aiming at the downstream exit point, the craft moves at a greater speed relative to the banks after entry than it does as it nears the exit due to the current's velocity. This technique may be favored when the enemy has better observation of the entry bank rather than the exit bank. Watercraft moving fast and at a changing rate are more difficult to engage effectively.

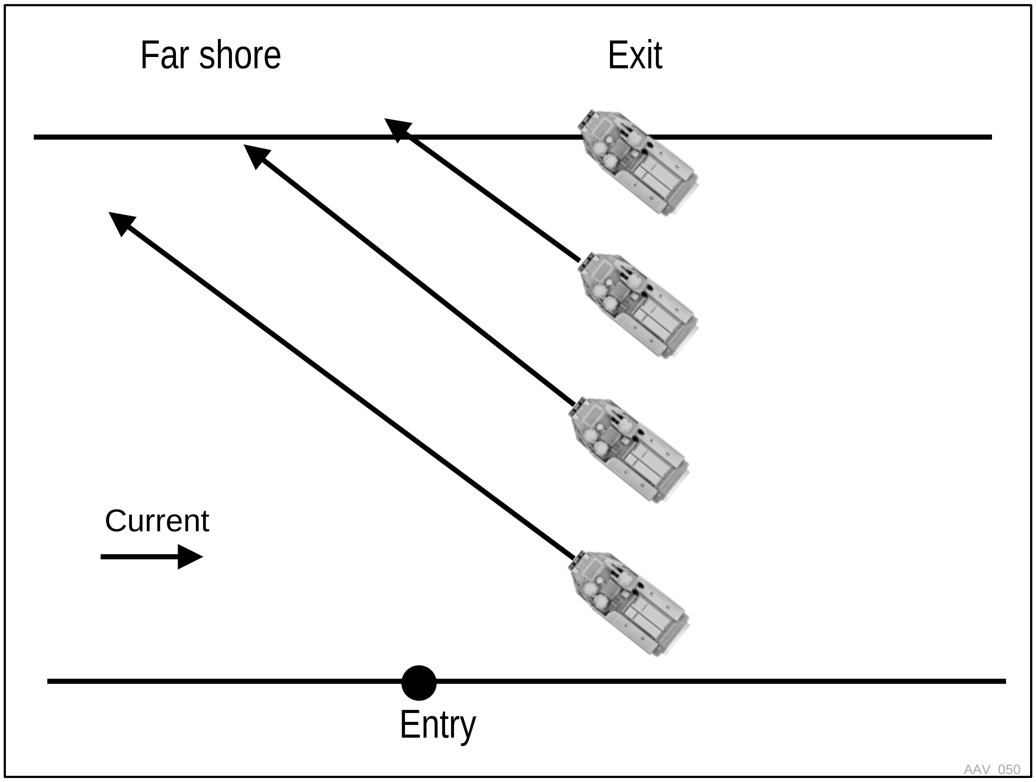


Figure A-9. Constant Heading Technique.

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APPENDIX B
AMPHIBIOUS ASSAULT VEHICLE FAMILY OF VEHICLES

The AAV7A1 family of vehicles includes three functional variants: personnel transport, command and control, and recovery.

CAPABILITIES

To maximize its operational utility on the battlefield, it is important to understand the AAV's capabilities and limitations. It is a self-deploying amphibious armored personnel carrier capable of open ocean movement from naval shipping through rough seas and plunging surf. Without modification, it can traverse beaches, cross rough terrain, and perform continuous mechanized operations. It provides the GCE with armor protection as well as land and water operation capabilities. The AA community continues to incorporate and integrate advanced technologies in order to meet current and future warfighting requirements.

Armor

The AAV's armor affords protection to the crew and embarked personnel from the effects of certain types of enemy fire. It also allows the AAV to close with the enemy and maneuver while under either enemy fire or friendly close supporting fires with a degree of survivability that other weapon systems do not possess.

The AAV's hull is constructed from welded plates of ballistic aluminum and provides a high degree of protection against small arms fire, up to 7.62mm at 300 meters and 105mm high explosive (variable time) fragmentations at 15 meters. When equipped with the enhanced appliqué armor kit, a series of bolt-on armor panels that offer additional armor protection, it provides a substantial increase in ballistic protection with no penetration from 12.7mm fire and virtually no penetration of 155mm high explosive at 15 meters.

Armor Protected Firepower

The AAVP7A1 is equipped with an UGWS that mounts both an M2 .50-caliber heavy barrel machine gun and a MK-19 40mm machine gun. Along with the elevated position and integrated thermal sighting system, the UGWS provides direct fire to supported units. See appendix B for additional specifications for the UGWS. The AAVC7A1 and AAVR7A1 are equipped with a 7.62mm machine gun used primarily for defense and local security.

Mobility

The AA units are capable of conducting mobile ground combat over broad areas of operations. Their speed and maneuverability allow the unit to remain dispersed and mass quickly for employment at a decisive time and place. By virtue of their full track, AAVs possess a high degree of cross-country mobility that is comparable to a main battle tank. Their speed and mobility allow them to provide firepower and deliver a reinforced rifle squad per vehicle against enemy locations within a short period of time. They can also quickly mass the fires of their weapon systems while remaining physically dispersed in order to limit enemy counteraction.

Amphibious

The AAV is a self-deploying fully amphibious vehicle capable of operating in various sea states and moving directly inland to follow-on objectives. It can use ocean and inland water passages as maneuver space, which allows for greater flexibility in choosing avenues of approach. It is capable of safe, long distance water movement/maneuver that is limited only by extremely rough seas and the associated effects on embarked personnel. Waterborne movements over two hours may have negative effects on passengers.

Flexibility

The AA units are capable of responding rapidly to a variety of situations. Their lift capacity and mobility provide a platform that is suitable during operations ranging from disaster relief to combat operations. During mechanized operations, AA units can displace rapidly once ground forces have dismounted and execute follow-on missions directed by the supported unit commander in response to changing tactical situations. The UGWS and thermal imaging capability of AAVs allow the supported unit commander to employ them as mobile, on-call, direct fire platforms. In addition, their cargo capacity facilitates a greater self-sustainment period for the mechanized force.

Shock Effect

The AAVs can create a shock effect on the enemy that is both physical and psychological. If properly executed, it can also give a boost to friendly morale. To properly exploit this intimidating effect, a well-integrated mechanized infantry team employing combined arms is essential.

Extensive Communications

The radio is the primary means of communications for both AA units and their embarked infantry. Each AAV is capable of transmitting/receiving on one frequency while receiving on another frequency, allowing for the rapid and secure communication of orders and instructions. Additionally, a vehicle intercommunications system allows the crew and infantry commander to exchange information while the vehicle is on the move.

The AAVC7A1 provides the supported commander and staff with the latest C2 communications systems to allow secure communications with subordinate, adjacent, and higher units, as well as with supporting arms and logistic agencies. The AAVC7A1's intercommunications assets provide the embarked commander and staff with the capability to communicate with each other while stationary or moving from staff positions within the vehicle. Chapter 9 provides additional information about the C2 capabilities of the AAVC7A1. For more information, see the *AAVC7A1* section below.

Visibility

The AAV possesses extended visibility through most types of weather and battlefield obscuration, during daylight and limited visibility, with its thermal and magnified vision devices. The elevated positions of the troop commanders and vehicle commanders allow a greater view and enhanced situational awareness of the battlespace. The AAV's imaging devices assist supported ground units in engaging and observing enemy targets in limited visibility conditions.

LIMITATIONS

A clear understanding of an AAV's employment limitations enables commanders to both effectively plan and fully exploit the capabilities of AA units. These limitations include the vehicles' inherent size and weight and the ability to negotiate both natural and man-made obstacles.

Size

The size of an AAV can make it difficult to conceal, depending on the terrain. The vehicle commander can overcome this limitation by positioning the vehicle in areas that minimize its exposure to enemy observation until it is ready to be employed.

Weight

An AAV's weight prevents use of low-capacity bridges and requires the use of special equipment and techniques for recovering immobilized vehicles. Planning for the necessary support and the careful selection of routes and areas of operations can reduce this limitation.

Natural Obstacles

Of the limiting factors that inhibit AAV operations, none have a more decisive effect than terrain. If not properly considered in the planning process, the slope of the beach in the littorals, coral reef locations, the composition of the beach itself, and the availability of exits to the near hinterland can inhibit AAV mobility. The type of terrain may dictate the number of AAVs that can be employed, but will seldom prohibit their employment entirely. Extremes in weather can also inhibit mobility, as well as reduce the efficiency of AAV crews. In deep snow, icy conditions, and excessively soft terrain, AAVs can experience reduced traction and difficulty in negotiating slopes. Many of these limitations can be overcome with the assistance of engineer support (refer to MCTP 3-34A). Proper reconnaissance is advisable to ensure the best use of the vehicle's range of capabilities.

Man-Made Obstacles

Man-made explosive and non-explosive obstacles (e.g., wire obstacles, antitank ditches, tank traps, mines and/or improvised explosive devices, tetrahedrons and naval mines) are likely to be encountered and restrict the mobility of AAVs. Prior planning and the proper employment of organic or supporting capabilities given adequate time and resources can overcome many of these obstacles. For additional information, refer to MCTP 3-34A.

Fuel Consumption and Maintenance

An AAV's fuel consumption is high in comparison to a wheeled vehicle. Careful planning and a coordinated logistic effort are required to ensure that AAVs' fuel requirements do not impose a logistic burden.

An AAV's complexity requires dedicated maintenance time. The AAV crews accomplish preventive maintenance during halts, rest periods, and periods of resupply without interrupting support functions. However, the systematic relief of individual AAVs or AA units is required to permit thorough maintenance. The failure to recognize or plan for this results in degraded capability of the mechanized unit and risk to mission. Foregoing maintenance in an operational environment is a false economy.

Visibility

The AAV provides enhanced visibility with its optics and night vision devices; however, vision is still limited during operations when the hatch is closed or buttoned up, requiring dismounted security from the supported unit during security halts. The inability of the crew to view the immediate area surrounding the vehicle requires dismounted personnel to maintain a safe distance from the AAV. When operating in close terrain, including urban environments, the AAV is susceptible to ambush. It is also vulnerable to mechanical damage caused by terrain (e.g., brush-covered gullies) or obstacles that are hidden from view (e.g., a concealed antitank ditch). Conducting a detailed terrain analysis can mitigate risk, but may not eliminate these limitations. Infantry should accompany AAVs operating in close, broken terrain and urban environments to provide visual assistance to protect the AAV from ambush.

Un-stabilized Weapons Platform

The AAV has a decreased ability to provide precision fires while moving from the UGWS due to the platform's un-stabilized weapons and sighting system. The UGWS cannot maintain rounds on target while moving in rolling terrain or any sea state. The AAV must halt in order to place accurate fires on target. Trained crews can utilize various techniques; however, when moving or negotiating waterways, accuracy cannot be guaranteed.

AAVP7A1 Personnel Variant

The AAVP7A1 is designed to provide combat support and armor-protected firepower and mobility for a reinforced rifle squad and associated combat equipment for operations on land or sea. Although the vehicles are principally personnel carriers, they may also be employed to transport cargo in support of logistic operations (see fig. B-1). Table B-1 on page B-6 provides technical data relative to the AAVP7A1.

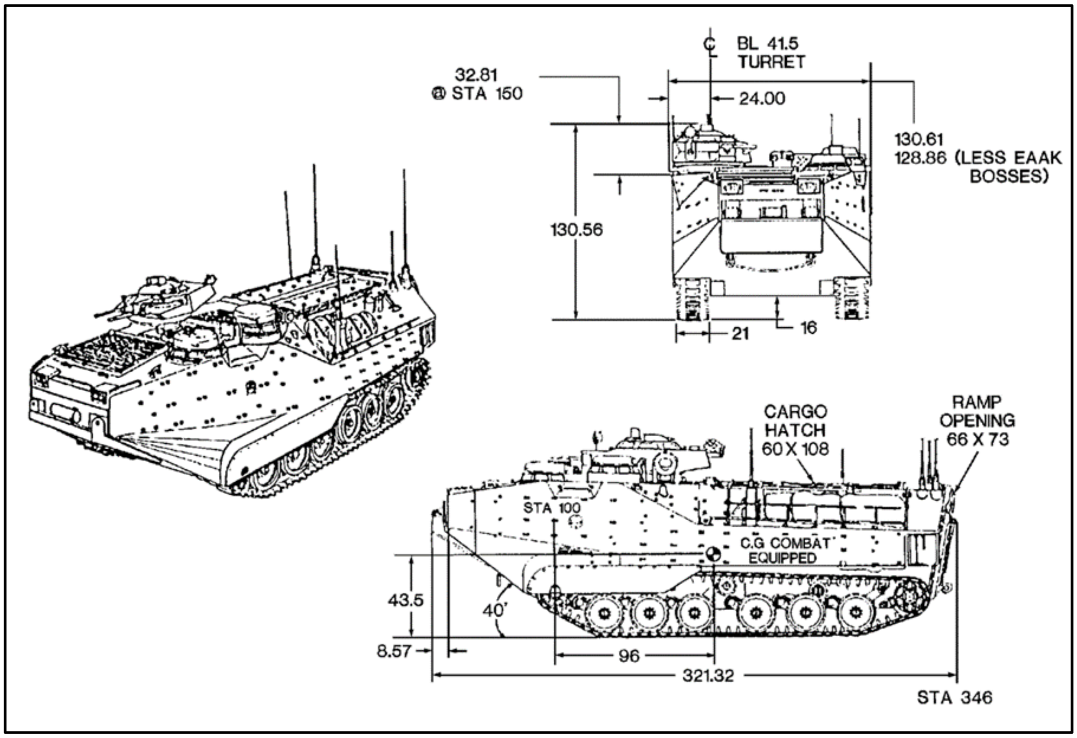


Figure B-1. Amphibious Assault Vehicle Personnel Variant.

Table B-1. AAVP7A1 Personnel Variant Technical Specifications.

General	
Crew	3
Weight	Unloaded: 48,060 pounds (with EAAK, less crew, fuel, OEM, and ammunition)
	Combat-equipped: 52,504 pounds (EAAK, crew, fuel, OEM, and ammunition)
	Troop-loaded: 58,489 pounds (combat-equipped with troops)
	Cargo-loaded: 62,504 pounds (combat-equipped with cargo)
Load capacity	21 combat-equipped troops (at 360 pounds each) or 10,000 pounds of cargo
Mean seawater draft (cargo-loaded)	81.8 inches
Freeboard at bow (station 34)	25.5 inches
Freeboard at stern (station 346)	11.5 inches
Unit ground pressure (cargo-loaded)	9.7 pounds per square inch
Fuel capacity	171 gallons
Performance	
Cruising range	Land: at 25 miles per hour, 200 miles
	Water: at 2,600 RPM, 7 hours
Cruising speed	Land: 20 to 30 miles per hour
	Water: 6 miles per hour
Maximum speed forward	Land: 45 miles per hour
	Water: 8.2 miles per hour
Maximum speed reverse	Land: 12 miles per hour
	Water: 4.5 miles per hour
Obstacle ability	8-foot trench span, 3-foot vertical wall
Maximum forward grade (cargo-loaded)	60 percent
Maximum side slope (cargo-loaded)	40 percent
Ground clearance (cargo-loaded)	16 inches
Surf ability	Negotiate 6-foot plunging surf cargo-loaded and survive 10-foot plunging surf without sustaining mission failure
Cargo Compartment	
Length	13.5 feet
Width	6 feet
Height	5.5 feet
Volume	445.5 cubic feet
Other	
Special mission kits	Visor kit: Protect driver from elements in extreme cold weather
	Litter kit: 6 litters for mobile aid station/medical evacuation vehicle
	Winterization kit: Used when operating in extreme cold weather conditions

Table B-1. AAVP7A1 Personnel Variant Technical Specifications—Continued.

Armor	
Permanent hull	Aluminum armor plate
Ramp outer	1 inch
Ramp inner	.5 inch
Sides	1.75, 1.395, and 1.222 inches
Top	1.185 inches
Bottom	1.185 inches
Stern	1.395 inches
EAAK	Secondary armor
	Maximum offset from hull: 8.5 inches per side
	Material: homogeneous hardened steel, rubber, mild steel composite
Armament and Ammunition	
UGWS, improved	
Traverse	360 degrees
Elevation	Plus 45 degrees
Depression	8 degrees
Weapons	
M2 HB caliber .50 machine gun	Maximum effective range: 2,000 yards (1,830 meters)
	Ammunition load: 200 ready rounds, 1,000 rounds stowed in 10 ammunition boxes
MK-19 model 3, 40-mm machine gun	Maximum effective range: 1,640 yards (1,500 meters)
	Ammunition load: 96 ready rounds, 768 rounds stowed in 16 ammunition boxes
M257 smoke grenade launchers	Quantity: 2 assemblies, 4 tubes each
	Total: 8 UKL8A1 or UKL8A3 grenades

LEGEND

EAAK	enhanced appliqué armor kit	OEM	on equipment material
HB	heavy barrel		

AAVC7A1 Command and Control Variant

Figure B-2 and table B-2on page B-9 provide the characteristics of the AAVC7A1 C2 variant.

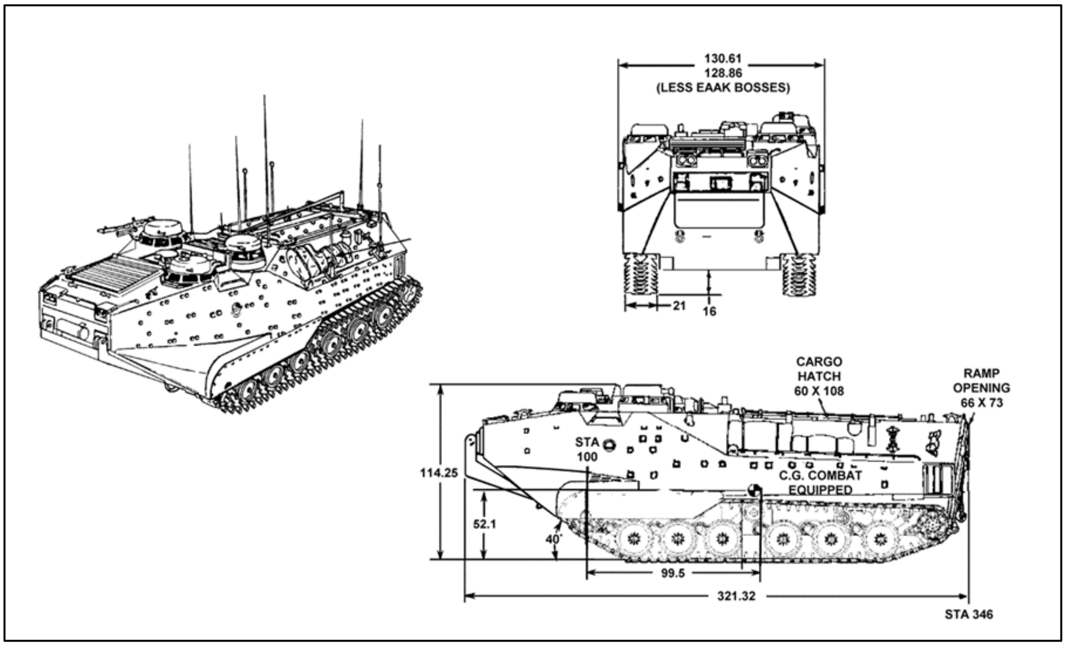


Figure B-2. AAVC7A1 Command and Control Variant Specifications.

Table B-2. AAVC7A1 Command and Control Variant Technical Specifications.

General	
Crew	3
Passengers	7 (commander and 6 staff members)
Weight	Unloaded: 51,360 pounds (with EAAK, less crew, fuel, OEM, and ammunition)
	Combat-equipped: 54,765 pounds (with EAAK, crew, fuel, OEM, and ammunition)
Mean seawater draft (cargo-loaded)	Approximately 75.6 inches
Freeboard at bow (station 34)	Approximately 26.8 inches
Freeboard at stern (station 346)	Approximately 22.6 inches
Unit ground pressure (combat-equipped, zero penetration)	8.5 pounds per square inch
Fuel capacity	171 gallons (multifuel)
Performance	
Cruising range	Land: at 25 miles per hour, 200 miles
	Water: at 2,600 RPM, 7 hours
Cruising speed	Land: 20 to 30 miles per hour
	Water: 6 miles per hour
Maximum speed forward	Land: 45 miles per hour
	Water: 8.2 miles per hour
Obstacle ability	8-foot trench span, 3-foot vertical wall
Maximum forward grade (combat-equipped)	60 percent
Maximum side slope (combat-equipped)	40 percent
Ground clearance (combat-equipped)	16 inches
Surf ability	Negotiate 6-foot plunging surf combat-equipped and survive 10-foot plunging surf without sustaining mission failure

Table B-2. AAVC7A1 Command and Control Variant Technical Specifications—Continued.

Communications	
Mission-Essential Radios	
AN/VRC-89	3
AN/VRC 92	1
AN/PRC-117G	2 (1 organic and 1 carry on)
AN/PRC -150	1
AN/PRC-117F	2
Server Rack	
Blue force tracker	1
Server interconnect panel	1
Tactical navigation	1
Defense Advanced GRP Receiver	1
DuraNET 30-20-20 network	1
DuraMAR 5995 Cisco router	1
Operator / Staff workstations	6
Advanced Field Artillery Tactical Data System	1 (carry on)
CF-31 Toughbook	6
Racal headsets	6
Other	
Special mission kits	Visor kit: Protect driver from elements in extreme cold weather
	Winterization kit: Used when operating in extreme cold weather conditions
	EAAK: See below for details
Armor	
Permanent hull	Aluminum armor plate
Ramp outer	1 inch
Ramp inner	.5 inch
Sides	1.75, 1.395, and 1.222 inches
Top	1.185 inches
Bottom	1.185 inches
Stern	1.395 inches
EAAK	Secondary armor
	Max offset from hull: 8.5 inches per side
	Material: homogeneous hardened steel, rubber, mild steel composite
Armament and Ammunition	
M240B machine gun, pintle-mounted	1
Ammunition	7.62 mm; 1,000 rounds stowed

LEGEND

EAAK	enhanced appliqué armor kit	GPS	global positioning system
EPLRS	enhanced position location reporting system	OEM	on equipment material

Basic information on the NOTM system is included in chapter 9. The AAV NOTM point of presence kit (see fig. B-3) is integrated on the AAVP7A1. It consists of several sub-systems and components vital to providing a BLOS on-the-move network point of presence on the battlefield. The point of presence consists of the following:

- Multiband on-the-move SATCOM antenna with ballistic radome.
- MPM-1000 SATCOM modem.
- 2.4/4.4 GHz Fortress radio.
- Two AN/PRC-117G multi-band networking radios.
- Network stack consisting of black core, NIPRNET, SIPRNET, and mission-specific enclaves.
- Riverbed Steelhead WAN [wide area network] Optimization.
- CM2 Video Scout for ISR downlink and distribution.
- Application server.
- Joint Tactical Common Operation Picture Workstation terminals.
- Tactical power supply allows points of presence and staff vehicles to draw DC [direct current] power from external sources (generator or shore power).

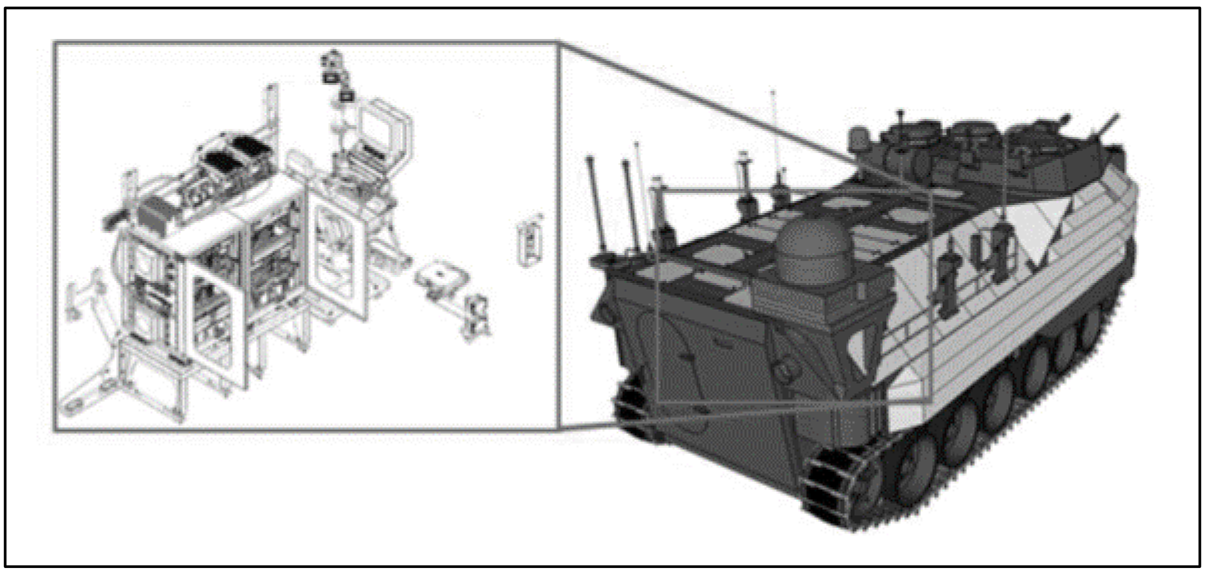


Figure B-3. AAVP7A1 with Networking On-the-Move Point of Presence Kit.

The NOTM AAV staff vehicle kit is integrated on the AAVC7A1 (see fig. B-4 on page B-12). It consists of several sub-systems and components to connect wirelessly to the AAV point of presence, providing commanders and staffs operating out of the AAVC7A1 on-the-move access to C2 applications, mission-specific NIPRNET and SIPRNET voice and data networks, and streaming ISR resources. The staff variant kit consists of the following:

- 2.4/4.4 GHz Fortress radio.
- One AN/PRC-117G multi-band networking radio.

- Network stack consisting of black core, NIPRNET, SIPRNET, and mission-specific enclaves.
- Two Joint Tactical Common Operation Picture Workstations that supplant two laptops in the traditional AAVC7 configuration. A network switch included in the AAV staff vehicle allows for additional workstations (staff positions) on the network, if desired.

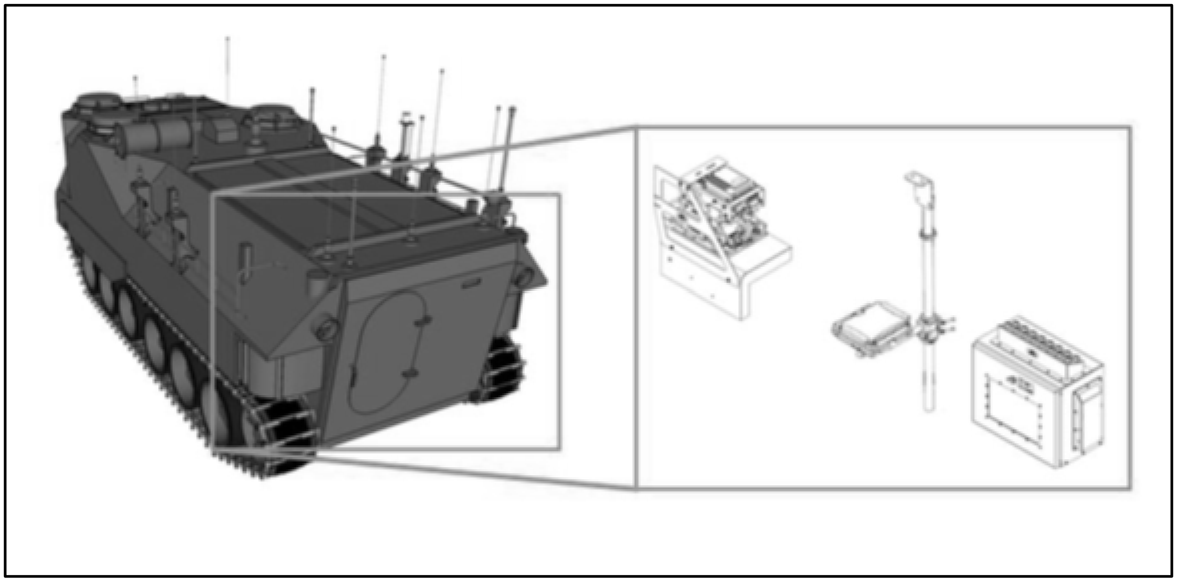


Figure B-4. AAVC7A1 with Networking On-the-Move Staff Vehicle Kit.

AAVR7A1 Recovery Variant

Figure B-5 and table B-3, on page B-14, provide characteristics and specifications regarding the AAVR7A1 recovery variant.

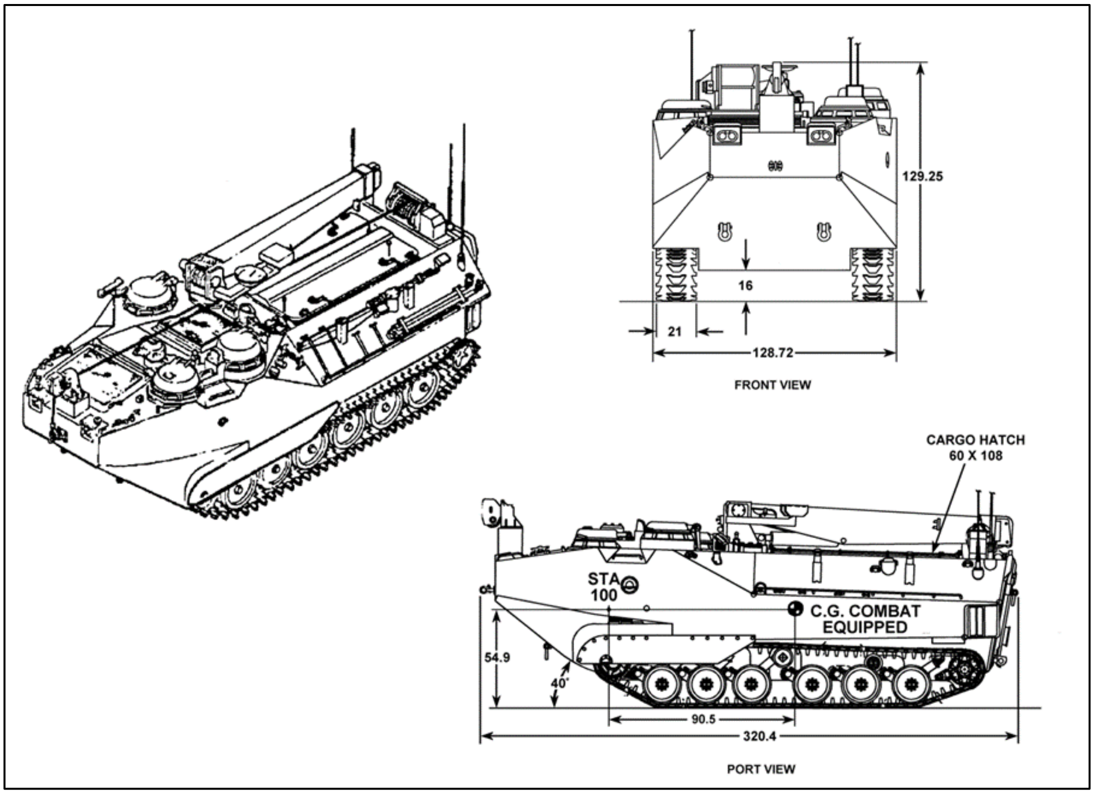


Figure B-5. AAVR7A1 Recovery Variant.

Table B-3. AAVR7A1 Recovery Variant Technical Specifications.

General	
Crew	5
Weight	Unloaded: 52,059 pounds (less crew, fuel, and ammunition)
	Combat-equipped: 54,069 pounds (crew, fuel, OEM, and ammunition)
Mean seawater draft (combat-equipped)	Approximately 68 inches
Freeboard at bow	Approximately 37.3 inches
Freeboard at stern	Approximately 39 inches
Unit ground pressure (combat-equipped, zero penetration)	7.8 pounds per square inch
Fuel capacity	171 gallons
Performance	
Cruising range	Land: at 25 miles per hour, 200 miles
	Water: at 2,600 RPM, 7 hours
Cruising speed	Land: 0 to 30 miles per hour
	Water: 6 miles per hour
Maximum speed forward	Land: 45 miles per hour
	Water: 8.2 miles per hour
Obstacle ability	8-foot trench span, 3-foot vertical wall
Maximum forward grade (combat-equipped)	60 percent
Maximum side slope (combat-equipped)	40 percent
Ground clearance (combat-equipped)	16 inches
Surf ability	Negotiate 6-foot plunging surf combat-equipped and survive 10-foot plunging surf without sustaining mission failure
Recovery Equipment	
Air compressor	
Piston displacement	14.4 CFM
Operating pressure	145-175 PSIG
Speed	720 RPM
Welder power	
Voltage range in CV mode (MIG)	10-36 VDC
Amperage range in CC mode (TIG)	3-375 amps
Open-circuit voltage in CC mode	80 VDC (maximum)
Hydraulic crane	
Horizontal reach maximum boom load capacity	6,500 pounds
Boom working angle	0-65 degrees

Table B-3. AAVR7A1 Recovery Variant Technical Specifications—Continued.

Recovery winch	
Line pull	
Low speed	
Bare drum	38,200 pounds
Full drum	22,000 pounds
High speed	
Bare drum	11,500 pounds
Full drum	9,000 pounds
Line speed	
Low speed	
Bare drum	14.5 FPM
Full drum	15.5 FPM
High speed	
Bare drum	17.3 FPM
Full drum	9,000 pounds
Line speed	
Low speed	
Bare drum	14.5 FPM
Full drum	15.5 FPM
High speed	
Bare drum	17.3 FPM
Full drum	28.9 FPM
Wire rope	
Diameter and classification	3/4 inch, 6 x 37 wire
Breaking strength	48,600 pounds
Length	278 Feet
Other	
Special mission kits	Visor kit: Protect driver from elements in extreme cold weather
	Winterization kit: Used when operating in extreme cold weather conditions
Armor	
Permanent hull	Aluminum armor plate
Ramp outer	1 inch
Ramp inner	.5 inch
Sides	1.75, 1.395, and 1.222 inches
Top	1.185 inches
Bottom	1.185 inches
Stern	1.395 inches
EAAK	Secondary armor
	Max offset from hull: 8.5 inches per side
	Material: homogeneous hardened steel, rubber, mild steel composition

Table B-3. AAVR7A1 Recovery Variant Technical Specifications—Continued.

Armament and Ammunition	
M240B machine gun, pintle-mounted	1
Ammunition	7.62 mm; 1,000 rounds stowed

LEGEND

CC	constant current	OEM	on equipment material
CFM	cubic feet per minute	PSIG	pound force per square inch
CV	constant voltage	TIG	tungsten inert gas welding
EAAK	enhanced appliqué armor kit	VDC	volts direct current
MIG	metal inert gas welding		

Mk-154 Launcher, Mine Clearance Kit

The Mk-154 launcher, mine clearance is an electric and hydraulic system that can be installed into any AAVP7A1. The hydraulics are self-contained and the electrical power is provided through the host vehicle's slave receptacle. The system has the capability to house and fire three linear demolition charges using three MK22 rockets. Each of the rockets, when launched, pulls a series of tubing from the cargo/personnel area of the AAVP7A1. Each series of tubing contains 1,750 pounds of C-4 explosive. The overpressure created by the linear demolition charge will clear a path 16 meters wide and 100 meters long through a minefield consisting of single impulse, non-blast resistant, pressure-fused mines. It can produce up to a 95 percent probability of destruction against these types of mines. The width of the lane and the ability to neutralize mines, however, depends upon the mine type, fusing, and location (i.e., surface-laid or buried). For additional information and technical specifications regarding the Mk-154 launcher, mine clearance kit, see TM 09962B-10/1A, *Operator and Organizational Maintenance Manual for Launcher, Mine Clearance Model: Mk 154 MOD 1* and TM 09962B-23&P/1, *Organizational and Intermediate Maintenance Manual Including Repair Parts and Special Tools List for Launcher, Mine Clearance Mk 154, MOD 1 NSN 1-55-01-643-6075*.

The Mk-154 launcher, mine clearance kit is specifically designed for use on the AAVP7A1. When not installed on an AAV, the system is stored in its own shipping container. A trained crew can mount the Mk-154 in two hours. The AAVR7A1's boom or other materials handling equipment is required to mount the system on top of the AAVP7A1 (see fig. B-6). Once installed, the Mk-154 and AAVP7A1 together are referred to as the Mk-154 Mod 1 mine clearance system.

The Mk-154 Mod 1 ammunition load occupies the entire troop compartment of the AAV. A full reload of the system, three line charges and rockets, requires approximately 45 minutes. Each line charge consists of a rocket, a 100-meter line charge of C-4 explosive, and 66 meters of safety line. The crew remains inside the Mk-154 Mod 1 when using the hydraulically deployed rocket launcher.

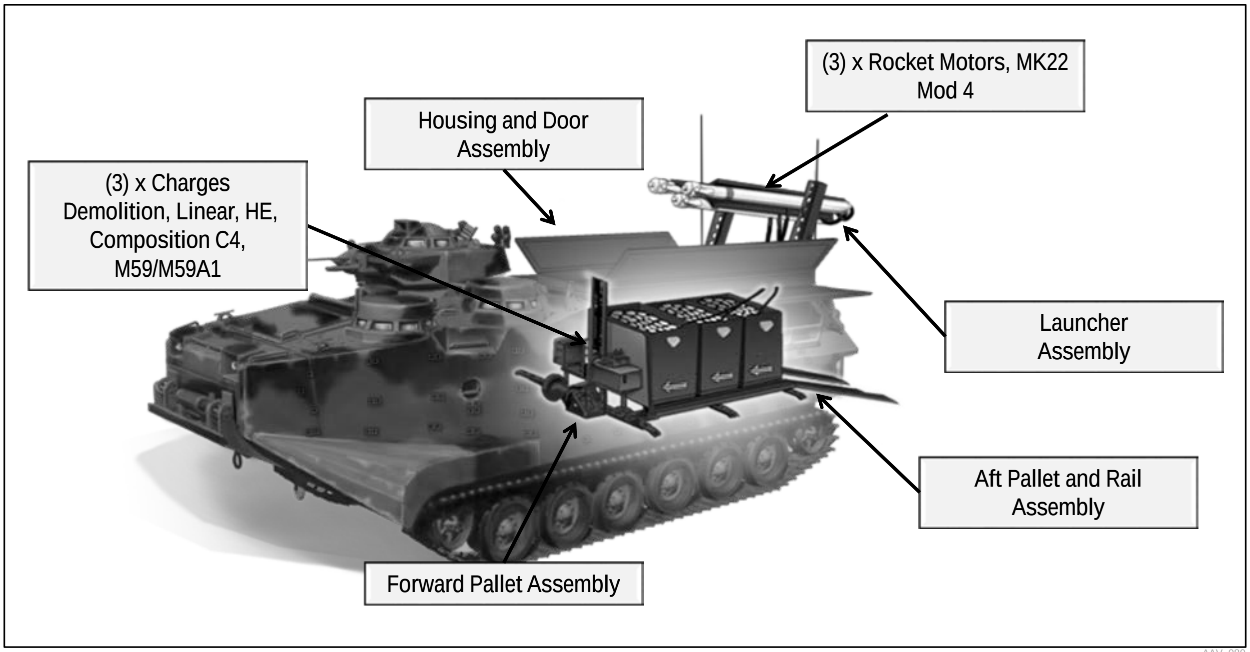


Figure B-6. Mk-154 Mod 1 Mine Clearance System.

Characteristics

The Mk-154 launcher, mine clearance kit has the following characteristics:

- The launching device weighs 3,040 pounds.
- The container and device weigh 8,790 pounds.
- The container dimensions are 175.75 by 96.88 by 60.5 inches.

Ammunition for the Mk-154 has the following characteristics:

- The linear demolition charge with tub (ML25) weighs 2,550 pounds.
- The C-4 charge weighs 1,750 pounds.
- The MK22 Mod 3 model rockets (J143) weigh 115 pounds each.
- The MK22 Mod 4 model rockets (J143) weigh 128 pounds each.
- The weight of the Mk-154, including 3 charges and 3 rocket motors, is 10,690 pounds.
- The Mk-154 launcher and the combat-equipped AAV weigh 63,194 pounds.

Capabilities

The Mk-154 Mod 1 is specifically designed for defeating explosive obstacles intended to hinder and delay military operations. The capabilities of the Mk-154 Mod 1 system include the following:

- The Mk-154 launcher, mine clearance kit can be mounted on any AAVP7A1 hull without additional modification to the AAV.
- It is capable of firing three line charges consecutively without reloading the system.

- Water has a tamping effect on the mine clearing line charges and increases the overpressure that is created.
- The Mk-154 Mod 1 system can breach a minefield up to 270 meters in depth by properly overlapping each charge.
- It creates a linear area 16 meters wide and 100 meters long that is 95 percent clear of mines (with the exception of double impulse and magnetic impulse mines).
- The line charge blast also reduces wire obstacles and trip wires.

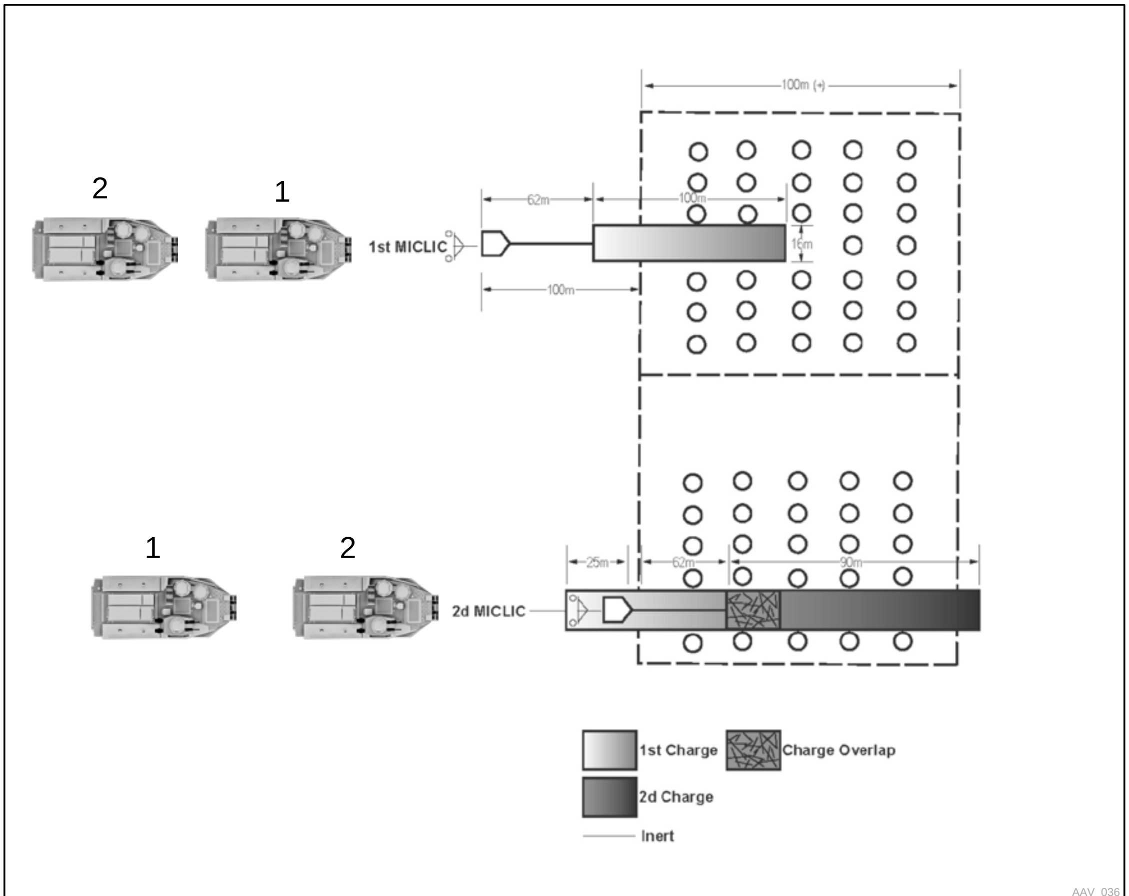
Limitations

Environmental factors may restrict the capability of the Mk-154 Mod 1. Proper overlapping the consecutive charges is required to ensure a thorough explosively breached lane, which may prove extremely difficult depending of the sea state and surf conditions during an amphibious assault. The Mk-154 Mod 1 system is not a stabilized system; the littoral current can significantly affect the drift of the AAVP7A1. The Mk-154 Mod 1 vehicle crew must make slow and deliberate movements when conducting amphibious breaching in order to reduce drifting outside of the breach lane, reduce the likelihood of being swamped in the surf zone, ensure the proper arming of the fuse, and maintain the proper orientation of the Mk-154 Mod 1.

When the vehicle is on a slope in excess of 53 percent bow up, the Mk-154 Mod 1 is unable to fire using its electrical system. However, the system can be fired manually with the vehicle on a slope up to 60 percent bow up. In addition, waves over three feet in the surf zone may swamp the vehicle when the system is raised and preparing to fire.

Employment Techniques

The Mk-154 Mod 1 AAV approaches to within approximately 62 meters of the obstacle, then the launcher is deployed and aimed by pointing the vehicle in the direction of intended rocket flight. When fired, the rocket pulls the line charge from the troop compartment of the AAVP7A1. The rocket reaches the end of the 166-meter line (62.5 meters of safety line and 103.5 meters of explosive), pulls the line charge taut, and the line falls to the ground. The 62.5-meter safety line provides the maximum distance between the launch vehicle and the explosion. The vehicle may need to back up in order to straighten the mine-clearing line charge before detonation (in case twists and curves in the line charge occurred during the rocket's flight). The AAV crew detonates the line charge from within the vehicle. If the depth of the minefield requires multiple line charges to breach, the lane created by the first line charge must be proofed before the Mk-154 Mod 1 moves forward to its next firing position. For additional information, refer to MCTP 3-34A and MCTP 3-10B, *Marine Corps Tank Employment*. Figure B-7 displays how the Mk-154 Mod 1 is employed.



LEGEND
m meters
MICLIC Mine-clearing line charge

Figure B-7. Employment of the Mk-154 Mod 1.

LITTER KIT

The litter kit provides space for up to six litters and is installed by the vehicle crew when the vehicle is to be used by medical support personnel as a mobile aid station or casualty evacuation vehicle. The litter kit is installed on the AAVP7A1 using straps and is secured to existing hull brackets and deck plate slots.

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APPENDIX C
SURF OBSERVATION REPORT AND MODIFIED SURF INDEX CALCULATION

NAME & RANK OF OBSERVER:________________________ DATE:__________ TIME:__________ BEACH:__________ UNIT:__________

NOTE: BEFORE YOU START RECORDING WAVES, YOU MUST REFER TO THE SUROB WORKSHEET PROVIDED. BEGIN BY STARTING YOUR STOPWATCH. WHILE OBSERVING EACH OF THE 100 WAVES, MAKE NOTE OF THE TYPE (P=PLUNGING, S=SPILLING, OR X=SURGING) OF WAVES AND RECORD IT AS APPROPRIATE. ONCE THE 100TH WAVE IS OBSERVED, STOP THE STOPWATCH.

LINE	INFORMATION	SUROB DATA	MSI	NOTES:
A	SIGNIFICANT BREAKER HEIGHT IN FEET.	________FEET=	_____._____	OBSERVE 100 WAVES. ONLY THE HIGHEST 33 WAVES WILL BE ADDED TOGETHER AND THEN DIVIDED BY 33 FOR THE SIGNIFICANT BREAKER HEIGHT. THE MSI FACTOR WILL ALWAYS BE THE SAME AS THE BREAKER HEIGHT WITH A DECIMAL POINT ADDED. EXAMPLE: 3 FEET = 3.0 MSI
B	MAXIMUM BREAKER HEIGHT IN FEET.	________FEET	N/A	THIS IS THE SINGLE HIGHEST WAVE OBSERVED DURING THE 100 WAVE COUNT. MSI IS NOT COMPUTED IN THIS LINE.
C	BREAKER PERIOD IN SECONDS.	________SEC		THIS IS COMPUTED BY TAKING THE TOTAL TIME IN SECONDS THAT WAS RECORDED BY YOUR STOPWATCH AND DIVIDING IT BY 100 WAVES. EXAMPLE: 22 MIN = 1320 SECONDS AND 1320 SECONDS DIVIDED BY 100 WAVES = 13.2 SECONDS. USE THE CHART BELOW TO FIND THE MSI FACTOR.

BREAKER PERIOD MODIFICATION TABLE

BREAKER PERIOD IN SECONDS	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0
17	0.0	-0.1	-0.2	-0.3	-0.4	-0.5	-0.6	-0.8	-1.0
16	0.0	-0.1	-0.1	-0.2	-0.2	-0.3	-0.4	-0.5	-0.8
15	0.0	0.0	-0.1	-0.1	-0.1	-0.2	-0.2	-0.3	-0.3
14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
13	0.0	0.0	0.1	0.1	0.1	0.2	0.2	0.3	0.3
12	0.0	0.1	0.1	0.2	0.2	0.3	0.4	0.5	0.7
11	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.8	1.0
10	0.1	0.1	0.2	0.3	0.5	0.7	0.9	1.1	1.3
9	0.1	0.1	0.3	0.3	0.6	0.8	1.1	1.3	1.7
8	0.1	0.2	0.3	0.3	0.7	1.0	1.3	1.6	2.0

SIGNIFICANT BREAKER HEIGHT IN FEET

LINE	INFORMATION	SUROB DATA	MSI	NOTES:
D	BREAKER TYPES: PLUNGING, SPILLING, OR SURGING	____% PLUNGING ____% SPILLING ____% SURGING	_____._____	AS EACH WAVE IS OBSERVED, IT IS RECORDED ON THE SUROB WORKSHEET: P=PLUNGING S=SPILLING X=SURGING. DIVIDE THE NUMBER OF EACH BREAKER TYPE BY 100. THIS WILL GIVE YOU PERCENTAGE OF EACH BREAKER TYPE. REFER TO THE CHART BELOW TO GET THE MSI VALUE. THERE IS NO MSI TABLE FOR PLUNGING WAVES. **YOU WILL ONLY RECORD THE LOWEST MSI VALUE FROM EITHER SPILLING OR SURGING.**

SPILLING BREAKER MODIFICATION TABLE

PERCENT SPILLING BREAKERS	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0
100	-0.1	-0.2	-0.5	-0.8	-1.3	-1.8	-2.5	-3.2	-4.1	-5.0
90	0.0	-0.2	-0.4	-0.7	-1.1	-1.6	-2.2	-2.9	-3.6	-4.5
80	0.0	-0.2	-0.4	-0.6	-1.0	-1.4	-2.0	-2.6	-3.2	-4.0
70	0.0	-0.1	-0.3	-0.6	-0.9	-1.3	-1.7	-2.2	-2.8	-3.5
60	0.0	-0.1	-0.2	-0.5	-0.8	-1.1	-1.5	-1.9	-2.4	-3.0
50	0.0	-0.1	-0.2	-0.4	-0.6	-0.9	-1.2	-1.6	-2.0	-2.5
40	0.0	-0.1	-0.2	-0.3	-0.5	-0.7	-1.0	-1.3	-1.6	-2.0
30	0.0	-0.1	-0.1	-0.2	-0.4	-0.5	-0.7	-1.0	-1.2	-1.5
20	0.0	0.0	-0.1	-0.2	-0.3	-0.4	-0.5	-0.6	-0.8	-1.0
10	0.0	0.0	0.0	-0.1	-0.1	-0.2	-0.2	-0.3	-0.4	-0.5
0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

SIGNIFICANT BREAKER HEIGHT IN FEET

SURGING BREAKER MODIFICATION TABLE

PERCENT SURGING BREAKERS	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0
100	0.1	0.2	0.5	0.8	1.3	1.8	2.5	3.2	4.1	5.0
90	0.0	0.2	0.4	0.8	1.2	1.7	2.3	3.0	3.8	4.7
80	0.0	0.2	0.4	0.7	1.1	1.6	2.2	2.9	3.6	4.5
70	0.0	0.2	0.4	0.6	1.0	1.5	2.0	2.7	3.4	4.2
60	0.0	0.2	0.3	0.6	1.0	1.4	1.9	2.5	3.1	3.9
50	0.0	0.1	0.3	0.6	0.9	1.3	1.7	2.3	2.9	3.5
40	0.0	0.1	0.3	0.5	0.8	1.1	1.5	2.0	2.6	3.2
30	0.0	0.1	0.2	0.4	0.7	1.0	1.3	1.8	2.2	2.7
20	0.0	0.1	0.2	0.4	0.6	0.8	1.1	1.4	1.8	2.2
10	0.0	0.1	0.1	0.3	0.4	0.6	0.7	1.0	1.3	1.6
0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

SIGNIFICANT BREAKER HEIGHT IN FEET

Figure C-1. Surf Observation Report Format.

LINE	INFORMATION	SUROB DATA	MSI	NOTES
E	**BREAKER ANGLE**: IN DEGREES, TOWARD THE RIGHT OR LEFT FLANK.	_____° RIGHT/LEFT FLANK	_____._____	THIS IS THE ANGLE AT WHICH WAVES BREAK ON THE SHORE. IT IS MEASURED IN DEGREES. IN MOST CASES, IT WILL NOT EXCEED 5 DEGREES. USE THE MODIFICATION TABLE BELOW FOR THE MSI FACTOR. RIGHT OR LEFT FLANK IS DETERMINED AS IF YOU WERE LANDING ON THE BEACH.

WAVE ANGLE MODIFICATION TABLE

WAVE ANGLE IN DEGREES										
40	0.1	0.3	0.7	1.3	2.0	2.9	3.9	5.1	6.5	8.0
35	0.1	0.3	0.6	1.1	1.8	2.5	3.4	4.5	5.7	7.0
30	0.1	0.2	0.5	1.0	1.5	2.2	2.9	3.8	4.9	6.0
25	0.1	0.2	0.5	0.8	1.3	1.8	2.5	3.2	4.1	5.0
20	0.0	0.2	0.4	0.6	1.0	1.4	2.0	2.6	3.2	4.0
15	0.0	0.1	0.3	0.5	0.8	1.1	1.5	1.9	2.4	3.0
10	0.0	0.1	0.2	0.3	0.5	0.7	1.0	1.3	1.6	2.0
5	0.0	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.8	1.0
0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SIGNIFICANT BREAKER HEIGHT IN FEET	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0

LITTORAL CURRENT MODIFICATION TABLE

KNOTS	MSI MOD	KNOTS	MSI MOD	KNOTS	MSI MOD
0.0=	0.0	1.0=	3.0	2.0=	6.0
0.1=	0.3	1.1=	3.3	2.1=	6.3
0.2=	0.6	1.2=	3.6	2.2=	6.6
0.3=	0.9	1.3=	3.9	2.3=	6.9
0.4=	1.2	1.4=	4.2	2.4=	7.2
0.5=	1.5	1.5=	4.5	2.5=	7.5
0.6=	1.8	1.6=	4.8	2.6=	7.8
0.7=	2.1	1.7=	5.1	2.7=	8.1
0.8=	2.4	1.8=	5.4	2.8=	8.4
0.9=	2.7	1.9=	5.7	2.9=	8.7

LINE	INFORMATION	SUROB DATA	MSI	NOTES
F	**LITTORAL CURRENT**: IN KNOTS, TOWARD THE RIGHT OR LEFT FLANK	_____ KNOTS RIGHT/LEFT FLANK	_____._____	THROW A BUOYANT OBJECT INTO THE WATER AND BEGIN TIMING ONE MINUTE. PACE OFF THE DISTANCE THE OBJECT TRAVELED IN FEET OVER THE PERIOD OF ONE MINUTE. NOW DIVIDE THE DISTANCE THE OBJECT TRAVELED BY 100. EXAMPLE: 80 FEET TRAVELED = 0.8 KNOTS USE TABLE ABOVE FOR MSI FACTOR.
G	**SURF ZONE**: LINES OF BREAKERS AND DEPTH OF SURF ZONE IN FEET	_______LINES _______FEET	**N/A**	COUNT THE NUMBER OF SWELLS AND BREAKERS WITHIN YOUR SPLASH AREA; THIS IS THE NUMBER FOR "LINES OF BREAKERS." DEPTH IS MEASURED FROM THE CLOSEST BREAKING WAVE TO THE FURTHEST APPROACHING SWELL AND IS DONE SO IN FEET. NO MSI FACTOR IS USED.
H	**ADDITIONAL REMARKS**: WIND SPEED/DIRECTION: IN KNOTS/DEGREES, TOWARD THE RIGHT/LEFT FLANK WIND: ONSHORE OR OFFSHORE (CIRCLE ONE)	_____KNOTS _____° RIGHT/LEFT FLANK	_____._____	WIND SPEED IS MEASURED IN KNOTS USING THE RANGE FLAG METHOD. WIND DIRECTION IS MEASURED IN DEGREES TOWARD THE RIGHT OR LEFT FLANK TO THE BEACH. IF THE WIND IS BLOWING ONTO THE BEACH, IT IS "ONSHORE" WIND. IF THE WIND IS BLOWING ONTO THE OCEAN, IT IS "OFFSHORE" WIND.

WIND MODIFICATION TABLE

WIND SPEED IN KNOTS	ONSHORE WIND				OFFSHORE WIND		
36-40	2.0	3.0	4.0		1.5	2.0	4.0
31-35	1.5	2.0	3.0		1.0	1.5	3.0
26-30	1.0	1.5	2.0		0.5	1.0	2.0
21-25	0.5	1.0	1.5		0.0	0.5	1.5
16-20	0.0	0.5	1.0		0.0	0.0	1.0
11-15	0.0	0.0	0.5		0.0	0.0	1.0
6-10	0.0	0.0	0.5		0.0	0.0	0.5
0-5	0.0	0.0	0.0		0.0	0.0	0.0
WIND ANGLE RELATIVE TO THE BEACH	0-30	30-60	60-90		0-30	30-60	60-90

LINE	INFORMATION	SUROB DATA	MSI	NOTES
H (CONT.)	SECONDARY WAVE HEIGHT IN FEET:	_____FEET	_____._____	SECONDARY WAVE HEIGHT REFERS TO AN ADDITIONAL SURF ZONE BEYOND THE INITIAL SURF ZONE OR ONE APPROACHING A DIFFERENT ANGLE. THIS WILL USUALLY OCCUR ONLY ON BEACHES WITH A REEF EXTENDING BEYOND THE INITIAL SURF ZONE AND IS RARELY ENCOUNTERED. THE MSI IS CALCULATED THE SAME AS LINE "A."
	DEBRIS IN SURF ZONE: GENERAL DESCRIPTION OF OBJECTS		**N/A**	GENERAL DESCRIPTION OF ANY OBJECTS IN THE SURF ZONE. FOR EXAMPLE: LOGS, FISHING NETS.
	SEA STATE: CALM / MODERATE / ROUGH (CIRCLE ONE)		**N/A**	

Figure C-1. Surf Observation Report Format—Continued.

TIME BEGAN: MIN: SEC:

	1	2	3	4	5	6	7	8	9	10
1	___ P S X	___ P S X	___ P S X	___ P S X	___ P S X	___ P S X	___ P S X	___ P S X	___ P S X	___ P S X
2	___ P S X	___ P S X	___ P S X	___ P S X	___ P S X	___ P S X	___ P S X	___ P S X	___ P S X	___ P S X
3	___ P S X	___ P S X	___ P S X	___ P S X	___ P S X	___ P S X	___ P S X	___ P S X	___ P S X	___ P S X
4	___ P S X	___ P S X	___ P S X	___ P S X	___ P S X	___ P S X	___ P S X	___ P S X	___ P S X	___ P S X
5	___ P S X	___ P S X	___ P S X	___ P S X	___ P S X	___ P S X	___ P S X	___ P S X	___ P S X	___ P S X
6	___ P S X	___ P S X	___ P S X	___ P S X	___ P S X	___ P S X	___ P S X	___ P S X	___ P S X	___ P S X
7	___ P S X	___ P S X	___ P S X	___ P S X	___ P S X	___ P S X	___ P S X	___ P S X	___ P S X	___ P S X
8	___ P S X	___ P S X	___ P S X	___ P S X	___ P S X	___ P S X	___ P S X	___ P S X	___ P S X	___ P S X
9	___ P S X	___ P S X	___ P S X	___ P S X	___ P S X	___ P S X	___ P S X	___ P S X	___ P S X	___ P S X
10	___ P S X	___ P S X	___ P S X	___ P S X	___ P S X	___ P S X	___ P S X	___ P S X	___ P S X	___ P S X

TIME ENDED: MIN: SEC:

TOTAL NUMBER OF
PLUNGING = ____ ÷ 100 = %

TOTAL NUMBER OF
SPILLING = ______ ÷ 100 = %

TOTAL NUMBER OF
SURGING = ______ ÷ 100 = %

TOTAL TIME TO OBSERVE,
IN SECONDS

100 WAVES = ____ ÷ 100 WAVES =
BREAKER PERIOD

SIGNIFICANT BREAKER HEIGHT COMPUTATION (HIGHEST 33 WAVES OBSERVED)			
WAVE HEIGHT	X	OCCURRENCE	= PRODUCT
	X		
	X		
	X		
	X		
	X		
	X		
TOTAL PRODUCT ÷ 33 = SIGNIFICANT WAVE HEIGHT			

SUROB LINE	MSI FACTOR	INSTRUCTIONS
A		ADD SUROB LINES A, C, AND D TOGETHER. DETERMINE WHICH OF THE TWO LINES, E OR F, HAS **THE LARGER** MSI VALUE AND ADD IT. FINALLY, ADD LINES F AND H AND YOU WILL HAVE YOUR TOTAL MSI FACTOR.
B	N/A	
C		
D		
E OR F		
G	N/A	
H		A+C+D+(**E OR F**)+H= MSI TOTAL
TOTAL		

Figure C-2. Surf Observation Report and Modified Surf Index Worksheet.

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APPENDIX D
LANDING DOCUMENTS

Instructions for preparing the landing documents for an amphibious operation are found in MCTP 13-10E. The documents in this appendix are specific to AA units participating in an amphibious operation. This appendix contains examples and descriptions of the following documents:

- Landing diagram.
- Landing craft and amphibious vehicle assignment table.
- Landing force serial assignment table.
- Landing force landing sequence table.
- Assault schedule.
- Amphibious vehicle availability table.
- Amphibious vehicle employment plan.

LANDING DIAGRAM

The landing diagram is the graphic means of illustrating the plan for the ship-to-shore movement of an assault unit's scheduled waves (see fig. D-l on page D-2). The landing formation and type of landing craft or vehicles comprising the wave are normally determined by the CATF and CLF and are based on the naval capabilities supporting the plan, AAV availability, and the recommendations from the AA unit leader. The AAVs depicted in the landing diagram portray the boat teams embarked on AAVs numbered from left to right in each wave. For example, number 5-5 would be the fifth vehicle from the left in the fifth wave.

For planning purposes, the landing diagram should allow dispersion of at least 25 meters in daylight or 50 meters in reduced visibility between AAVs, at least 3 minutes between AAV waves, and at least 10 minutes between boated waves, unless landing in column. This timing provides room for AAVs to move off the beach before the next wave and for boated waves to extract from the beach to the boat return lane. For further examples, see MCTP 13-10E.

Beach Red 1								
H-hour 0530 local								
Scheduled Waves	**Wave Composition**							
Wave 0 **H-3 min**	0-1		0-2		0-3		0-4	
	X^{L}		X		X^{L}		X	
Wave 1 **H-hour**	1st and 2d Platoons, Company G, BLT 2/5							
	1-1	1-2	1-3	1-4	1-5	1-6	1-7	
	X	X	X	(X)	X	X	X	
Wave 2 **H+3 min**	3rd Platoon and Mortars, Company G, BLT 2/5 Command Group							
	2-1	2-2	2-3	2-4	2-5	2-6	2-7	2-8
	X	X	X	X	(X)	X	C	R
Wave 3 **H+6 min**	Weapons Company, BLT 2/5							
	3-6	3-4	3-2	3-1	3-3	3-5		
	U	U	U	(U)	U	U		

Figure D-1. Example Landing Diagram.

LANDING CRAFT AND AMPHIBIOUS VEHICLE ASSIGNMENT TABLE

The landing craft and amphibious vehicle assignment table shows the breakdown of units into boat teams and the assignment of boat teams to waves or to a serialized element of a non-scheduled unit (see fig. D-2). This table and the debarkation schedule provide information on the debarkation of troops to the ship's commanding officer and crew. The AA unit leaders advise their supported commanders and staffs with respect to vehicle capacity and methods of employment.

Landing Craft and Amphibious Vehicle Assignment Table.			
Craft Number	**Personnel and Material**	**Boat Spaces**	**Beach Red 1 Formation**
1-1 AAVP7A1	Company Commander, Company G	1	
	Messenger radio operator	1	
	81-mm FO team with radio operator	2	Column
	FAC with radio operator	2	
	Weapons Platoon Commander, Company G	1	1-1
	Company 1st Sergeant, Company G	1	
	TOTAL	8	1-2
1-2 AAVP7A1	Platoon Commander, 1st Platoon, Company G	1	1-3
	Messenger radio operator	1	
	1st Squad, 1st Platoon, Company G	13	1-4
	Corpsman	2	
	TOTAL	17	1-5
1-3 AAVP7A1	Platoon Guide, 1st Platoon, Company G	1	1-6
	2d Squad, 1st Platoon, Company G	13	
	Corpsman	1	1-7
	1st Machine Gun Team, Weapons Platoon, Company G	3	
	TOTAL	18	1-8
1-4 AAVP7A1	Platoon Sergeant, 1st Platoon, Company G	1	1-9
	3d Squad, 1st Platoon, Company G	12	
	Corpsman	1	1-10
	1st Assault Team, Weapons Platoon, Company G	2	
	TOTAL	16	1-11

Figure D-2. Example Landing Craft and Amphibious Vehicle Assignment Table.

Craft Number	Personnel and Material	Boat Spaces	Beach Red 1 Formation
*(Information for vehicles 1-5 through 1-13 omitted for brevity)			
1-14 AAVC7A1	BLT 2/5 Commander	1	1-12
	S-3 officer	1	1-13
	S-2 officer	1	
	Naval gunfire liaison officer	1	1-14
	Air officer	1	
	Company commander, weapons company (fire support coordinator)	1	
	Artillery liaison officer	1	
	Radio operators	1	
	Communications technician	3	
	TOTAL	11	

Figure D-2. Example Landing Craft and Amphibious Vehicle Assignment Table—Continued.

LANDING FORCE SERIAL ASSIGNMENT TABLE

A serial is a group of units, supporting units, and their equipment embarked on the same ship that will be landed on the same beach at the same time. The AAVs may be used to transport a serial.

The landing force serial assignment table is prepared and issued at the landing force level. The AA unit personnel advise on the capacities of AAVs and potential problems with loading AAVs aboard ships (see fig. D-3).

Landing Force Serial Assignment Table.

Serial Number	Unit	Number of Personnel	Material Equipment Vehicles	Number and Type of Craft	Parent Ship	Remarks
L Company (Rein), 3rd Battalion, 6th Marines (1401-1402)						
1401	Co L (-)	140	Normal Combat	7 AAVP7A1 1 AAVC7A1	LPD-21	1st Wave, Beach Red 1
1402	3d Platoon (Rein), Company L	126	Normal Combat	7 AAVP7A1	LSD-50	2d Wave, Beach Red 1
K Company, 3rd Battalion, 6th Marines (1403-1404)						
1403	Co K (-)	133	Normal Combat	7 AAVP7A1	LPD-21	1st Wave, Beach Blue 1
1404	3d Platoon, Company K	120	Normal Combat	7 AAVP7A1 1 AAVR7A1	LSD-50	2d Wave, Beach Blue 1

Figure D-3. Example Landing Force Serial Assignment Table.

LANDING FORCE SEQUENCE TABLE

Detailed plans for the ship-to-shore movement of non-scheduled units are set forth in the landing force sequence table (see fig. D-4). It is the principal document used by control agencies in directing the ship-to-shore movement of these units. The completed table is prepared at the landing force level and subordinate units extract applicable portions. The AA commander advises as to which vehicle best meets this landing force requirement, where it would be best embarked, and other considerations pertaining to AAV employment.

Landing Force Sequence Table.

Unit	Element	Serial Number	Carrier Number and Type	Ship	Beach
1st and 2d Platoon, A Co	A Co	905	3 LCUs	LPD	Red
3rd Platoon, A Co 1st and 2d Platoon, B Co Bn HQ Co	A CO 1st Bn	906 907 908	3 LCUs 3 LCUs 3 LCUs	LHD LHD LPD	Red Blue Blue
1/10 1/10	A/B/C Battery	1013 1014 1015	7 LCUs	LPD LPD LPD	Red Red Red
Division Forward CP A Co (-), 2d CEB	HQ Battery D Battery	1016 1023 401 105	3 LCUs 8 LCUs 4 LCUs 4 LCUs	LPD LPD LHA LHA	Red Blue Blue Red

Figure D-4. Example Landing Force Sequence Table.

ASSAULT SCHEDULE

An assault schedule is prepared and issued to prescribe the composition and timing of waves landing over designated beaches (see fig. D-5). The schedule is prepared at the landing force level and subordinate units extract applicable portions. The schedule shows each scheduled wave number, the time that the landing craft or AAVs are scheduled to land, the craft/vehicle serial numbers, and the units landing.

Assault Schedule Table.							
		Beach					
		Red 1			Red 2		
Wave	**Time**	**Craft and Number**	**Serial Number**	**Unit**	**Craft and Number**	**Serial Number**	**Unit**
1	H-hour	12 AAVP7A1	1426	Company A 1/7	12 AAVP7A1	1426	Company E 2/7
2	H+5	12 AAVP7A1	1427	Company B 1/7	12 AAVP7A1	1477	Company F 2/7
3	H+10	6 AAVP7A1	1430	Company C 1/7, 1st and 2d Platoons	6 AAVP7A1	1480	Company G 2/7, 1st and 2d Platoons
4	H+15	6 AAVP7A1	1431	Company C (-), 1/7 3d Platoon	5 AAVP7A1	1481	Company G (-) 2/7, 3d Platoon
5	H+20	3 LCU	2351	H&S Company (-) 1/7	4 LCU	1482/1484	Weapons Company 2/7
6	H+27	8 LCU	1432-1434	Weapons Company 1/7	8 LCU	1483/1485	H&S Company (-) 2/7
On-Call Waves							
Report to PCS at H+40		1 LCU 2 LCU 1 LCU	2305/2306	Shore Party Team 1	1 LCU, 2 LCU 1 LCU	2307/2308	Shore Party Team 2
Report to PCS at H+45		2 LCU		Floating Dumps	2 LCU		Floating Dumps

Figure D-5. Example Assault Schedule Table.

AMPHIBIOUS VEHICLE AVAILABILITY TABLE

The amphibious vehicle availability table is a list of AAV numbers and types available to the landing force (see fig. D-6). The landing force prepares the amphibious vehicle availability table using data derived from consultation with the AA vehicle commander. The table includes the number and type of vehicles embarked in each ship and identifies the AA unit involved.

Amphibious Vehicle Availability Table.

Ship	Amphibious Vehicle Unit	Number and Type of AAV		
		AAVP7A1	AAVC7A1	AAVR7A1
LPD-26	1st Platoon, Co A, 2d AA Battalion	8	1	
LPD-26	2d Platoon, Co A, 2d AA Battalion	8	1	
LPD-26	4th Platoon, Co A, 2d AA Battalion	10	2	
LPD-27	HQ Platoon, Co A, 2d AA Battalion	3	2	1
LPD-27	4th Platoon, Co A, 2d AA Battalion	6		
Total		35	6	1

Figure D-6. Example Amphibious Vehicle Availability Table.

AMPHIBIOUS VEHICLE EMPLOYMENT PLAN

The amphibious vehicle employment plan shows the planned employment of amphibious vehicles, including their employment after landing (see fig. D-7). The CLF's staff prepares the amphibious vehicle employment plan when shipping availability is confirmed and after the assault schedule is completed. The AA commander should be intimately involved in the completion of this document because it controls AAV employment. The plan includes the identification of ships in which vehicles are embarked, the number and type of amphibious vehicles employed, the wave in which the vehicles will land, and the destination of vehicles.

Amphibious Vehicle Employment Plan							
	Number and Type of Amphibious Vehicle						
Origin	**AAVP7A 1**	**AAVC7A 1**	**AAVR7A 1**	**Light Amphibious Resupply Cargo**	**Wave**	**Destination**	**Remarks**
LSD-50	7				1	Red One	Aslt Plt, Co B
LSD-50	6	1	1		2	Red One	Aslt Plt, Co F
LSD-51	7				3	Red One	Aslt Plt, Co A
LSD-51	6	1	1		4	Red One	Co E(-), BLT 2/6
Continue as above for the entire first trip of vehicles							
LPD-27				2		PCS Red Beach	Land BPT
LPD-27				2		PCS Red Beach	Land BPT
Continue as above for subsequent employment							

Figure D-7. Example Amphibious Vehicle Employment Plan.

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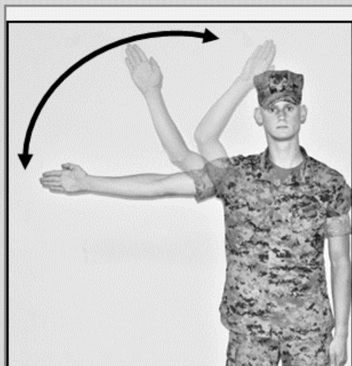
APPENDIX E
VISUAL SIGNALS FOR THE CONTROL OF AMPHIBIOUS ASSAULT VEHICLES

The use of hand and arm signals and flag signals aboard AAVs helps to safely control the movement of individual AAVs or AA units. This appendix presents a standardized set of signals for conducting day and night (i.e., limited visibility) AAV operations. The signals for use during night operations utilize signal lights. The AAV crewmembers, particularly drivers, should understand these signals to ensure safe and effective operations during training and combat. The signals contained within this appendix are not all-inclusive. Units may develop their own signals to meet unit needs for inclusion in a unit SOP. This appendix contains the day and night hand and arm signals and flag signals listed below.

Hand and Arm Signals	**Page**

HAND AND ARM SIGNALS

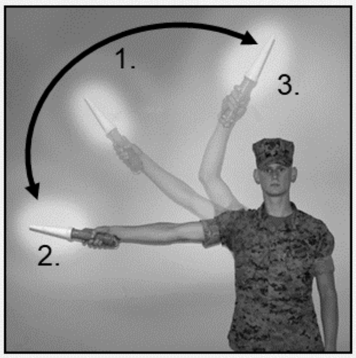
DAY



ATTENTION

Turn light on when arms are in the starting position. Turn light off when signal is completed. Repeat as necessary.

NIGHT



ATTENTION

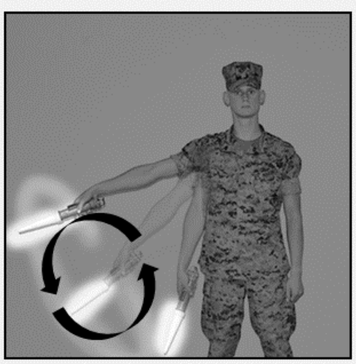
Turn light on when arms are in the starting position. Turn light off when signal is completed. Repeat as necessary.

DAY

START ENGINES, PREPARE TO MOVE

Turn lights on when arms are in starting position. Turn lights off when signal is complete.

NIGHT



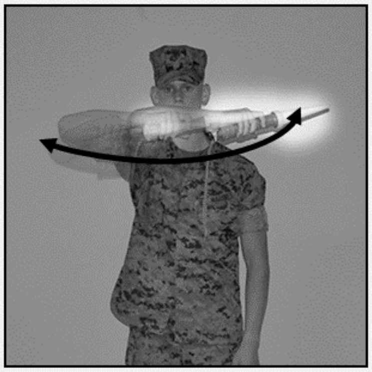
START ENGINES, PREPARE TO MOVE

Turn lights on when arms are in starting position. Turn lights off when signal is complete.

DAY

STOP ENGINE

CAUTION: This signal should not be used for waterborne AAVs.



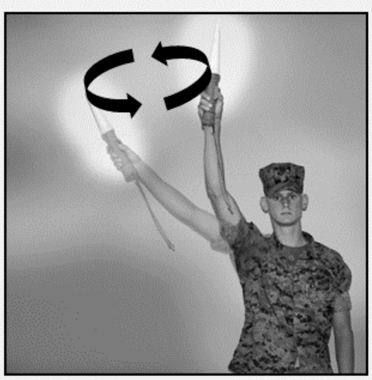
NIGHT

STOP ENGINE
Turn light on when arm is in starting position. Turn light off when signal is complete.

CAUTION: This signal should not be used for waterborne AAVs.

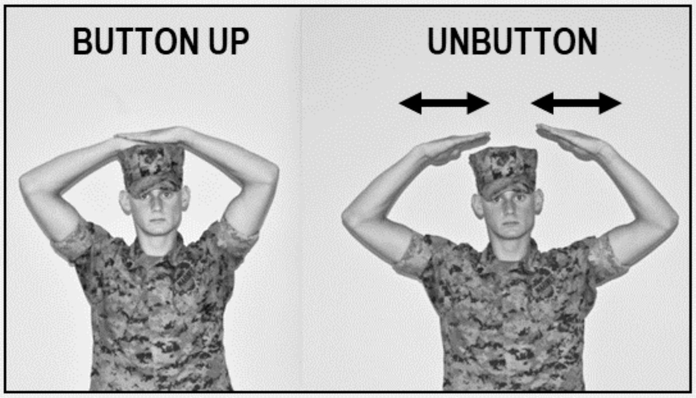
DAY

ASSEMBLE OR PASS TOWLINE



NIGHT

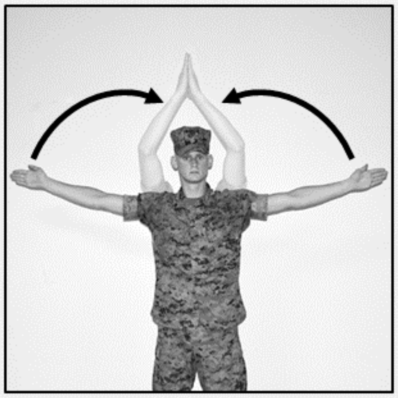
ASSEMBLE OR PASS TOWLINE
Turn light on when arm is extended overhead, execute large horizontal circle. Turn light off before lowering arm. Repeat as necessary.



BUTTON UP OR UNBUTTON

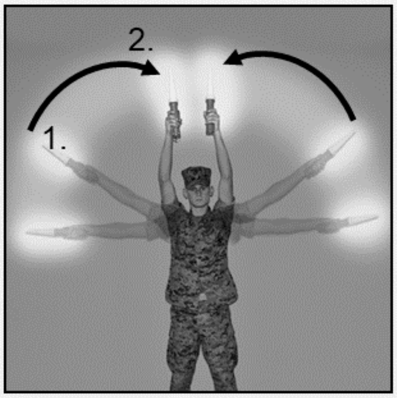
For BUTTON UP, place both hands, one on top of the other, palms down, on top of the head. The arms are back and in same plane as the body.
For **UNBUTTON,** give BUTTON UP signal, then separate the hands, moving them to each side in a slicing motion; repeat.

DAY



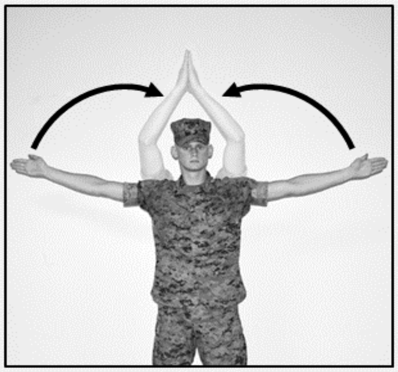
OPEN UP/EXTEND

NIGHT



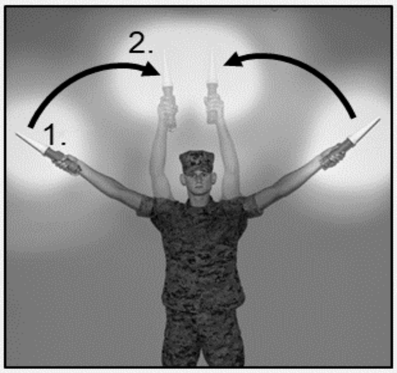
OPEN UP/EXTEND
Turn lights on when arms are in starting position. Turn lights off when arms are in horizontal position. Repeat as necessary.

DAY



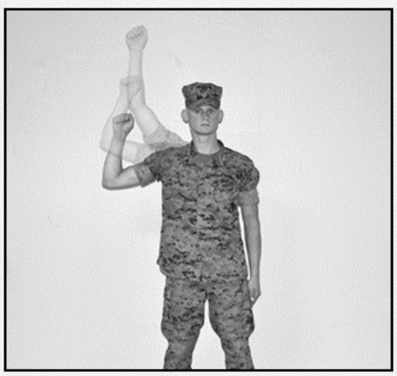
CLOSE UP

NIGHT



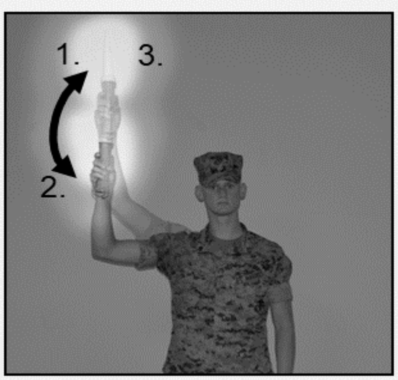
CLOSE UP
Turn light on when arms are in the starting position, execute signal turning light off when hands touch overhead. Repeat as necessary.

DAY



INCREASE SPEED/DOUBLETIME

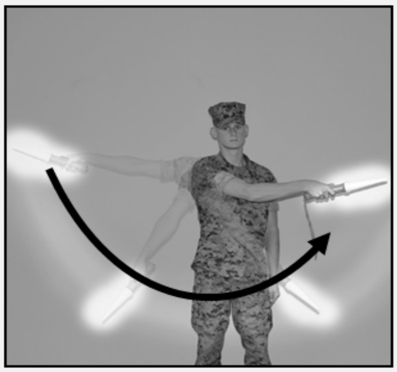
NIGHT



INCREASE SPEED/DOUBLETIME
Turn light on when arm is in starting position. Turn light off when completed. Repeat as necessary.

DAY

COMMENCE TOWING



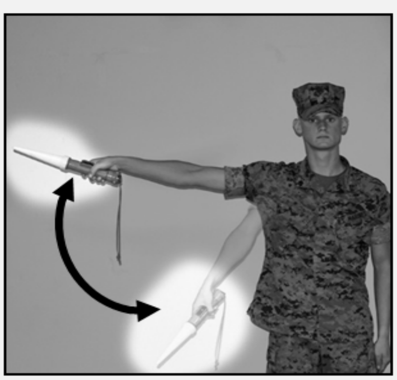
NIGHT

COMMENCE TOWING

Turn light on when arm is extended; move arm in semicircle from right horizontal position downward to left horizontal position. Turn light off when signal is completed. Repeat as necessary.

DAY

DECREASE SPEED (VEHICLES) OR QUICK TIME (DISMOUNTED TROOPS)



NIGHT

DECREASE SPEED (VEHICLES) OR QUICK TIME (DISMOUNTED TROOPS)

Turn light on when arm is in the starting position. Turn light off when signal is completed. Arm does not move above the horizontal position. Repeat as necessary.

DAY

HALT OR STOP TOWING

NIGHT

HALT OR STOP TOWING

Turn light on when arm is in the signal position. Blink light several times. Turn light off before lowering arm.

DAY

CAST OFF TOWLINE

NIGHT

CAST OFF TOWLINE

Turn light on with arms extended overhead. Swing arms forward and down to knees. Swing arms forward and upward from knees to overhead. Repeat as necessary.

MESSAGE ACKNOWLEDGED

DAY

I DO NOT UNDERSTAND

NIGHT

I DO NOT UNDERSTAND

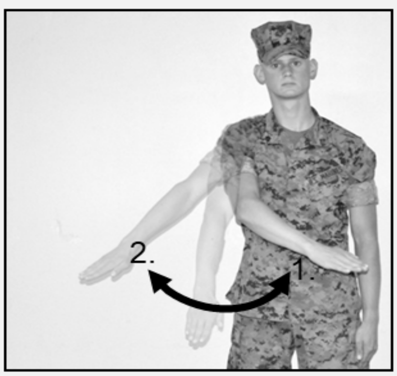
Turn lights on as hands are brought down across the face, hold in position, parallel, horizontal until acknowledged. Turn lights off while they are still in front of the face.

DAY

DISREGARD PREVIOUS COMMAND (AS YOU WERE)

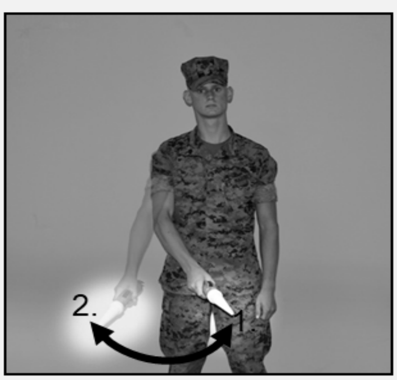
NIGHT

DISREGARD PREVIOUS COMMAND (AS YOU WERE)
Turn light on when arm is in the starting position. Turn light off when arm is down at the side. Repeat as necessary.



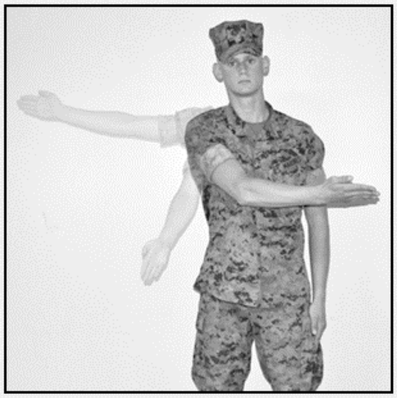
DAY

COMMENCE FIRE
Extend the arm in front of the body, palm down, and move it through a wide horizontal arc several times. For machine guns, when giving the signal again, moving the arm faster means to change to the next higher rate of fire. This signal is used primarily for direct fire weapons.



NIGHT

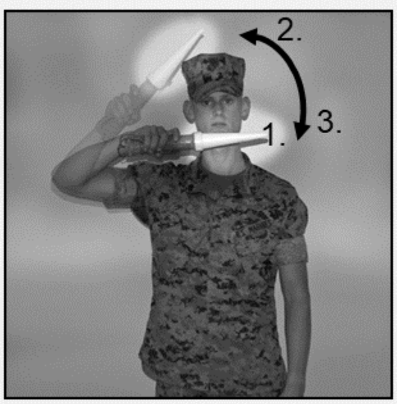
COMMENCE FIRE
Turn lights on when arm is in the starting position. Turn light off when signal is completed. Repeat as necessary.



MOVE OVER, OR SHIFT FIRE
Raise the hand (on the side toward the new direction) and move it across the body to the opposite shoulder, palm to the front. Then swing the arm in a horizontal arc, extending the arm and hand to point in the new direction. From slight changes in direction, move the hand from the final position to the desired direction of movement.

DAY

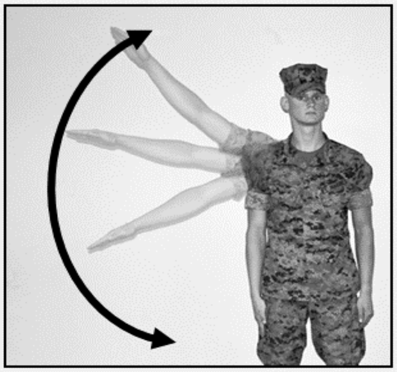
CEASE FIRE
Raise the hand in front of the forehead, palm to the front, and swing the hand and forearm up and down several times in front of the face.



NIGHT

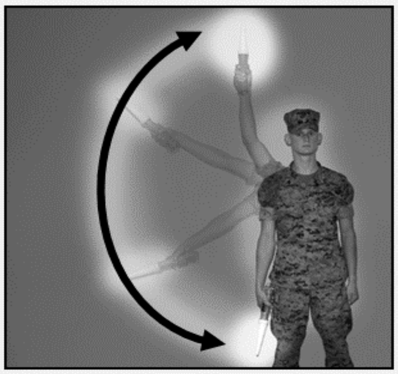
CEASE FIRE
Turn light on when arms are in the starting position. Turn light off when signal is completed. Repeat as necessary.

DAY



DISMOUNT, DOWN, TAKE COVER

NIGHT



DISMOUNT, DOWN, TAKE COVER
Turn light on when arm is in the starting position. Turn light off when arm is down at the side. Repeat as necessary.

DAY

MOVE FORWARD
Move the hands and forearms backward and forward with palms toward the chest as if pulling the vehicle.

NIGHT

MOVE FORWARD
Same as day, except with the use of light wands.

DAY

MOVE IN REVERSE, BACK UP
Move the hands and forearms backward and forward with palms toward the vehicle as if pushing the vehicle.

NIGHT

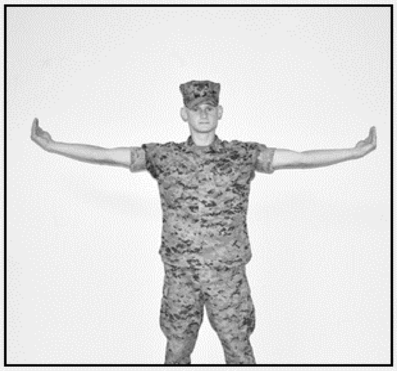
MOVE IN REVERSE, BACK UP
Same as day, except with use of light wands.

DAY

VEHICLE HALT
Clasp hands together, palms facing each other at throat level.

NIGHT

VEHICLE HALT
Cross light wands in front of throat.



DAY

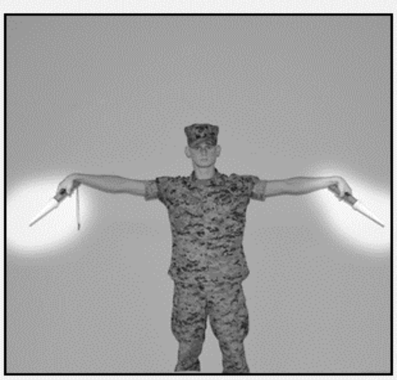
RAMP UP AND DOGGED
Arms held out parallel to deck with wands held open and pointed up. (Coxswains acknowledge with same signal to inform traffic control Marine ramp is up and dogged.)

NIGHT

RAMP UP AND DOGGED
Turn on lights. Arms held out parallel to deck with wands pointed straight up. (Coxswains acknowledge with same signal to inform traffic control Marine ramp is up and dogged.)

DAY

RAMP DOWN
Arms held out parallel to deck with hands held open and pointed down. (Coxswains acknowledge with same signal.)



NIGHT

RAMP DOWN
Turn on lights. Arms held out parallel to deck with wands pointed straight down. (Coxswains acknowledge with same signal.)

DAY

PIVOT RIGHT
Hold one hand, fingers together, palm facing inboard in front of the chest in vertical position. Hold the other hand with fingers jointed, palm in direction the vehicle is to travel.

NIGHT

PIVOT RIGHT
Same as day, except with use of light wands.

DAY

PIVOT LEFT
Hold one hand, fingers together, palm facing inboard in front of the chest in vertical position. Hold the other hand with fingers jointed, palm in direction the vehicle is to travel.

NIGHT

PIVOT LEFT
Same as day, except with use of light wands.

DAY

RIGHT TURN

Form clenched fist on arm in the direction the turn is to be made in, make beckoning motion with other arm to bring vehicle forward. For reverse, make a pushing motion.

NIGHT

RIGHT TURN

Same as day, except point light wand in the direction of the turn.

DAY

LEFT TURN

Form clenched fist on arm in the direction of turn is to be made in, make beckoning motion with other arm to bring vehicle forward. For reverse, make a pushing motion.

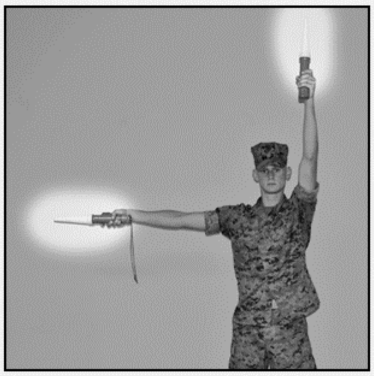
NIGHT

LEFT TURN

Same as day, except point light wand in the direction of the turn.

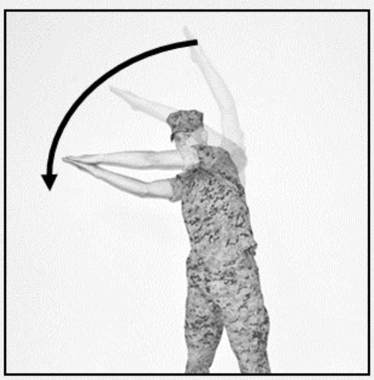
DAY

VECTOR LEFT (OR RIGHT)
Signal Marine faces beach with one arm straight out to side pointing in direction of the turn. Other arm raised straight up, palm forward.



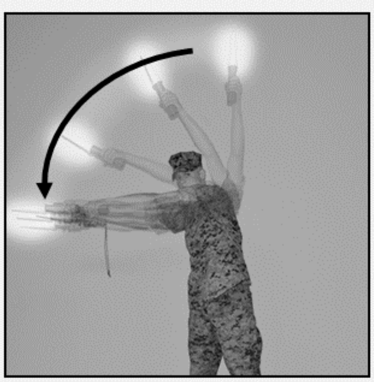
NIGHT

VECTOR LEFT (OR RIGHT)
Turn on lights. Light wand in each hand, one straight out to side pointing in direction of the turn; other straight up, palm forward.



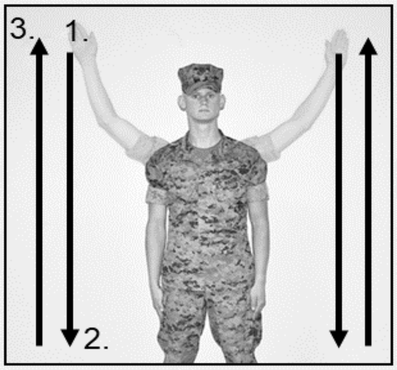
DAY

BY THE RIGHT (OR LEFT) FLANK
Extend the right (left) arm parallel to the deck and hold the left (right) arm above the head so that both arms are at a 90-degree angle to each other. At the point of execution, move the left (right) arm across the body as if to clap hands together.



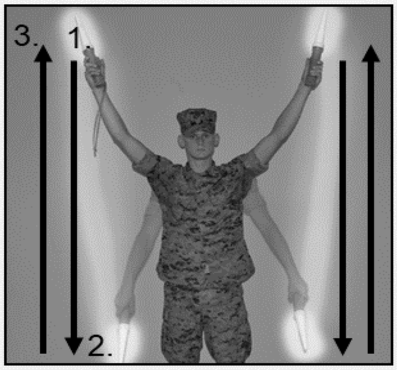
NIGHT

BY THE RIGHT (OR LEFT) FLANK
Extend the right (left) arm parallel to the deck and hold the left (right) arm above the head so that both arms are at a 90-degree angle to each other. At the point of execution, move the left (right) arm across the body as if to clap hands together.



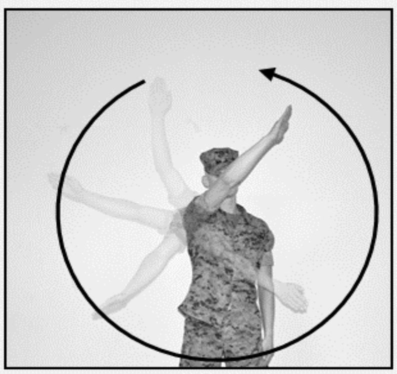
DAY

BREAKDOWN



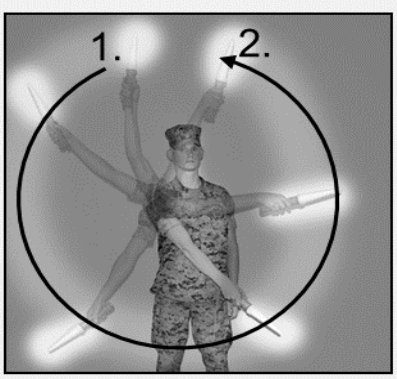
NIGHT

BREAKDOWN
Turn light on with arms extended overhead. Swing arms forward and down to knees. Swing arms forward and upward from knees to overhead. Repeat as necessary.



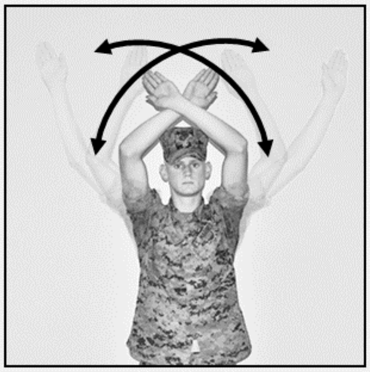
DAY

MARINE OVERBOARD



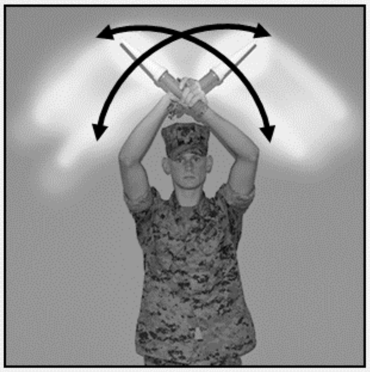
NIGHT

MARINE OVERBOARD
Turn light on when arm is in vertical position; execute complete circle while blinking the light. Turn light off when arm is returned to the vertical position. Repeat as necessary.



DAY

AIR ATTACK



NIGHT

AIR ATTACK

Turn on lights. Rapidly cross and uncross arms fully extended above the head with wand in each hand.

DAY

CHEMICAL, BIOLOGICAL, RADIOLOGICAL, OR NUCLEAR ATTACK WARNING

NIGHT

CHEMICAL, BIOLOGICAL, RADIOLOGICAL, OR NUCLEAR ATTACK WARNING

Turn on light. Cover both eyes with wand held in right hand to warn exposed troops to take cover before the detonation of a CBRN weapon.

DAY

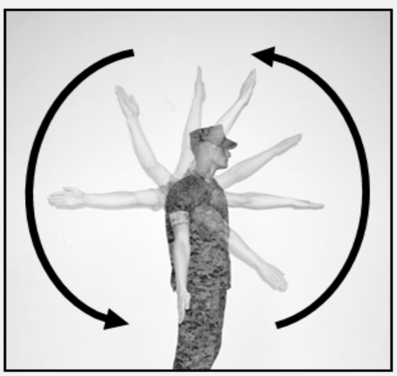
LINE FORMATION

NIGHT

LINE FORMATION

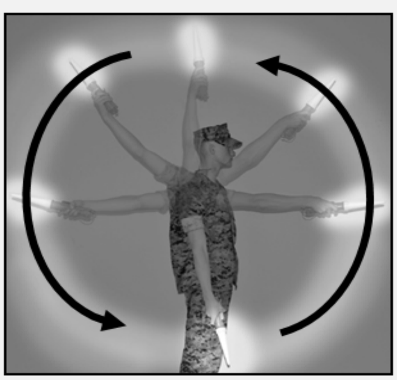
Turn light on as arms are extended; hold in position until signal is understood or acknowledged or the maneuver is executed. Turn lights off while arms are still in signal position. Repeat as necessary.

DAY



COLUMN FORMATION

NIGHT



COLUMN FORMATION

Turn light on when arm movement for signal is started. Turn light off when completed. Repeat as necessary.

DAY

COLUMN RIGHT (OR LEFT)

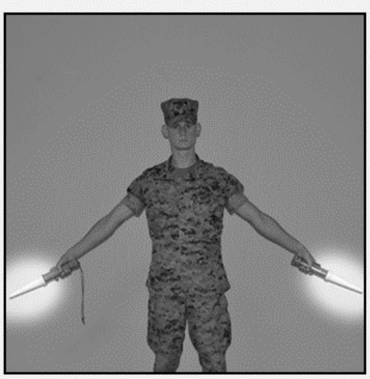
NIGHT

COLUMN RIGHT (OR LEFT)
Turn light on as arm is extended; hold in position until understood or acknowledged or the maneuver is executed. Turn light off while arm is still extended. Repeat as necessary.

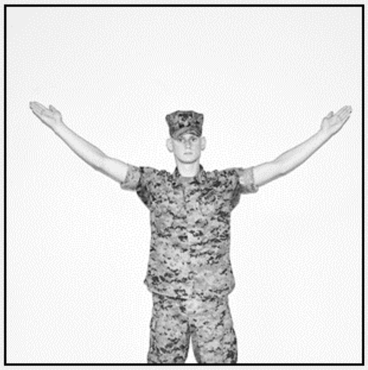
DAY

WEDGE FORMATION

NIGHT



WEDGE FORMATION
Turn lights on as arms are extended; hold in position until signal is understood or acknowledged or the maneuver is executed. Turn lights off while arms are still in signal positlon. Turn light off when signal is completed. Repeat as necessary.

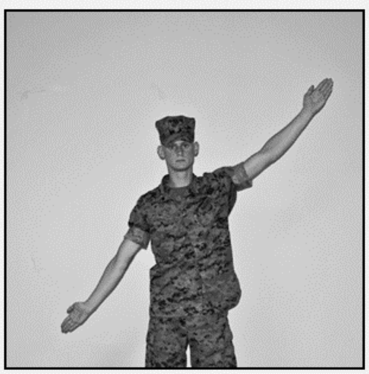


DAY

VEE FORMATION

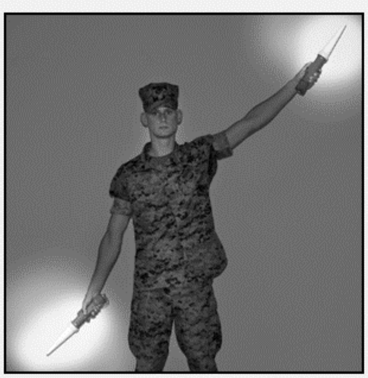
NIGHT

VEE FORMATION
Turn lights on as arms are extended. Hold in position until signal is understood or acknowledged or the maneuver is executed. Turn lights off while arms are still in signal positions. Repeat as necessary.



DAY

ECHELON RIGHT (OR LEFT)



NIGHT

ECHELON RIGHT (OR LEFT)
Turn lights on when arms are in the correct positions. Turn lights off before taking arms from the signal position. Repeat as necessary.

BOOM UP

BOOM DOWN

BOOM IN

BOOM OUT

BOOM ROTATE RIGHT

BOOM ROTATE LEFT

CRANE COMMAND:
CABLE DOWN

CRANE COMMAND:
CABLE UP

RECOVERY WINCH COMMAND:
WINCH CABLE OUT

RECOVERY WINCH COMMAND:
WINCH CABLE IN

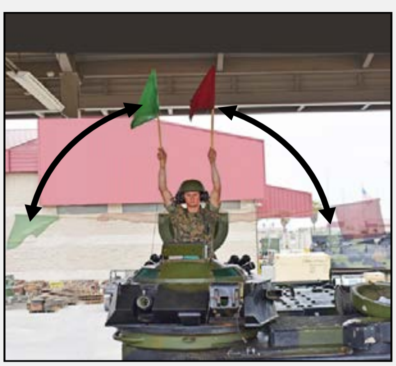
STOP OPERATIONS

FLAG SIGNALS

USE OF A SINGLE SIGNAL FLAG

MOUNT

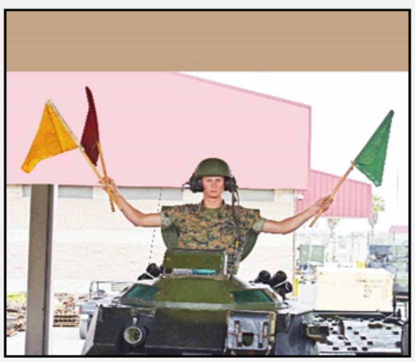
DISMOUNT



DISMOUNT AND ASSAULT

ASSEMBLE OR CLOSE

MOVE OUT



CHEMICAL, BIOLOGICAL, RADIOLOGICAL, OR NUCLEAR HAZARD PRESENT

ALL WEAPONS CLEAR

CONDUCTING LIVE FIRE

CONDUCTING PREPARE-TO-FIRE OR NON-FIRING EXERCISE

MALFUNCTION-WEAPONS CLEAR

MALFUNCTION-WEAPONS LOADED

APPENDIX F
STANDARD NAVAL FLAGS, LIGHTS, AND MARKERS

The illustrations in this appendix include flags, lights, and other markers that are employed at sea and ashore in the control of AAVs. These signals are also standard to landing craft and landing ships. Additional illustrations of these control means are found in MCTP 13-10E. Figure F-1 shows the light legend that applies to figures F-2 through F-41 for day and night light signals.

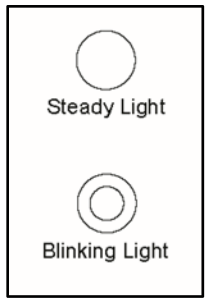


Figure F-1. Steady/Blinking (Day or Night) Light Legend.

BEACH MARKERS (FROM SEAWARD)

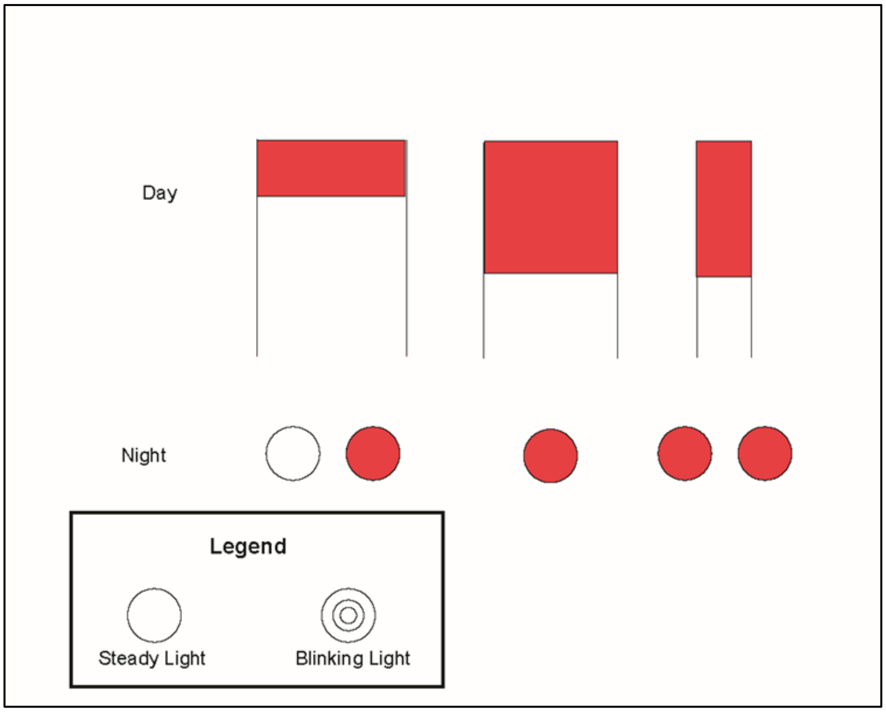


Figure F-2. Beach Red One.

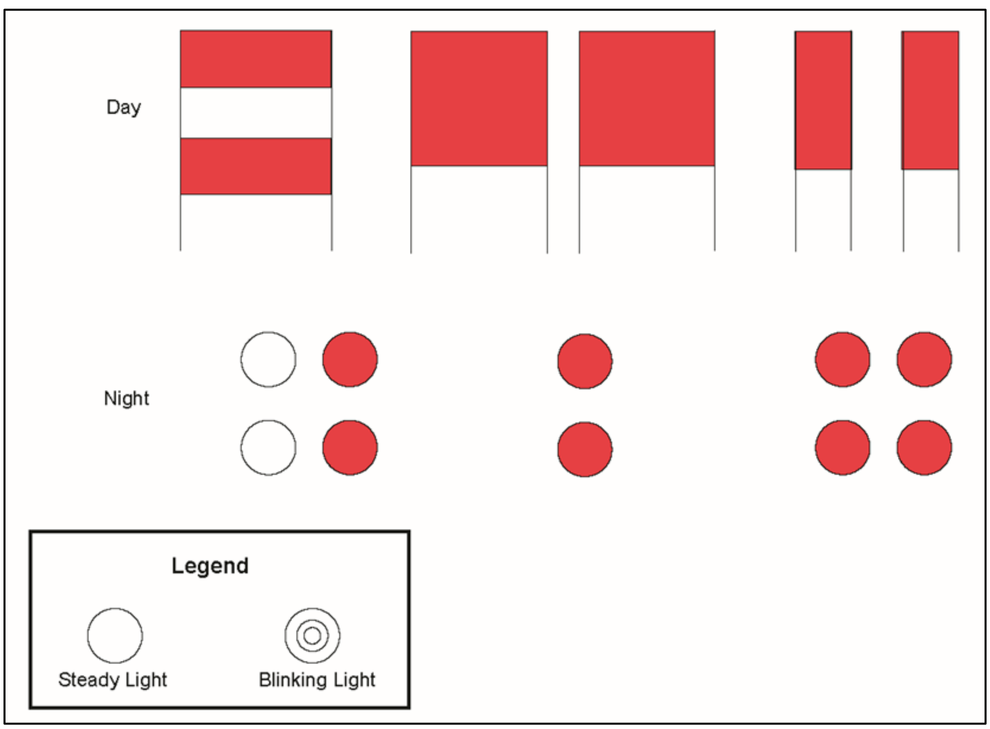


Figure F-3. Beach Red Two.

OCEANOGRAPHIC MARKERS (FROM SEAWARD)

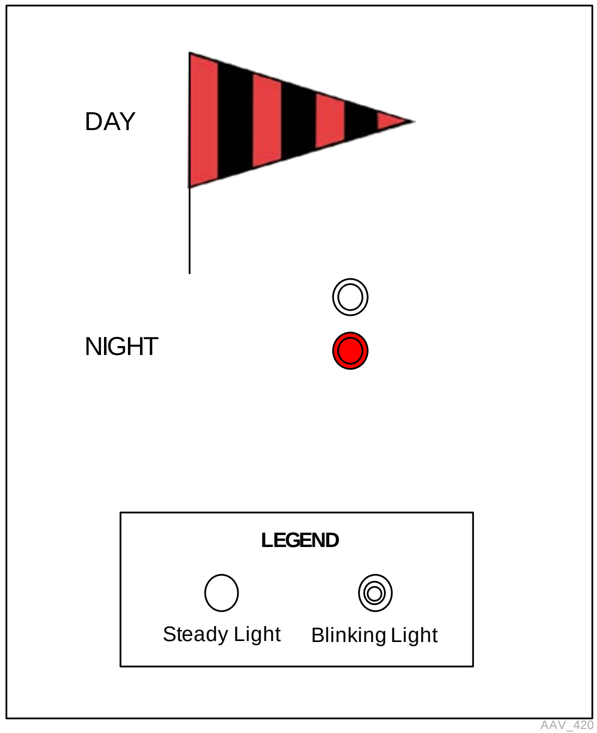


Figure F-4. Rocks, Shoals, and Obstruction.

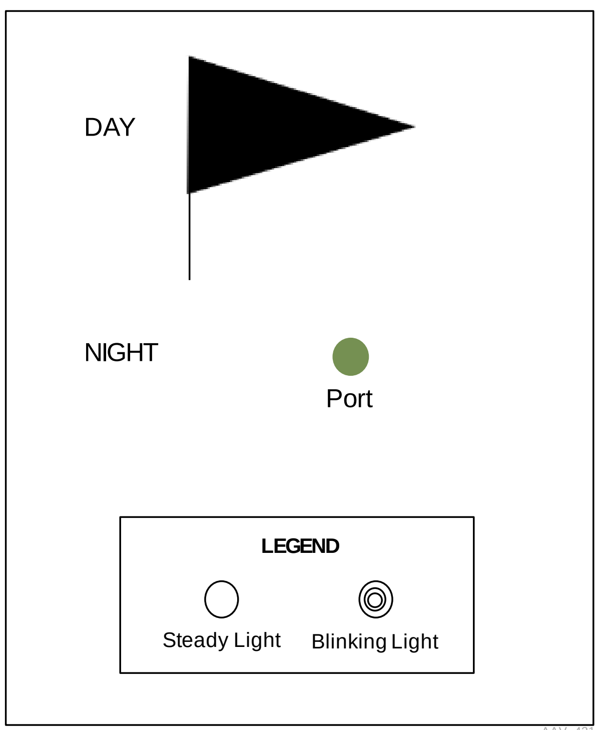


Figure F-5. Port.

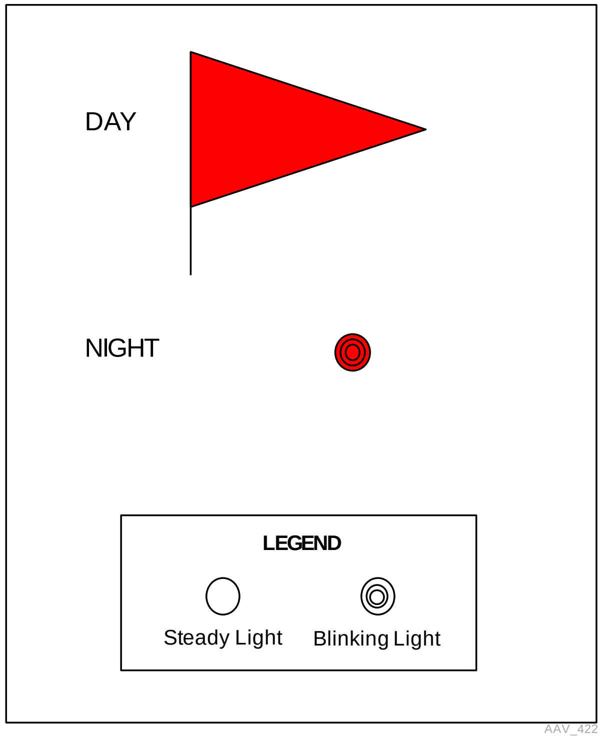


Figure F-6. Starboard.

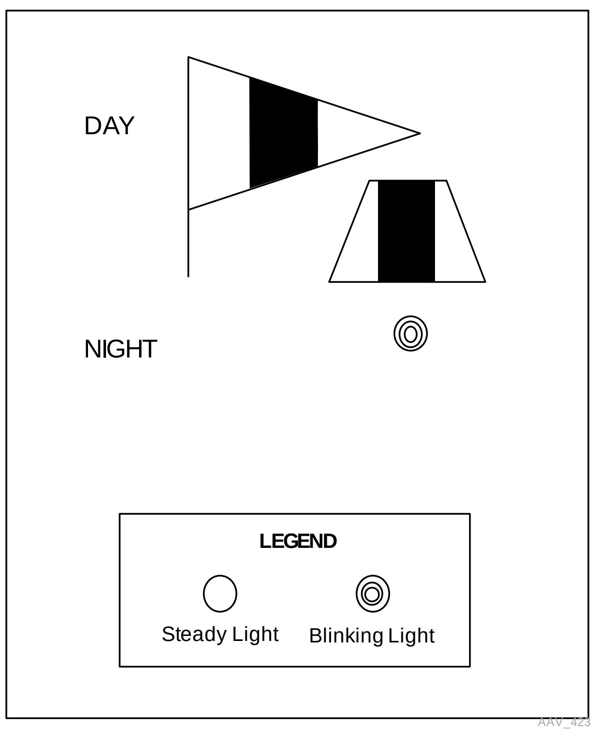


Figure F-7. Fairway of Channel.

MISCELLANEOUS BEACH SIGNS

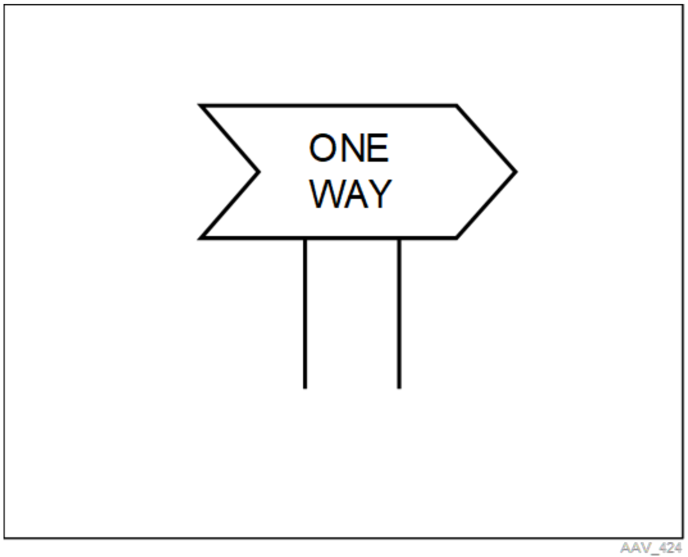


Figure F-8. One Way.

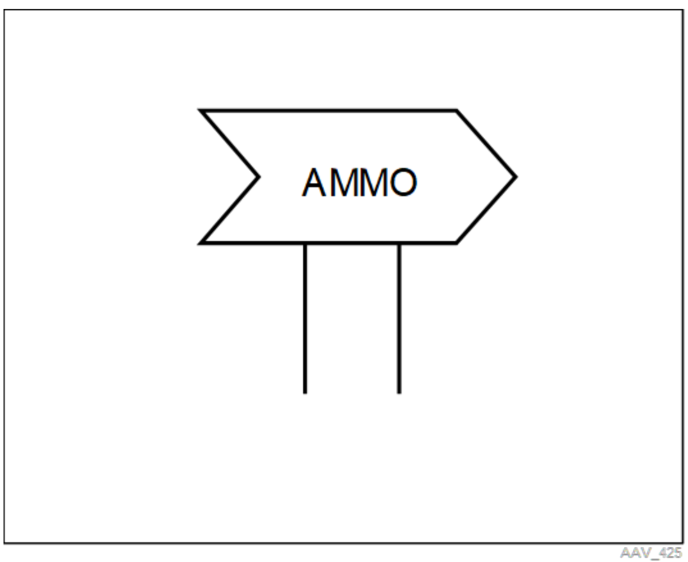


Figure F-9. Dump Direction Sign.

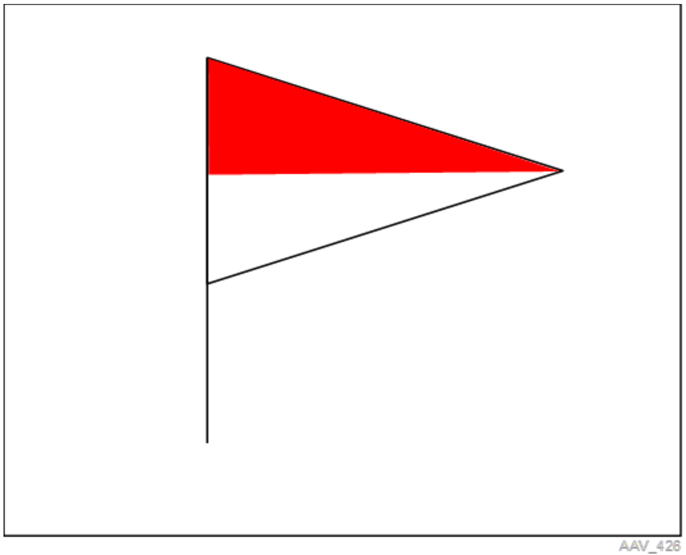


Figure F-10. Dud Flag.

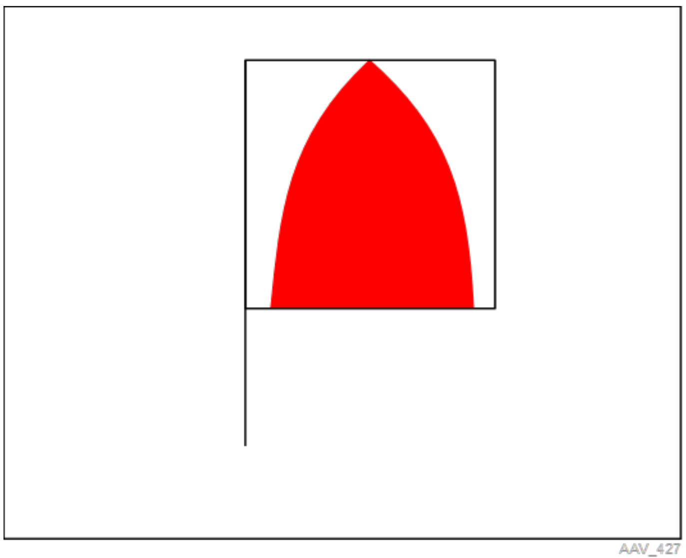


Figure F-11. Dump Flag.

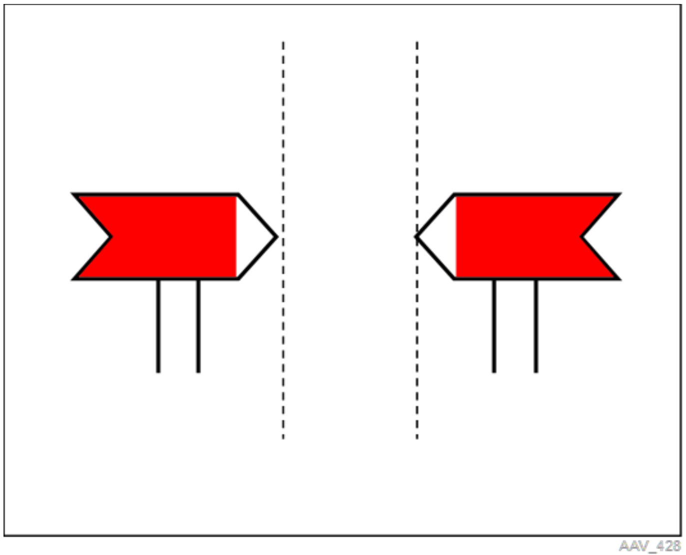


Figure F-12. Minefield Cleared Area/Lane Markers.

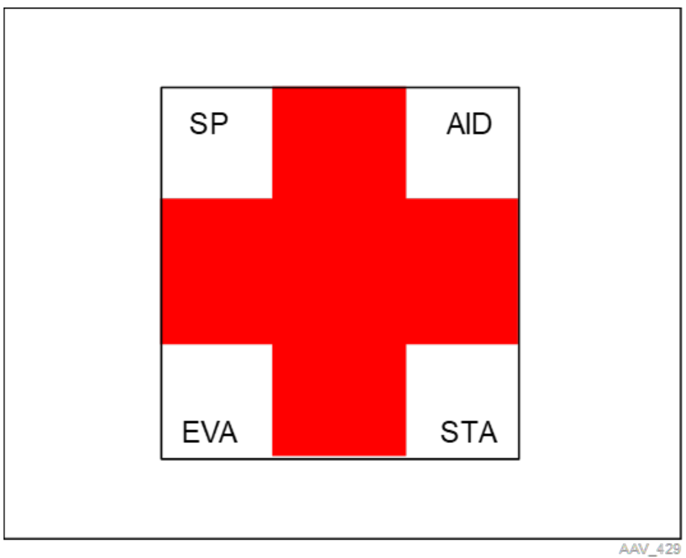


Figure F-13. Medical Evacuation Station.

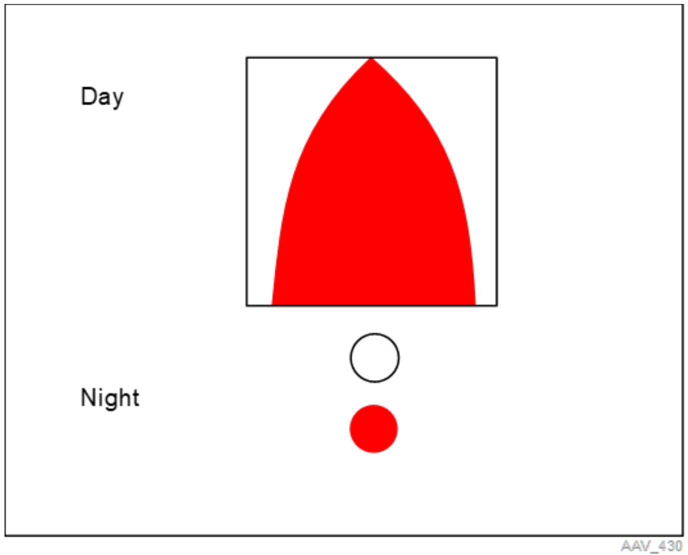


Figure F-14. Ammunition.

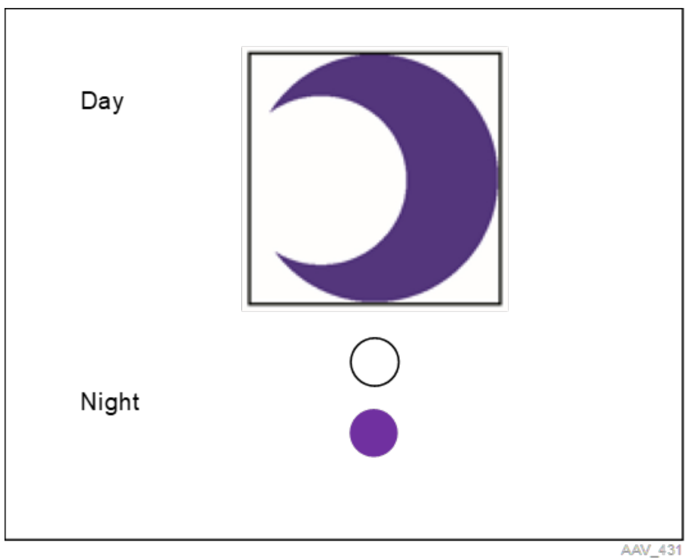


Figure F-15. Rations.

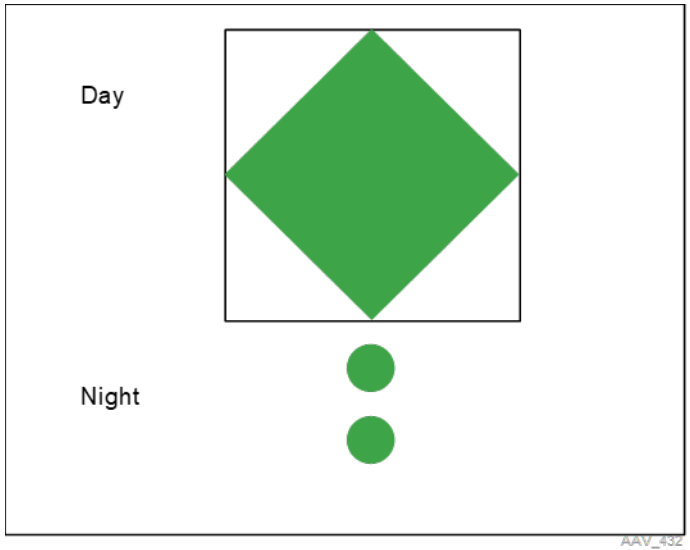


Figure F-16. Tracked Vehicles.

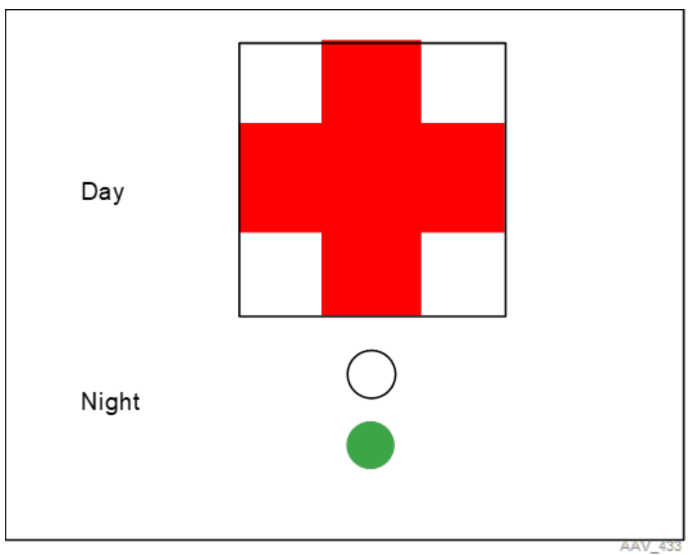


Figure F-17. Medical Supplies/Casualty Evacuation.

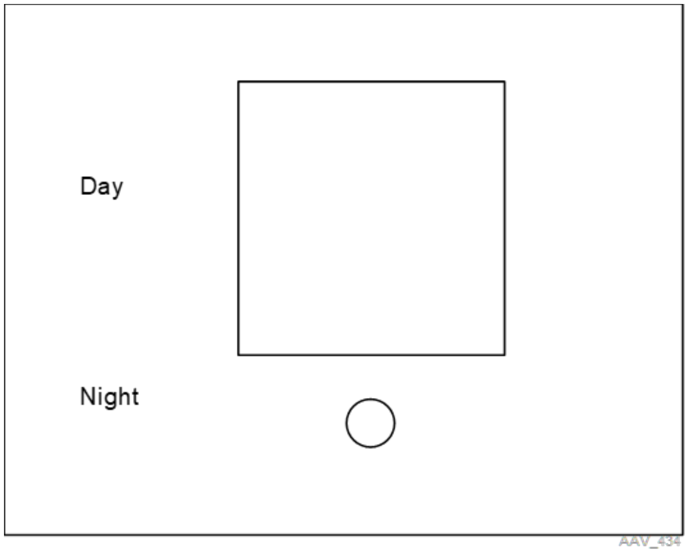


Figure F-18. Wheeled Vehicles.

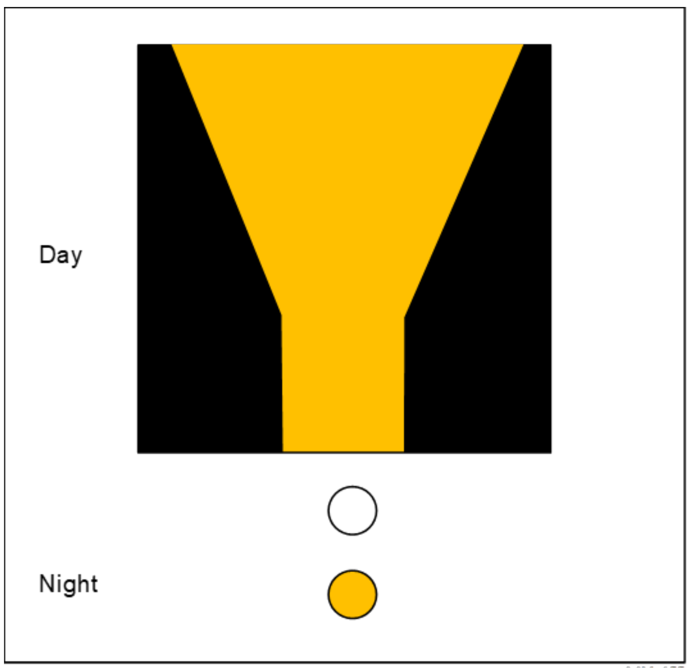


Figure F-19. Fuel.

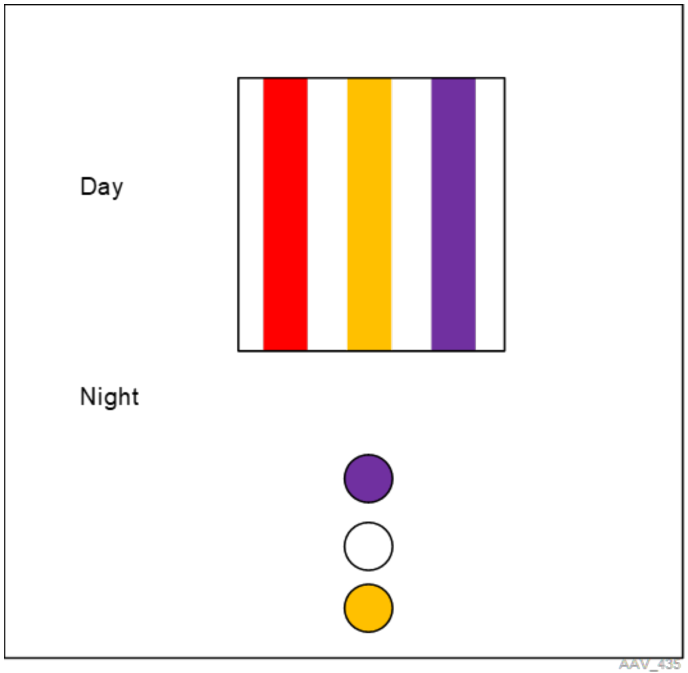


Figure F-20. Miscellaneous Supplies.

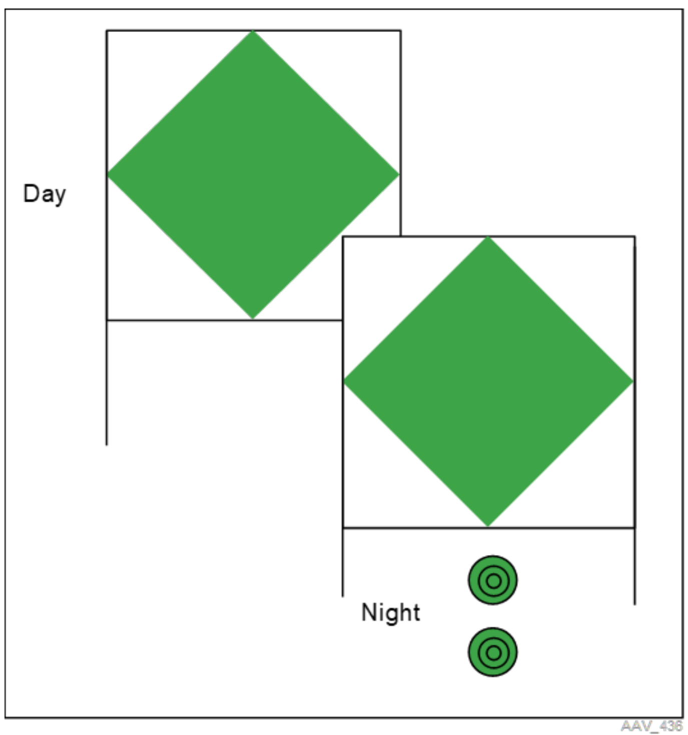


Figure F-21. Beaching Point for Landing Craft, Utility.

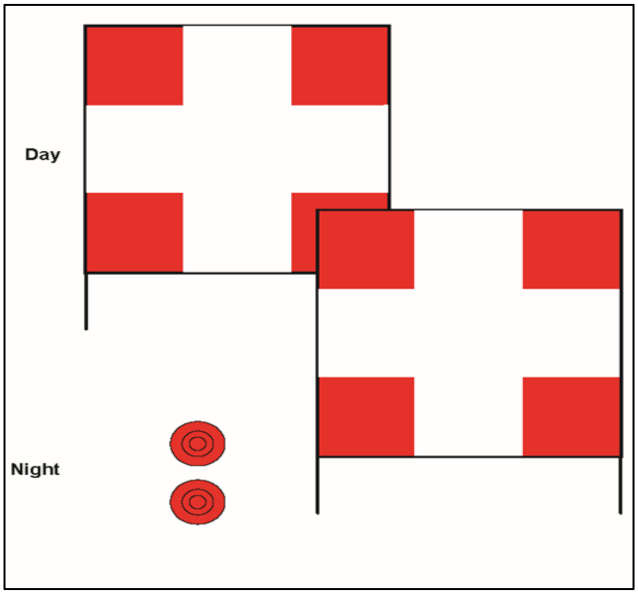


Figure F-22. Causeway Range Markers.

MISCELLANEOUS FLAGS AND IDENTIFICATION INSIGNIA

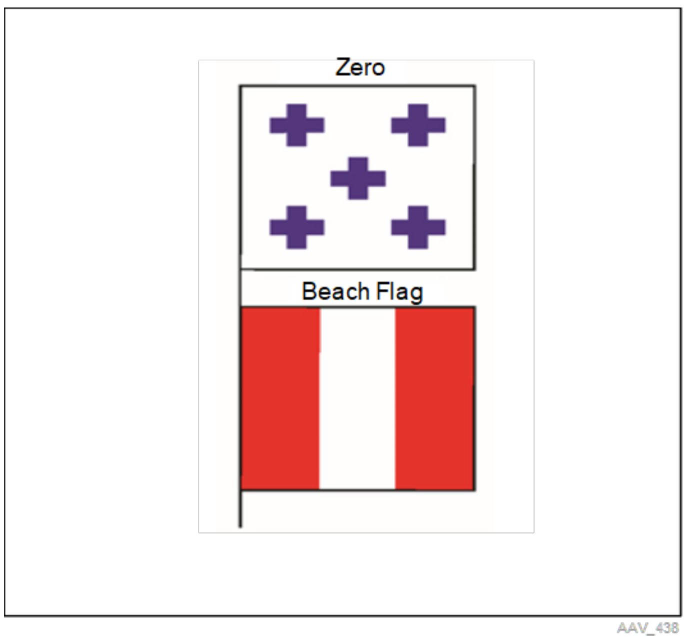


Figure F-23. Boat Group Commander.

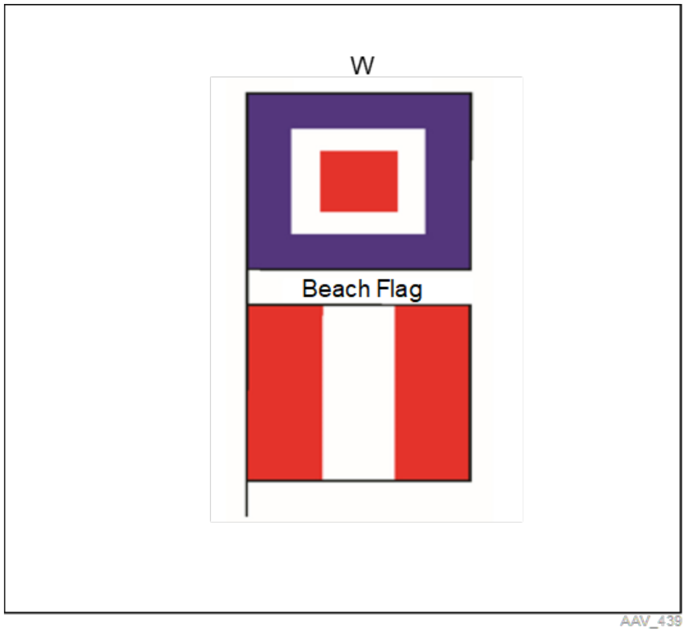


Figure F-24. Assistant Boat Group Commander.

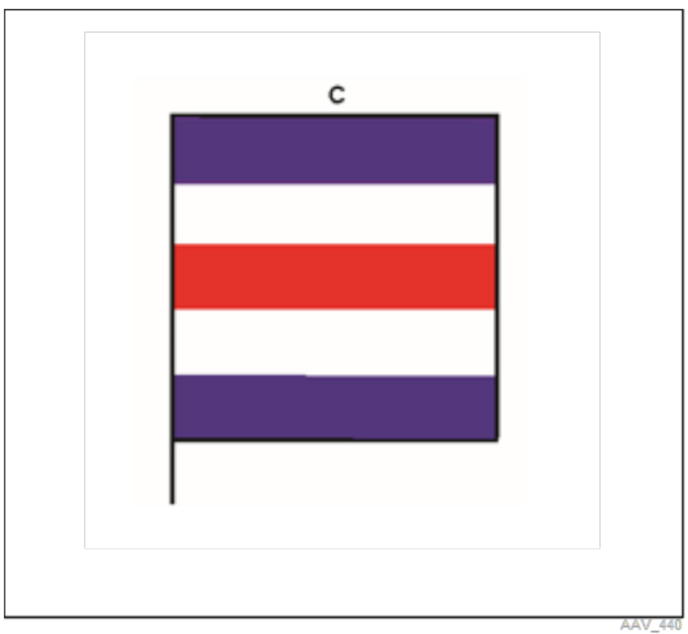


Figure F-25. Channel Control Boat.

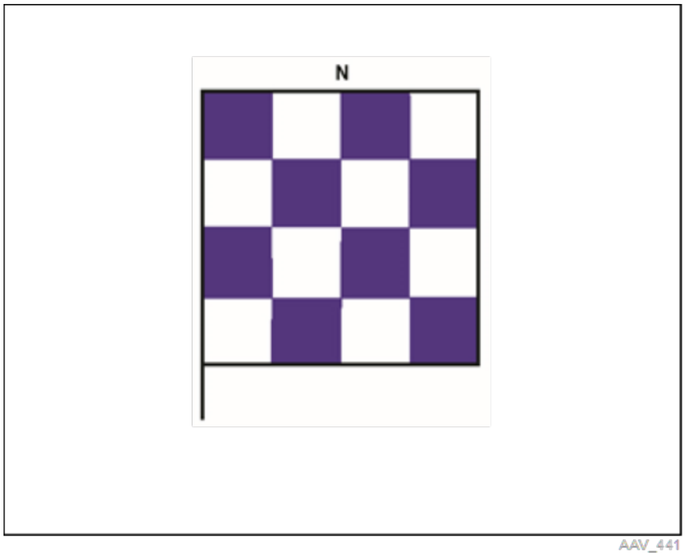


Figure F-26. Amphibious Assault Vehicle Emergency Flag.

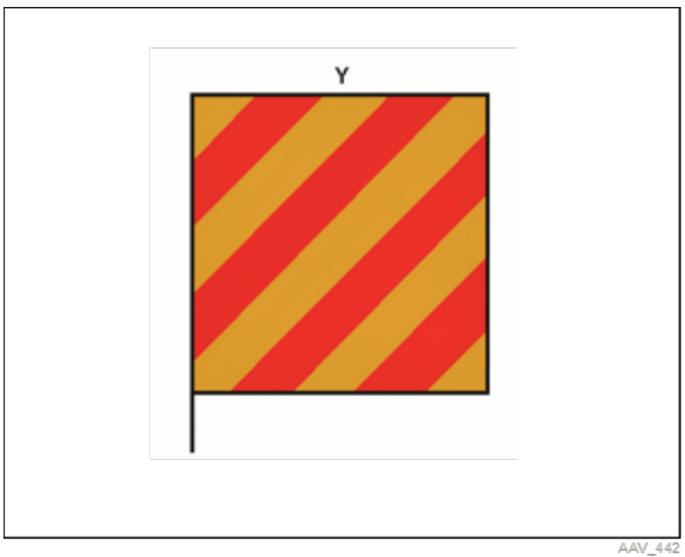


Figure F-27. Amphibious Vehicle Pool Control Officer.

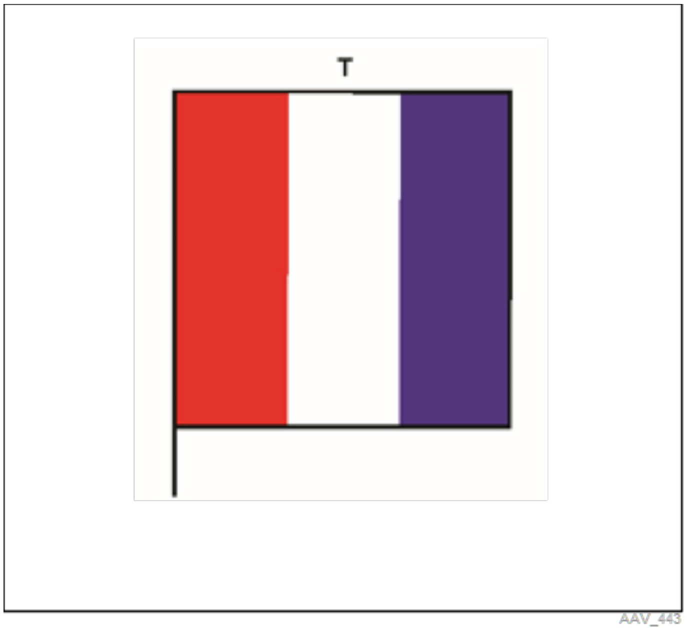


Figure F-28. Transfer Line Control Officer.

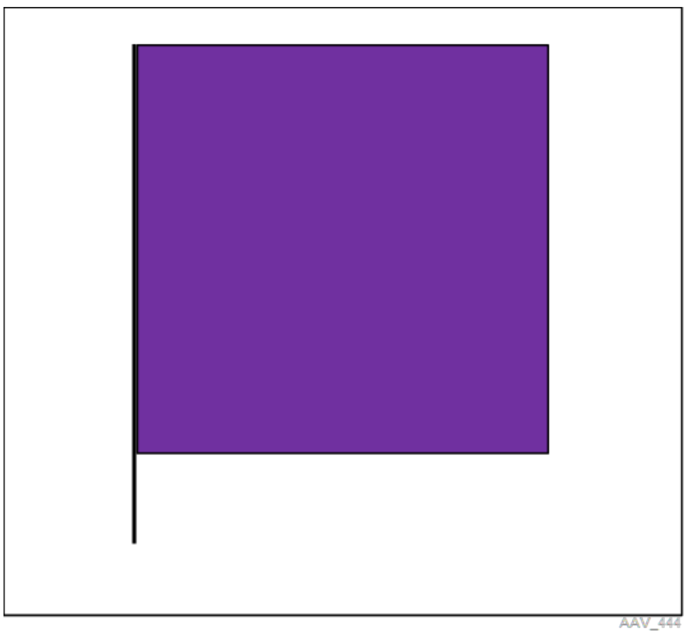


Figure F-29. Self-Propelled Vehicle Embarked.

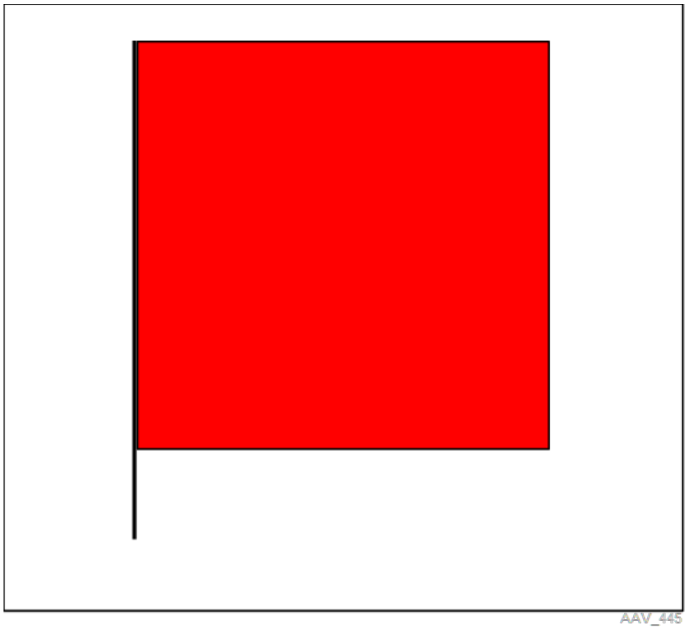


Figure F-30. Bulk Cargo Requiring Personnel or Materials Handling Equipment to Unload.

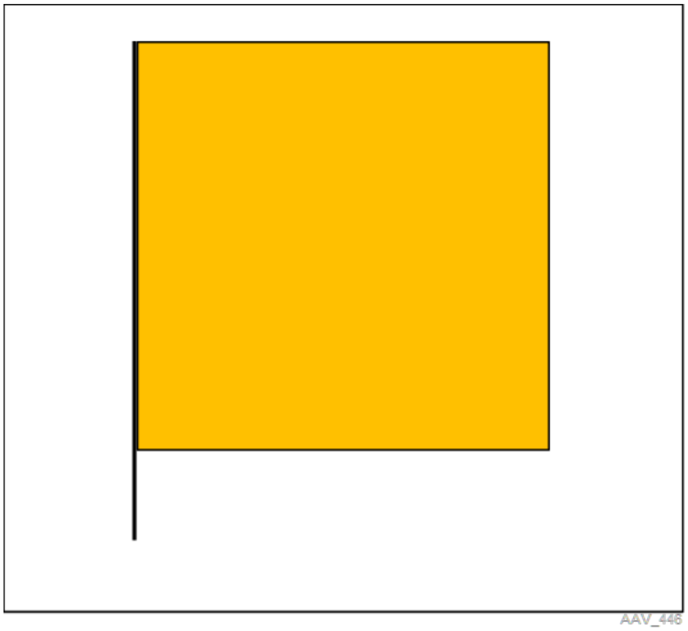


Figure F-31. Cargo Requiring Assistance of Prime Mover to Unload.

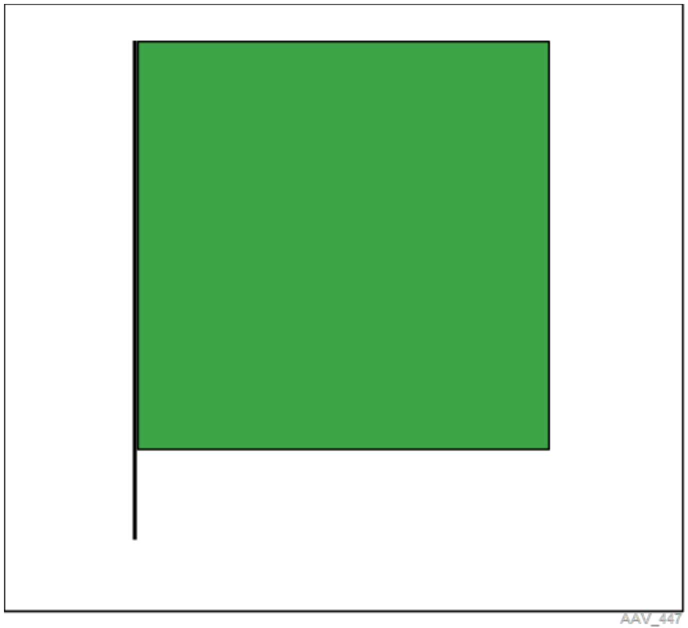


Figure F-32. Boats Assigned to Floating Dumps.

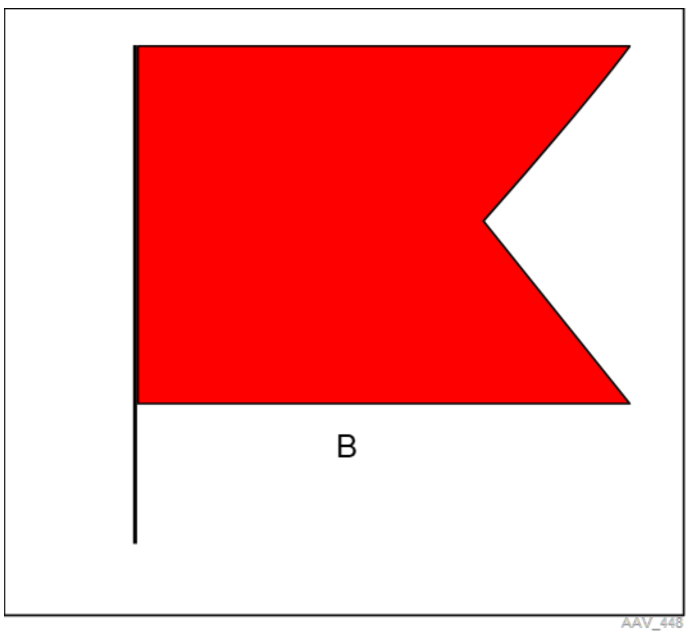


Figure F-33. Bowser Boat.

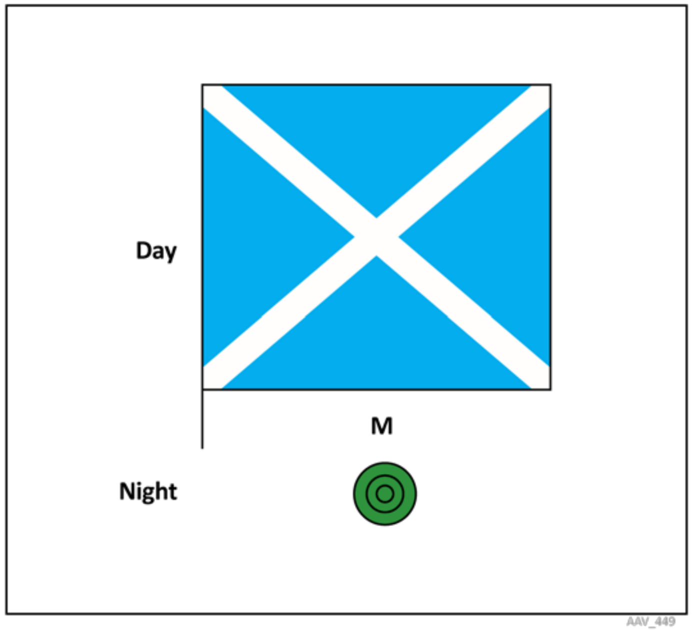


Figure F-34. Casualty Receiving Treatment Ship.

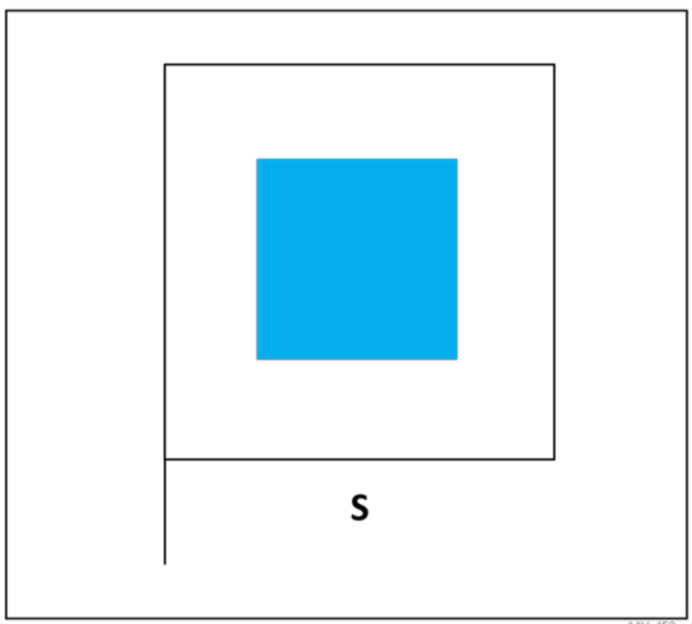


Figure F-35. Salvage Boat.

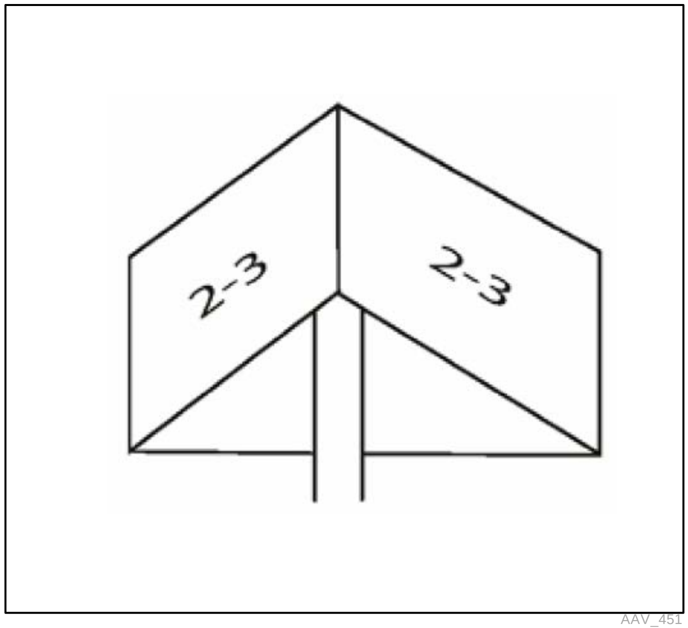


Figure F-36. Boat Team Paddle (Third Boat, Second Wave).

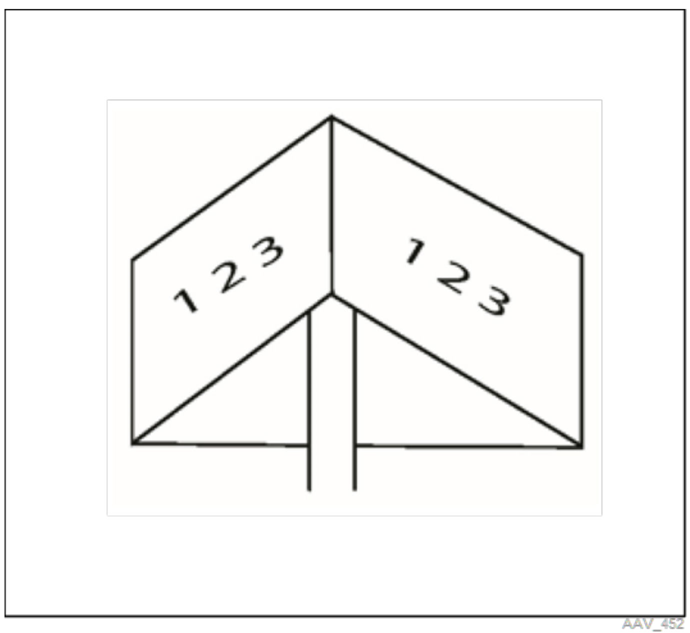


Figure F-37. Serial Paddle for On-Call and Non-Scheduled Waves.

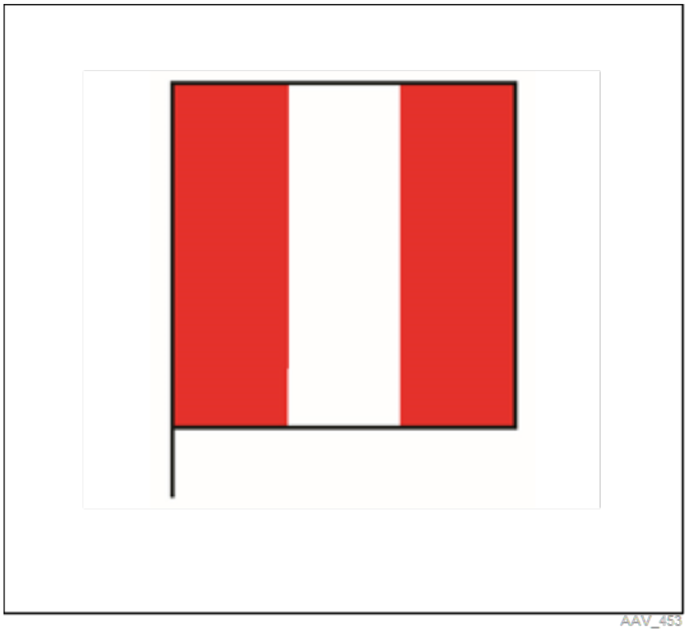


Figure F-38. Beach Red One Flag.

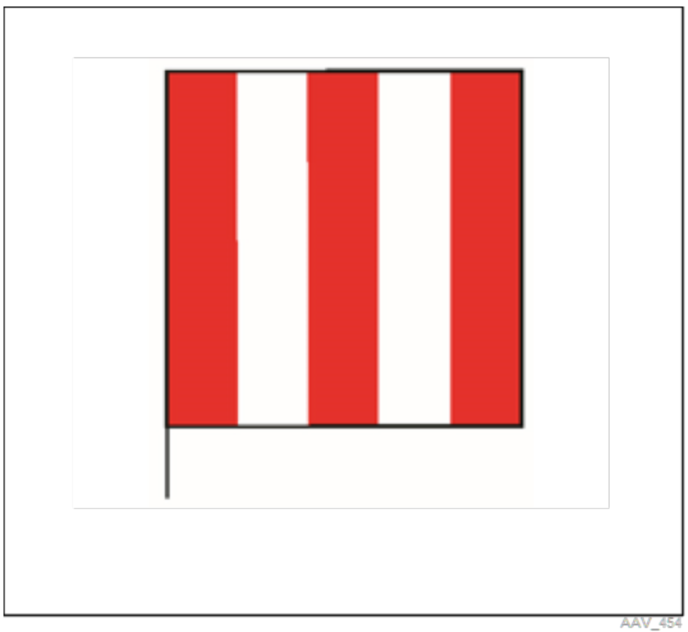


Figure F-39. Beach Red Two Flag.

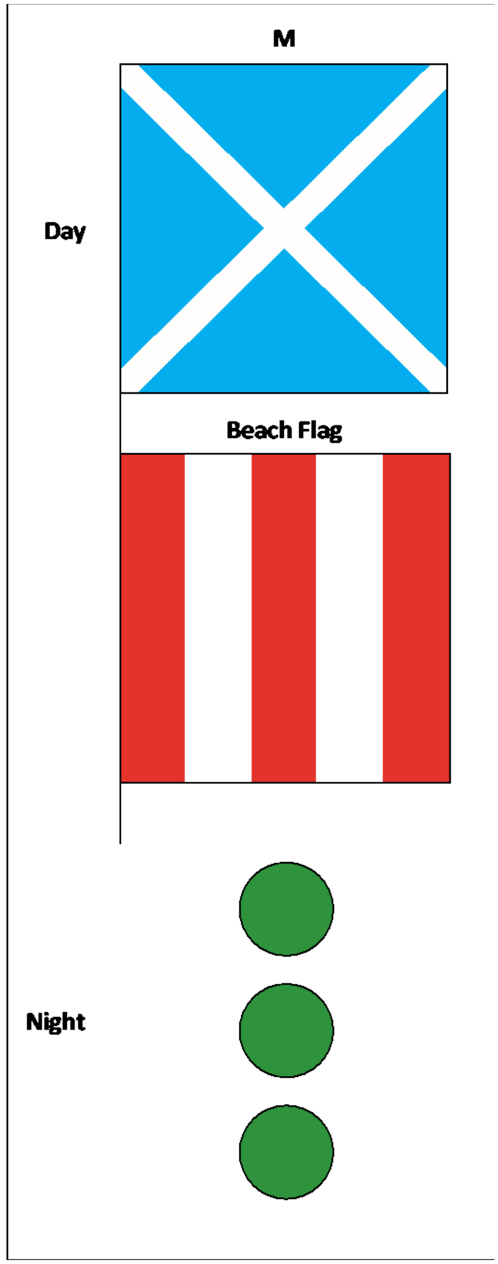


Figure F-40. Medical Boat.

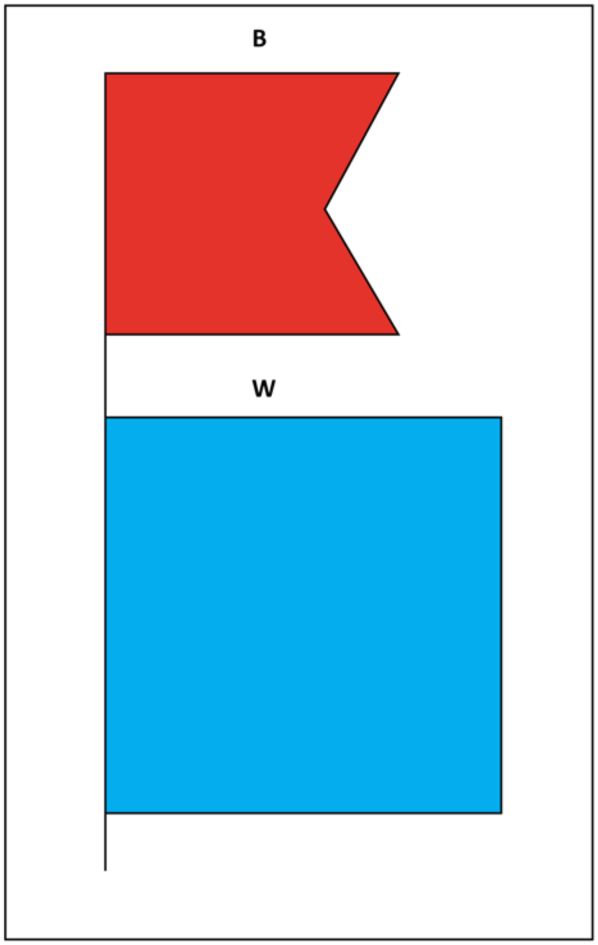


Figure F-41. Senior Beachmaster.

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APPENDIX G
LANDING CRAFT CONTROL PROCEDURES

There are three types of landing craft control procedures: positive, advisory, and independent. The type of control exercised depends on the nature of the mission, the tactical situation, the capabilities of the craft being controlled (including its installed navigation and C2 suite), the command and control capabilities of the PCS and the assigned control team. See MCTP 13-10E, Appendix C (*Landing Craft and Amphibious Vehicle Procedures Using Grid Reference System and Alternate Control Procedures*) for more information on landing craft control procedures and grid construction for boat lanes.

WAVE CONTROL

Prior to debarkation, the craft commanders are issued a grid diagram of the boat lane. Displacement landing craft or waves in the rendezvous area are provided navigational assistance by the PCS to maintain proper distances from the LOD. The control team begins marking the position of each landing craft or wave on the grid diagram as it departs the rendezvous area. As each wave or craft crosses the LOD, the control team advises the craft commanders or LCAC wave commanders of the wave's position via voice radio or flashing light signal. The grid positions may be supplemented with vectors and "early" or "late" information, as necessary. Upon receiving a grid position indicating the landing craft or wave is not in the center of the boat lane or not progressing according to schedule, either the craft commander or the wave commander adjusts course and speed, as necessary, to re-match the schedule. Grid positions are transmitted every minute from the rendezvous area until 200 yards from the beach (or during reduced visibility, all the way to the beach). If corrective action is required, grid positions may be transmitted more frequently.

MESSAGE PARTS

To guide the landing craft waves ashore, the Navy has devised a series of short standardized radio transmissions containing six parts that follow each other in sequence.

Wave Call Sign

The call sign of the wave consists of the wave number and the designated beach for that wave. The following example refers to the first wave going to Beach Red One:

"One Red One."

Message Identifier

The message identifier is the ship's call sign and the words "Grid Posit" (short for grid position). For example:

"One Red One, this is Red Catskill, Grid Posit."

Location of Center Vehicle in the Boat Lane

The location of the center vehicle in the boat lane is the wave's physical location as it is plotted in the CIC. The orientation to the center of the wave is given first. The following example indicates a wave centered in the left side of the boat lane:

"One Red One, this is Red Catskill, Grid Posit, Lima."

The following message indicates a wave centered outside and to the left of the boat lane:

"One Red One, this is Red Catskill, Grid Posit, Lima."

Distance of the Wave from the Beach

The distance of the center vehicle from the beach is reported as a number following the location. The following example indicates a wave that is centered in the boat lane 1,600 yards from the beach:

"One Red One, this is Red Catskill, Grid Posit, Charlie, 16."

To maintain an accurate track of their progress, craft commanders are generally directed to plot their positions each time the PCS transmits its location. This action helps to determine and correct the effects of the winds and seas or any incorrect actions taken. Once reliable radio communications are established, grid position transmissions are not required. The PCS will continue to transmit the grid position "in the blind" and may request visual acknowledgment. Radio or visual receipt is always required for vector or speed changes.

Time in Relation to the Landing Schedule

The time in relation to the landing schedule is how the wave is proceeding in respect to the timeline for movement. The time in relation to the landing schedule is expressed using the phrases *on time*, *early*, or *late*. This portion is followed by a time expressed in minutes. The following example indicates a wave that is right of center in the boat lane, 1,200 yards from the beach, and two minutes behind schedule:

"One Red One, this is Red Catskill, Grid Posit, Romeo, 12, Late 2."

Corrections

The Navy provides direction on how to correct the heading of the wave. These corrections should be transmitted immediately to the wave so it may correct its position. Usually, late time corrections are given only if the wave is more than one minute late. Corrections can take several forms. The following example represents a vehicle that is left of the center and late:

"Vector Right 10 Degrees, Speed Up."

This example represents a vehicle that is right of center and early:

"Vector Left 5 Degrees, Slow Down."

ASSEMBLED MESSAGE

Once the parts are assembled into a complete grid position message, the message tells the wave commander exactly where the wave is in the boat lane and whether or not it needs to correct its heading. The following example indicates that Wave 1, which is going to Beach Red One, is in the center of the boat lane 1,600 yards from the beach and behind schedule one minute:

"One Red One, this is Red Catskill, Grid Posit, Charlie, 16, Late 1, Out."

The transmission ends with "*out*," as there was no vector correction sent, and therefore, no response required.

The following example indicates Wave 2 going to Beach Red One is centered in the left side of the boat lane, 1,400 yards from the beach, and is two minutes late—the wave is directed to vector right five degrees and speed up:

"Two Red One, this is Red Catskill, Grid Posit, Lima, 14, Late 2, Vector Right 5 Degree, Speed Up, Over."

This transmission ends in "*over*" since a vector correction was sent and acknowledging receipt of transmission is required.

BOAT CONTROL AND OPERATIONS NETS

Two nets are designated for each colored beach. The Boat Alpha net is a directed net used by the PCS to pass grid positions and vectors to scheduled waves and landing craft from the rendezvous or underway launch area until they land. The PCS and other ships use the Boat Bravo net to control boats prior to being dispatched to the beach and following wave or craft landing. Landing reports and administrative traffic between the PCS and landing craft are also passed on this net.

CONTROL SHIP COORDINATION NET

If more than one colored beach is being used, the Control Ship Coordination net is established for coordinating the assault or action and providing status reports between the PCO and the CCO. The PCO uses this net to report when each wave is crossing the LOD, when the first wave is 1,200 yards and 500 yards from the beach, and upon touchdown for each wave. This is a type of situation report required between the PCS and the CCO.

PROCEDURES

During amphibious operations, the PCS and AAV waves must track the grids for the units involved. The following procedures ensure situational awareness and that the waves land at the correct location as scheduled:

- Upon launching from the ship, the wave checks in with the PCS on Boat Bravo net. Boat Bravo net is used to control waves from the time they depart the ship until they cross the LOD (or reach their rendezvous point in the case of large-scale operations). Since AAVs are normally launched at or in close proximity to the LOD, the Boat Bravo net is unlikely to be used for long.
- Once the wave crosses the LOD, the AAVs switch to the Boat Alpha net to receive grid positions from the PCS.
- The PCS tracks the wave and fixes the position of each wave on the boat lane diagram in the CIC.
- The boat control team then transmits the AAV wave's position in the prescribed format to the AAV wave commander.
- When receiving a grid position message that indicates the wave is not in the center of the lane and/or is not progressing according to schedule, the wave commander corrects the position and movement of the wave.
- Control officers supplement grid positions with vectors and early or late wave-timing corrections as necessary.
- Grid positions are normally transmitted every minute or as required.
- The last 1,000 yards to the beach are travelled at full battle speed.
- To obtain full benefit from the grid, AAV wave commanders should plot their position each time the controlling station transmits it to obtain a track of the wave's progress. The effects of wind and sea and/or the effects of taking incorrect headings can be determined and corrected on the next launch.

When the AAV wave commander's vehicle contacts the bottom, the wave commander transmits, ***"Touchdown, Touchdown, Touchdown,"*** which notifies the PCS that the vehicles have landed ashore.

APPENDIX H
SAFETY GUIDELINES

Effective safety requires trained and skilled AAV crews, properly oriented passengers, and well-maintained vehicles. Many historical AAV mishaps can be directly attributed to not following proper procedures and safety guidelines. The combination of heavy equipment, high mobility, limited observation, and waterborne maneuvers creates conditions that require strict adherence to instructions and SOPs. Carelessness, recklessness, shortcuts, and inattention can result in serious injury or death to personnel and damage to equipment. Personnel must be instructed, inspected, reminded, and corrected continually about following proper procedures.

RESPONSIBILITIES

Safety is the responsibility of all Marines. However, the supported unit troop leaders embarked on the AAVs and the AA unit leaders share specific responsibilities to ensure safe operations.

Assault Amphibian Unit Leaders

When AAVs are employed, the safety of embarked personnel and the proper operation of the vehicles is the responsibility of the senior AA unit leader. The AA unit leader ensures the safety of personnel on and around the vehicles. The AA unit leader should be the primary advisor to supported infantry units on the safety aspects of AAV operations and the mechanical operability of the AAVs.

Crew Members

The vehicle commander is responsible for the performance of the AAV and the safety of its passengers and crew and is therefore also responsible for briefing embarked personnel on their responsibilities as passengers aboard the AAV. The senior AA unit leader present has the final decision if the safety of the AAV, crew, or passengers is in question. The third crew member advises the vehicle commander of the situation and the physical welfare of the embarked troops. In an emergency, the third crew member is responsible for restoring calm and assisting troops in an orderly evacuation of the vehicle.

VEHICLE EMPLOYMENT

The safety of the crew and passengers embarked in AAVs is ensured through strict adherence to the following guidelines:

- Smoking is not allowed on or in AAVs.
- Embarked troops must wear required personal protective equipment (e.g., helmet, body armor, and eye protection) and must not ride atop the vehicle.

- Troops on foot should give an AAV a wide berth, as the driver's field of vision from a closed-up AAV is limited.
- Open personnel hatches must be secured with restraints when the AAV is moving because unsecured open hatches can inadvertently close on a person's hands or head.
- Personnel riding in the AAV open-hatch area must not ride with their chest extending above the hatch opening (i.e., "nametag defilade").
- Hatches must be closed and locked while the AAV is transiting through the surf zone.
- Front and rear ground guides should be used when vehicles are backing up or moving in congested areas, while troops are on the deck, or during periods of reduced visibility.
- Personnel must stand clear of the ramp area when the ramp is being raised or lowered. In non-tactical situations, the vehicle's horn should be sounded three times before the ramp is raised or lowered. An inoperable ramp should be held with a ramp jack, a sign indicating "ramp held by jack/hoist" placed on the back and inside of the vehicle, and a tow cable attached from the mooring cleats to the tow shackle.
- Plenums should be raised and lowered by a minimum of two personnel; if the plenum springs are bad, at least three personnel should raise and lower them. Personnel must ensure their fingers and toes are clear and that no personnel are inside the engine compartment before lowering the plenums.
- Amphibious assault vehicles should never operate alone, whether on land or in the water; a minimum of two vehicles should operate together.
- The AAV must not be left with the engine running without an operator in the driver's seat.

Amphibious assault vehicles require time for preventive and corrective maintenance. Prior to land and water operations, a pre-operation checklist and pre-water operation checklist must be completed, found in TM 09647A-10/3D with Change 1. Operational checklists should also be provided to focus crew members' efforts during operations, ensuring each vehicle's readiness. Upon completing operations, the after-operation checklist ensures the thorough identification of issues or problems that could affect the vehicle's operational status. Use of this standardized process provides a systematic methodology from which crews perform their duties to ensure the readiness of their assigned vehicles. At least one hour of dedicated preventive maintenance time should generally be planned for every seven hours of operation.

Before an operation, the senior AA unit leader should ensure AAV leaders, vehicle commanders, and crew members receive an operational briefing. At the beginning of each operation, the AA unit leader should ensure that safety orientation classes are conducted for embarking units. The orientation should include the vehicles' employment and capabilities, emergency procedures, and specific training considerations.

WATERBORNE SAFETY

Safety is critical during water operations. During water operations, a minimum of three qualified crew members are required. Embarked troops often have limited experience in waterborne operations, so crews must have a clear understanding of the required equipment, operational requirements, safety criteria, water operating speeds and distances, emergency signals, and embarked troops' safety procedures. In addition, embarked troops must have a clear understanding of what their safety roles and responsibilities are when aboard AAVs in the water. The following definitions must be understood when conducting waterborne operations, including their distinctions:

- **Sinking.** This means that the vehicle's watertight integrity is compromised to the extent that the amount of water entering the vehicle exceeds the amount being pumped out. This situation requires evacuation or egress, based on the specific situation and determined by the vehicle commander.
- **Evacuation.** This is the orderly process of embarked personnel, and possibly the crew, disembarking a slowly sinking AAV.
- **Egress.** This is the orderly process of embarked personnel and the crew disembarking a rapidly sinking or submerged AAV.

Procedures on evacuation and egress must be thoroughly rehearsed prior to conducting operations with passengers.

Bow Plane Employment

An empty AAV7A1 without the bow plane employed will nose down as speed increases. As speed increases, water will enter the driver's station and lead to the vehicle swamping/sinking if the driver fails to respond by decreasing speed or cross-steering the vehicle. This causes an unsafe condition that requires the driver's and troop commander's hatches to be closed when the bow plane is not employed. Prior to entering the water, all hatches (i.e., personnel door, ramp, cargo hatches, driver's hatch, troop commander's hatch, and turret hatch) must be closed and secured. The hatches must remain secured until the bow plane is fully employed.

> Note: The AAVR7A1 is exempt from this requirement due to the lack of a bow plane and the vehicle's weight displacement.

Required Equipment

Operating AAVs is inherently dangerous. This danger is compounded when conducting amphibious operations. Flotation devices and body armor help mitigate some of the risks associated with waterborne operations. All embarked personnel must wear flotation devices while in the water and should refer to the unit SOP for specific instruction. They should also wear body armor and helmets while the vehicle is moving.

During training, Marines should invert their weapons and place them in condition three (i.e., magazine inserted, weapon on safe, and bolt forward on an empty chamber). When exiting the vehicle, they can transition their weapons to condition one.

Vehicles must have the following equipment on board before launching:

- 1 November flag.
- 1 red and 1 white flare for night water operations.
- 2 50-foot tow ropes with spliced eyelets.
- 2 serviceable boat hooks.

- First aid kit.
- Axe mounted on the turret.
- Battle lantern or searchlight.

Operational Requirements

The following reports, checklists, and training must be completed before launching vehicles:

- Pre-water operational checklists must be completed before vehicles enter the water.
- The SUROB reports must be completed before launching AAVs to determine whether the surf conditions meet the minimum safety criteria.
- A waterborne vehicle orientation brief must be given to embarked personnel before the vehicle enters the water. The brief should include the proper use of the lifejacket, the wearing of equipment, and the handling of weapons. In addition, emergency procedures such as the transfer of troops, vehicle abandonment, personnel overboard, and actions for sinking vehicles must be explained and practiced.
- A personnel manifest of the passengers and crew must be prepared before the AAV is launched. The passengers listed on the manifest must remain on board until the vehicle commander authorizes debarkation.
- Launch team inspections must be conducted before the AAV is launched. Supervised by a designated AA unit leader, the launch team inspection ensures the bilge pumps are operational and the AAV is watertight. In addition, the team inspects the vehicle's ramp and ensures the personnel hatch remains secured until the AAV reaches land.
- Surf survival training and qualification should be conducted on an annual basis.

Rescue Teams

A rescue team should be designated before vehicles enter the water, and the rescue team's vehicle number and location should be made known to all hands. Although every vehicle can potentially serve as a rescue vehicle, the rescue team's vehicle is the primary rescue vehicle if an AAV becomes disabled. The rescue team's vehicle must be capable of receiving personnel from a disabled AAV and should have a corpsman embarked. Appendix L gives specific instructions regarding rescue procedures for disabled waterborne AAVs.

Disabled Vehicles. During daylight, the November flag (see appendix F) should be displayed from a vertical boat hook. At night, a searchlight or battle lantern should be turned on and pointed vertically. If the night signal fails, one white flare should be fired into the air.

Sinking Vehicles. During daylight, the November flag should be waved continuously or a red flare should be fired into the air. At night, a searchlight or battle lantern should be turned on and pointed vertically or a red flare should be fired into the air.

LAND SAFETY

Once on land, collisions with other vehicles can result in serious injury or death. Additionally, AAVs are not air-conditioned and can cause heat injury to crews or embarked troops if the right precautions are not followed. The safe operation of AAVs on land depends largely on the environment in which they are operating and the crews' ability to adjust. The following general land safety considerations should be observed:

- A minimum of two qualified crew members should be on board for land operations.
- The AAV's safe operating speed and interval over land is influenced by congested areas, troop locations, equipment or AAV parks, reduced visibility due to dust or fog, wooded areas, terrain, and urban areas.
- During reduced visibility operations when night vision devices are used, operating speeds and distances must be adjusted to compensate for reduced visibility. Rest time must be allotted for personnel using these devices, as night vision devices can cause vision to quickly fatigue.
- AAVs must never be moved without the aid of front and rear ground guides in high-traffic areas.

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APPENDIX I
AMPHIBIOUS ASSAULT VEHICLE QUICK REFERENCE PLANNING CONSIDERATIONS

Planning for any operation begins when the commander receives a warning order or combat order. Concurrent planning is essential to facilitate preparation. Planning should not be conducted by the supported unit alone, but should involve all supporting elements from the beginning stages through completion. Such coordination facilitates the proper employment of AA units and fosters the establishment of an effective combined arms effort between the supported and supporting units. For more information on planning, see MCWP 5-10, *Marine Corps Planning Process*.

Planners use IPB to prepare key intelligence requirements for an operation. Intelligence preparation of the battlespace is employed to identify, assess, and reduce uncertainty regarding the operational environment. Similarly, civil preparation of the battlespace is employed to identify, assess, and mitigate the effects military operations may have on the civilian populace. For more information on IPB, see MCRP 2-10B.1, *Intelligence Preparation of the Battlespace*.

RECONNAISSANCE AND SURVEILLANCE PLAN

The reconnaissance and surveillance plan must be coordinated with higher headquarters to avoid duplication of efforts, to exploit available reconnaissance and surveillance assets, and to reduce the risk of fratricide (i.e., friendly fire) among forces employed in the security area. Amphibious assault vehicles can be used in the reconnaissance and surveillance plan if more capable mobility assets are not available.

DECEPTION PLAN

The noise and dust signature created by moving AAVs can be used to the commander's advantage if part of a deception plan. A land or amphibious demonstration or feint conducted by AAVs may be used to deceive the enemy from identifying the main effort of the attack. Amphibious assault vehicles can be used to highlight a deception plan by occupying a terrain feature and setting up dummy positions during the day, then leaving at night.

INTELLIGENCE REQUIREMENTS

Key intelligence requirements for planning include the following:

- The avenues of approach (both mounted and dismounted).
- The location of potential assembly areas and firing positions for enemy supporting arms.
- The size, composition, organization, rate of movement, capabilities, limitations, and tactics of the enemy force.
- The locations of enemy reserves, fire support, and CSS.
- Enemy C2 systems and nodes/facilities.
- Enemy intelligence capabilities, with an emphasis on enemy reconnaissance capabilities.
- Potential routes, obstacles, and chokepoints en route to the objective.
- A modified combined obstacle overlay reflecting obstacles restricting military movement, key geography, and military objectives.
- Hydrographic and beach surveys.

MANEUVER

The maneuver plan includes (but is not limited to) the following:

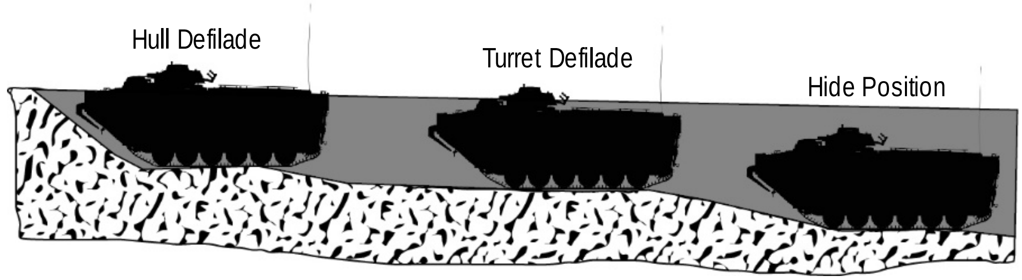
- Counter-reconnaissance and other force protection measures.
- Initial positions to be occupied, prepared, and reconnoitered.
- Withdrawal routes and passage points for the security force.
- Primary, alternate, and supplementary positions for the main battle area forces.
- Counterattack plans.
- Contingency plans to block penetrations or reinforce threatened areas.
- The deception plan.
- Obstacles and barriers (integrated with the fire support plan).
- Plans to draw the enemy into engagement areas.
- Follow-on objectives after the dismount point.
- Immediate actions.

FIGHTING POSITIONS

Defensive fighting positions for AAVs can be constructed by supporting the supporting engineer unit in accordance with the commander's priority of work. When planning for AAV fighting positions, the commander and staff should consider the following:

- The positions employed—hide position, hull defilade position, and turret defilade position (see fig. I-1)—based on the mission, the time available, the amount of engineer support available, and the terrain.
- The cover and concealment available.

- Dispersion (laterally and in depth, with maneuver space between primary, alternate, and supplementary positions).
- Mutual support.
- Standoff range to minimize exposure time to enemy fires.
- Flank shots available.



- Berms attract attention. Dig down, not up.
- Do not put spoil to the front, sides , or rear of the fighting position. Reduce spoil so that it blends into the existing terrain.
- Tie down all antennas and keep reflective surface covered.
- If possible, make sure the fighting position has a covered exit and covered route to the next fighting position.
- Construct overhead cover and add camouflage to create a hide position if time and materials are available.

AAV_056

Figure I-1. Amphibious Assault Vehicle Positions.

LOGISTICS

The availability of the required logistics enables operations, especially when dealing with a mechanized unit. The following are some key points to consider during planning:

- The distance to be traveled or covered.
- Potential refueling, maintenance, or vehicle recovery points.
- Classes of supply that can be carried aboard vehicles.
- The availability of spare parts and their locations.

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APPENDIX J
AMPHIBIOUS WARFARE SHIP LAUNCH TRACKS

The approach a ship uses when conducting an underway launch affects the launch and landing of an AA unit. The most common types of underway launch tracks that the Navy employs are parallel, turn-away, angled, parallel U-turn, and angled U-turn.

PARALLEL

In a parallel launch track, the ship approaches the beach at 30 to 45 degrees, turns left or right parallel to the shore (90 degrees) near the LOD, launches the waves in column, and turns quickly out to sea. The AAVs continue in a column until they are inside the boat lane, where they flank and begin to move toward the beach. This is a popular launching technique because the ship is exposed broadside to the shore for only a short time, the AA unit is debarked on or near the LOD, and the swim time is short. A disadvantage of using this method is the extra travel time required for the second wave to reach the boat lane (see fig. J-1).

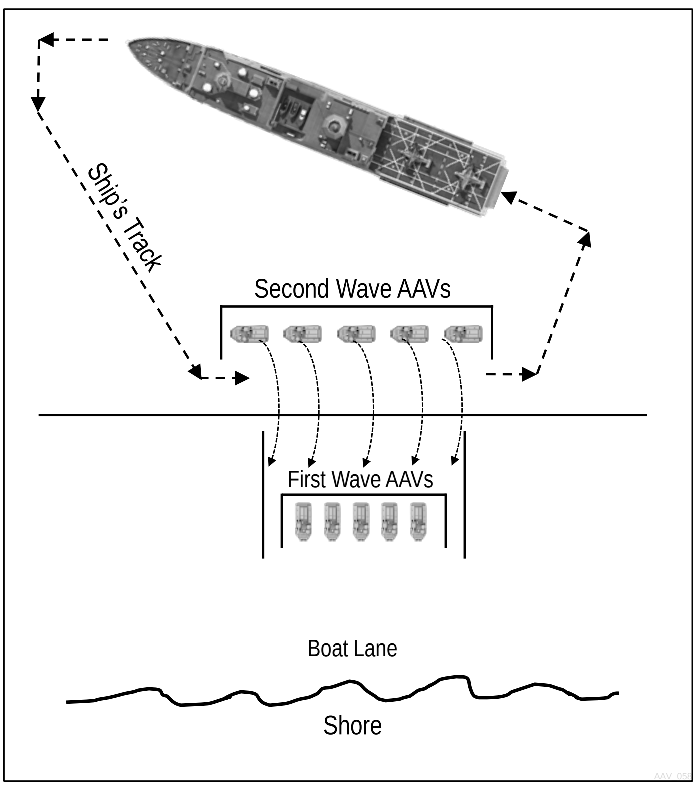

Figure J-1. Parallel Launch of First and Second Waves.

TURN-AWAY

In a turn-away launch track, the ship approaches the beach approximately straight ahead (i.e., zero degrees), conducts a U-turn at the LOD, and launches AAVs in a column headed directly toward the beach as the ship moves away from the beach (see fig. J-2). This pattern minimizes the ship's exposure to the shoreline and launches the wave in column. Although highly effective at disembarking a wave in column toward the beach, this maneuver may result in a long approach for the last vehicle launched.

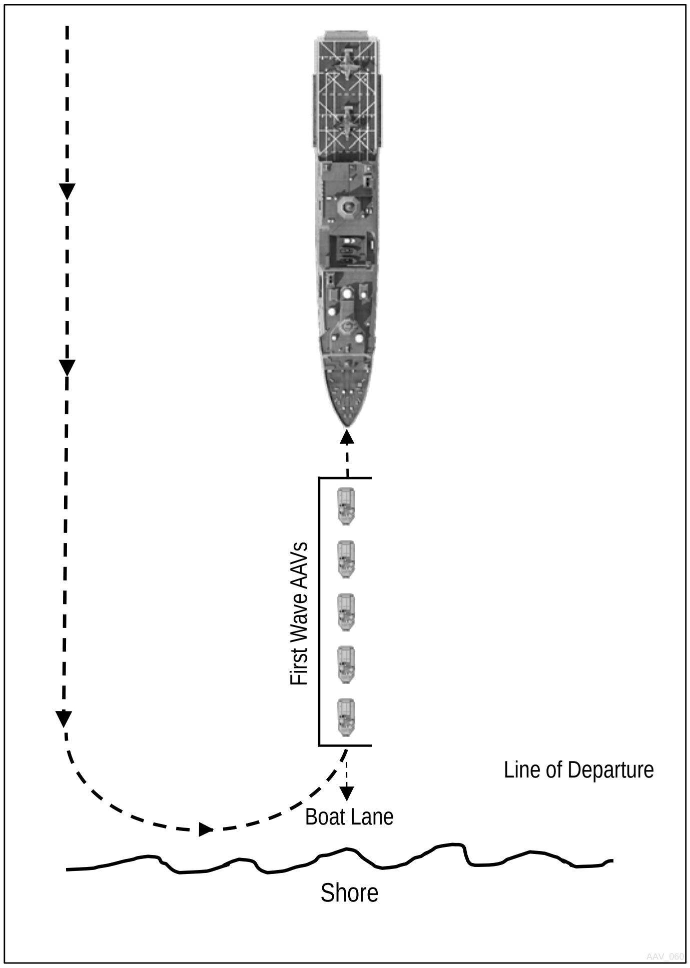

Figure J-2. Turn-Away Launch.

ANGLED

In the angled launch pattern, the ship approaches the shore at a 45-degree angle and begins launching AAVs even with the edge of the boat lane. Once waterborne, AAVs turn toward the shore and approach the LOD (see fig. J-3).

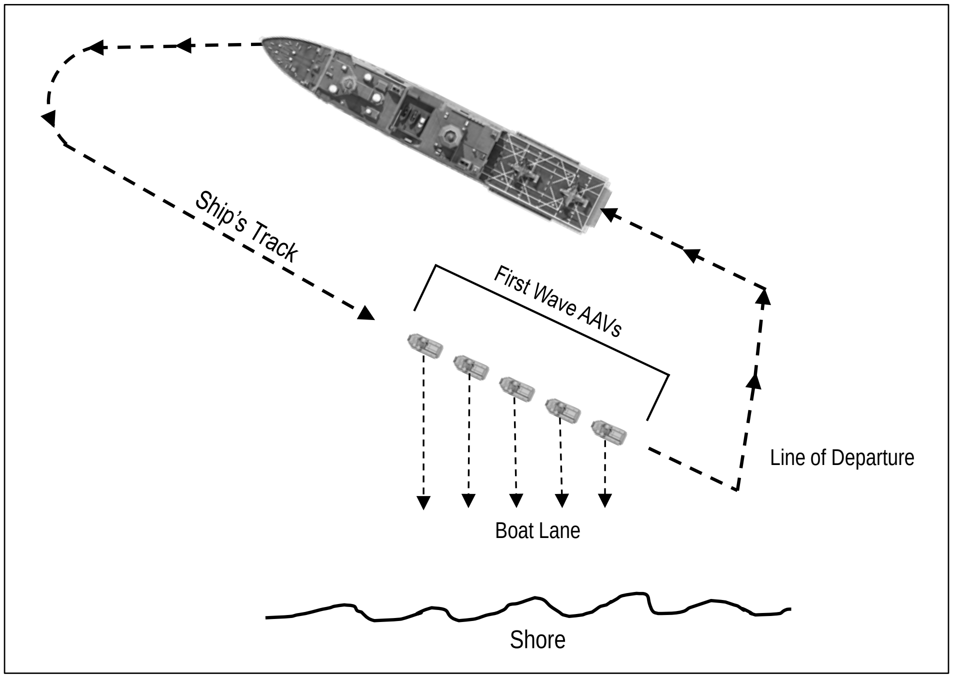

Figure J-3. Angled Launch of the First Wave.

As the ship launches the vehicles closer to the LOD, the vehicles form online and cross the LOD. The ship can then turn away and begin a similar approach on the same boat lane for the second wave (see fig. J-4). Vehicles turn immediately toward the shore and begin to assault. This launch track minimizes static time spent maneuvering in the water.

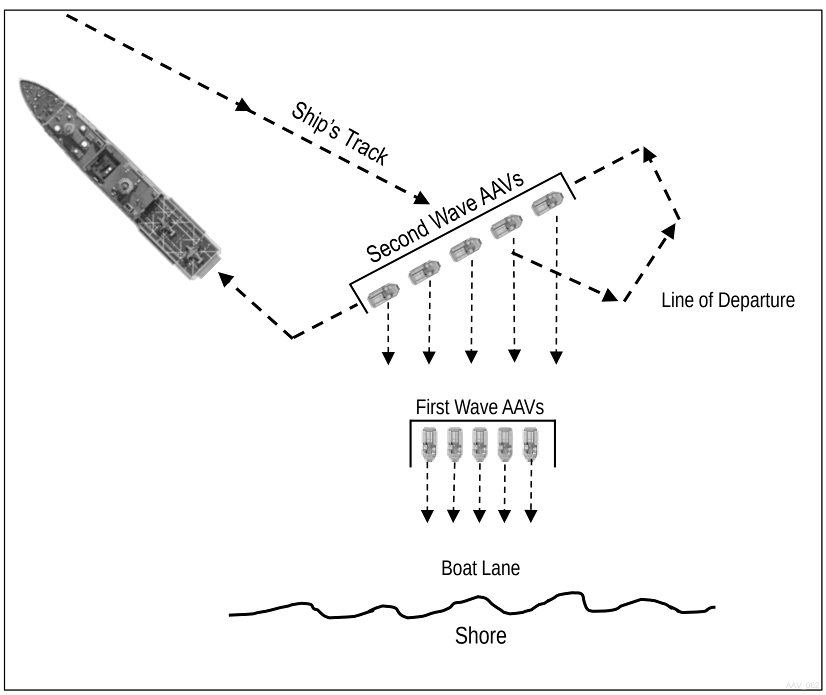

Figure J-4. Angled Launch of the Second Wave.

PARALLEL U-TURN

The parallel U-turn maneuver combines the parallel launch with the basic turn-away launch. The ship approaches the shore parallel and launches AAVs at the edge of the boat lane. Then the ship conducts a U-turn away from the shore, begins launching the second wave at the opposite edge of the boat lane, and completes the maneuver by turning away from the shore (see fig. J-5). This maneuver exposes the ship to the shoreline for the longest period.

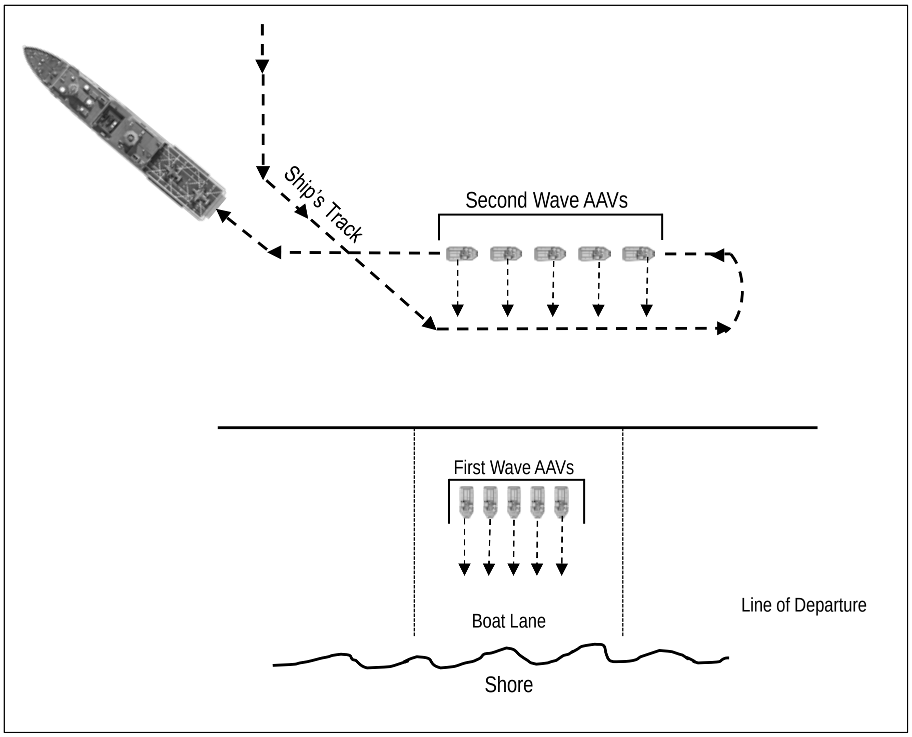

Figure J-5. Parallel U-Turn Launch.

ANGLED U-TURN

The angled U-turn maneuver combines the turn-away and the angled approach paths. The ship initially conducts an angled launch, executes a tight U-turn, and then conducts a parallel launch of the second wave. This maneuver exposes the ship to the shoreline for a slightly shorter period than the parallel U-turn launch track (see fig. J-6).

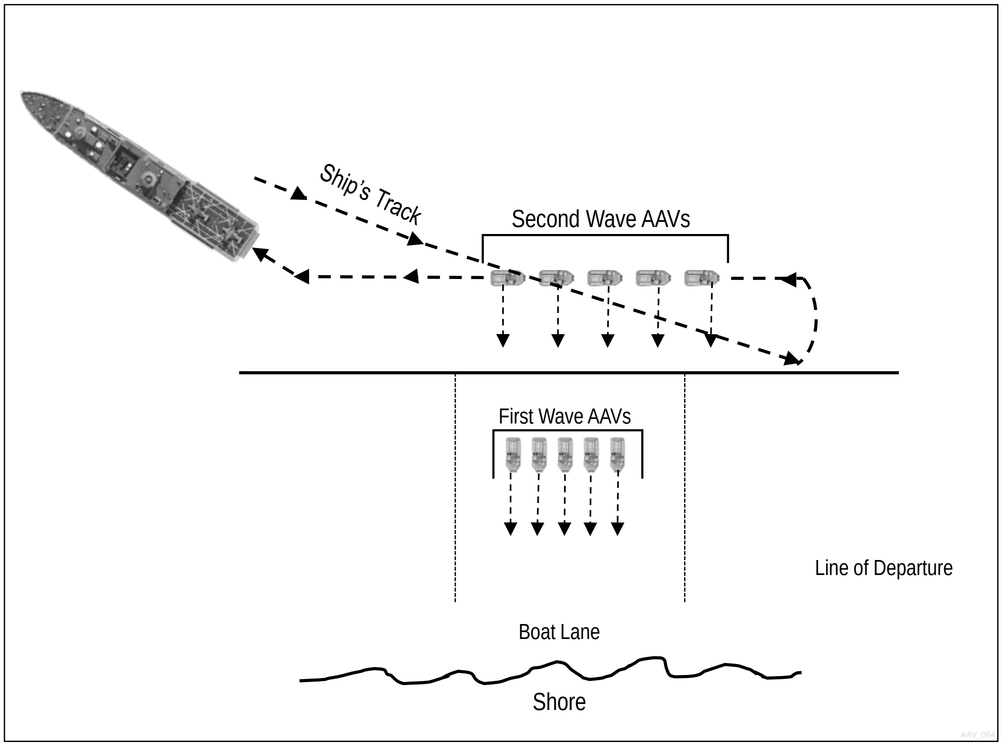

Figure J-6. Angled U-Turn Launch of First and Second Waves.

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APPENDIX K
EMBARKATION AND DEBARKATION PROCEDURES

Specific procedures are followed to safely embark and debark AAVs from amphibious warfare ships. The LSD, LHD, LPD, and LHA (excluding LHA-7 and LHA-8, which lack well decks) can conduct embarkation and debarkation operations for AAVs either by flooding their well decks (i.e., wet loading) or with a dry well deck (i.e., dry loading). The AAV crews should be familiar with each ship's method of debarkation and embarkation, safety criteria, and recovery procedures for disabled AAVs.

Amphibious warfare ships have varying internal characteristics that affect their capacities to carry AAVs. Table K-1 displays the approximate maximum capacities for the classes of amphibious warfare ships. For information on a specific ship, the loading characteristics pamphlet must be consulted.

Table K-1. Ships' Amphibious Assault Vehicle Capacities.

Ship Type	Ship Class	AAV Capacity	
LSD-41	Whidbey Island Class	Well Deck	64
LSD-49	Harpers Ferry Class	Well Deck	27
LPD-17	San Antonio Class	Well Deck	38
LHD-1	Wasp Class	Well Deck	52

METHODS

The following are the methods for AAVs to embark and debark LSDs, LHDs, LPDs, and LHAs (excluding LHA-7 and LHA-8):

- Ship at anchor.
- Ship lying to or with bare steerageway—the screws and rudders used only to maintain the ship's heading into the swells. This method is the least desirable of embarking AAVs. It should not be attempted unless optimum conditions exist.
- By ramp while the ship is moored pierside.
- Ship is underway (debarkation only).

SAFETY CRITERIA

Table K-2 on page K-2 covers the various safety criteria that LSD, LHD, LPD, and LHA (excluding LHA-7 and LHA-8) ships must follow to safely embark and debark AAVs.

Table K-2. Safety Criteria for Amphibious Assault Vehicles Embarking and Debarking Amphibious Ships.

	Stern Gate Position	Vent Fans	Ballast	Water Depth at Sill	Maximum Ship Speed
Debark	0 to -3 degrees[1]	On[2]	Not applicable	6 inches to 1 foot	21.5 knots
Embark	Lowered	On[2]	Steep wedge	4 to 6 feet[3]	3 knots[4]

Notes:
[1] LSD, LHD, LPD, and LHA stern gates should be lowered to an angle level with the well deck. If depressed greater than 10 degrees, the stern gates can interfere with AAVs' abilities to break free from the ship's wake once launched.

[2] LSD-41 class ships do not have vent fans.

[3] The optimal depth for recovery is approximately 4 feet of water at the sill. Ships should ballast to 8 feet to recover a disabled AAV that is being towed by another AAV or when the ship's positioning or steadying lines will be used.

[4] The maximum speed depends on the speed the AAVs are able to make and the water's current speed.

EMBARKATION PROCEDURES

Embarking AAVs onto an amphibious warfare ship can be challenging and dangerous, especially in higher sea states. The following steps should be followed to reduce risk:

- The AA unit should maintain an interval of 50 to 75 meters between vehicles in column to facilitate loading.
- Before the signal to load is received from the ship, the first AAV should position itself approximately 100 meters from the stern, depending on the operational conditions and schedules.
- Before receiving the signal to load, the first AAV driver should retract the bow plane. The troop commander and driver hatches should remain closed during bow plane retraction.
- Upon receiving the loading signal (i.e., green flag or green light) from the ship's crew, the AAV approaches the well bow on. The approach to the ship should be made from directly astern in water-jets mode at 1,500 to 1,800 RPM.
- The AAV driver receives guidance via hand signals from the well deck guides.
- Approximately 30 meters before entering the well, the driver should place the vehicle in first gear to engage the tracks.
- As the AAV approaches the sill, the driver decreases speed and proceeds until the tracks touch down.
- Once in contact with the deck, the driver is ground-guided to pivot the vehicle 180 degrees.
- Directed by the ground guide, the driver backs the vehicle into its parking space. Although less desirable, AAVs may pivot when waterborne using their water-jets and be ground-guided back into their parking spaces.
- To prevent confusion and mishaps, embarked personnel should remain aboard the AAVs until all vehicles have embarked and stopped. Select AAV personnel may disembark to begin preparations to secure the vehicles.

- When directed by the well deck supervisor or petty officer-in-charge, the embarked troops and other AAV crew members disembark and the AAV crews secure their vehicles.

RECOVERY OF DISABLED AMPHIBIOUS ASSAULT VEHICLES

If conditions necessitate a disabled AAV being brought aboard an amphibious warfare ship, recovery safety considerations and procedures must be followed to avoid serious mishaps.

Safety Considerations

The decision to load AAVs in rough seas or in foul weather rests with the AA unit leader and ship's captain. The safety of personnel should be the primary consideration when retrieving a disabled AAV. Other factors to consider include the following:

- The crew's experience.
- The equipment availability to recover the disabled AAV.
- The action of waves within the well and upon the vehicle to be recovered.

Safety Procedures

The disabled AAV is towed by another AAV astern of the ship or to a distance considered safe under the prevailing conditions. When preparing to recover a disabled AAV, the amphibious warfare ship should ballast to eight feet of water at the sill, which provides the towed AAV sufficient room to move into the well before excessive tension is placed on the AAV's tow ropes or the ship's positioning lines. Although the ship's SOP will contain specific embarkation details, the following are general procedures for embarking a disabled AAV aboard an LSD, LHD, LPD, or LHA (excluding LHA-7 and LHA-8):

- When signaled, the towing vehicle pulls the disabled AAV as far into the well deck as possible without causing the towropes to separate.
- Once the disabled AAV is grounded in the well, the towing vehicle slowly backs up, releasing the tension on the tow ropes. Care should be taken not to foul the towing vehicle's tracks with the towropes.
- After the towropes are removed, positioning lines may be attached to maintain the disabled AAV's safe position in the well. Positioning lines may also be used to turn the AAV for backing it into position.
- Once the disabled AAV is secured with lines, the towing AAV moves close enough to the disabled vehicle for AAV personnel to attach a tow bar or tow cables. The towing vehicle then continues to pull the disabled AAV out of the way.
- If the AAV cannot be towed into the well deck to a point where it can be recovered using tow cables or bars, it is secured to the well deck using positioning or steadying lines and fenders/dunnage. Once the ship has de-ballasted and has a dry well deck, the disabled AAV can then be recovered using tow cables or a tow bar.

DEBARKATION

Time Schedule

The time schedule for launching AAVs varies based on operational requirements. Table K-3 is an example format for use planning time estimates.

Table K-3. Example Time Schedule For Amphibious Assault Vehicles' Ship-to-Shore Movement.

Time	Event
H-90	Ship sets condition 1-A. Ballast and sea and anchor details are stationed.
H-85	Time check.
H-85	AAV crews board vehicles, un-gripe the AAVs, and conduct communications checks.
H-80	The ship's exhaust system or tank deck blowers are started.
H-75	AAVs are started and warmed. Pre-operational checks are conducted. AAVs are spotted. Boats to the rails.
H-75	Boats are launched. Radio checks are conducted with boats.
H-70	Boats take station.
H-45	Ship underway.
H-43	Troops load AAVs. Manifests are verified and turned in.
H-18	5-minute standby to launch Wave 1. Wave 1 starts engines.
H-17	Number one flag at the dip.
H-16	5-minute standby to launch wave 2. Wave 2 starts engines.
H-15	AAVs close topside hatches and switch vehicles to water mode.
H-14	Number 1 flag close up.
H-13	Launch Wave 1. 2-minute standby to launch wave 2.
H-12	Wave 1 crosses the LOD. Number 1 flag hauled down.
H-11	Launch wave 2.
H-9	Number 2 flag close up.
H-7	Wave 2 crosses LOD. Number 2 flag hauled down.
H-Hour	Wave 1 touchdown on shore.
H+5	Wave 2 touchdown on shore.

Debarkation Procedures.

The debarkation of AAVs from amphibious ships can be difficult and complicated. The following are recommended procedures for debarkation:

- The AAV crews proceed to the well deck 1 to 1 1/2 hours before launch.
- The petty officer-in-charge, ship's first lieutenant, or AA unit leader direct the AAV crews to remove and stow the gripes.
- The ship's personnel must turn on the well deck blowers or vent fans to high before the AAVs are started.
- The AAV crews conduct preliminary AAV warm-ups at least one hour before launch. Warm-ups in groups no larger than three AAVs at a time ensure the engine exhaust fumes remain within the capacity of the well deck blowers or vent fans.

- AAV crews stand by to embark troops after AAVs have been warmed up, checked, and shut down. Vehicles are only restarted with permission from the AA unit leader or well deck debark control.
- Troops should embark aboard their respective AAVs no later than 30 to 45 minutes before launch and after the AAV engines are shut down. To reduce confusion and prevent injuries, only AAV personnel and necessary ship's crew should move in and among the vehicles until time to load troops.
- Personnel may be required to load through the rear personnel hatch or through the topside cargo hatches if tight spacing between AAVs prevents ramps from opening. The debarkation schedule must allow time for such delays and for inexperienced troops to receive safety briefs and find their way to their vehicles.
- The individual vehicle commanders manifest (or verify pre-made manifests of) all personnel to be embarked in their vehicles.
- The AA unit leader collects, checks, and gives the manifests to the petty officer-in-charge.
- The AAV crews properly mark their AAVs before debarkation during night operations. During night training launches, only blue or red chemical lights are attached to one of each AAV's antennas. Green should not be used, as it is a signal or marker for personnel overboard. If used in combat, chemical lights should be taped so that only the rear portion shows to minimize enemy observation from shore.
- The ship's personnel signal the first wave of AAVs to restart their engines.
- The first AAV then proceeds as directed to the launch line. Red flags (during the day) or red wands (at night) may be used to halt the AAV.
- The AAVs are staged at the launch line with at least three feet of clearance between vehicles, regardless of whether AAVs are launched in a single column or in pairs.
- The ship's personnel use flags to launch the AAVs.
- Each succeeding AAV (or pair of AAVs if launched double) launches when the preceding AAV is clear and the ship's personnel give the signal. The next AAV automatically moves up to the launch line as each lead AAV launches. The signal to launch is a rapid waving of the green flag (during the day) or a green wand (at night).
- The AAVs in the follow-on waves do not restart their engines until signaled to do so by the ship's personnel. This signal is normally given five minutes before the wave's launch.

Warning: Failure to follow procedures may cause injury or death or cause serious delays that affect the mission.

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APPENDIX L
RESCUE PROCEDURES FOR DISABLED AMPHIBIOUS ASSAULT VEHICLES

In any rescue or retrieval operation, the protection of lives takes priority over the salvage of disabled vehicles. Any vehicles disabled in the surf zone fall under the cognizance and control of the AA unit leader in charge of the operation. Detailed rescue responsibilities are designated in the AAV common SOP and/or the operation order. Rescue procedures cannot be anticipated and established for all circumstances that may occur when waterborne. This appendix includes considerations for emergency signals, rescue teams, the transfer of passengers, the retrieval of personnel overboard, towing, special safety considerations, sinking AAV procedures, and crew members' responsibilities. The following factors may influence the rescue of waterborne AAVs:

- The urgency of the situation aboard the vehicle.
- The condition of the sea.
- The number and experience of the passengers embarked.
- The skill of the AAV crew.
- The availability of rescue means or craft.

EMERGENCY SIGNALS

Radio communications concerning disabled waterborne AAVs take precedence over other communications. If the radio is inoperable, the disabled vehicle should use the following visual distress signals:

- Inoperable (day)—Display the November flag attached to a vertical boat hook.
- Sinking (day)—Wave the November flag continuously and fire a red flare into the air.
- Inoperable (night)—Turn on and point a searchlight or battle lantern vertically. If this signal fails, fire one white flare into the air.
- Sinking (night)—Turn on and point a searchlight or battle lantern vertically and fire red flares into the air.

RESCUE TEAMS

Waterborne operations must be conducted with a designated rescue team. The rescue team can be a part of the waterborne operation; it is not required to be a separate entity or element. Regardless of the size of the unit, the unit commander must specifically assign at least one AAV as the rescue team. The tactical numbers and location should be specified in the operation order. The embarked rescue team should have two first class swimmers and a corpsman. The AAV designated as the rescue team should not carry a full load of embarked personnel or cargo, because it must be capable of receiving personnel transferring from a disabled vehicle. The rescue team equipment should include a matched set of nylon towing lines (with spliced eyelets) and one ring buoy with 50 feet of line attached to mark a disabled vehicle in case it sinks. If a ring buoy is not available, an empty water can or life jacket is suitable with the equivalent length of rope to attach to the disabled vehicle.

During waterborne operations, each AAV is a potential safety vehicle and can assist and tow the closest disabled vehicle. The initial concern of the rescuing vehicle's crew is the safety and recovery of embarked passengers and crew. Embarked personnel should be loaded into the designated rescue team vehicle before recovery of the disabled vehicle is attempted. Vehicles will not be towed with embarked troops on board unless a greater physical hazard would be posed by the sea condition or tactical situation in transferring the embarked personnel to another vehicle.

TRANSFER OF PASSENGERS AT SEA

The greatest hazard to AAV crews and passengers at sea is a vehicle sinking. If a vehicle's watertight integrity becomes questionable, the embarked passengers should be immediately evacuated. The vehicle commander embarked aboard the vehicle determines when transfer of passengers at sea is necessary. Troops are transferred using the side-to-side, bow-to-bow, and rough sea methods.

Bow-to-Bow Transfer

A bow-to-bow transfer is the preferred method of transferring troops from a disabled AAV when the sea state prevents a side-to-side transfer (see fig. L-1). Before approach, the safety vehicle's bow planes must be lowered and fender material placed in a position to prevent bow damage. Both vehicles open their starboard cargo hatches, which allows embarking/debarking troops to stand on the port cargo hatches and use the radio cages to climb up or down. After approach, the AAVs are held in position by crew members using boat hooks or handheld lines until the troop transfer is complete.

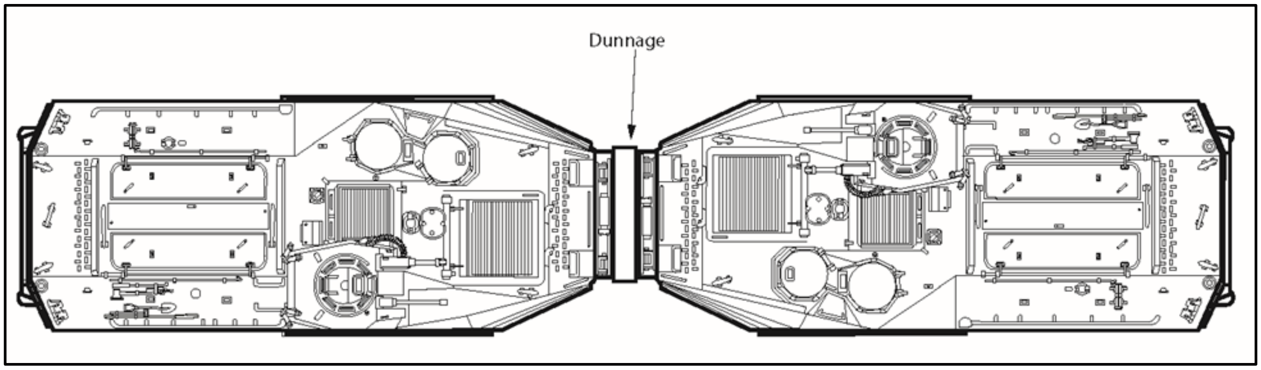

Figure L-1. Bow-to-Bow Transfer Diagram.

Side-to-Side Transfer

The side-to-side method is used in a calm sea state (see fig. L-2). It can be used with either an AAV or a Navy safety boat. The rescuing vehicle comes along the leeward side of the disabled AAV and docks port side to port side using fender material secured to the side of the AAVs. Personnel then exit the disabled vehicle by climbing up the radio grill and stepping across the center bar to the port cargo hatch and then onto the receiving vehicle.

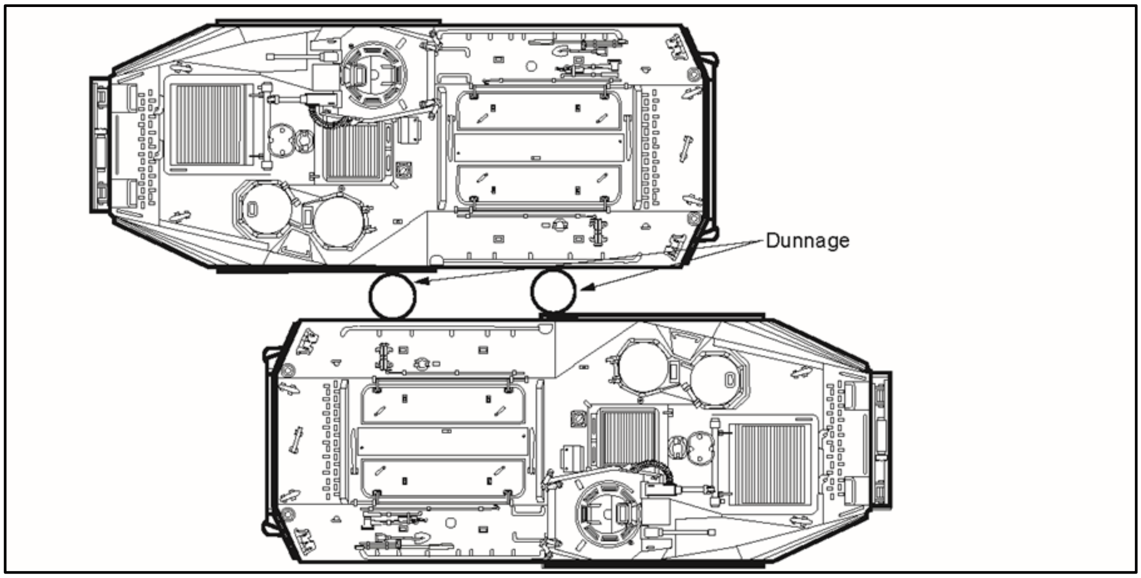

Figure L-2. Side-by-Side Transfer Diagram.

Rough Sea Transfer

Direct transfers should not be attempted in high swells or within the surf zone. In such cases, personnel should enter the water in pairs and swim to the safety vehicle. During transfer, the vehicle commanders ensure the AAVs are in neutral, the brakes are locked, and water jets are not used. The following rescue procedures are used in rough seas:

- Personnel exit through the starboard cargo hatch, move to the other side of the AAV, and prepare to swim to the safety vehicle.
- The safety vehicle should be positioned between 25 to 50 meters away from the disabled vehicle on the windward side (i.e., the wind blowing from the safety vehicle toward the disabled vehicle). This prevents the disabled AAV from coming down on personnel as they swim to the safety vehicle.
- Troops embarked on the disabled vehicle inflate their lifejackets, jump (not dive) into the water, stay with their assigned buddy, and swim to the safety vehicle. The vehicle commander should dispatch personnel in an orderly manner.
- Personnel should use the port and starboard cargo hatches to exit through the top if the disabled vehicle is in danger of sinking. If a safety vehicle is not available, personnel should inflate their lifejackets and swim away from the disabled AAV.

RECOMMENDED TRIGGER POINTS FOR VEHICLE EVACUATION

The vehicle commander is ultimately responsible for the safety of the crew and embarked personnel. The following trigger points are recommendations for evacuating an AAV when waterborne:

- Water at the deck plates—Prepare troops to transfer.
- Water at ankle level—Transfer all embarked personnel.
- Water at bench level—Transfer all crew members from the vehicle.

RETRIEVAL OF PERSONNEL OVERBOARD

Rescue personnel use a boat hook, life ring, or towline to retrieve personnel overboard. Only as a last resort should someone from the safety vehicle enter the water. If required, however, the rescuer should jump with their arms and legs spread wide to keep their head above water and their eyes on the person overboard. The vehicle, with the brake set, should be maneuvered close to the person overboard.

TOWING A FLOATING AMPHIBIOUS ASSAULT VEHICLE

To prepare for towing, the crew of a disabled AAV maintains 1,800 RPM in order to continue bilge operations. Hatches and plenums are closed, watertight integrity is ensured, the transmission is placed in the neutral position, and the mode selector switch is set in the water/track mode. If the hydraulic bilge pumps are not functioning due to an engine failure, the master switch is left on and the electric bilge pumps are activated. Before towing the disabled AAV commences, the crew on the disabled vehicle attempts repairs. If unsuccessful, the AAV is taken under tow. The preferred method of towing an AAV is stern to bow; those procedures are as follows:

- The safety vehicle should be positioned with its stern to the bow of the vehicle being towed. An alternate method involving docking the sterns of both vehicles can be used when the integrity of the disabled vehicle's plenums is in question.
- The disabled vehicle provides the towlines. One end of each of the two 50-foot towlines are passed through the eyes of the towing vehicle's aft mooring bits and secured to the quick release mechanism.
- The port towline is attached through the starboard mooring bit and the starboard towline is attached through the port mooring bit. By crossing the towlines, great control over the disabled vehicle is achieved once it is under tow. Once the two lines are connected, care must be taken to avoid possible backlash injury.
- The crew of the disabled vehicle secures the hatches, except for the turret hatch. The turret hatch of the disabled vehicle should be locked at 90 degrees, with the hatch facing the towing vehicle. The crew of the towing vehicle positions its hatches as follows:
  - The driver's hatch is locked at the combat lock.

    - The troop commander’s hatch is closed and locked.
    - The vehicle commander positions the turret hatch at 90 degrees and locked.
- The towing vehicle commander places the vehicle axe in the turret for ready use to cut the towlines should the quick release mechanism fail.
- The vehicle commander of the towing vehicle looks aft from inside the turret to watch the condition of the disabled vehicle. The third crew member is stationed inside at the rear of the towing vehicle to observe the proceedings from the vision block. Crew members should be evacuated from disabled AAVs that are without electrical power and have lost watertight integrity.
- Hatches should be kept closed on both vehicles until the disabled AAV is towed through the surf zone onto the beach, or onto an amphibious ship, and there is slack in the lines.
- When towing a disabled AAV with another AAV, the appropriate naval authority will determine the final COA. Disabled AAVs should be towed to the nearest safe boat/haven.

Wet-well ships are the preferred platform of amphibious warfare ships. Prior to entering the surf zone, all hatches on both vehicles should be closed and locked. Disabled AAVs should be towed through the surf at a 90-degree angle to the surf line and to a point on the beach where—

- Neither vehicle has tracks in the water.
- Collision between the vehicles is unlikely.
- The disabled AAV will not roll backward.

When this point in the surf zone has been reached, the tow lines can be replaced by tow cables. However, the rescuing vehicle may attempt to tow the disabled vehicle past the surf zone onto the beach, thereby eliminating the necessity of hooking up land towing lines in the surf zone. If the beach gradient is steep or the surf conditions permit, the vehicle may stop before the high-water mark and connect tow cables.

SPECIAL SAFETY CONSIDERATIONS

The following special safety measures should be considered for water operations:

- When conducting AAV water operations, the third crew member must ride in the troop compartment to constantly monitor watertight integrity.
- Planning for water operations should include evacuation drills.
- When planning for water operations in an emergency, the water temperature, sea state, and available of safety vehicles/vessels must be considered to determine the best type of evacuation to employ, brief, and practice.
- When troops and crew are required to evacuate in a combat environment, the vehicle commander, with advice from the supported unit commander, must quickly decide whether to retain individual equipment and weapons.
- After the command is given to evacuate the AAV, crew members must not remain in a disabled AAV that is sinking and without power.

- Only the most experienced AAV crews should attempt to recover an AAVR7A1 because of its unique weight and balance considerations.

Sinking Amphibious Assault Vehicle Procedures

An AAV may sink rapidly, making it impossible to evacuate embarked personnel before the vehicle slips under the surface of the water. A vehicle may sink in three tactical areas of transit—launching, landing, or fording.

Launching

Waterborne operations are inherently dangerous, whether entering the surf zone from shore or debarking from an amphibious ship. Once waterborne, the AAV is subject to the effects of weather and the state of the ocean (or other body of water). Embarked personnel are subject to the frequent violent motion inherent in ship-to-shore or shore-to-shore operations. Additionally, upon entering the water, there is the possibility of operator-induced mechanical failures or other unforeseen circumstances that may result in a vehicle emergency, such as the gradual or rapid sinking of the AAV. During these times, embarked personnel should be at their most alert for guidance from vehicle crew members for instructions on egress procedures (either transferring to another vehicle or immediately abandoning the vehicle). Additionally, upon egress from an AAV in the surf zone, Marines have to survive and overcome the dangers of the surf zone itself. If the vehicle sinks yet remains buoyant (i.e., the top of the vehicle is close to the water surface), to avoid the adverse effects of wave action in the surf zone, the crew members and passengers should stay with the vehicle and await recovery by another AAV rather than abandoning it.

Landing

Exiting the water to shore requires transit through the surf zone, exposing the AAV to rolling off either of its axes. During these times, the embarked personnel should be alert since, if egress becomes necessary, they will have a small window of survivability. Additionally, upon egress from an AAV in the surf zone, the Marines will have to survive and overcome the dangers of the surf zone.

Fording

When the vehicle is not completely (or is sporadically) waterborne, the probability of a partial submersion increases, with an accompanied risk that the AAV will be unable to right itself. A rollover or submersion in this environment may be violent as it subjects the occupants to the immediate jarring effects of an AAV landing on its side or top. Furthermore, if the hatches are open, water will immediately flow into the interior of the vehicle.

Preparations

In addition to the standard pre-water operational checks and safety briefs, there are several other steps that vehicle commanders may perform to increase the survivability of an AAV submersion.

Individual Equipment Storage

Individual equipment should be waterproofed and secured to the exterior of the AAV. All gear stowed within the cargo hold must be secured with cargo straps. If a vehicle submerges, unsecured gear will float to the top of the vehicle and block egress points, essentially sealing the occupants inside the sinking AAV. Additionally, violent motion may cause unsecured gear to become projectiles, potentially injuring embarked personnel.

Seatbelts

During a submersion or rollover, the vehicle may be subjected to violent motion as it sinks. Seatbelts in AAVs provide the same stability for embarked personnel as they do in helicopters. Secured in the seat by the seatbelt, the embarked Marine can locate their reference points, orient themselves relative to the vehicle's interior, and find their way to the nearest exit point.

Conversely, if not secured by the seatbelt, an embarked Marine may find themselves violently thrown about the interior of the vehicle as it rolls in the water, which may result in severe injury or unconsciousness, impeding escape.

Rehearsals

Similar to immediate action drills, egress rehearsals enhance individual and squad survivability in a vehicle rollover or submersion. Embarked personnel should rehearse exiting the AAV in the various submersion scenarios on dry land by doing "walk-throughs" or utilizing an AAV submersion trainer.

Designated embarked personnel are assigned specific duties and tasks in the event of a rollover or submersion that must be rehearsed. Examples include assigning specific Marines to open the cargo hatches or personnel hatch to restore calm and expedite egress.

EGRESS PROCEDURES

In the event of a rapidly sinking AAV, when transferring embarked personnel is impossible, it may not be possible to evacuate personnel before the vehicle slips below the surface. Due to the rapid and violent nature of a submersion, personnel may not be able to remove their individual equipment before exiting the vehicle. Attempts to remove equipment inside the vehicle while submerged will burn energy, consume limited breath, and add to the clutter in the interior, making egress more difficult. The following subparagraphs discuss egress procedures for surface, submerging, and submerged egresses.

Surface Egress

A surface egress may be conducted when the vehicle has flooded with water but is grounded on a sandbar or beach while in the surf zone. Upon command from the vehicle commander, the starboard cargo hatch is opened from the inside. Once the hatch has been locked and secured in the open position, embarked personnel move atop the vehicle two at a time, utilizing the radio cage, and move to the port side of the vehicle. Rear crew members exit last and secure the cargo hatch once topside.

The driver should remain in position until the vehicle commander directs them to exit. A bow-to-bow or side-to-side transfer is then conducted with another vehicle.

Submerging Egress

A submerging egress is conducted when there is minimal or no warning that the vehicle is sinking. Embarked personnel will only become aware of the sinking vehicle due to the rapid rising of water in the cargo area. Once the water reaches the established trigger point, all embarked personnel should immediately egress without command. All Marines unfasten their seatbelts, pre-designated personnel unsecure assigned locks and open both cargo hatches, and all Marines climb out of the vehicle as rapidly as possible. There is the high possibility that some Marines will be forced to exit the vehicle once it has already slipped below the surface of the water.

Submerged Egress

There are four positions that the vehicle may assume in the event of a rollover or rapid submersion:

- 0 degrees—The vehicle is upright resting on the tracks.
- 90 degrees—The vehicle is resting on its starboard side.
- 180 degrees—The vehicle is upside down.
- 270 degrees—The vehicle is on its port side.

0 Degrees. Once the violent motion of the vehicle has stopped, all embarked personnel should gain a reference point on the vehicle and secure themselves with one hand. Once a reference point has been established and the Marines are confident of their location in the vehicle, they should unfasten their seatbelts. Pre-designated personnel will unlock and open all hatches. Personnel should exit the vehicle through all available hatches. Exiting personnel should maintain contact with the vehicle to prevent the loss of orientation while exiting the vehicle. Once free of the vehicle, they should remove their gear and inflate their life preservers.

90 Degrees. Once the violent motion of the vehicle has stopped, all embarked personnel should gain a reference point on the vehicle and secure themselves with one hand. Once a reference point has been established and the Marines are confident of their location in the vehicle, they should unfasten their seatbelts. Pre-designated personnel will unlock and open the starboard side cargo hatch and the personnel hatch. The port side hatch must stay closed due to the weight of the door and the difficulty required to keep it in the open position. The personnel that were on the starboard side of the vehicle may be injured due to loose gear flying around the troop compartment and may require assistance evacuating. Once free of the vehicle, personnel can remove gear and inflate their life preservers.

180 Degrees. Once the violent motion of the vehicle has stopped, all embarked personnel should gain a reference point on the vehicle and secure themselves with one hand. Embarked personnel have to overcome the initial disorientation due to being inverted, in addition to the vehicle sinking. Once a reference point has been established and Marines are confident of their locations in the vehicle, they should unfasten their seatbelts. Pre-designated personnel unlock and open the personnel hatch. All personnel then exit through the personnel hatch. Once free of the vehicle, personnel can remove gear and inflate their life preservers.

270 Degrees. Once the violent motion of the vehicle has stopped, all embarked personnel should gain a reference point on the vehicle and secure themselves with one hand. Once a reference point has been established and the Marines are confident of their location in the vehicle, they should unfasten their seatbelts. Pre-designated personnel unlock and open the port side hatch. The starboard side cargo hatch and the personnel hatch should not be used due to their weight and the difficulty required to keep them open. The personnel that were on the port side of the vehicle may be injured due to loose gear flying around the troop compartment and may require assistance evacuating. Once free of the vehicle, personnel can remove gear and inflate their life preservers.

Crew Member Responsibilities

Table L-1 on page L-10 details the responsibilities of AAV crew members during specific emergency situations.

Table L-1. Crew Members' Responsibilities During Emergency Situations.

Status of Disabled AAV	Crew Chief	Troop Commander	Driver	Third Crew Member
Dead engine (with battery power)	Display the November flag during the day or fire a white flare and use a battle lantern to display a vertical light beam in the air at night. Inform the platoon commander of the situation by radio. Troubleshoot the AAV systems to attempt to regain power. Inform the troop commander of the situation and the steps being taken. Check that the electric bilge pumps are operating. Keep the hatches closed to prevent taking in excess water. Prepare to be towed or to transfer troops. Supervise the troop transfer to a safety vehicle.	Obey the crew chief's commands. Give a warning order to the troops to prepare for evacuation as directed by the crew chief. Assist the crew in maintaining discipline.	Keep the master switch on. Keep the electric bilge pumps on. Shift to neutral. Check the fuel shutoff lever to ensure it is in an upright position. Check the fuel shutoff valve on the deck behind the driver. Attempt to restart the engine. Continue attempts to restart the engine (conserve electricity). Disconnect the hydrostatic steer unit if the engine will not start and prepare for tow or to transfer troops.	Check constantly for watertight integrity and report compromises immediately to the crew chief. Help maintain discipline in the troop compartment. Assist topside with troop transfer.

Table L-1. Crew Members' Responsibilities During Emergency Situations—Continued.

Status of Disabled AAV	Crew Chief	Troop Commander	Driver	Third Crew Member
Dead engine (without battery power)	Display the November flag during the day or fire a white flare and use a battle lantern to display a vertical light beam in the air at night. Troubleshoot the AAV systems and attempt to regain power. Inform the troop commander of the situation and the steps being taken. Keep the hatches closed to prevent taking in excess water. Prepare to be towed or to transfer troops. Supervise the troop transfer to a safety vehicle or into the water.	Obey the crew chief's commands. Inform troops of the situation and prepare for troop transfer or vehicle evacuation. Assist the crew in maintaining discipline.	Shift the engine throttle to neutral. Troubleshoot the AAV systems to attempt to regain power. Disconnect the hydrostatic steer unit and prepare for tow or to transfer troops.	Check constantly for watertight integrity and report leaks immediately to the crew chief. Help maintain discipline in the troop compartment. Assist topside with troop transfer.

Table L-1. Crew Members' Responsibilities During Emergency Situations—Continued.

Status of Disabled AAV	Crew Chief	Troop Commander	Driver	Third Crew Member
Sinking (with power)	Wave the November flag during the day or fire a red star distress signal in the air over the vehicle and use a battle lantern to display a vertical light beam in the air at night. Notify the platoon commander by radio. Open the cargo hatches with assistance from the third crew member. Order embarked troops to execute evacuation procedures. Order the crew to abandon the vehicle. Debark the vehicle after personnel have been evacuated.	Obey the crew chief's commands. Assist the crew in maintaining discipline.	Keep the engine, electric bilge pumps, and headlights on. Lower the seat and evacuate the vehicle through the driver's hatch when ordered by the crew chief.	Check constantly for watertight integrity and report compromises immediately to the crew chief. Help maintain discipline in the troop compartment. Assist the crew chief in opening the cargo hatches. Assist passengers topside. Notify the crew chief when the embarked troops have been evacuated. Evacuate the vehicle when ordered by the crew chief.

Table L-1. Crew Members' Responsibilities During Emergency Situations—Continued.

Status of Disabled AAV	Crew Chief	Troop Commander	Driver	Third Crew Member
Sinking (without power)	Wave the November flag during the day or fire a red star distress signal in the air over the vehicle and use a battle lantern to display a vertical light beam in the air at night. Notify the platoon commander of the situation via voice or flashing light. Order preparations for evacuating embarked troops. Open the cargo hatches with assistance from the third crew member. Execute evacuation procedures. Order the crew to abandon the vehicle. Debark the vehicle after personnel have been evacuated.	Obey the crew chief's commands. Assist the crew in maintaining discipline.	Keep the master switch on. Shift the engine throttle to neutral. Troubleshoot the AAV systems and attempt to regain power. Lower the seat and evacuate the vehicle through the driver's hatch when ordered by the crew chief.	Check constantly for watertight integrity and report compromises immediately to the crew chief. Help maintain discipline in the troop compartment. Assist the crew chief in opening cargo hatches. Assist passengers topside. Notify the crew chief when embarked troops have been evacuated. Evacuate the vehicle when ordered by the crew chief.

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APPENDIX M
CHEMICAL, BIOLOGICAL, RADIOLOGICAL, AND NUCLEAR DEFENSE

The threat of an enemy employing CBRN weapons poses a significant risk to US forces. Additionally, there is risk to deployed personnel from toxic industrial materials that may pose a CBRN hazard. The ability for AA units to operate in a CBRN environment, defend against CBRN attack, operate in a contaminated environment, and conduct decontamination procedures requires regular training and exercise evaluations from the highest supported/supporting unit to the lowest crew/team level. For additional information regarding CBRN operations, threats and hazards, see MCTP 10-10E, *MAGTF Nuclear, Biological, and Chemical Defense Operations* and MCRP 10-10E.4, *Chemical, Biological, Radiological, and Nuclear Threats and Hazards*.

ORGANIZATION

Each AA company organizes organic CBRN teams to fulfill the missions of CBRN protection and hazard mitigation. Additionally, the unit CBRN teams augment the CBRN staff (i.e., CBRN officer and CBRN specialists) at the company levels. Augments are task-organized and trained by CBRN personnel to provide CBRN warning and reporting, CBRN reconnaissance and surveillance support through monitoring and survey functions, and support for decontamination missions. The company CBRN officer and NCO are responsible for ensuring that their company's Marines and CBRN teams are trained in accordance with current policies and directives.

The CBRN officer and NCO advise and assist in the company's CBRN defense activities and in training the different CBRN teams and CBRN defense equipment operators. The CBRN officer and NCO advise the commander on CBRN defense operations and ensure that CBRN defense is included in operational planning when required. Along with the company's medical personnel, the CBRN officer and NCO also advise the commander on operational exposure guidance and decontamination operations. Additionally, they coordinate radiological monitoring and surveillance.

CHEMICAL, BIOLOGICAL, RADIOLOGICAL, AND NUCLEAR ENVIRONMENTAL EFFECTS

Operating in a CBRN environment affects both offensive and defensive AA operations; however, the proper training and equipment diminishes the effects. For more information on CBRN protection and MOPP level considerations, see MCRP 10-10E.8, *Multi-Service Tactics, Techniques, and Procedures for Chemical, Biological, Radiological, and Nuclear Passive Defense*.

Offensive Operations

The risk of exposing protected infantry by dismounting them in contaminated areas must be weighed against the risks inherent in conducting a mounted attack. Ultimately, the pattern of contamination, enemy situation, and duration of the combat operation must be considered when making the decision to attack dismounted or mounted.

Land level MOPP level 4 degrades AA crew members' and embarked infantry's ability to operate by fatiguing them due to the heat and limited visibility/communication provided by field protective masks. Chemical mines emplaced within enemy obstacle systems pose a serious threat to infantry and force them into MOPP level 4. This posture produces the following effects on movement and breaching:

- Movement rates of dismounted infantry are reduced.
- Target acquisition for AAV and infantry is hindered.
- Synchronization of combat assets on the battlefield is more difficult.
- Units move less often.
- Combat support arrives later due to the restricted nature of MOPP gear.
- Unit and CSS trains become larger due to the use of MOPP gear and have to consider the contamination of their supplies.

Defensive Operations

Since MOPP gear prevents personnel recognition at a distance and increases the physical effort needed to move from position to position, delegation of authority is critical. Commanders must anticipate being attacked with chemical agents while conducting a defensive mission. To prepare the initial battle position, the CBRN NCO should analyze the terrain to identify those areas where agents are less likely to accumulate. This helps identify alternate platoon positions.

NUCLEAR DEFENSE

The global proliferation of nuclear materials makes a nuclear threat to friendly or allied forces more likely. A nuclear detonation produces damaging effects through blast, thermal energy, radiation, and electromagnetic pulse. The use of armored vehicles to protect their crews and mounted infantry help minimize these effects.

Electromagnetic Pulse

An electromagnetic pulse is the high-energy, short-duration pulse generated by a nuclear detonation. It can affect electronic equipment by inducing a current in an electrical conductor that can disrupt, overload, and damage unprotected equipment, such as radios and computers.

Use of Armored Vehicles for Protection

Amphibious assault vehicles give reasonable protection from the effects of a nuclear attack. Though their armor and weight provide most of the protection, personnel should take the following steps to enhance protection:

- Get as low as possible inside the AAV. Marines in the vehicle, including the crew members, troop commander, and embarked troops, should get to the deck. Assuming a low position on the deck can reduce the radiation received by a factor of four.
- Keep hatches shut. An open hatch unnecessarily exposes the crew to both blast effects and radiation.
- Secure loose equipment inside the vehicle to prevent injury. The blast wave will throw Marines and unsecured equipment around inside the vehicles.
- Dig in AAVs (hull defilade) or place them in trenches or cuts in the road. This placement will provide limited line-of-sight radiation protection and considerable blast protection. A hull defilade fighting position or trench that allows half of the vehicle to be covered can reduce gamma radiation by a factor of two.
- Face the AAV bow toward the blast. This places the mass of the vehicle's engine between the potential radiation source and the crew. This head-on orientation can reduce the crew's potential radiation exposure to half of that of a broadside exposure. Closing the plenums also reduces radiation exposure.

CHEMICAL/BIOLOGICAL DEFENSE

Chemical/biological defense in an AAV is similar to that for dismounted troops. The AAV does not have a CBRN overpressure capability or any system for protecting those embarked in the vehicle from chemical or biological agents. Because the AAV is not air-tight, aerosols are a distinct danger. When buttoned up, the vehicle only provides cover from direct contact with liquid agents. Marines in the AAV during a chemical or biological attack must wear their CBRN individual protective equipment (i.e., field protective mask and chemical protective over-garment, gloves, and over-boots).

Chemical/biological defense procedures in an AAV are the same as for dismounted troops, with the addition that the personnel vent fan on the AAV should be shut off. Transition to various MOPP levels is determined based on the assessment of possible contamination or attack. When an attack is detected, personnel not in MOPP level 4 should don their protective gear (mask first) as quickly as possible. The unit commander who detected the attack should send a CBRN-1 report to higher headquarters. Once the all clear is sounded or the unit has moved into an uncontaminated area, the contaminated MOPP gear should be exchanged for clean gear as quickly as possible. See MCTP 10-10E for additional information on CBRN threat assessment, CBRN reports, decontamination procedures, and MOPP gear exchange.

DECONTAMINATION PROCEDURES

Amphibious assault vehicles can be decontaminated more easily than other vehicles because AAVs are designed to operate in water and resist water damage. The AA unit commander should ensure their AAVs are decontaminated as quickly as possible after a CBRN attack to prevent spreading contamination, which can occur when troops climb in and out of a contaminated vehicle and spread the agent from the outside to the inside of the AAV, as well as to areas around it. The AA unit has organic CBRN decontamination equipment which can be used to conduct either immediate or operational decontamination to continue the mission or conduct thorough decontamination when conditions allow or at the conclusion of the mission.

Successful avoidance and protection may prevent the need for decontamination; however, due to the large area CBRN weapons can potentially affect, units must be prepared to decontaminate themselves. The primary purpose of decontamination is to restore the unit's combat power and reduce the number of casualties caused by CBRN contamination. When planning and conducting decontamination, the following principles should be followed:

- **Speed.** Personnel should conduct decontamination operations as soon as possible. Direct exposure to some CBRN hazards could be fatal within minutes. The sooner equipment is decontaminated, the less likely it is to absorb the agent or spread to other surfaces.
- **Need.** Decontaminate only what is necessary. Personnel have a limited supply of decontamination resources and should only expend resources only where they are needed.
- **Priority.** Decontaminate the most essential items first; especially the skin if contact occurs. Once wearing protective equipment, personnel should decontaminate operations on clothing, equipment, and vehicles.
- **Limited area.** Personnel should perform decontamination operations near the area where the contamination occurs to limit the spread of contamination to other areas.

Decontamination is conducted on four levels based upon the decontamination principals and METT-T considerations. The four levels of decontamination are *immediate*, *operational*, *thorough*, and *clearance* (see table M-1). Immediate and operational decontamination are time critical and designed to remove life-threatening contamination on personnel and equipment as quickly as possible to save lives and regenerate combat power. Thorough and clearance decontamination are time and resource intensive as they are intended to remove virtually all of the contamination, and are usually conducted as part of a reconstitution effort. These levels are not sequential—they do not have to be performed in order from immediate to clearance. For example, conducting operational decontamination to continue the mission, combined with the natural weathering process, may alleviate the requirement to conduct thorough decontamination. For additional information, see MCRP 10-10E.8.

Table M-1. Decontamination Levels/Techniques.

Levels	Techniques[1]	Purpose	Best Start Time	Performed by
Immediate	Skin decontamination	Save lives and stop agent from penetrating	Before 1 minute	Individual
	Personal wipe-down		Within 15 minutes	Individual or crew
	Operator spray-down		Within 15 minutes	Individual or crew
Operational	MOPP gear exchange[2]	Provides temporary MOPP level 4 and limits agent spread	Within 6 hours	Unit
	Vehicle wash-down[3]			Battalion crew or decontamination platoon
Thorough	Detailed equipment decontamination	Provides probability of long-term MOPP reduction with less risk	When mission allows reconstitution	Decontamination platoon
	Detailed aircraft decontamination			
	Detailed troop decontamination			Unit
Clearance	Unrestricted use of resources	Dependent on type of equipment contaminated	When mission permits	

Notes:
1. The techniques become less effective the longer they are delayed.
2. Performance degradation and risk assessment must be considered when exceeding 6 hours.
3. Vehicle wash-down is most effective if started within 1 hour.

Immediate

Immediately upon becoming contaminated, individuals must decontaminate personnel, clothing, and equipment. Immediate decontamination consists of personnel skin decontamination and a wipe-down of equipment by its operators. It is designed to prevent casualties and permit the use of individual equipment and key systems.

Operational

Operational decontamination is carried out by an individual unit and is restricted to specific parts of operationally essential equipment, materiel, and/or work areas in order to minimize contact and transfer hazards and sustain operations. For equipment and vehicles, operational decontamination limits the spread of contamination and facilitates additional decontamination requirements by speeding up the natural weathering process, possibly eliminating the need for thorough decontamination. Operational decontamination consists of MOPP gear exchange and vehicle wash-down.

A MOPP gear exchange should be performed within six hours of being contaminated due to the inherent performance degradation that occurs the longer a unit is in MOPP level 4. The MOPP gear exchange allows a unit to remove the gross contamination from personnel and equipment and provides temporary relief from MOPP level 4 and a return to an increased operational tempo.

Vehicle wash-down should be performed within six hours of contamination if the mission does not permit a thorough decontamination. This process removes gross contamination and limits its spread.

Thorough

Thorough decontamination reduces and sometimes eliminates contamination. It restores combat power by reducing or removing nearly all the contamination on personnel, equipment, and materiel, permitting the partial or total removal of individual protection equipment and allowing units to maintain operations with minimum degradation. Detailed troop and detailed equipment decontamination are conducted as part of a reconstitution effort when not engaged in combat operations. They require immense logistical support and are personnel intensive. Thorough decontamination removes the unit from performing its primary mission but allows it to return with restored effectiveness. To perform thorough decontamination, AAVs move to a detailed equipment decontamination site based on the type of contamination. Thorough chemical and biological decontamination is a five-step process, whereas thorough radiological decontamination is only a four-step process (see figure M-1).

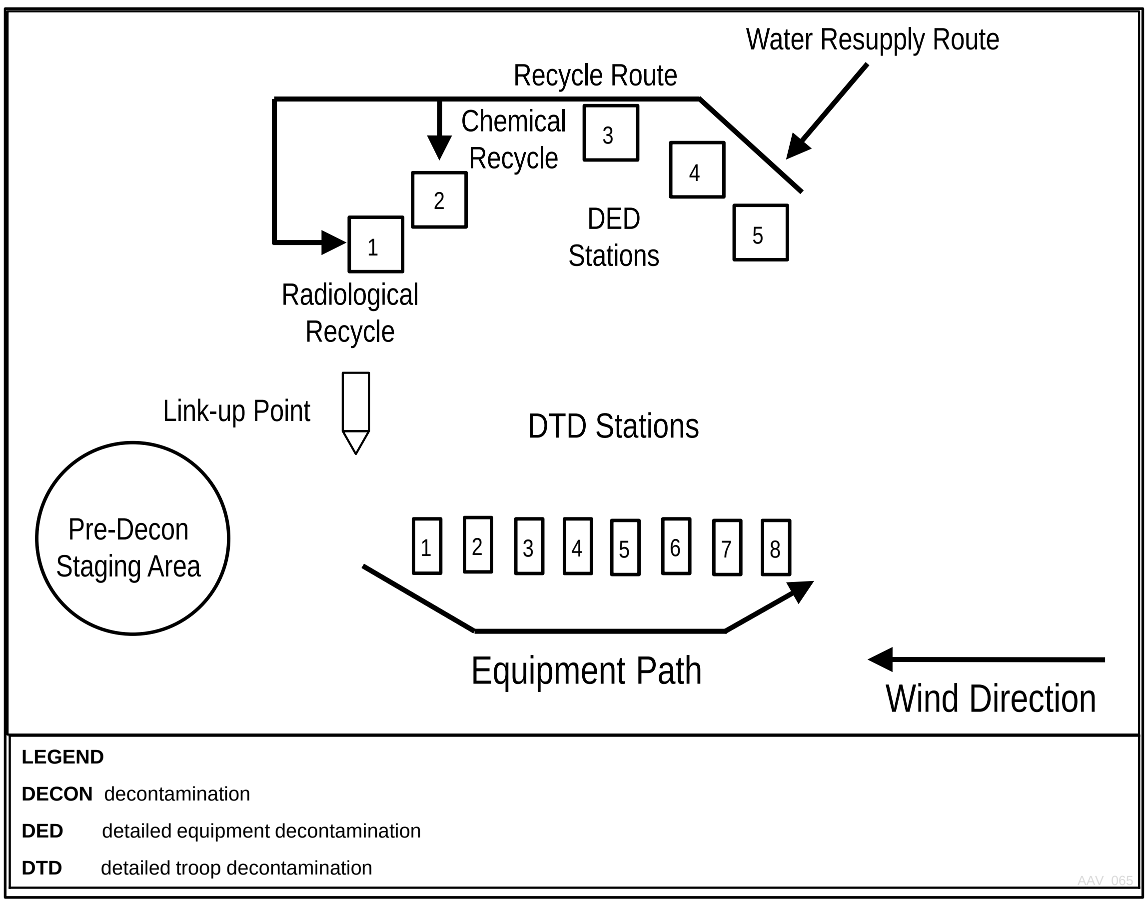

Figure M-1. Thorough Decontamination Station.

Clearance

Clearance decontamination of equipment/personnel accomplishes the decontamination process to a standard that allows unrestricted transportation, maintenance, employment, and disposal. Clearance decontamination consists of a combination of all the techniques and procedures known to reduce contamination to levels below that which can be detected using current detection suites.

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GLOSSARY

Section I: Acronyms and Abbreviations

AA ……………………………………assault amphibian
AAV ……………………………………..amphibious assault vehicle
ANW2…………………………………..Adaptive Networking Wideband Waveform
AOA ……………………………………amphibious objective area
ATF ……………………………………amphibious task force

BLOS ……………………………………beyond line-of-sight
BLT ……………………………………...battalion landing team

C2 ……………………………………...command and control
CATF ……………………………………commander, amphibious task force
CBRN ……………………………………..chemical, biological, radiological, and nuclear
CEB……………………………………..combat engineer battalion
CCO ……………………………………...central control officer
CIC ……………………………………combat information center
CLF ……………………………………commander, landing force
COA……………………………………..course of action
COC……………………………………...combat operations center
CP …………………………………….…………command post
CSS ……………………………………..combat service support

EMS……………………………………..electromagnetic spectrum

FHA……………………………………foreign humanitarian assistance

GCE ……………………………………ground combat element

H&S ……………………………………...headquarters and service
HMMWV ……………………………………...high mobility multipurpose wheeled vehicle

IPB……………………………………..intelligence preparation of the battlespace
ISR ……………………………………...intelligence, surveillance, and reconnaissance

JDAM……………………………………joint direct attack munition
JP ……………………………………joint publication

km……………………………………...kilometer

LCAC ……………………………………landing craft, air cushion
LCE ……………………………………...logistics combat element

LD……………………………………………………………...line of departure *(land warfare)*
LHA ……………………………………………...amphibious assault ship (general purpose)
LHD ………………………………………………...amphibious assault ship (multipurpose)
LOC ……………………………………………………………………line of communications
LOD …………………………………………………line of departure *(amphibious operation)*
LPD ………………………………………………………………amphibious transport dock
LSD ……………………………………………………………………...dock landing ship
LVS …………………………………………………………………..Logistics Vehicle System

MAGTF …………………………………………………………..Marine air-ground task force
MCM …………………………………………………………………….mine countermeasures
MCRP …………………………………………………..Marine Corps reference publication
MCT ……………………………………………………………..……..maintenance contact team
MCTP……………………………………………………...Marine Corps tactical publication
MCWP …………………………………………………..Marine Corps warfighting publication
MEF ………………………………………………………………...Marine expeditionary force
METT-T ……mission, enemy, terrain and weather, troops and support available—time available
MEU ………………………………………………………………Marine expeditionary unit
mm ……………………………………………………………………………………millimeter
MOPP ……………………………………………...mission-oriented protective posture
MOUT ………………………………………………...military operations on urbanized terrain
mph…………………………………………………………………………………miles per hour
MRF ……………………………………………………………………mobile riverine force
MSI ………………………………………………………………………modified surf index
MST ………………………………………………………………maintenance support team
MTVR ……………………………………………………medium tactical vehicle replacement

NCO ………………………………………………………………..noncommissioned officer
NEO ……………………………………………………noncombatant evacuation operation
NIPRNET……………………………………Non-classified Internet Protocol Router Network
NOTM*……………………………………………………………..networking on-the-move
Proposed for inclusion in the next edition of MCRP 1-10.2
NTTP…………………………………………………Navy tactics, techniques, and procedures

OPCON ………………………………………………………………...operational control

PCO ………………………………………………………………..primary control officer
PCS ………………………………………………………………...primary control ship
POL …………………………………………………………..petroleum, oils, and lubricants

RPM ……………………………………………………………………..revolutions per minute

S-3……………………………………………………..operations officer/operations office
S-4 ……………………………………………………………..logistic officer/logistic office
SATCOM…………………………………………………………...satellite communications
SIPRNET……………………………………………..SECRET Internet Protocol Router Network

SOP ……………………………………………………………….standing operating procedure
SUROB ……………………………………………………………………...surf observation

TACLOG ……………………………………………………………………...tactical-logistical
TM……………………………………………………………………………..technical manual
TTP……………………………………………………………tactics, techniques, and procedures

UGWS…………………………………………………………………up-gunned weapons station

Section II. Definitions

amphibious demonstration—A type of amphibious operation conducted for the purpose of deceiving the enemy by a show of force with the expectation of deluding the enemy into following an unfavorable course of action. (DOD Dictionary)

amphibious operation—A military operation launched from the sea by an amphibious force to conduct landing force operations within the littorals. (DOD Dictionary)

approach lane—An extension of a boat lane from the line of departure toward the transport area. (Proposed for inclusion in the next edition of MCRP 1-10.2.)

boat lane—A lane for amphibious assault landing craft, which extends from the line of departure to the beach. (DOD Dictionary)

central control officer—The officer, embarked in the central control ship, designated by the amphibious task force commander for the overall coordination of the waterborne ship-to-shore movement. Also called **CCO**. (DOD Dictionary)

counterattack—Attack by part or all of a defending force against an enemy attacking force, for such specific purposes as regaining ground lost or cutting off or destroying enemy advance units, and with the general objective of denying to the enemy the attainment of the enemy's purpose in attacking. In sustained defensive operations, it is undertaken to restore the battle position and is directed at limited objectives. (MCRP 1-10.2)

cross-attachment—The exchange of subordinate units between units for a temporary period. (MCRP 1-10.2)

D-day—The unnamed day on which a particular operation commences or is to commence. (DOD Dictionary)

envelopment—An offensive maneuver in which the main attacking force passes around or over the enemy's principal defensive positions to secure objectives to the enemy's rear. (Part 1 of a 2-part definition.) (MCRP 1-10.2)

exploitation—(See DOD Dictionary, part 3 for core definition. Marine Corps amplification follows.) An offensive operation following a successful attack that is designed to disorganize the enemy in depth. It extends the initial success of the attack by preventing the enemy from disengaging, withdrawing, and reestablishing an effective defense. (MCRP 1-10.2)

frontal attack—An offensive maneuver in which the main action is directed against the front of the enemy forces. (MCRP 1-10.2)

H-hour—In amphibious operations, the time the first landing craft or amphibious vehicle of the waterborne wave lands or is scheduled to land on the beach and, in some cases, the commencement of countermine breaching operations. (Part 2 of a 2-part definition.) (DOD Dictionary)

infiltration—The movement through or into an area or territory occupied by either friendly or enemy troops or organizations. The movement is made, either by small groups or by individuals at extended or irregular intervals. When used in connection with the enemy, it implies that contact is avoided. (Part 1 of a 2-part definition.) (MCRP 1-10.2)

landing beach—That portion of a shoreline required for the landing of an amphibious force. (DOD Dictionary)

landing craft and amphibious vehicle assignment table—A table showing the assignment of personnel and materiel to each landing craft and amphibious vehicle and the assignment of the landing craft and amphibious vehicles to waves for the ship-to-shore movement. (DOD Dictionary)

landing diagram—A graphic means of illustrating the plan for the ship-to-shore movement. (DOD Dictionary)

line of departure—1. In land warfare, a line designated to coordinate the departure of attack elements. Also called **LD.** 2. In amphibious operations, a suitably marked offshore coordinating line, which is located at the seaward end of a boat lane, to assist in the landing of landing craft and amphibious vehicles on designated beaches at the scheduled times. Also called **LOD**. (DOD Dictionary)

penetration—A form of maneuver in which an attacking force seeks to rupture enemy defenses on a narrow front to disrupt the defensive system. (MCRP 1-10.2)

pursuit—An offensive operation designed to catch or cut off a hostile force attempting to escape, with the aim of destroying it. (MCRP 1-10.2)

reconnaissance in force—A deliberate attack made to obtain information and to locate and test enemy dispositions, strengths, and reactions. It is used when knowledge of the enemy is vague and there is insufficient time or resources to develop the situation. (MCRP 1-10.2)

riverine operations—Operations conducted by forces organized to cope with the unique characteristics of a riverine area and/or to achieve or maintain control of the riverine area. (DOD Dictionary)

sea state—A scale that categorizes the force of progressively higher seas by wave height. (DOD Dictionary)

serial assignment table—A table that is used in amphibious operations and shows the serial number, the title of the unit, the approximate number of personnel; the material, vehicles, or equipment in the serial; the number and type of landing craft and/or amphibious vehicles required to boat the serial; and the ship on which the serial is embarked. (DOD Dictionary)

spoiling attack—A tactical maneuver employed to seriously impair a hostile attack while the enemy is in the process of forming or assembling for an attack. A spoiling attack is usually an offensive action conducted in the defense. (MCRP 1-10.2)

surf zone—The area of water from the surf line to the beach. (DOD Dictionary)

turning movement—A variation of the envelopment in which the attacking force passes around or over the enemy's principal defensive positions to secure objectives deep in the enemy's rear to force the enemy to abandon his position or divert major forces to meet the threat. (DOD Dictionary)

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3-34C Survivability Operations
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12-10A Mountain Warfare Operations
12-10B Urban Operations
12-10C Jungle Operations
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12-10A.4 Cold Region Operations
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09962B-23&P/1 Organizational and Intermediate Maintenance Manual Including Repair Parts and Special Tools List for Launcher, Mine Clearance Mk 154, MOD 1 NSN 1055-01-643-6075
12444B-12&P/1 Operator and Field Maintenance Manual with Repair Parts List for Command and Control System (Networking On-The-Move (NOTM)) Assault Amphibious Vehicle (AAV) Staff Vehicle (SV) Kit
12445B-12&P/1 Operator and Field Maintenance Manual with Repair Parts List for Command and Control System (Networking On-The-Move (NOTM)) Assault Amphibious Vehicle (AAV) Point of Presence (POP)

Miscellaneous Marine Corps Documents
Capabilities Baseline Document for the Amphibious Assault Vehicle (AAV7A1) Family of Vehicles

Navy Publications

Naval Warfare Publications (NWPs)
3-02.12 Employment of Landing Craft Air Cushion (LCAC)

Navy Tactics, Techniques, and Procedures (NTTPs)
3-06.1 Riverine Operations

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